IN THE MATTER OF
THE QUEENSLAND FLOODS COMMISSION OF INQUIRY

A COMMISSION OF INQUIRY UNDER THE
COMMISSIONS OF INQUIRY ACT 1950

AND PURSUANT TO
COMMISSIONS OF INQUIRY ORDER (NO. 1) 2011

STATEMENT OF PETER WILLIAM CARE

I, **Peter William Care**, of c/- 31 Ellengowan Street, Urangan, Hervey Bay, say as follows:

1. I am currently employed by Wide Bay Water Corporation ("***the Corporation***") as Chief Operating Officer.

2. My statement to the Commission has been prepared in reliance upon the documents identified by me to be relevant in the limited time available since I received the statement requirement dated 23 August 2011.

3. I have separately provided to the Commission a response to the information requirement dated 23 August 2011. To the extent that I refer to documents in this statement which are not included in my information response, I have attached these documents as annexures to this statement.

4. By email dated 8 September 2011, the Commission agreed to extend the deadline for the information requirement and statement requirement to 5.00pm on Wednesday, 14 September 2011.

Qualifications and Experience

5. I hold the following qualifications:

   (a) New Zealand Certificate in Engineering (Civil), New Zealand (1980); and

   (b) Registered Engineering Associate (Civil), New Zealand (1982).

6. My employment history may be summarised as follows:

   (a) From 2001 to the present time, I have been employed by the Corporation in various capacities, as follows:

      (i) Since December 2010, I have held my present position as Chief Operating Officer. This role involves management of:

(A) raw water supply systems including dams, pump stations and delivery network to treatment plants;

(B) water, wastewater treatment and network operations; and

(C) an engineering support group, including planning and delivery of the annual capital works program.

(ii) From 2003 to 2010, I was the Director of Engineering Consultancy Services. That role involved:

(A) providing engineering consulting services to the Corporation and other water service providers in Australia, Asia and the Pacific;

(B) development of strategic plans, capital works programs, network modelling and providing operational support to water infrastructure activities of the Corporation and to external water service providers;

(C) development of engineering, procurement and construction management procedures for delivery of capital development projects;

(D) management of planning, design and construction of Lenthalls Dam raising project;

(E) management of planning, design and construction of Burgowan Water Treatment Plant;

(F) management of planning, design and construction of Nikenbah MBR Wastewater Treatment Plant; and

(G) management of water supply project to Adagege (Solomon Islands).

(iii) From 2001 to 2003, I was the manager of Regional Operations. That role involved:

(A) management of the engineering and reticulation operations;

(B) management of service delivery to customers and engineering support, including strategic planning and capital works delivery;

(C) management of planning, design, construction and commissioning for upgrade of Leshan No. 2 Water Treatment Plant, China; and

(D) preparation of planning reports for operational improvements for wastewater treatment plants in Hong Kong and Zhaoquing, China.

(b) From 1998 to 2000, I was Design and Project Manager for the ABI Group / JJB Group. That role involved:

(A) management of design and construction of Thursday Island Wastewater Treatment Plant;

(B) management of design and construction of 70 ML/per day Moorabool Water Treatment Plant, Victoria;

(C) management of design, construction and operation of Woodford Water Reclamation Plant, Queensland; and

(D) management of design, construction and operation of Moonee Wastewater Re-use Plant, New South Wales.

(c) From 1996 to 1998, I was a Senior Engineer - Municipal at Gutteridge Haskins and Davey. That role involved:

(i) design of trunk sewer pipeline for Hervey Bay City Council;

(ii) design of 125 lot subdivision in Mackay;

(iii) management of Queensland Transport services delivery for south-east Brisbane;

(iv) secondment to Hervey Bay City Council as Manager of Water and Wastewater for six months; and

(v) project manager for augmentation of Coolum sewer treatment plant for Maroochy Shire Council.

(d) From 1984 to 1995, I was the Area Manager for Thames Coromandel District Council, New Zealand. That role involved:

(i) management of council activities for east coast communities, including reporting to Community Councils;

(ii) management of financial planning and delivery of rapidly expanding holiday communities on the Coromandel Peninsular;

(iii) management of planning, design, construction and operation of New Zealand's first 100% wastewater re-use project;

(iv) design, construction and operation of water supply schemes for communities of Whangamata, Tairua and Pauanui;

(v) design and construction of various road development projects in Whangamata, Tairua and Pauanui; and

(vi) after amalgamation of local governments, management of water and wastewater design, construction and operation of business units.

(e) From 1975 to 1982, I was the Project Engineer at McConnell Dowell Constructors, New Zealand. That role involved:

(i) tendering for construction projects;

(ii) site engineer for construction of Fergusson Container wharf and terminal, Auckland;

(iii) surveyor and project engineer on construction of various gas pipelines in central North Island;

(iv) surveyor and project engineer on construction of pipeline projects in South Island; and

(v) project manager for:

(A) upgrade of Mangere Sewerage Treatment Plant, Auckland;

(B) construction of sewerage overflow pipeline to Wanganui River;

(C) construction of Wanganui Ocean Outfall into Tasman Sea; and

(D) the Gas to Gasoline Pipeline in New Plymouth.

The Dam Raising Project

7. The Lenthalls Dam ("***Dam***") was constructed in 1983-84 by the former Hervey Bay/ Woocoo Water Supply Board and was subsequently operated by the Hervey Bay City Council ("***former Council***") (now Fraser Coast Regional Council). The Dam is now owned and operated by the Corporation, which was constituted on 1 January 2002. Before 1 January 2002 "Wide Bay Water" was a business unit of the former Council.

8. In this statement, references to "Dam Raising Project" are taken to mean the project for the raising of the full supply level ("***FSL***") of the Dam from RL 24.0m to RL 26.0m by the installation of "Crest Gates" onto the existing spillway crest of the Dam. The Dam Raising Project provided an additional storage capacity of approximately 11,375ML (with a total storage capacity of approximately 28,400ML, as defined in the *Mary Basin Resource Operations Plan* ("***Mary Basin ROP***")). This description of the "Dam Raising Project" is consistent with the approval and design documents referred to in my statement. However, for the sake of completeness, I note that the Mary Basin ROP describes the raised Dam FSL as EL 25.86m AHD and not RL 26.0m. This discrepancy has arisen as a result of a resurvey of benchmarks used during the construction of the Dam. For the sake

of consistency, I will refer to the elevations in the approval and design documents throughout this statement.

Background to Dam Raising and Gates Design

9. I was not personally involved in the early stages of the Dam Raising Project, and in particular, I was not involved in the process for selecting the design for the gates system. I became involved with the Dam Raising Project in about January 2001. My involvement with the Dam Raising Project mainly involved managing the acquisition of land, the approvals and the design processes. In providing the summary of the Dam Raising Project which follows, I have had regard to the following key documents:

- *Environmental Impact Statement – Lenthall's Dam Raising Project* (October 1996) prepared by Gutteridge Haskings & Davey Pty Ltd ("***EIS***");
- *Raising Lenthall's Dam* (November 1996) prepared by John Wilson and Partners Pty Ltd ("***1996 JWP Report***");
- *Raising Lenthall's Dam – Addendum to Report* (November 1996) prepared by John Wilson and Partners Pty Ltd ("***Addendum***");
- *Lenthall's Dam - Raising Full Supply Level by Two Metres with Gates on Spillway* (December 1997) prepared by John Wilson and Partners Pty Ltd ("***1997 JWP Report***");
- *Options for the Raising of Lenthall's Dam – Supplementary Report* (December 2000) prepared by SunWater ("***Supplementary SunWater Report***");
- *Environmental Impact Statement – Lenthall's Dam Raising Project – Addendum Report – Reduction in Height of Dam Raising* (March 2002) prepared by Montgomery Watson Harza ("***EIS Addendum***");
- *Lenthall's Dam Full Supply Level Raising Project – Planning Report* (May 2005) prepared by Evans & Peck ("***Evans & Peck Report***");
- *Raising of Lenthalls Dam and Associated Works – Technical Specification* (May 2005) prepared by GHD ("***Specifications Report***"); and
- *Report for Lenthall Dam – Data Book* (November 2007) prepared by GHD ("***Data Book***") which includes:
  - *Lenthall Dam Raising - Design Report* (May 2006) prepared by GHD ("***Design Report***");
  - *Lenthalls Dam - Probable Maximum Flood Review* (October 2004) prepared by GHD;

- *Lenthalls Dam – Dam Break Analysis* (June 2002) prepared by SunWater; and
- *Lenthalls Dam - Summary of Dam Failure Impact Assessment* (July 2002) prepared by SunWater.

10. The concept of raising the Dam level dates back to the original construction of the Dam in 1983-84, when the idea of raising the FSL from RL 24.0m to RL 30.1m was first identified as the "second stage" of the Dam development. This history is briefly described in section 1 of the 1996 JWP Report.

11. Subsequent to the construction of the Dam, reports developed by the former Council, identified a need to raise the FSL of the Dam to RL 30.0m to address population growth in the community. This raising of the FSL was originally proposed to take place in 1998.

12. In about 1995 or 1996, the former Council engaged GHD to develop the EIS for the raising of the Dam by 6.0m to RL 30.0m. The EIS identified a number of environmental concerns with a raising of this magnitude, in particular the impact to the Wongi Waterholes, an area of importance to the local indigenous community.

13. The 1996 JWP Report commissioned by the former Council identified options for raising the Dam level, including a gated system, to either RL 26.0m or RL 28.0m. The report expressed concerns with a raising to RL 30.0m due to the potential inability of the Dam to pass floods in line with ANCOLD guidelines. John Wilson & Partners identified that a gated system (as opposed to a solid wall raise) may address these concerns. In the Addendum, the advantages of a gated spillway are considered.

14. On or about 16 December 1996, the former Council adopted a recommendation to proceed with the raising of the Dam by 6.0m in a special meeting. The recommendations adopted by the former Council at that meeting are set out in the *Hervey Bay City Council Special Meeting (Report No. SPC51)* dated 11 December 1996.

15. In December 1997, John Wilson and Partners completed the 1997 JWP Report. This report concluded that the 2.0m raising would provide water security for at least 10 years.

16. On or about 6 May 1998, the former Council adopted a resolution at an ordinary meeting to proceed with a 2.0m raising of the Dam. The resolutions adopted by the former Council are contained in the *Minutes of the Ordinary Meeting No. 1* (6 May 1998).

17. The Supplementary SunWater Report dated December 2000 considered the use of "TOPS Gates" and "Crest Gates" for raising the existing spillway. At that time, the patents for both gates systems were owned by Flowgate Projects Pty Ltd ("***Flowgate***"). The report recommended that the "Crest Gates" option be adopted for the Dam Raising Project.

Included in the Supplementary SunWater Report was a risk assessment prepared by GHD entitled *Lenthalls Dam Raising – Risk Assessment for Comparison of Gates and Concrete Ogee Spillway Options* (undated). That GHD report recommended the use of "Crest Gates" for raising the FSL to RL 26.0m.

18. The Supplementary SunWater Report contains the conceptual designs and operational procedures for the Flowgate "Crest Gates".

19. On 31 January 2001, the former Council considered a report entitled *Raising Lenthalls Dam – Concept Design Report* in an ordinary meeting. This report recommended the adoption of the Flowgate "Crest Gates" option and progressing the detailed design process on that basis.

20. In 2001, the Corporation engaged GHD to undertake the detailed design of the "Crest Gates" for the Dam Raising Project. Flowgate, the owner of the "Crest Gates" design, was engaged by GHD as a sub-consultant on the Corporation's recommendation.

21. While the "Crest Gates" conceptual design identified in the SunWater Supplementary Report had previously been successfully installed as part of new dam projects, the design had never been used to raise an existing dam. Further, the Flowgate "Crest Gates" design had previously been used only on "straight crest" as opposed to curved "ogee crest" like the Dam. For that reason, as part of its detailed design work, GHD had to modify the conceptual designs.

22. The former Council, and later the Corporation, had engaged in discussions with the relevant State and Federal Government departments on the approval process for the Dam Raising Project from 1996 onwards.

23. In March 2002, the EIS Addendum was finalised. The EIS Addendum considered the impacts of raising the FSL of the Dam by 2.0m (reduced from 6.0m as considered in the EIS).

24. The State and Federal approvals for the Dam Raising Project were in place by 2006. Page 10 of the Evans & Peck Report identifies the approvals and the status of outstanding approvals for the Dam Raising Project at that time. Also, the Executive Manager's Report to the Board (Item No. 6.1) provides an update regarding the approvals as at 13 March 2006.

25. In May 2005, GHD provided the Specifications Report which included detailed drawings and technical specifications to be used by the Corporation to develop a tender document for award of the construction contract. The construction contract for the Dam Raising Project was awarded to Geotechnical Engineering in April 2006 with the intention that the contract

works would be completed by November 2006. A number of design issues throughout the construction process delayed completion of the works until February 2007.

26. I recall that the main cause of the delay was the need to redesign the support structure for the gates, to accommodate the curved (not straight) spillway structure. The construction contract was put on hold while the redesign was completed.

Description of Crest Gates and Operation

27. In summary, the gates system is comprised of four 14.8m wide gates (Gates 1, 2, 4, 5) and one 9.8m wide gate (Gate 3) which is centrally positioned between the other gates. All of the gates are 2.0m in height. The gates are designed to automatically open as water levels in the Dam rise. As water levels rise, Gate 3 is designed to open first followed by Gates 2, 4, 5 and 1 in succession.

28. Gate 3 is designed to start opening when the Dam level reaches RL 26.15m, followed by the other gates in succession at 50mm intervals.

29. The SunWater Supplementary Report and the Design Report describe the gates system and how it operates.

Key Operational Documents and Personnel

30. The key operational documents for the Dam are as follows:

- Operation and Maintenance Manual ("***O&M Manual***") (contained in the Design Report in the Data Book);
- Standard Operating Procedures ("***SOPs***");
- Emergency Action Plan ("***EAP***"); and
- Data Book.

31. The *Lenthalls Dam Safety Conditions Schedule* (July 2007) ("***Conditions Schedule***") requires the Corporation to develop the above operational documents, having regard to the Conditions Schedule and the *Queensland Dam Safety Management Guidelines* (February 2002). The Conditions Schedule is attached as Annexure 1 to this statement.

32. The key personnel with operational responsibility for the crest gates are defined in the EAP.

33. The EAP identifies different "trigger events", including the actions and procedures which the Corporation needs to follow during a flood trigger event or a forecast flood trigger event. The Treatment Manager is primarily responsible for administering the EAP.

34. The EAP requires the Corporation to maintain contact with the Dam Safety Regulator ("***DSR***"), upstream landowners and the Local Disaster Management Group ("***LDMG***") in certain flood events. Under the EAP downstream landowners do not need to be notified during flood events by the Corporation.

Maintenance of Crest Gates

35. The SOPs and O&M Manual define the actions to be undertaken in maintaining the operational performance of the Dam including the crest gates. The Corporation generally follows these procedures in undertaking maintenance as defined in these documents.

36. In summary, the gates are tested and operational maintenance is undertaken annually at the time of the first Spring rains (see item 4.2 of the O&M Manual). This will involve flushing inlet pipes, discharge pipes and air vents. As part of the operational maintenance work, the Corporation does not open the gates unless the flow can be secured in a downstream impoundment.

37. The crest gates were not capable of being operationally commissioned until a flood event occurred, as a flood event was necessary to establish that the gates operated automatically as Dam levels rose and fell during a flood event. A large enough flood event did not occur until February 2008. The February 2008 flood event revealed that the gates did not operate as designed. Subsequent flood events confirm that the operational issues with the crest gates have not been resolved. These flood events and operational issues are discussed in my statement below.

Flood Events Post - 2006/07 Wet Season

38. Since completion of the Dam Raising Project, there have been 7 flood events which have exceeded "trigger event" 4.5 as defined in the versions of the EAP which applied before and during the 2010/11 wet season. The version of the EAP in force during the 2010/11 wet season was Revision 11 (October 2010). This version of the EAP (and the earlier superseded versions of the EAP) defines "trigger event" 4.5 as the point where the reservoir level is approaching RL 26.10m and either further rain is forecast or the reservoir level is rising. At this trigger event, the gates are not operational but are forecast to become operational.

39. I have provided an account of each of these 7 flood events below, based on my recollection of these events and where I do not have specific recollection, to the various event logs, incident reports and correspondence available to me in the time available.

40. During the February 2008, the May/June 2008 and the March 2010 flood events described below, I did not have operational responsibility for the crest gates but I provided engineering support to the operators of the gates. For that reason, I did not generally

have any direct involvement in communications with upstream landowners or the LDMG during these events. I did, however, correspond with the DSR and upstream owners on behalf of the Corporation at certain times during this period.

February 2008 Flood Event

41. The Corporation maintains a daily record of water levels at the Dam and associated water infrastructure operated by the Corporation ("***Water Log***"). The Water Log is contained in Annexure 2 to this statement.

42. According to the Water Log, heavy rainfall in the catchment commenced on 5 February 2008 with the water levels in the Dam peaking on around 12 February 2008 at RL 27.41m. During the flood event, water levels in the Dam rose to the point where the crest gates should have become operational (RL 26.15m). However, as the water rose, none of the gates opened as designed.

43. An account of the flood event in February 2008 and the failure of the crest gates to operate as designed is provided in the letters dated 10 March 2008 and 6 June 2008 from the Corporation to the DSR. These letters are contained in Annexure 3 to this statement.

44. At the time of the flood event in February 2008, the EAP and the O&M Manual were in draft form. There was no event log or incident report prepared for this event.

45. During and following the February 2008 flood event, the Corporation sent email updates to the DSR regarding water levels in the Dam, the performance of the gates and proposed modifications to improve the performance of the gates. All of the relevant emails I have been able to locate in the time available between the Corporation and the DSR are contained in Annexure 4 to this statement.

46. During the flood event, the Corporation received advice from GHD about the appropriate method for manually opening the gates during the flood event (see letter dated 15 February 2008 from GHD to the Corporation at Annexure 5). In this letter, GHD indentified that the likely cause of the gates failure was excess of pressure on the gate lintel seals which prevented them from dropping during the flood event.

47. During a site inspection on 25 February 2008, the gate orifice plate outlets on each of the gates were altered to reduce the flow from the gate and increase the volume of water within the gate during filling to assist the gates in lowering. It was also identified at that time that the gate seals would need to be modified. The modification is referred to in the 6 June 2008 letter to the DSR referred to in paragraph 43 above.

48. In response to the failure of the gates during the February 2008 flood event (and subsequently during the May/June 2008 flood event, discussed in paragraphs 60-64

below), the Corporation implemented a program of works to adjust the lintel seals ("***Seal Improvement Program***") in accordance with advice received from GHD. The Seal Improvement Program is discussed at paragraphs 54-59 below.

49. Separately, the Corporation engaged to GHD to prepare a report to investigate the impact of the February 2008 flood event on upstream properties, including properties owned by the [redacted]). The [redacted] property is, in part, bounded by Doongul Creek and Logbridge Creek (also known as Powell Creek) both of which flow into the Dam. Mr [redacted]'s property adjoins the southern boundary of the [redacted] property. Access to both properties is through a causeway which was constructed as part of the Dam Raising Project. This causeway was damaged from flows during the February 2008 flood event.

50. During and following the February 2008 flood event, the Corporation was in contact with the [redacted] regarding access issues and damage to the causeway. All of the relevant emails around this period between the Corporation and the [redacted] that I have been able to locate in the time available are contained in Annexure 6 to this statement.

51. In the report titled *Lenthalls Dam Flooding Draft Report* (February 2009) ("***2008 Flood Report***") GHD considered impacts on access to the farmhouse situated on the [redacted] property, relative to various flood events in Doongul and Logbridge Creeks. The main conclusion in the 2008 Flood Report was that the increase in water level in a 1% AEP flood event with a total failure of the gates would trigger a 0.43m increase in water level at the farmhouse (compared to the scenario where all gates operated as designed). The relative water level difference in a 50% AEP event given an "all gates fail" scenario is similar (an increase of 0.33m). The various scenarios are captured in the subsequent letter dated 25 March 2009 from GHD to the Corporation, which also includes a review of the potential flood impacts to the farmhouse had the Dam Raising Project not been undertaken at all.

52. By letters dated 5 March 2009 and 14 May 2009, the DSR provided comments in relation to the findings in the 2008 Flood Report, particularly in relation to the flood immunity of the [redacted]'s farmhouse (see letters from the DSR at Annexure 7 of this statement).

53. The General Manager's Reports to the Board (which I understand went to the Board and 23 March 2009 (Item No. 7.1) and on 10 July 2009 (Item 7.2)) contain a summary of the 2008 Flood Report.

Seal Improvement Program

54. GHD's investigations into the gates failure following the February 2008 and May/June 2008 flood events led to the preparation of the *Report for Lenthalls Dam Raising – Lintel Seal Adjustment for Crest Gates* (November 2008) (***Seal Adjustment Report***). This report identifies and evaluates the cause of the inoperability of the crest gates during the events and the available rectification options.

55. Before the Seal Adjustment Report was finalised, a series of interactions took place between the Corporation, GHD and Flowgate in an effort to determine a solution. Trials on potential seal modifications were undertaken in Bundaberg and alternative seals were considered.

56. The Corporation implemented the crest gates Seal Improvement Program in accordance with the recommendations in the Seal Adjustment Report between about December 2008 and January or February 2009. These works were performed by Geotechnical Engineering and involved construction of stop logs to enable the removal of the gates and modifications to the seals to reduce the friction loads on the seal plates.

57. Following completion of the Seal Improvement Program in January or February 2009, wet testing of the crest gates was undertaken in accordance with the procedures outlined in the *Report for Lenthalls Dam – Spillway Crest Gates Wet Testing Procedure* (March 2009) prepared by GHD. Testing with water levels below RL 26.0m showed that the gates were operational following the improvement program.

58. During the Seal Improvement Program, the Corporation implemented the Manual Operations Procedure (***Manual Procedure***) dated September 2008. The Manual Procedure was acknowledged by the DSR by letter dated 29 September 2008 (contained in Annexure 8 to this statement).

59. The General Manager's Report to the Board (Item 7.1, referred to in paragraph 53 above) contains a summary of the Seal Improvement Program.

May/June 2008 Flood Event

60. At the time of the flood event, the Corporation had not received the Seal Adjustment Report or the 2008 Flood Report from GHD. The Seal Improvement Program had not been implemented.

61. According to the Water Log, rainfall in the catchment commenced on 29 May 2008 and on 31 May 2008, water levels in the Dam exceeded the gates operational level of RL 26.15m. The water levels continued rise until they peaked at RL 26.64m on 3 June 2008. As with the February 2008 flood event, the gates did not operate as designed.

62. A description of the flood event and the performance of the gates is provided in the letters dated 18 June 2008 and 27 June 2008 from the Corporation to the DSR. These letters are contained in Annexure 9 of this statement. I am unable to locate an event log or incident report for this event.

63. On 19 June 2008, officers from the DSR, Peter Allen and Ron Guppy, attended site to inspect the crest gates. Prior to that meeting, the DSR sent a list of matters for discussion with the Corporation during the meeting (see emails dated 4 June 2008 and 16 June 2008 from Ron Guppy to me at Annexure 10 of this statement).

64. Following the site inspection the Acting Chief Executive Officer sent the 27 June 2008 letter to the DSR (referred to in paragraph 62 above).

March 2010 Flood Event

65. An event log for this flood event entitled *Lenthalls Dam Event Log (March 2010)* was prepared by the Treatment Manager, in accordance with the requirements of the EAP. The relevant event log provides an account of the actions taken and communications that occurred during the flood event.

66. According to the Water Log, rainfall in the catchment commenced on 1 March 2010. As set out in the event log, peak water levels were reached on 6 March 2010 at RL 26.451m. Gates 2 and 4 operated automatically as designed during the event. Attempts were made to manually open Gates 1 and 5 by opening the valves. However these attempts failed in relation to both Gates 1 and 5. Eventually Gate 1 was opened using an hydraulic jack, but all attempts to open Gate 5 failed. Initially, Gate 3 did not open as designed. However, Gate 3 opened automatically on 9 March 2010 as the Dam level dropped on 7 March 2010.

67. During the flood event, the Corporation communicated with the [redacted]. The details of these communications is set out in the event log.

Preparation for 2010/11 Wet Season

68. I was not appointed as Chief Operating Officer to the Corporation until 1 December 2010 and accordingly, I was not directly involved in preparation for the 2010/11 wet season until that date.

69. In October 2010, the Corporation undertook a "Disaster Simulation" exercise to test the Corporation's preparedness for a major event, namely a tropical cyclone. The exercise included a consideration of the potential impacts to the Dam and how those events would be managed. Information on the exercise and how it transpired is set out in the meeting minutes dated 29 October 2010. I did not personally attend this exercise.

70. Media coverage had identified that the coming wet season could be very 'wet'. As a result the Treatment Manager, Fitters Supervisor and I had a number of informal discussions regarding staff support for the Dam gate operations, if the need arose. No minutes were kept during these meetings.

71. In preparation for the wet season, manual testing of the gates was undertaken in November 2010. As part of this testing, all gates had their air vents and water discharges cleared. During the testing Gates 1-4 opened as designed, but Gate 5 required external hydraulic assistance to open. This testing was undertaking in accordance with gate exercising procedures in the SOPs and O&M Manual. The Lenthall Dam Maintenance Log (November 2010), the 12 November 2010 Report and the internal emails dated 2 November 2010, 18 November 2010 and 16 December 2010 from the Treatment Manager to other personnel provide a summary of the maintenance undertaken on the gates during November 2010. These documents are contained in Annexure 11 to this statement.

72. A number of flood events occurred during the 2010/11 season. The Board Report (Report No. 17) dated 12 January 2011 provides an overview of the flood events that occurred during the 2010/11 wet season and the operation of Dam gates during those flood events.

12 December 2010 Flood Event

73. Details of the 12 December 2010 flood event are provided in the *Lenthall Dam Event Log – 12/12/10* and the *Lenthall Dam Incident Report – 12/12/10* prepared by the Treatment Manager. An overview is also provided in the Board Report referred to in paragraph 71 above.

74. Inflows had been recorded in the Dam from 1 December 2010 with significant flows experienced from 12 December 2010. The event log indicates that the EAP "trigger event" 4.5 (RL 26.10m) was reached at 7:10am on 12 December 2010. The manual valve for Gate 5 was then opened in an effort to lower the Dam levels to manage forecast inflows. However, as at 9:20am Gate 5 had not opened.

75. An attempt was then made to manually open Gate 5 using a hydraulic jack. This attempt was also unsuccessful. The Treatment Manager then issued instructions for the manual valve for Gate 1 to be opened to lower Dam levels. At 10:00am on 12 December, manual opening of Gate 1 was successful with water levels at RL 26.17m. In normal operating procedures, Gate 1 is the last gate to open during a flood event. However to manage forecast inflows the decision was made to open Gate 1 earlier.

76. Gate 2 opened automatically as designed and Gate 4 was manually opened to further address predicted inflows.

77. The Dam levels peaked 11:00pm, reaching a level of RL 27.70m (defined as EAP "trigger event" 4.7). Gates 3 and 5 remained closed for the entire duration of the flood event. Although Gate 1 was manually opened, Gate 1 closed when the Dam level reached 550mm above FSL and reopened some hours later as the dam level continued to fall. Gate 1 should have remained open until water levels had dropped to 350mm above FSL.

78. During the flood event, the Corporation communicated with the DSR, personnel from the LDMG and the [redacted] on a number of occasions in accordance with the EAP requirements. The details of these communications are set out in the event log. In particular, the [redacted] were first notified on 12th December 2010 at 7.10am that there was a flood event. The LDMG were notified at 11.53am of the flood event and the DSR was notified at 1.53pm. Again contact was made with the LDMG at 1.58pm and the [redacted] at 2.13pm at which time the Treatment Manager was notified that the [redacted] had left their property. The LDMG were again notified at 9.05pm and the Corporation continued to monitor Bureau of Meteorology sites throughout the evening.

17 December 2010 Flood Event

79. Details of the 17 December 2010 flood event are provided in the *Lenthall Dam Event Log – 16/12/10 – 22/12/10*, the *Lenthall Dam Incident Report – 16/12/10* and in the email dated 17 December 2010 from me to the DSR. A brief overview is also provided in the Board Report referred to in paragraph 72 above.

80. Rainfall created large inflows to the catchment area on 15 December 2010. Based on forecast rain to the Dam catchment area, I made a decision on 15 December 2010 to open Gate 1 in an attempt to control the rate of the Dam level rising.

81. On 6.00pm on 16 December 2010, compressed air was used to blow clear one of the Gate 1 vent pipes to restore air flow . Following this procedure, the manual valve of Gate 1 was opened. As outlined in the incident report, after some difficulty Gate 1 was successfully opened at 9:40pm, when the Dam level was RL 26.09m (no gates would normally have opened at this point).

82. Within a few hours of manually opening Gate 1, it became evident to me that the rate of rise in water levels could not be adequately controlled with only one gate open. As the Dam levels continued to rise, at 8:05am on 17 December 2010, attempts were made to manually open Gates 4 and 5 using a hydraulic jack. These attempts were not successful. All of the gates, except Gate 1, were closed at this stage even though the Dam level was above RL 26.54m. At this point all of the gates should have been operational.

83. At 10:50am on 17 December 2010, the Dam level had peaked at RL 26.78m. At this point, based on the change in water flow and observations by the Treatment Manager and the Ranger, Gate 1 appeared to be partially closed. None of the other gates had opened during this flood event. The Dam level slowly fell until 7:04pm on 18 December 2010, when it reached RL 26.48m. After that the Dam level once again continued to rise.

84. At 5:00am on 19 December 2010, the Treatment Manager developed a proposal to manually open Gate 2 by clearing the vents. However, at 8:00am on 19 December 2010, I aborted the vent clearing task, as the weather and Dam levels made it unfeasible for the work to be carried out safely.

85. At 12:40pm on 20 December, the Dam level once again peaked, having reached RL 26.89m. At this point the Dam level began to fall. As the Dam level fell, Gate 2 was manually opened at 5:51am on 21 December 2010. The Dam level was RL 26.46m at 6:00am, at which time all gates should have opened.

86. At 6:14am, manual valves for all of the gates were opened. As a result, Gate 1 fully opened at 6:45am. At 6:55am, attempts were made to manually open Gates 4 and 5 using a hydraulic jack. These attempts were unsuccessful. The manual valve on Gate 2 was left open overnight in order to lower the Dam level.

87. During the flood event, the Corporation communicated with the DSR, the LDMG and local residents on numerous occasions in accordance with the EAP. The details of these communications are set out in the event log.

Temporary Solution

88. Following the 12 December 2010 flood event, I had engaged in discussions and correspondence with GHD personnel in order to find a solution to the operational problems with the crest gates. It was clear to me that there was a problem with the air venting system in the gates.

89. During these discussions, GHD accepted my opinion that the air venting system was the cause of the failure of the gates to open as designed. A temporary solution was then identified. This involved the drilling of an 11mm hole on top of the access hatch on each of the gates to allow air entrapped within the gates to be released (***Temporary Solution***).

90. On 21 December at 7.10pm, with GHD personnel on site, we drilled a hole into the access hatch on Gate 1 as per GHD's recommendation. We then trialled the operation of Gate 1 by manually opening it. The manual tests proved that the gate would operate with the Temporary Solution in place.

91. To facilitate safe access to the other gates we had to close Gate 2 to drop water levels to RL 26m. On 22 December 2010, Gate 2 was closed with water levels at 25.79m. Personnel from the Corporation then drilled holes on the top of Gates 2-5.

92. I have discussed the status of the Temporary Solution in paragraph 113 below.

23 December 2010 Flood Event

93. Details of the 23 December 2010 flood event are provided in the *Lenthall Dam Event Log – 22/12/10 – 29/12/10* and *Lenthall Dam Incident Report – 22/12/10.* A brief overview of this flood event is also provided in the Board Report referred to in paragraph 72 above. This incident commenced with rainfall in the catchment area on 22 December 2010.

94. On 22 December 2010, the Treatment Manager and I made arrangements regarding the availability of equipment and personnel to deal with the flood event, particularly given the Christmas and New Year period. It was decided that over this period either the Treatment Manager or I would be available at all times.

95. During this flood event, with the exception of Gates 1 and 5, all of the gates appeared to open as designed. However, I did have some concerns that these gates were not remaining open as designed during the event. In particular, I could not be sure that whether Gates 2, 3 and 4 were closing or partially closing during the event.

96. A subsequent report prepared by GHD titled *Lenthalls Dam Flooding December 2010 Event* (August 2011) (***2011 Flood Report***) confirmed that while the gates did operate during the early stages of the flood event, as the water levels in the Dam rose, the gates malfunctioned and shut closed. The report also notes that the gates appeared to work again once the water level dropped.

97. It was unclear why Gate 5 failed to perform as designed. This issue is still the subject of ongoing investigations by GHD on behalf of the Corporation. Gate 1 had eventually opened during the flood event but only with external force applied by hydraulic jack.

98. During the flood event, the Corporation communicated with the DSR, personnel from the LDMG and the upstream property owners, including the [redacted], in accordance with the EAP requirements. The details of these communications are set out in the event log.

6 January 2011 Flood Event

99. Following the previous events the gates were kept open to lower the Dam level to RL 25.82m. The Water Log indicates that rainfall in the catchment area started on 3 January 2011 and the water levels peaked on 8 January 2011 at RL 26.94m.

100. An event log was not prepared in relation to this flood event. However, I believe that notifications were made to the [redacted] and the LDMG on 7 January 2011 in accordance with the EAP requirements.

101. To the best of my recollection, Gates 2, 3, 4 opened as designed during the flood event and Gate 5 did not open. On 11 January 2011, we decided to close the manual valve on Gate 1 and leave the manual valve open on Gate 2 until 6.00am on the following day to keep water levels down to manage inflows.

Post 2010/2011 Wet Season

102. During and following the 2010/11 wet season, concerns were raised by the [redacted] regarding the contact procedures under the EAP. The concerns are summarised in the Board Report referred to in paragraph 72 above. I understand that the Chief Executive Officer of the Corporation met with the [redacted] to discuss the EAP contact procedure in late January 2011. The changes to the EAP implemented as an outcome of concerns raised by the [redacted] during the wet season and in that meeting are summarised in the memorandum from the Chief Executive Officer dated 26 January 2011.

103. I also had concerns that the notification trigger in the EAP needed to be reviewed as, in my view, the trigger levels were occurring way too early. For example, "trigger event" 4.4 in the EAP occurs at RL 25m and "trigger event" 4.5 at RL 26.1m. Both of these occur before the gates become operational. This requires the Corporation to notify various stakeholders, including the LDMG and upstream landowners, too early causing undue alarm.

104. Following the 2010/11 wet season, the Corporation instructed GHD to review the EAP trigger limits in light of recent rainfalls.

105. Under the latest version of the EAP (Revision 12, August 2011), former "trigger event" 4.4 is now trigger "F1" which occurs at RL 25.7m and former "trigger event" 4.5 is now trigger "F2" which occurs at RL 26.2 m. Also the contact details for the [redacted] have been updated in the EAP.

106. The [redacted] also raised concerns about access to the farmhouse during the 23 December 2010 flood event. Following the flood events over the 2010/11 wet season, the Corporation instructed GHD to review the 2008 Flood Report. In the 2011 Flood Report, GHD identified that the 23 December 2010 flood event was a less than 20% AEP flood event. However, as the gates had not functioned as designed during the flood event, water levels in the Dam had been indicative of a higher magnitude event, in the order of 2% AEP.

107. The 2011 Flood Report also confirmed that the findings of the 2008 Flood Report remained unchanged, in particular, in respect of the flood impacts to the [redacted] farmhouse.

108. Since the flood event in the 2010/11 season, I am not aware of any changes to any other procedures relating to the operation of the Dam. However, as discussed below, there are ongoing discussions with GHD about the Temporary Solution, which may lead to amendments to the operational documents in future.

109. Separately, the Corporation instructed GHD to investigate a permanent solution to the air venting system on the crest gates to improve performance following the 2010/11 wet season. A report was developed by GHD titled *Report for Lenthalls Dam – Crest Gate Operational Issues and Modifications* (June 2011) (***Crest Gates Report***).

110. The Crest Gates Report identifies the inability of the crest gates to adequately vent air on a permanent basis to lower during a flood event. The report identifies that water is being trapped in the air vent pipework after the gate has been lowered and subsequently raised, which causes a water lock within the pipework. This water lock prevents the gates from lowering without external clearing of the pipework and inhibits performance of the gates.

111. This report also identifies a permanent solution which requires modification to the vent system to enable the release of water trapped within the pipework after the gate has been lowered and raised. In my opinion, this solution cannot be logistically undertaken until Dam water levels are at around RL 23.0m.

112. The Crest Gates Report is presently going through a third party review before the recommendations are implemented by the Corporation.

113. In the interim, the Temporary Solution continues to be implemented and the Corporation, in consultation with GHD, is continuing to review its effectiveness. I am currently working with GHD to implement a modification to the Temporary Solution which will involve the installation of snorkels on the 11mm holes in the access hatches. This measure will enable air trapped within the gates (once the gates have lowered below water level) to escape. At the time of the making of this statement, a trial is underway for the installation of these snorkels.

114. It is my belief that Gates 1-4 are presently capable of opening as designed with Gate 5 the only gate causing concerns with opening. Of greater significance is the fact that there appears to be problems with all gates inadvertently rising during a flood event. This issue addressed in the Crest Gates Report, which is the subject of ongoing peer review.

Planned Upgrades

115. The Corporation does not propose to undertake any upgrade of the Dam wall at this time.

116. In relation to the crest gates operational issues, the Corporation is presently considering the findings in the Crest Gates Report. Glen Hobbs & Associates (consulting mechanical engineers) has been retained to undertake a peer review of the recommendations in the Crest Gates Report. This peer review is presently underway and is referred to in the letters dated 10 June 2011 and 5 September 2011 to the DSR. These letters, including an email response from the DSR dated 14 June 2011, are contained in Annexure 12 to this statement.

Signed by **Peter William Care** in the presence of:

[redacted]

Witness Signature

[redacted]

Signature 14 September 2011

Adrian Perry JP(Qual)

Print Name

87413

Copy to Peter + Joanne.

Queensland Government

Author [redacted]
File number DAM/130/000(0309)
Directorate / Unit Water Industry Regulation
Phone [redacted]

Department of
Natural Resources and Water

WIDE BAY WATER CORPORATION
TO
26 JUL 2007
☐ COPY
COMMENTS

July 12, 2007

Wide Bay Water Corporation
PO Box 5499
TORQUAY QLD 4655

Attention: [redacted]

Dear Sir,

Information Notice applying safety conditions to Lenthalls Dam
Dam Number: 309

I refer to Lenthalls Dam and **enclose** an information notice issued under section 491 of the *Water Act 2000* (the Act) applying safety conditions to that dam.

Pursuant to section 491(9) of the Act, the enclosed information notice is now taken to be a development permit given for the construction of the dam, and the safety conditions detailed in the enclosed information notice are taken to be conditions attaching to that development permit.

Your appeal rights in relation to the decision to apply safety conditions are set out in the enclosed information notice.

You will note that several of the safety conditions require documents to be submitted or given to the chief executive, Department of Natural Resources and Water. For those conditions, the documents should be sent to the following address:

Peter Allen
Department of Natural Resources and Water
GPO Box 2454.
BRISBANE. QLD 4001

Should you have any questions regarding the above, please contact [redacted] on telephone number [redacted]

Street Address
Level 10, ANZ Building
324 Queen Street.
Brisbane QLD 4000
Postal Address
GPO Box 2454
Brisbane QLD 4001
Telephone + 61 7 3405 4920
Facsimile + 61 7 3224 7999
Website www.nrw.qld.gov.au
ABN 83 705 537 586

Yours sincerely

[redacted]

Peter Allen
Director, Dam Safety (Water Supply)
Delegate of the Regulator

Att.(1)

- s.491(7)(a) information notice.
- Dam Safety Conditions

Distribution:

- Wide Bay Water Corporation

INFORMATION NOTICE APPLYING SAFETY CONDITIONS TO A REFERABLE DAM

Water Act 2000 Section 491(7)

To: Wide Bay Water Corporation

This decision was made and information notice issued by Peter Allen, Director, Dam Safety (Water Supply), Water Industry Compliance under section 491(7) of the *Water Act 2000* ("the Act") and pursuant to a delegation of authority by the chief executive of the Department of Natural Resources and Water, the regulator specified in the Act.

The decision made

On July 12, 2007 I decided, under s.491(1) of the *Water Act 2000*, to apply the safety conditions set out in the attached schedule to Lenthalls Dam located at Maryborough.

Findings on material questions of fact

In making my decision, I made the followings findings of fact:

- **Lenthalls Dam is a Category 2 referable dam under the *Water Act 2000* with a population at risk, if the dam were to fail, of 270 people.**

Evidence or other material on which those findings were based (material considered)

In making my decision, I had regard to the following material:

a) ***Water Act 2000.***
b) **Queensland Dam Safety Management Guidelines, NRM, February 2002.**
c) **Failure Impact Assessment Guidelines, NRM, April 2002.**
d) **Various guidelines produced by the Australian National Committee on Large Dams (ANCOLD) including their guidelines on:**
    - **Selection of Acceptable Flood Capacity for Dams, March 2000.**
    - **Assessment of the Consequences of Dam Failure, March 2000.**
    - **Risk Assessment, October 2003.**
    - **Design of Dams for Earthquake, August 1998.**
    - **Dam Safety Management 2003.**
e) **The recommendation form completed by [redacted] 11th July 2007 and the documents referenced in the recommendation form.**

Street Address
Level 10, ANZ Building
324 Queen Street,
Brisbane QLD 4000
Postal Address
GPO Box 2454
Brisbane QLD 4001
Telephone + 61 7 3405 4920
Facsimile + 61 7 3224 7999
Website www.nrw.qld.gov.au
ABN 83 705 537 586

Reasons for the decision

I made the decision for the following reasons:

- **The accepted FIA for Lenthalls Dam has shown that the dam has a known population at risk in the event of failure and I consider the conditions to be applied will ensure the continued safe management and operation of the dam to the standard expected for referable dams in Queensland. The Annual Inspection condition has been included because it is a Category '2' referable dam. Spillway Gate Operation condition has been included because of recent addition of the spillway gates and the need to ensure that they operate reliably as designed.**

Name and address of other person/s given this notice

Chief Executive Officer
Wide Bay Water Corporation
PO Box 5499
TORQUAY QLD 4655

How to appeal or apply for arbitration

A person who has been given an information notice by the regulator may appeal against the decision in the notice, or appeal the review decision, within 30 business days after the day the notice is given. **However, every appeal against the decision in the notice must be, in the first instance, by way of an application for internal review.** The application must be in the approved form which can be obtained at http://www.nrm.qld.gov.au/compliance/wic/pdf/forms/internal_review.pdf or by visiting your local departmental office.

Making the application for internal review does not delay the person's obligation to comply with the notice. A person who has been given an information notice by the regulator may apply to a court of competent jurisdiction for a stay of the decision.

If an applicant is dissatisfied with the internal review decision, the applicant may, within 30 business days after the day the applicant is given notice of the internal review decision or the decision is taken to have been made ("the review decision"), appeal against the review decision under Part 3 of Chapter 6 of the *Water Act 2000*

Attached is an extract from the *Water Act 2000*, that details the review and appeal rights regarding this decision.

This appeal process may not be the only right of review. You should seek legal advice about other potential avenues.

This decision was made on the **12 day of July 2007.**

[redacted]

Peter Allen
Director, Dam Safety (Water Supply)
Delegate of the Regulator

ATTACHMENT

Chapter 6 – Reviews, appeals and arbitration

Part 1 – Interpretation

851 Who is an interested person

(1) In this part, a person who has been given an information notice or a compliance notice by the chief executive, or an authorised officer appointed by the chief executive, is an ***interested person***.

(2) However, if the decision for which the notice was given is in relation to a water resource plan, a resource operations plan or a wild river declaration, the interested person may appeal only to the extent a different decision, consistent with the plan, could have been made

(3) In this part, a person who has been given an information notice or a compliance notice by the regulator, or an authorised officer appointed by the regulator, is also an ***interested person***.

(4) In this part, a person who has been given an information notice by a local government is an ***interested person***.

(5) In this part, a rate payer or customer of a category 2 water authority who is dissatisfied with the authority's decision about a rate or charge made and levied on the customer or ratepayer is an ***interested person***.

(6) The decision or action for which a notice was given under subsection (1), (3) or (4) or the decision mentioned in subsection (5) is an ***original decision***.

Part 2 – Internal review of decisions

861 Appeal process starts with an internal review

Every appeal against an original decision must be, in the first instance, by way of an application for internal review.

862 Who may apply for internal review

(1) An interested person, may apply for a review (an ***internal review***) of an original decision mentioned in –

(a) section 851(1) – to the chief executive (the ***reviewer***); or

(b) section 851(3) – to the regulator (also the ***reviewer***); or

(c) section 851(4) – to the chief executive of the local government (also the ***reviewer***); or

(d) section 851(5) – to the chief executive officer of the category 2 water authority (also the ***reviewer***).

(2) The application must be -

(a) in the approved form; and

(b) supported by enough information to enable the reviewer to decide the application.

863 Applying for an internal review

(1) The application must be made within 30 business days after –

(a) if the person is given an information notice about the decision or a compliance notice – the day the person is given the information notice or a compliance notice; or

(b) if paragraph (a) does not apply and notice of the decision is published – the day notice of the decision is published.

(2) The reviewer may extend the time for applying for an internal review.

(3) On or before making the application, the applicant must send the following documents to any other person who was given an information notice about the original decision -

(a) notice of the application (the ***submitter notice***);

(b) a copy of the application and supporting documents.

(4) The submitter notice must inform the recipient that written submissions on the application may be made to the reviewer within 5 business days after the application is made to the reviewer.

(5) The application does not stay the original decision.

(6) 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.

(7) Subsection (6) -

(a) applies despite the *Acts Interpretation Act 1954*, section 27A; and

(b) does not apply to an original decision made by the chief executive; and

(c) does not apply to an original decision made by a reviewer who is a category 2 water authority.

864 Review decision

(1) Subsection (2) applies if the reviewer is satisfied the applicant has complied with -

(a) section 862; and

(b) either -

(i) section 863(1); or

(ii) if the reviewer has extended the time for applying for an internal review – section 863(1) within the time extended under section 863(2); and

(c) if any other person was given an information notice about the original decision – section 863(3) and (4).

(2) The reviewer must, within 20 business days after receiving the application -

(a) review the original decision; and

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

(c) make a decision (the ***review decision***) to -

(i) confirm the original decision; or

(ii) amend the original decision; or

(iii) substitute another decision for the original decision.

(2A) The reviewer may, by notice to the applicant, before the period mentioned in subsection (2) has expired, extend the period by not more than 30 business days.

(2B) Only 1 notice may be given under subsection (2A) for each review.

(3) Within 10 business days after making the review decision, the reviewer must give the applicant and any person who was given notice of the original decision notice (the ***review notice***) of the review decision.

(4) The review notice must also state -

(a) the reasons for the review decision; and

(b) that the applicant may, within 30 business days after the day the applicant is given the notice -

(i) for a decision or action mentioned in section 851(3) – apply for arbitration on the review decision under part 4; and

(ii) for a decision or action about a water bore driller's licence – appeal against the review decision to the Magistrates Court; and

(iii) for a decision or action mentioned in section 851(1) other than the giving of a compliance notice or a decision or action mentioned in section 851(5), other than a decision or action mentioned in subparagraph (ii) or (iv)—appeal against the review decision to the Land Court; and

(iv) for a decision or action mentioned in section 489, 490, 491, 492 or 494 – appeal against the review decision to the Planning and Environment Court; and

(iv) for a decision or action mentioned in section 851(1) for which a compliance notice was given or a decision or action mentioned in section 851(4) – appeal against the review decision to the Magistrates Court; and

(c) if the notice states under paragraph (b)(i), that the applicant may apply for arbitration – that the applicant may apply to a court of competent jurisdiction for a stay of the review decision; and

(d) that the applicant may apply to the court mentioned in paragraph (b)(ii), (iii), (iv) or (v) for a stay of the review decision.

(4A) A copy of the relevant appeal or arbitration provisions of this Act must also be given with each review notice or copy of a review notice.

(5) If the reviewer does not comply with subsection (2) or (3), the reviewer is taken to have made a decision confirming the original decision.

(6) If the review decision confirms the original decision, for the purpose of arbitration or an appeal to a court, the original decision is taken to be the review decision.

(7) If the review decision amends the original decision, for the purpose of arbitration or an appeal to a court, the original decision as amended is taken to be the review decision.

865 Stay of operation of original decision

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

(a) If, under section 864(4)(b)(i), the applicant would be able to apply for arbitration – a court of competent jurisdiction; and

(b) If, under section 864(4)(b)(ii)or (v), the applicant would be able to appeal to the Magistrates Court – the Magistrates Court; and

(c) If, under section 864(4)(b)(iii), the applicant would be able to appeal to the Land Court – the Land Court; and

(d) If, under section 864(4)(b)(iv), the applicant would be able to appeal to the Planning and Environment Court – the Planning and Environment Court.

(2) The court may stay the original decision to secure the effectiveness of the review and any later arbitration or appeal to the court.

(3) The stay -

(a) may be given on conditions the court considers appropriate; and

(b) operates for the period fixed by the court; and

(c) may be revoked or amended by the court.

(4) The period of the stay must not extend past the time when the reviewer makes a review decision about the original decision and any later period the court allows the applicant to enable the applicant to -

(a) seek arbitration on the review decision; or

(b) appeal against the review decision.

(5) The application affects the original decision, or carrying out of the decision, only if the decision is stayed.

Part 3—Appeals

877 Who may appeal

(1) If an interested person has applied for a review of an original decision, any interested person for the original decision may appeal against the review decision to—

(a) if the review decision was about an original decision or action about a water bore driller's licence—the Magistrates Court; and

(b) if the review decision was about an original decision or action mentioned in section 851(1), other than the giving of a compliance notice, or an original decision or action mentioned in section 851(5), other than a decision mentioned in paragraph (a) or (c)—the Land Court; and

(c) if the review decision was about an original decision or action mentioned in section 489, 490, 491, 492 or 494—the Planning and Environment Court; and

(d) if the review decision was about a decision or action mentioned in section 851(1) for which a compliance notice was given or a decision or action mentioned in section 851(4)—the Magistrates Court.

(2) The Magistrates Court that has jurisdiction to hear the appeal is the court exercising jurisdiction at or nearest the place of the activity, proposed activity or land concerned.

878 Starting an appeal

(1) An appeal is started by—

(a) filing a notice of appeal with the court; and

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

(2) The notice of appeal must be filed within 30 business days after the day the appellant receives notice of the decision or the decision is taken to have been made.

(3) The court may extend the period for filing the notice of appeal.

(4) A copy of the notice of appeal must be served on the chief executive within 10 business days after the notice of appeal is filed with the court.

879 Staying operation of review decision

(1) The appellant may apply to the court to which the appellant could have applied for a stay of an original decision for a stay of the operation of the review decision to secure the effectiveness of the arbitration or appeal.

(2) The court may grant a stay of the operation of the review decision to secure the effectiveness of the arbitration or appeal.

(3) The stay—

(a) may be given on conditions the court considers appropriate; and

(b) operates for the period fixed by the court; and

(c) may be revoked or amended by the court.

(4) The period of the stay must not extend past the time when the arbitration is determined or the court decides the appeal.

(5) The appeal affects the review decision, or carrying out of the decision, only if the decision is stayed.

880 Hearing procedures

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

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

881 Assessors

If the judge or member hearing an appeal is satisfied the appeal involves a question of special knowledge and skill, the judge or member may appoint 1 or more assessors to help the judge or member in deciding the appeal.

882 Powers of court on appeal

(1) In deciding an appeal, the court may—

(a) confirm the review decision; or

(b) set aside the review decision; or

(c) amend the review decision in the way the court considers appropriate; or

(d) send the matter back to the reviewer and give the directions the court considers appropriate; or

(e) set aside the review decision and substitute it with a decision the court considers appropriate.

(2) If the court amends the review decision or substitutes another decision for the review decision, the amended or substituted decision is, for this Act (other than this part) taken to be the reviewer's decision.

(3) Each party to the appeal must bear the party's own costs for the appeal.

(4) However, the court may order costs for the appeal, including allowances to witnesses attending for giving evidence at the appeal, as it considers appropriate in the following circumstances—

(a) the court considers the appeal was started merely to delay or obstruct;

(b) the court considers the appeal, or part of the appeal, to have been frivolous or vexatious;

(c) party has not been given reasonable notice of intention to apply for an adjournment of the appeal;

(d) a party has incurred costs because the party is required to apply for an adjournment because of the conduct of another party;

(e) a party has incurred costs because another party has defaulted in the court's procedural requirements;

(f) without limiting paragraph (d), a party has incurred costs because another party has introduced, or sought to introduce, new material;

(g) a party to the appeal does not properly discharge its responsibilities in the appeal.

(5) If the court makes an order under subsection (4), the court may also order the party ordered to pay costs under subsection (4) to pay to the other party an amount as compensation for loss or damage suffered by the other party because of the appeal if the court considers—

(a) the appeal was started merely to delay or obstruct; or

(b) the appeal, or part of the appeal, to have been frivolous or vexatious.

Part 4—Arbitration

891 Who may apply for arbitration

(1) Subsection (2) applies to a review decision about an original decision mentioned in section 851(3).

(2) An interested person who applied for the review decision and is dissatisfied with the decision may give the authority under the *Queensland Competition Authority Act 1997* a notice (a ***dispute notice***) applying for arbitration on the decision.

(3) The dispute notice must—

(a) be given within 30 business days after the day the interested person receives notice of the decision or the decision is taken to have been made; and

(b) state—

(i) the name and address of the interested person; and

(ii) details of the review decision and the grounds on which arbitration is sought.

(4) The interested person must, at the same time, give a copy of the dispute notice to the regulator.

892 Acknowledging dispute notice

On receiving the dispute notice, the authority must give the interested person and the regulator a notice acknowledging receipt of the dispute notice.

893 Withdrawing dispute notice

The interested person may withdraw the dispute notice at any time before the authority makes its determination on the dispute.

894 Parties to arbitration

The parties to the arbitration are the interested person and the regulator.

895 Determination by authority

(1) The authority must make a written determination in an arbitration on the dispute.

(2) When making the determination, the authority must give the parties its reasons for making the determination.

(3) However, the authority is not required to make a determination if it ends the arbitration and the authority is satisfied—

(a) the giving of the dispute notice was vexatious; or

(b) the subject matter of the dispute is trivial, misconceived or lacking in substance.

896 Conduct of arbitration

The *Queensland Competition Authority Act 1997*, part 7 applies to the arbitration.

Lenthalls Dam (#0309)
Dam Safety Condition Schedule
For: Wide Bay Water

Introduction

Lenthalls Dam is the main water supply for the Hervey Bay area. The dam is sited on the Burrum River at AMTD 34.2km. The nearest township is Howard, approx 30km due west of Hervey Bay.

The construction of the dam was originally completed in 1984. Upgrade works including the installation of Crest Gates to raise the full supply level by 2 metres were completed in 2007.

The conditions as outlined below apply to Lenthalls Dam as constructed in 2007.

Category Assessment:

Failure Impact Assessment Category:	2
Population at risk:	270
Date of Assessment:	August 6, 2002

Basic Description of the Dam:

Location:	Burrum River, (AMTD 34.2km)
Property description of lots inundated or partially inundated by storage or covered/partially covered by dam structure	Lot 21, Plan SP134986
Date of completion:	1984 Stage 2 was completed in 2007.
Purpose:	Town Water Supply

MAIN EMBANKMENT

Construction Type:	Zoned earth fill embankment
Total Length:	347 m
Embankment Crest Level	EL 34.6 m
Embankment Crest Width:	6 m
Maximum Embankment Height:	29 m

SPILLWAY

Full Supply Level	EL 26 m
Storage Capacity (at FSL)	28,411ML
Spillway – 75m Gated Ogee crest with 4 x 14.8m wide and 1 x 9.8m wide by 2m high crest gates	
Fixed Crest level	EL 24 m
Max Discharge Capacity (at DCF)	5670 m^3/sec

NOTE:
1. Levels quoted are to the Burrum No. 3 Datum (Add 0.18m to convert to AHD).

Condition DS 0 - General

1. The dam is to be kept safe at all times.

Condition DS 1 - Documentation

1. Any documentation prepared in order to comply with these conditions must be stored securely by the dam owner until such time as the dam is decommissioned.
2. The documentation must be made available for inspection by the Chief Executive, Department of Natural Resources and Water, within seven (7) days of a written request for access being received by the dam owner.
3. On change of ownership of the dam, all documentation prepared in compliance with these conditions must be transferred to the new owner.

Condition DS 2 - Incidents and Failures

1. In addition to the requirements detailed within the Emergency Action Plan, the dam owner must report in writing all incidents and failures (as defined in the *Queensland Dam Safety Management Guidelines – February 2002*) to the Chief Executive, Department of Natural Resources and Water, within seven (7) days of becoming aware of the incident or failure.
2. The dam owner must advise the Chief Executive, Department of Natural Resources and Water of any proposed remedial actions in writing within thirty (30) days of the incident or failure.

Condition DS 3 - Design Report

1. The Design Report prepared by GHD dated February 2006 and titled "*Lenthalls Dam Raising, Design Report, Wide Bay Water*" shall be taken as the final design report for the dam.

Condition DS 4 - Design and Construction

1. In addition to the design report as referred to in condition DS3, copies of drawings and information used for the Lenthalls Dam Raising project shall be delivered to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**. This information shall then be considered as the design and construction information for the dam.
2. Any remedial works or reconstruction of the dam must be carried out in accordance with current engineering practice to ensure that the dam remains generally in accordance with the documentation referred to within this condition schedule.
3. Where remedial, reconstruction or upgrade works are proposed by the dam owner, information describing the final design and construction methodology must be forwarded to the Chief Executive, Department of Natural Resources and Water for their consideration. A written report outlining the design and methodology must be presented to the Chief Executive, Department of Natural Resources and Water, no later than thirty (30) days prior to the signing of any contractural arrangement for such works.

Condition DS 5 - Data Book

1. The dam owner must prepare a Data Book in accordance with this condition and the *Queensland Dam Safety Management Guidelines - February 2002.*
2. The Data Book must be prepared by no later than the **30th day of November 2007**.
3. The Data Book must include all information as is required in the *Queensland Dam Safety Management Guidelines – February 2002* including:
    a. All pertinent records and history relating to the dam.
    b. All available documentation relating to the investigation, design, construction, operation, maintenance, surveillance, monitoring

measurements and any remedial action taken during construction and subsequent operation of the dam.
   c. Known deficiencies such as seepage, cracking.
4. The dam owner must ensure the Data Book is reviewed (and if necessary updated) in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the **1st day of November** of each calendar year.
5. A written notification confirming that the Data Book has been reviewed (and if necessary updated) shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.

Condition DS 6 - As Constructed Documentation

1. As constructed documentation which details the arrangement of the as constructed works is to be provided to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**.

Condition DS 7 - Standing Operating Procedures

1. The dam owner must develop Standing Operating Procedures (SOP) in accordance with this condition and the *Queensland Dam Safety Management Guidelines-February 2002*. The SOP must include the following activities:
   - Personal Training and Procedural Issues
     a. Operator Training
     b. Documentation Control and Review
     c. Setting of Normal Operation Criteria
   - Emergency Action and Incident Reporting
     a. Accident and Incident Reports
     b. Review of EAP including Verification of Emergency Contact Details
     c. Communication procedures and procedures covering loss of Communication during an Emergency Event
   - Critical Operating Procedures
     a. Inspection, testing and maintenance of critical mechanical and electrical equipment
     b. Notification of any spillway discharge
     c. Water Level monitoring procedures
     d. Communication security and failsafe procedures
     e. Bulkhead gate installation and removal, penstock drainage, trash screen removal and installation (where applicable)
     f. Confined Space Access (where applicable)
     g. Diving operations during inspections (where applicable)
   - Monitoring and Surveillance
     a. Water level monitoring procedures and the monitoring of inflow events
     b. Owners routine dam safety inspection including checklists and reporting requirements
     c. Inspection, testing and maintenance of all mechanical and electrical equipment
     d. Dam Safety Annual Periodic Inspections (DS 10)
     e. Dam Safety five (5) yearly Comprehensive Inspection (DS 11)
     f. Inspection during and after flood or seismic events.
   - Maintenance of a Dam Log Book
     a. Equipment Testing
     b. Planned and Unplanned maintenance
     c. Testing of gate functions (if applicable)
     d. Environmental and flood discharge with respective reservoir levels
     e. Incident details
2. The dam owner must submit a copy of the SOP to the Chief Executive, Department of Natural Resources And Water no later than the **30th day of November 2007**.
3. The dam must be operated in accordance with the SOP.

4. The dam owner must ensure the SOP is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any SOP, the updated documents are to be forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.
    b. Where no amendments are necessary, a written notification confirming that the SOP have been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.

Condition DS 8 - Detailed Operation and Maintenance Manuals

1. The dam owner must prepare Detailed Operation and Maintenance Manuals in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*
2. The Operation and Maintenance Manuals must be prepared no later than the **30th day of November 2007.**
3. The dam owner must ensure that the Operation and Maintenance Manuals provide a comprehensive set of instructions on all equipment operated at the dam
4. The dam owner must ensure the Detailed Operating and Maintenance manuals are reviewed and if necessary updated by the **1st day of November** of each calendar year.
5. A written notification confirming that the Detailed Operating and Maintenance Manuals have been reviewed and/or updated shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same Calendar year.

Condition DS 9 - Special Inspections

1. When directed by the Chief Executive, Department of Natural Resources and Water, a Special Inspection must be carried out at the cost of the dam owner and a report must be prepared in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of inspection and may elect to observe any or all procedures involved in the inspection process.
3. The dam owner must provide one copy of the Special Inspection Report to the Chief Executive, Department of Natural Resources and Water within thirty (30) days of completion of inspection.

Condition DS 10 - Annual Periodic Inspections

1. The dam owner must undertake an annual (periodic) inspection of the dam in accordance with the *Queensland Dam Safety Management Guideline – February 2002* on or before the **1st day of November** of each calendar year.
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of the Annual inspection and may elect to observe any or all procedures involved in the inspection process.
3. The owner must produce a written record of these annual inspections and each written record is to be incorporated into the Comprehensive Inspection Report.
4. A written notification confirming that the Annual inspection has been carried out in accordance with the *Queensland Dam Safety Management Guideline – February 2002* shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same Calendar year.
5. In addition to the items listed in the *Queensland Dam Safety Management Guideline – February 2002*, the Annual Periodic Inspection Reports must address the following:
    a. Evidence of any concrete cracking, spalling, or other identified deficiency.
    b. Evidence of any leakage through the structure.
    c. Test operation of all equipment.

d. Evaluation of all surveillance data.
e. Any other issues the inspecting engineer considers appropriate.

Condition DS 11 - Comprehensive Inspections

1. The dam owner must carry out a comprehensive inspection of the dam in accordance with the *Queensland Dam Safety Management Guidelines – February 2002*, on or before the 1st **day of November 2008**, and on or before every fifth anniversary thereafter.
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of the Comprehensive Inspection and may elect to observe any or all procedures involved in the inspection process.
3. A Comprehensive Inspection Report detailing the findings of the comprehensive inspection in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* must be submitted to Chief Executive, Department of Natural Resources and Water, within three (3) months after completion of the comprehensive inspection.

Condition DS 12 - Safety Review

1. The dam owner must carry out a Safety Review in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the 1st **day of November 2023.**
2. The dam owner must prepare a Safety Review Report and provide one copy of the Safety Review Report to the Chief Executive, Department of Natural Resources and Water within three (3) months of completing the review.
3. Further Safety Reviews are to be carried out at twenty (20) year intervals, but may be required at more regular intervals by the Chief Executive, Department of Natural Resources and Water in such cases as:
    a. An absence of adequate documentation;
    b. Detection of abnormal behaviour of the structure;
    c. Changes to design standards, construction standards;
    d. A regulatory requirement.

Condition DS 13 - Emergency Action Plans and Event Reports

1. The dam owner must prepare and maintain an Emergency Action Plan (EAP) in accordance with this condition and the requirements of the *Queensland Dam Safety Management Guidelines – February 2002.*
2. Where the reservoir headwaters are such that inundation of any upstream dwellings is likely, such dwellings must be considered in the preparation of any Emergency Action Plan.
3. The EAP must cover the potential failure of any part of the structure that can put a population at risk either upstream or downstream. The emergency events described in the EAP shall cover those events as outlined in the *Queensland Dam Safety Management Guidelines – February 2002*, and include such failure modes as:
    a. Sunny day embankment failure
    b. Overtopping embankment failure
    c. Failure of control structures such as intake works, outlet works and gated spillways. This failure condition shall include:
        i. Loss of one and all gates in a sunny day event
        ii. Loss of one and all gates in a flood event
4. Inundation mapping shall be developed as outlined in the *Queensland Dam Safety Management Guidelines – February 2002*, and shall be at a sufficiently large scale so as to easily identify those areas subject to possible danger. Mapping shall be developed for all failure modes described in the EAP.
5. The EAP must be disseminated to those who have responsibilities under the EAP and shall:

a. Determine and identify those conditions that could forewarn of an emergency and specify the actions to be taken and by whom;
b. Identify all jurisdictions, agencies and individuals who could be involved in the Emergency Action Plan (for example, local governments, the Queensland Police, State Emergency Services and downstream residents);
c. Identify primary and secondary communication systems, both internal (between persons at the dam) and external (between dam personnel and outside entities);
d. Identify all resources, special tools, equipment, keys and where they can be located if required in an emergency;
e. List and prioritise all persons and entities involved (including contact details) in the notification process and the roles and responsibilities assigned to them (eg. A flow chart may be useful);

6. The dam owner must provide a copy of the EAP to the Chief Executive, Department of Natural Resources And Water by the **30th day of November 2007**.
7. The dam owner must ensure the EAP is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any EAP, a copy of the updated document is to be forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year;
    b. Where no amendments are necessary, a written notification confirming that the EAP has been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.
8. If the EAP is changed between the normal review periods, the dam owner must provide one copy of the changed EAP to the Chief Executive, Department of Natural Resources And Water within thirty (30) days of the changes being made.
9. The dam owner must ensure that in addition to any copy or amended copy of the EAP provided to the Chief Executive, Department of Natural Resources And Water in compliance with this condition (DS13), current versions of the EAP are also provided to the following parties : -
    a. Wide Bay Water (owner).
    b. Hervey Bay City Council
    c. Hervey Bay Counter Disaster Coordination Committee.
    d. Any additional group with responsibilities under the Emergency Action Plan.
10. In all emergencies, the dam owner must respond in accordance with the Emergency Action Plan.
11. In the event of an emergency, the dam owner must notify the Chief Executive, Department of Natural Resources And Water within forty-eight (48) hours. The notification shall include a brief description of the event and the time of activation of the Emergency Action Plan.
12. Within thirty (30) days of the event the dam owner must prepare an Emergency Event Report and provide a copy of the report to the Chief Executive, Department of Natural Resources And Water. The Emergency Event Report must include:
    a. A description of the event.
    b. Instrumentation readings (where appropriate).
    c. Description of any observed damage.
    d. Photographs.
    e. Details of communication and actions which took place during the emergency.
    f. How the EAP was implemented during the event and comment on the adequacy of the EAP and any changes proposed.

Condition DS 14 - Decommissioning

1. The dam must not be taken out of service (decommissioned) except in accordance with a Decommissioning Plan accepted by the Chief Executive, Department of Natural Resources and Water.

2. The Decommissioning Plan must indicate how the dam is to be rendered safe in the long term and how the contents are to be drained in a controlled and safe manner.

Condition DS 15 - Spillway Gate Operation

1. The dam owner is to provide the following information in relation to gate operation:
    a. Gate Maintenance routines including gate exercise methodology and frequency
    b. Operator training procedures and frequency of training updates
    c. Details of personnel responsible for gate operations and the numbers of operators available for releases at any given time.
    d. Gate operation methodology during planned river releases.
    e. Gate operation methodology during a flood and/or emergency event. Special emphasis will be required on gate operation in relation to both upstream and downstream river levels.
    f. Details of any alternate or backup operating system should the primary method of gate operation fail.
2. Documentation detailing the procedures as described in this safety condition is to be supplied to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**.
3. The dam owner must ensure the gate operation information is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any information, a copy of the updated document is to be forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same calendar year;
    b. Where no amendments are necessary, a written notification confirming that the information has been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same calendar year.

Note: data is midnight - midnight and should be entered against the day before the date of entry

	Lenthalls					Wongi	Lenthalls Water Balance (ML)						Rainfall (mm)			Burrum 1				Burrum 2				
Date	Level	Volume	Percent	26m%	Release	Level	Change	Inflow	Evapn	Discharge	Overflow	Diffnce	Musket	Lenthalls	Howard	Level	Volume	Percent	Overflow	Level	Volume	Percent	Release	Valve
31-Dec-07	23.579	16,274	91.4%	55.1%	shut		50	60	10	0	0	0	2	8	10	4.31	1,506	87.8%						
1-Jan-08	23.614	16,393	92.1%	55.5%	shut		119	125	6	0	0	0	32	18	33	4.31	1,506	87.8%						
2-Jan-08	23.719	16,761	94.2%	56.8%	shut		368	375	7	0	0	0	10	26	23	4.51	1,581	92.2%						
3-Jan-08	23.761	16,908	95.0%	57.3%	shut		147	155	8	0	0	0	10	9	20	4.76	1,674	97.6%						
4-Jan-08	23.774	16,953	95.3%	57.4%	shut		45	60	15	0	0	0	0	0	0	4.76	1,674	97.6%						
5-Jan-08	23.776	16,960	95.3%	57.5%	shut		7	25	18	0	0	0	0	0	0	4.81	1,693	98.7%						
6-Jan-08	23.774	16,953	95.3%	57.4%	shut		-7	10	17	0	0	0	0	0	0	4.81	1,693	98.7%						
7-Jan-08	23.771	16,943	95.2%	57.4%	shut		-10	10	20	0	0	0	0	0	0	4.81	1,693	98.7%						
8-Jan-08	23.766	16,925	95.1%	57.3%	shut		-18	0	18	0	0	0	0	0	1	4.81	1,693	98.7%						
9-Jan-08	23.769	16,936	95.2%	57.4%	shut		11	21	10	0	0	0	22	3	10	4.81	1,693	98.7%						
10-Jan-08	23.779	16,971	95.4%	57.5%	shut		35	45	10	0	0	0	14	10	20	4.86	1,711	99.8%						
11-Jan-08	23.846	17,217	96.7%	58.3%	shut		246	256	10	0	0	0	25	15	11	4.91	1,736	101.2%	46					
12-Jan-08	24.051	18,006	101.2%	61.0%	shut		789	805	16	0	0	0	1	0	1	4.91	1,736	101.2%	138					
13-Jan-08	24.116	18,273	102.7%	61.9%	shut		267	285	18	0	0	0	0	0	0	4.86	1,711	99.8%	71					
14-Jan-08	24.336	19,225	108.0%	65.1%	shut		952	962	10	0	0	0	26	47	59	5.36	1,970	114.9%	663					
15-Jan-08	25.199	23,839	133.9%	80.8%	shut		4614	4,624	10	0	0	0	11	6	8	5.01	1,788	104.2%	3,142	11	2,242	100.0%		
16-Jan-08	25.399	25,127	141.2%	85.1%	shut		1288	1,310	22	0	0	0	0	0	0	4.91	1,736	101.2%	592					
17-Jan-08	25.446	25,449	143.0%	86.2%	shut		322	356	34	0	0	0	0	0	0	4.91	1,736	101.2%	187					
18-Jan-08	25.464	25,572	143.7%	86.6%	shut		123	157	34	0	0	0	0	0	0	4.91	1,736	101.2%	138					
19-Jan-08	25.471	25,620	144.0%	86.8%	shut		48	82	34	0	0	0	0	0	0	4.86	1,711	99.8%	54					
20-Jan-08	25.474	25,641	144.1%	86.9%	shut		21	51	30	0	0	0	1	0	0	4.86	1,711	99.8%						
21-Jan-08	25.474	25,641	144.1%	86.9%	shut		0	34	34	0	0	0	0	0	0	4.86	1,711	99.8%						
22-Jan-08	25.481	25,689	144.3%	87.0%	shut		48	78	30	0	0	0	0	0	0	4.81	1,693	98.7%						
23-Jan-08	25.479	25,675	144.3%	87.0%	shut		-14	6	20	0	0	0	1	6	6	4.81	1,693	98.7%						
24-Jan-08	25.474	25,641	144.1%	86.9%	shut		-34	0	34	0	0	0	0	0	0	4.81	1,693	98.7%						
25-Jan-08	25.469	25,607	143.9%	86.8%	shut		-34	0	34	0	0	0	0	0	0	4.76	1,674	97.6%						
26-Jan-08	25.466	25,586	143.8%	86.7%	shut		-21	0	21	0	0	0	0	0	0	4.76	1,674	97.6%						
27-Jan-08	25.459	25,538	143.5%	86.5%	shut		-48	0	48	0	0	0	0	0	0	4.76	1,674	97.6%						
28-Jan-08	25.454	25,504	143.3%	86.4%	shut		-34	0	34	0	0	0	0	0	0	4.76	1,674	97.6%						
29-Jan-08	25.439	25,401	142.7%	86.1%	shut		-103	0	34	0	69	0	0	0	0	4.81	1,693	98.7%		11	2,236	99.8%		
30-Jan-08	25.434	25,366	142.5%	85.9%	shut		-35	0	35	0	0	0	0	0	0	4.81	1,693	98.7%		11	2,231	99.5%		
31-Jan-08	25.431	25,346	142.4%	85.9%	shut		-20	7	27	0	0	0	4	1	2	4.81	1,693	98.7%		2.7	42	1.9%		
1-Feb-08	25.424	25,298	142.1%	85.7%	shut		-48	0	48	0	0	0	0	0	1	4.76	1,674	97.6%						
2-Feb-08	25.436	25,380	142.6%	86.0%	shut		82	112	30	0	0	0	9	20	16	4.76	1,674	97.6%						
3-Feb-08	25.469	25,607	143.9%	86.8%	shut		227	250	23	0	0	0	0	11	14	4.81	1,693	98.7%						
4-Feb-08	25.481	25,689	144.3%	87.0%	shut		82	110	28	0	0	0	0	2	28	4.86	1,711	99.8%						
5-Feb-08	26.444	33,318	187.2%	112.9%	shut		7629	7,961	20	0	312	0	61	54	45	5.36	1,970	114.9%	1,175	11	2,242	100.0%		
6-Feb-08	26.589	34,661	194.8%	117.4%	shut		1343	7,346	30	0	5,973	0	13	7	18	5.41	1,996	116.4%	6,622	11	2,242	100.0%		
7-Feb-08	26.466	33,521	188.4%	113.6%	shut		-1140	3,112	30	0	4,222	0	11	10	21	5.31	1,944	113.3%	5,427	11	2,242	100.0%		
8-Feb-08	26.364	32,596	183.2%	110.4%	shut		-925	1,956	30	0	2,851	0	0	15	25	5.36	1,970	114.9%	4,017	11	2,242	100.0%		
9-Feb-08	26.256	31,652	177.9%	107.2%	shut		-944	1,082	30	0	1,996	0	0	11	3	5.11	1,840	107.3%	2,760	11	2,242	100.0%		
10-Feb-08	26.174	30,949	173.9%	104.9%	shut		-703	430	40	0	1,093	0	0	0	0	5.01	1,788	104.2%	1,427	11	2,242	100.0%		
11-Feb-08	26.134	30,619	172.0%	103.7%	shut		-330	363	30	0	663	0	4	4	3	4.96	1,762	102.7%	685	11	2,242	100.0%		
12-Feb-08	27.306	42,237	237.3%	143.1%	shut		11618	16,308	20	0	4,670	0	69	75	100	6.26	2,438	142.1%	12,437	11	2,242	100.0%		
13-Feb-08	27.044	39,292	220.8%	133.1%	shut		-2945	13,761	20	0	16,688	0	41	31	32	5.91	2,256	131.5%	20,776	11	2,242	100.0%		
14-Feb-08	27.046	39,314	220.9%	133.2%	shut		22	15,084	20	0	15,042	0	13	9	15	5.81	2,204	128.5%	18,670	11	2,242	100.0%		
15-Feb-08	26.569	34,476	193.7%	116.8%	open		-4838	3,617	36	72	8,347	0	0	0	0	5.41	1,996	116.4%	10,517	11	2,242	100.0%		
16-Feb-08	26.156	30,801	173.1%	104.4%	shut		-3675	2,000	36	130	5,509	0	0	0	0	5.26	1,918	111.8%	5,313	11	2,242	100.0%		
17-Feb-08	26.131	30,595	171.9%	103.7%	shut		-206	1,000	36	0	1,170	0	0	0	0	4.96	1,762	102.7%	1,209	11	2,242	100.0%		
18-Feb-08	26.119	30,496	171.4%	103.3%	shut		-99	441	36	0	504	0	0	0	0	4.96	1,762	102.7%	466	11	2,242	100.0%		
19-Feb-08	26.099	30,331	170.4%	102.8%	shut		-165	286	36	0	415	0	0	0	0	4.96	1,762	102.7%	466	11	2,242	100.0%		
20-Feb-08	26.091	30,265	170.1%	102.5%	shut		-66	302	36	0	332	0	0	0	0	4.91	1,736	101.2%	236	11	2,242	100.0%		
21-Feb-08	26.084	30,208	169.7%	102.3%	shut		-57	275	36	0	296	0	0	0	0	4.91	1,736	101.2%	138	11	2,242	100.0%		
22-Feb-08	26.074	30,125	169.3%	102.1%	shut		-83	202	36	0	249	0	0	0	0	4.91	1,736	101.2%	138	11	2,242	100.0%		
23-Feb-08	26.069	30,084	169.0%	101.9%	shut		-41	209	36	0	214	0	0	3	4	4.91	1,736	101.2%	138	11	2,242	100.0%		
24-Feb-08	26.064	30,043	168.8%	101.8%	shut		-41	189	36	0	194	0	0	0	0	4.91	1,736	101.2%	138	11	2,242	100.0%		
25-Feb-08	26.056	29,977	168.4%	101.6%	shut		-66	138	36	0	168	0	0	1	1	4.91	1,736	101.2%	138	11	2,242	100.0%		
26-Feb-08	26.046	29,895	168.0%	101.3%	shut		-82	80	36	0	126	0	0	0	0	4.91	1,736	101.2%	386	11	2,242	100.0%		
27-Feb-08	26.036	29,812	167.5%	101.0%	shut		-83	60	36	0	107	0	0	0	0	4.91	1,736	101.2%	151	11	2,242	100.0%		
28-Feb-08	26.026	29,730	167.1%	100.7%	shut		-82	55	36	0	101	0	0	0	0	4.91	1,736	101.2%	138	11	2,242	100.0%		
29-Feb-08	26.016	29,648	166.6%	100.4%	shut		-82	40	36	0	86	0	0	0	0	4.86	1,711	99.8%	42	11	2,242	100.0%		
1-Mar-08	26.011	29,607	166.4%	100.3%	shut		-41	12	36	0	17	0	0	0	0	4.86	1,711	99.8%		11	2,242	100.0%		
2-Mar-08	26.006	29,565	166.1%	100.2%	shut		-42	0	32	0	10	0	0	0	0	4.86	1,711	99.8%		11	2,242	100.0%		
3-Mar-08	26.003	29,541	166.0%	100.1%	shut		-24	0	22	0	2	0	0	0	0	4.86	1,711	99.8%		11	2,242	100.0%		
4-Mar-08	25.998	29,500	165.8%	99.9%	shut		-41	0	41	0	0	0	0	0	0	4.81	1,693	98.7%		11	2,242	100.0%		
5-Mar-08	25.993	29,462	165.5%	99.8%	shut		-38	0	38	0	0	0	0	0	0	4.76	1,674	97.6%		11	2,242	100.0%		
6-Mar-08	25.988	29,423	165.3%	99.7%	shut		-39	0	39	0	0	0	2	0	0	4.76	1,674	97.6%		11	2,242	100.0%		
7-Mar-08	25.986	29,407	165.2%	99.6%	shut		-16	0	16	0	0	0	0	0	0	4.71	1,655	96.5%		11	2,242	100.0%		
8-Mar-08	25.981	29,369	165.0%	99.5%	shut		-38	0	38	0	0	0	0	0	0	4.71	1,655	96.5%		11	2,242	100.0%		
9-Mar-08	25.976	29,330	164.8%	99.4%	shut		-39	0	39	0	0	0	0	2	0	4.71	1,655	96.5%		11	2,242	100.0%		
10-Mar-08	25.978	29,345	164.9%	99.4%	shut		15	45	30	0	0	0	1	6	2	4.66	1,637	95.4%		11	2,242	100.0%		
11-Mar-08	25.983	29,384	165.1%	99.6%	shut		39	69	30	0	0	0	0	1	0	4.66	1,637	95.4%		11	2,242	100.0%		
12-Mar-08	25.978	29,345	164.9%	99.4%	shut		-39	0	39	0	0	0	0	0	1	4.61	1,618	94.3%		11	2,242	100.0%		
13-Mar-08	25.976	29,330	164.8%	99.4%	shut		-15	0	15	0	0	0	0	0	0	4.56	1,599	93.2%		11	2,242	100.0%		
14-Mar-08	25.971	29,291	164.6%	99.2%	shut		-39	0	39	0	0	0	0	0	1	4.56	1,599	93.2%		11	2,242	100.0%		
15-Mar-08	25.965	29,245	164.3%	99.1%	shut		-46	0	46	0	0	0	0	0	1	4.51	1,581	92.2%		11	2,242	100.0%		
16-Mar-08	25.963	29,229	164.2%	99.0%	shut		-16	16	32	0	0	0	1	2	3	4.51	1,581	92.2%		11	2,242	100.0%		
17-Mar-08	25.961	29,214	164.2%	99.0%	shut		-15	8	23	0	0	0	0	1	4	4.51	1,581	92.2%		11	2,242	100.0%		
18-Mar-08	25.961	29,214	164.2%	99.0%	shut		0	36	36	0	0	0	0	6	5	4.51	1,581	92.2%		11	2,242	100.0%		
19-Mar-08	25.963	29,229	164.2%	99.0%	shut		15	35	20	0	0	0	2	3	11	4.46	1,562	91.1%		11	2,242	100.0%		
20-Mar-08	25.965	29,245	164.3%	99.1%	shut		16	36	20	0	0	0	0	1	1	4.46	1,562	91.1%		11	2,242	100.0%		
21-Mar-08	25.963	29,229	164.2%	99.0%	shut		-16	14	30	0	0	0	0	0	0	4.41	1,543	90.0%		11	2,242	100.0%		
22-Mar-08	25.961	29,214	164.2%	99.0%	shut		-15	8	23	0	0	0	10	1	0	4.41	1,543	90.0%		11	2,242	100.0%		
23-Mar-08	25.961	29,214	164.2%	99.0%	shut		0	20	20	0	0	0	1	0	3	4.36	1,524	88.9%		11	2,242	100.0%		
24-Mar-08	25.958	29,190	164.0%	98.9%	shut		-24	0	24	0	0	0	0	0	0	4.36	1,524	88.9%		11	2,242	100.0%		
25-Mar-08	25.953	29,152	163.8%	98.8%	shut		-38	0	38	0	0	0	0	0	0	4.31	1,506	87.8%		11	2,242	100.0%		
26-Mar-08	25.951	29,136	163.7%	98.7%	shut		-16	0	16	0	0	0	0	0	0	4.31	1,506	87.8%		11	2,242	100.0%		
27-Mar-08	25.948	29,113	163.6%	98.6%	shut		-23	0	23	0	0	0	2	1	2	4.31	1,506	87.8%		11	2,242	100.0%		
28-Mar-08	25.943	29,074	163.4%	98.5%	shut		-39	0	39	0	0	0	39	22	29	4.31	1,506	87.8%		11	2,242	100.0%		
29-Mar-08	25.971	29,291	164.6%	99.2%	shut		217	237	20	0	0	0	0	0	0	4.31	1,506	87.8%		11	2,242	100.0%		
30-Mar-08	25.981	29,369	165.0%	99.5%	shut		78	108	30	0	0	0	0	0	0	4.21	1,468	85.6%		11	2,242	100.0%		
31-Mar-08	25.981	29,369	165.0%	99.5%	shut		0	36	36	0	0	0	0	0	0	4.16	1,450	84.5%		11	2,242	100.0%		
1-Apr-08	25.976	29,330	164.8%	99.4%	shut		-39	0	39	0	0	0	0	0	0	4.12	1,435	83.7%		11	2,242	100.0%		
2-Apr-08	25.971	29,291	164.6%	99.2%	shut		-39	0	39	0	0	0	0	0	0	4.09	1,424	83.0%		11	2,242	100.0%		
3-Apr-08	25.968	29,268	164.5%	99.2%	shut		-23	0	23	0	0	0	0	0	0	4.11	1,431	83.4%		11	2,242	100.0%		
4-Apr-08	25.963	29,229	164.2%	99.0%	shut		-39	0	39	0	0	0	0	0	0	4.11	1,431	83.4%		11	2,242	100.0%		
5-Apr-08	25.958	29,190	164.0%	98.9%	shut		-39	0	39	0	0	0	0	0	0	4.11	1,431	83.4%		11	2,242	100.0%		
6-Apr-08	25.953	29,152	163.8%	98.8%	shut		-38	0	38	0	0	0	0	2	1	4.16	1,450	84.5%		11	2,242	100.0%		
7-Apr-08	25.951	29,136	163.7%	98.7%	shut		-16	0	16	0	0	0	1	0	0	4.11	1,431	83.4%		11	2,242	100.0%		
8-Apr-08	25.946	29,097	163.5%	98.6%	shut		-39	0	39	0	0	0	0	0	0	4.16	1,450	84.5%		11	2,242	100.0%		
9-Apr-08	25.941	29,058	163.3%	98.4%	shut		-39	0	39	0	0	0	0	0	0	4.16	1,450	84.5%		11	2,242	100.0%		
10-Apr-08	25.936	29,020	163.1%	98.3%	shut		-38	0	38	0	0	0	0	0	0	4.16	1,450	84.5%		11	2,242	100.0%		
11-Apr-08	25.933	28,996	162.9%	98.2%	shut		-24	0	24	0	0	0	0	0	0	4.16	1,450	84.5%		11	2,242	100.0%		
12-Apr-08	25.928	28,958	162.7%	98.1%	shut		-38	0	38	0	0	0	0	0	0	4.21	1,468	85.6%						
13-Apr-08	25.926	28,942	162.6%	98.1%	shut		-16	0	16	0	0	0	0	0	0	4.36	1,524	88.9%						
14-Apr-08	25.923	28,919	162.5%	98.0%	shut		-23	0	23	0	0	0	0	0	1	4.51	1,581	92.2%						
15-Apr-08	25.918	28,880	162.3%	97.8%	shut		-39	0	39	0	0	0	0	0	0	4.56	1,599	93.2%						
16-Apr-08	25.913	28,841	162.1%	97.7%	shut		-39	0	39	0	0	0	0	0	0	4.56	1,599	93.2%						
17-Apr-08	25.908	28,803	161.8%	97.6%	shut		-38	0	38	0	0	0	0	0	0	4.51	1,581	92.2%						
18-Apr-08	25.903	28,764	161.6%	97.5%	shut		-39	0	39	0	0	0	0	4	8	4.51	1,581	92.2%						
19-Apr-08	25.903	28,764	161.6%	97.5%	shut		0	36	36	0	0	0	2	2	6	4.51	1,581	92.2%						
20-Apr-08	25.901	28,748	161.5%	97.4%	shut		-16	20	36	0	0	0	0	5	0	4.46	1,562	91.1%						
21-Apr-08	25.906	28,787	161.8%	97.5%	shut		39	75	36	0	0	0	0	0	0	4.46	1,562	91.1%						
22-Apr-08	25.903	28,764	161.6%	97.5%	shut		-23	13	36	0	0	0	0	0	0	4.41	1,543	90.0%						
23-Apr-08	25.898	28,725	161.4%	97.3%	shut		-39	0	39	0	0	0	6	0	0	4.41	1,543	90.0%						
24-Apr-08	25.896	28,709	161.3%	97.3%	shut		-16	20	36	0	0	0	0	0	0	4.36	1,524	88.9%						
25-Apr-08	25.893	28,686	161.2%	97.2%	shut		-23	10	33	0	0	0	0	0	0	4.36	1,524	88.9%						
26-Apr-08	25.888	28,647	161.0%	97.1%	shut		-39	0	39	0	0	0	0	0	0	4.31	1,506	87.8%						
27-Apr-08	25.883	28,609	160.8%	96.9%	shut		-38	0	38	0	0	0	0	0	0	4.31	1,506	87.8%						
28-Apr-08	25.881	28,593	160.7%	96.9%	shut		-16	0	16	0	0	0	0	0	0	4.21	1,468	85.6%						
29-Apr-08	25.875	28,547	160.4%	96.7%	shut		-46	0	46	0	0	0	0	0	0	4.26	1,487	86.7%						
30-Apr-08	25.871	28,516	160.2%	96.6%	shut		-31	0	31	0	0	0	0	0	0	4.16	1,450	84.5%						
1-May-08	25.866	28,477	160.0%	96.5%	shut		-39	0	39	0	0	0	0	0	0	4.16	1,450	84.5%						
2-May-08	25.863	28,454	159.9%	96.4%	shut		-23	0	23	0	0	0	0	0	0	4.31	1,506	87.8%						
3-May-08	25.861	28,438	159.8%	96.3%	shut		-16	0	16	0	0	0	0	0	0	4.51	1,581	92.2%						
4-May-08	25.856	28,399	159.6%	96.2%	shut		-39	0	39	0	0	0	0	0	0	4.51	1,581	92.2%						
5-May-08	25.853	28,376	159.4%	96.1%	shut		-23	0	23	0	0	0	0	0	0	4.46	1,562	91.1%						
6-May-08	25.851	28,361	159.4%	96.1%	shut		-15	0	15	0	0	0	0	0	0	4.46	1,562	91.1%						
7-May-08	25.846	28,322	159.1%	96.0%	shut		-39	0	39	0	0	0	0	0	0	4.36	1,524	88.9%						
8-May-08	25.84	28,275	158.9%	95.8%	shut		-47	0	47	0	0	0	0	0	0	4.36	1,524	88.9%						
9-May-08	25.838	28,260	158.8%	95.7%	shut		-15	0	15	0	0	0	0	0	0	4.26	1,487	86.7%						
10-May-08	25.833	28,221	158.6%	95.6%	shut		-39	0	39	0	0	0	0	0	0	4.26	1,487	86.7%						
11-May-08	25.831	28,205	158.5%	95.6%	shut		-16	0	16	0	0	0	0	0	0	4.21	1,468	85.6%						
12-May-08	25.828	28,182	158.4%	95.5%	shut		-23	0	23	0	0	0	0	0	0	4.21	1,468	85.6%						
13-May-08	25.828	28,182	158.4%	95.5%	shut		0	0	0	0	0	0	0	0	0	4.16	1,450	84.5%						
14-May-08	25.823	28,143	158.1%	95.3%	shut		-39	0	39	0	0	0	0	7	11	4.16	1,450	84.5%						
15-May-08	25.826	28,167	158.3%	95.4%	shut		24	60	36	0	0	0	2	0	0	4.16	1,450	84.5%						
16-May-08	25.823	28,143	158.1%	95.3%	shut		-24	10	34	0	0	0	0	0	0	4.16	1,450	84.5%						
17-May-08	25.823	28,143	158.1%	95.3%	shut		0	10	10	0	0	0	0	0	0	4.16	1,450	84.5%						
18-May-08	25.818	28,105	157.9%	95.2%	shut		-38	0	38	0	0	0	0	0	0	4.16	1,450	84.5%		10.3	1,856	82.8%		
19-May-08	25.813	28,066	157.7%	95.1%	shut		-39	0	39	0	0	0	0	0	0	4.16	1,450	84.5%						
20-May-08	25.808	28,027	157.5%	95.0%	shut		-39	0	39	0	0	0	0	0	0	4.16	1,450	84.5%						
21-May-08	25.803	27,988	157.3%	94.8%	shut		-39	0	39	0	0	0	0	0	0	4.21	1,468	85.6%						
22-May-08	25.801	27,973	157.2%	94.8%	open		-15	0	15	0	0	0	0	0	0	4.36	1,524	88.9%						
23-May-08	25.796	27,936	157.0%	94.6%	open		-37	0	37	0	0	0	0	0	0	4.46	1,562	91.1%						
24-May-08	25.791	27,899	156.8%	94.5%	open		-37	0	37	0	0	0	0	0	0	4.56	1,599	93.2%						
25-May-08	25.785	27,856	156.5%	94.4%	open		-43

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30-May-11	25.914	28,845	162.1%	97.7%	shut	4	34	30	0	0	0	0	0	0	4.87	1,718	100.2%	1	11	2,250	100.4%	5	closed
31-May-11	25.914	28,847	162.1%	97.7%	shut	2	32	30	0	0	0	0	0	0	4.87	1,715	100.0%	3	11	2,243	100.0%	10	closed
1-Jun-11	25.915	28,853	162.1%	97.8%	shut	6	31	25	0	0	0	0	0	0	4.87	1,713	99.9%	0	11	2,243	100.0%	0	closed
2-Jun-11	25.915	28,859	162.2%	97.8%	shut	6	31	25	0	0	0	0	0	0	4.86	1,712	99.8%	0	11	2,238	99.8%	0	closed
3-Jun-11	25.914	28,848	162.1%	97.7%	shut	-11	14	25	0	0	0	0	0	0	4.86	1,711	99.8%	0	11	2,238	99.8%	0	closed
4-Jun-11	25.910	28,820	161.9%	97.6%	shut	-28	0	28	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
5-Jun-11	25.908	28,800	161.8%	97.6%	shut	-20	0	20	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
6-Jun-11	25.907	28,795	161.8%	97.6%	shut	-5	10	15	0	0	0	0	0	0	4.85	1,709	99.6%	0	11	2,238	99.8%	0	closed
7-Jun-11	25.906	28,783	161.7%	97.5%	shut	-12	8	20	0	0	0	0	0	0	4.85	1,708	99.6%	0	11	2,238	99.8%	0	closed
8-Jun-11	25.905	28,782	161.7%	97.5%	shut	-1	14	15	0	0	0	0	0	0	4.85	1,707	99.5%	0	11	2,238	99.8%	0	closed
9-Jun-11	25.902	28,753	161.6%	97.4%	shut	-29	0	29	0	0	0	0	0	0	4.84	1,706	99.4%	0	11	2,238	99.8%	0	closed
10-Jun-11	25.899	28,731	161.4%	97.3%	shut	-22	0	22	0	0	0				4.84	1,705	99.4%	0	11	2,238	99.8%	0	closed
11-Jun-11	25.913	28,843	162.1%	97.7%	shut	112	127	15	0	0	0				4.86	1,712	99.8%	0	11	2,250	100.4%	6	closed
12-Jun-11	25.915	28,859	162.2%	97.8%	shut	16	41	25	0	0	0				4.87	1,713	99.9%	0	11	2,243	100.0%	3	closed
13-Jun-11	25.915	28,854	162.1%	97.8%	shut	-5	20	25	0	0	0				4.86	1,711	99.8%	0	11	2,238	99.8%	0	closed
14-Jun-11	25.913	28,843	162.1%	97.7%	shut	-11	14	25	0	0	0	0	0	0	4.86	1,711	99.8%	0	11	2,243	100.0%	0	closed
15-Jun-11	25.910	28,818	161.9%	97.6%	shut	-25	0	25	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
16-Jun-11	25.908	28,802	161.8%	97.6%	shut	-16	0	16	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
17-Jun-11	25.905	28,782	161.7%	97.5%	shut	-20	0	20	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
18-Jun-11	25.903	28,761	161.6%	97.4%	shut	-21	0	21	0	0	0	0	0	0	4.86	1,710	99.7%	0	11	2,238	99.8%	0	closed
19-Jun-11	25.901	28,746	161.5%	97.4%	shut	-15	0	15	0	0	0	0	0	0	4.85	1,709	99.6%	0	11	2,238	99.8%	0	closed
20-Jun-11	25.898	28,727	161.4%	97.3%	shut	-19	0	19	0	0	0	0	0	0	4.85	1,708	99.6%	0	11	2,238	99.8%	0	closed
21-Jun-11	25.896	28,711	161.3%	97.3%	shut	-16	0	16	0	0	0	0	0	0	4.85	1,708	99.6%	0	11	2,234	99.6%	0	closed
22-Jun-11	25.894	28,697	161.2%	97.2%	shut	-14	0	14	0	0	0	0	0	0	4.85	1,707	99.5%	0	11	2,234	99.6%	0	closed
23-Jun-11	25.892	28,681	161.2%	97.2%	shut	-16	0	16	0	0	0	0	0	0	4.84	1,706	99.4%	0	11	2,234	99.6%	0	closed
24-Jun-11	25.890	28,665	161.1%	97.1%	shut	-16	0	16	0	0	0	0	0	0	4.85	1,707	99.5%	0	11	2,234	99.6%	0	closed
25-Jun-11	25.889	28,655	161.0%	97.1%	shut	-10	0	10	0	0	0	0	0	0	4.78	1,680	98.0%	0	11	2,234	99.6%	0	closed
26-Jun-11	25.887	28,642	160.9%	97.0%	shut	-13	0	13	0	0	0	0	0	0	4.74	1,666	97.1%	0	11	2,234	99.6%	0	closed
27-Jun-11	25.885	28,627	160.9%	97.0%	shut	-15	0	15	0	0	0	0	0	0	4.78	1,680	98.0%	0	11	2,234	99.6%	0	closed
28-Jun-11	25.885	28,622	160.8%	97.0%	shut	-5	0	5	0	0	0	0	0	0	4.78	1,680	98.0%	0	11	2,238	99.8%	0	closed
29-Jun-11	25.887	28,643	160.9%	97.0%	shut	21	26	5	0	0	0	1	1	5	4.78	1,683	98.1%	0	11	2,238	99.8%	0	closed
30-Jun-11	25.889	28,653	161.0%	97.1%	shut	10	15	5	0	0	0	2	2	5	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
1-Jul-11	25.888	28,648	161.0%	97.1%	shut	-5	10	15	0	0	0	0	0	0	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
2-Jul-11	25.887	28,637	160.9%	97.0%	shut	-11	4	15	0	0	0	0	0	0	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
3-Jul-11	25.885	28,622	160.8%	97.0%	shut	-15	0	15	0	0	0	0	0	0	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
4-Jul-11	25.882	28,602	160.7%	96.9%	shut	-20	0	20	0	0	0	0	0	0	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
5-Jul-11	25.879	28,579	160.6%	96.8%	shut	-23	0	23	0	0	0	0	0	0	4.79	1,684	98.2%	0	11	2,238	99.8%	0	closed
6-Jul-11	25.877	28,558	160.5%	96.8%	shut	-21	0	21	0	0	0	0	0	0	4.78	1,683	98.1%	0	11	2,238	99.8%	0	closed
7-Jul-11	25.874	28,537	160.3%	96.7%	shut	-21	0	21	0	0	0	0	0	0	4.78	1,682	98.0%	0	11	2,234	99.6%	0	closed
8-Jul-11	25.871	28,514	160.2%	96.6%	shut	-23	0	23	0	0	0	0	0	0	4.78	1,682	98.0%	0	11	2,234	99.6%	0	closed
9-Jul-11	25.868	28,493	160.1%	96.5%	shut	-21	0	21	0	0	0	0	0	0	4.78	1,680	98.0%	0	11	2,234	99.6%	0	closed
10-Jul-11	25.866	28,477	160.0%	96.5%	shut	-16	0	16	0	0	0	0	0	0	4.77	1,679	97.9%	0	11	2,234	99.6%	0	closed
11-Jul-11	25.863	28,456	159.9%	96.4%	shut	-21	0	21	0	0	0	0	0	0	4.77	1,679	97.9%	0	11	2,234	99.6%	0	closed
12-Jul-11	25.861	28,437	159.8%	96.3%	shut	-19	0	19	0	0	0	0	0	0	4.77	1,678	97.8%	0	11	2,234	99.6%	0	closed
13-Jul-11	25.859	28,426	159.7%	96.3%	shut	-11	0	11	0	0	0	0	0	0	4.77	1,677	97.8%	0	11	2,234	99.6%	0	closed
14-Jul-11	25.856	28,402	159.6%	96.2%	shut	-24	0	24	0	0	0	0	0	0	4.75	1,671	97.4%	0	10.9	2,229	99.4%	0	closed
15-Jul-11	25.859	28,420	159.7%	96.3%	shut	18	32	14	0	0	0	0	0	0	4.65	1,633	95.2%	0	11	2,234	99.6%	0	closed
16-Jul-11	25.874	28,535	160.3%	96.7%	shut	115	127	12	0	0	0	13	14	15	4.62	1,622	94.6%	0	11	2,243	100.0%	0	closed
17-Jul-11	25.873	28,534	160.3%	96.7%	shut	-1	13	14	0	0	0	0	0	0	4.55	1,596	93.1%	0	11	2,243	100.0%	0	closed
18-Jul-11	25.873	28,532	160.3%	96.7%	shut	-2	10	12	0	0	0	0	0	0	4.48	1,570	91.5%	0	11	2,243	100.0%	0	closed
19-Jul-11	25.871	28,516	160.2%	96.6%	shut	-16	6	22	0	0	0	0	0	0	4.40	1,540	89.8%	0	11	2,238	99.8%	0	closed
20-Jul-11	25.869	28,496	160.1%	96.5%	shut	-20	2	22	0	0	0	0	0	0	4.34	1,516	88.4%	0	11	2,238	99.8%	0	closed
21-Jul-11	25.867	28,484	160.0%	96.5%	shut	-12	0	12	0	0	0	0	0	0	4.27	1,492	87.0%	0	11	2,238	99.8%	0	closed
22-Jul-11	25.864	28,460	159.9%	96.4%	shut	-24	0	24	0	0	0	0	0	0	4.19	1,460	85.1%	0	11	2,238	99.8%	0	closed
23-Jul-11	25.860	28,432	159.8%	96.3%	shut	-28	0	28	0	0	0	0	0	0	4.11	1,432	83.5%	0	11	2,238	99.8%	0	closed
24-Jul-11	25.859	28,419	159.7%	96.3%	shut	-13	0	13	0	0	0	0	0	0	4.04	1,405	81.9%	0	11	2,238	99.8%	0	closed
25-Jul-11	25.855	28,392	159.5%	96.2%	shut	-27	0	27	0	0	0	0	0	0	3.95	1,374	80.1%	0	11	2,234	99.6%	0	closed
26-Jul-11	25.852	28,366	159.4%	96.1%	shut	-26	0	26	0	0	0	0	0	0	3.95	1,374	80.1%	0	10.9	2,212	98.7%	22	open
27-Jul-11	25.850	28,356	159.3%	96.1%	shut	-10	0	10	0	0	0	0	0	0	4.02	1,397	81.5%	0	10.8	2,174	97.0%	38	open
28-Jul-11	25.847	28,332	159.2%	96.0%	shut	-24	0	24	0	0	0	0	0	0	4.06	1,413	82.4%	0	10.8	2,140	95.4%	34	open
29-Jul-11	25.845	28,313	159.1%	95.9%	shut	-19	0	19	0	0	0	0	0	0	4.10	1,429	83.3%	0	10.7	2,102	93.7%	38	open
30-Jul-11	25.843	28,301	159.0%	95.9%	shut	-12	0	12	0	0	0	0	0	0	4.15	1,447	84.4%	0	10.7	2,068	92.2%	34	open
31-Jul-11	25.841	28,287	158.9%	95.8%	shut	-14	0	14	0	0	0	0	0	0	4.21	1,469	85.7%	0	10.6	2,029	90.5%	39	open
1-Aug-11	25.840	28,273	158.9%	95.8%	shut	-14	0	14	0	0	0	0	0	0	4.25	1,482	86.4%	0	10.5	1,995	89.0%	34	open
2-Aug-11	25.837	28,253	158.8%	95.7%	shut	-20	0	20	0	0	0	0	0	0	4.30	1,500	87.5%	0	10.5	1,959	87.4%	36	open
3-Aug-11	25.835	28,235	158.7%	95.7%	shut	-18	0	18	0	0	0	0	0	0	4.34	1,518	88.5%	0	10.4	1,923	85.8%	36	open
4-Aug-11	25.832	28,216	158.5%	95.6%	shut	-19	0	19	0	0	0	0	0	0	4.42	1,546	90.1%	0	10.3	1,884	84.0%	39	open
5-Aug-11	25.830	28,196	158.4%	95.5%	open	-20	0	8	12	0	0	0	0	0	4.42	1,547	90.2%	0	10.3	1,863	83.1%	34	closed
6-Aug-11	25.821	28,131	158.1%	95.3%	open	-65	0	20	45	0	0	0	0	0	4.42	1,546	90.1%	0	10.3	1,867	83.3%	38	closed
7-Aug-11	25.812	28,057	157.7%	95.1%	open	-74	0	29	45	0	0	0	0	0	4.42	1,546	90.1%	0	10.3	1,867	83.3%	16	closed
8-Aug-11	25.803	27,988	157.3%	94.8%	open	-69	0	24	45	0	0	1	0	0	4.42	1,547	90.2%	0	10.4	1,897	84.6%	0	closed
9-Aug-11	25.793	27,917	156.9%	94.6%	open	-71	0	26	45	0	0	0	0	0	4.34	1,518	88.5%	0	10.4	1,935	86.3%	0	closed
10-Aug-11	25.784	27,847	156.5%	94.3%	open	-70	0	25	45	0	0	0	0	0	4.29	1,498	87.3%	0	10.5	1,973	88.0%	0	closed
11-Aug-11	25.795	27,932	156.9%	94.6%	open	85	148	18	45	0	0	0	12	2	4.24	1,480	86.3%	0	10.6	2,021	90.1%	0	closed
12-Aug-11	25.785	27,859	156.5%	94.4%	open	-73	0	28	45	0	0	0	0	0	4.11	1,430	83.4%	0	10.6	2,059	91.8%	0	closed
13-Aug-11	25.776	27,791	156.2%	94.2%	open	-68	0	23	45	0	0	0	0	0	4.03	1,401	81.7%	0	10.7	2,093	93.4%	0	closed
14-Aug-11	25.769	27,739	155.9%	94.0%	open	-52	0	7	45	0	0	0	0	0	3.87	1,348	78.6%	0	10.8	2,127	94.9%	0	closed
15-Aug-11	25.760	27,671	155.5%	93.7%	open	-68	0	23	45	0	0	0	0	0	3.81	1,328	77.5%	0	10.8	2,166	96.6%	0	closed
16-Aug-11	25.753	27,620	155.2%	93.6%	closed	-51	0	18	33	0	0	0	0	0	3.81	1,328	77.5%	0	10.8	2,166	96.6%	24	opened
17-Aug-11	25.750	27,601	155.1%	93.5%	closed	-19	0	19	0	0	0	0	0	0	4.09	1,425	83.1%	0	10.7	2,077	92.6%	89	open
18-Aug-11	25.749	27,591	155.0%	93.5%	closed	-10	0	10	0	0	0	0	0	0	4.30	1,502	87.6%	0	10.6	2,008	89.5%	69	closed
19-Aug-11	25.737	27,507	154.6%	93.2%	Open	-84	0	10	74	0	0	0	0	0	4.14	1,444	84.2%	0	10.6	2,050	91.5%	50	closed
20-Aug-11	25.734	27,483	154.4%	93.1%	closed	-24	0	24	0	0	0	0	0	0	4.15	1,446	84.3%	0	10.6	2,050	91.5%	0	closed
21-Aug-11	25.731	27,463	154.3%	93.0%	closed	-20	0	20	0	0	0	0	2	3	4.01	1,395	81.3%	0	10.6	2,050	91.5%	0	closed
22-Aug-11	25.717	27,362	153.7%	92.7%	Open	-101	0	16	85	0	0	0	3	4	4.03	1,402	81.7%	0	10.8	2,153	96.0%	11	open
23-Aug-11	25.738	27,513	154.6%	93.2%	closed	151	162	11	0	0	0	1	21	17	4.17	1,455	84.9%	0	10.7	2,115	94.3%	38	open
24-Aug-11	25.735	27,491	154.5%	93.1%	closed	-22	0	22	0	0	0	0	0	0	4.28	1,496	87.3%	0	10.7	2,080	92.8%	35	open
25-Aug-11	25.732	27,472	154.4%	93.1%	closed	-19	0	19	0	0	0	0	0	0	4.39	1,537	89.6%	0	10.6	2,046	91.3%	34	open
26-Aug-11	25.771	27,756	156.0%	94.0%	closed	284	294	10	0	0	0	31	36	21	4.47	1,564	91.2%	0	10.6	2,063	92.0%	11	closed
27-Aug-11	25.808	28,025	157.5%	94.9%	closed	269	279	10	0	0	0	28	24	21	4.61	1,618	94.3%	0	10.7	2,119	94.5%	0	closed
28-Aug-11	25.880	28,585	160.6%	96.8%	closed	560	578	18	0	0	0	1	3	3	4.95	1,756	102.4%	184	11	2,273	101.4%	158	closed
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Peter Care
[redacted]

PC:PC

10 March 2008

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Department of Natural Resources and Water
GPO Box 2454
BRISBANE, QLD 4001

Dear Ron,

OPERATION OF LENTHALL DAM GATES

Following our conversation last week and your subsequent email, the following is an account of the operation of the Lenthall Dam gates last month and actions to remedy the failure of the gates to open as designed.

- On 29th January, Wide Bay Water (WBWC) staff were successful in dropping the centre and smallest gate installed on the dam structure, water level at the time was 25.44m. The dam designers were notified of the event at that time.
- On the 5th February 2008, heavy rainfall in the Lenthall Dam catchment resulted in the dam water level exceeding RL 26.0m and overtopping the crest gates.
- By 6th February the dam water level had reached 26.55m and none of the five gates had opened as designed. The first gate should have opened at 26.15m with each gate opening at 50mm intervals.
- On the 11th February the dam water level had dropped to 26.20m with still no gates opening. The crest gate designers, GHD, attended the site that day to view the gate operation.
- Continued heavy rainfall in the catchment resulted in the dam level reaching 27.41m on the 12th February with no gates dropping. GHD and their sub consultant, Flowgate from South Africa, were notified of the events. WBWC were notified by GHD that there was the potential for all gates to drop of their own accord if dam water levels exceeded 27.55m and that the smallest gate may drop as water levels receded.
- On the 16th February 2007 around midday, the smallest gate dropped and remained down for about 15 hours to release flows down the Burrum River.
- On the 18th February, GHD and WBWC were able to drop Gate 1, adjacent to the walkway, by the use of a hydraulic jack. Once inflow to the gate was cut, it returned to its operational level.
- GHD and Flowgate staff attended the site on 25th February to determine the cause of the gates failure to drop as designed. Gate 1 was again lowered with the assistance of a hydraulic jack and establish the primary cause of the failure was due to the pressure exerted on the gate seals was sufficient to hold the weight of the gate and prevent movement. An external load of approximately 0.6 tonne was sufficient to break the seal and allow the gate to lower. The gate outlet was altered to reduce the flow out of the gate and increase the volume of water within the gate during filling to increase the net weight of the gate and allow it to lower. This was trialed and Gate 1 operated without any external assistance.

- The outlet for each of the five gates has subsequently been altered to allow automatic operation along with the emergency inlets being lowered to enable operation at an earlier water level.
- GHD and Flowgate are presently evaluating options for altering the existing gate seals to provide a permanent solution to this problem, but this action will require the dam water level to be below RL24.0m or the installation of stop logs on the dam crest to allow modification to be made.

As mentioned above, GHD and Flowgate are evaluating options for a permanent solution to the gate seal problems and once these have been finalised, your office will be notified of the outcome. At this point in time we believe the gates will operate as designed in the event of an extreme flood event.

During the event of the 12th February, access was cut to a couple of properties upstream of the dam with WBWC keeping in regular contact with the owners to ensure that there was no detrimental effect. No reports of downstream damage were reported.

I have attached the Draft Emergency Action Plan and the Gate Operation Manual as requested, but must emphasise that these are in a draft format only, until the gates are fully commissioned and operating as designed.

If any additional assistance is required, please do not hesitate in contacting the writer.

Yours faithfully

PETER CARE
DIRECTOR ENGINEERING CONSLTANCY SERVICES
WIDE BAY WATER CORPORATION

Peter Care
[redacted]

6 June 2008

Mr[redacted]
Principal Policy Officer, Water Management
Department of Natural Resources and Water
GPO Box 2454
BRISBANE, QLD 4001

Dear Mr[redacted]

LENTHALL DAM GATES

This letter is to provide you with the information that you requested regarding Lenthalls Dam and its operation following the opening by the Deputy Premier on Wednesday May 21.

Hervey Bay is the second fastest growing city in Queensland with the population approximately doubling every 10 years for the past 25 years and current growth rates tracking at between 2.5 and 5%.

To secure water for the city, Wide Bay Water Corporation sought and gained Government approval for a two metre raising of Lenthalls Dam.

This increase of capacity from 17,800ML to 29,500ML secured enough water to meet the cities needs until an estimated 2025, dependent on growth rates.

To secure this water, the chosen construction method was Crest Gates and construction of these gates, were completed in February 2007. The main benefit of Crest Gate construction over a solid concrete wall (which was the conventional option that could have been used for this project) is:

1. The opportunity to minimise upstream inundation and flooding in rainfall events, and
2. The ability to improve and regulate environmental flow conditions in the Burrum River to mimic natural flow events thereby improving downstream ecosystems.

At this time, the Crest Gates **have not** been commissioned. However they do all rise as the dam level goes up, and harvests water to the raised level.

Wide Bay Water Engineers along with representatives from Flowgate and GHD are still working to complete the commissioning process. This work involves the adjustment of the seals and gate outlets to optimise performance of the gates.

It is anticipated that this work will take until the end of 2008 to complete, as true commissioning and testing can only occur during rainfall events. This commissioning process is normal, expected and planned for as part of the construction program for the raising of the dam.

During the rainfall event on February 6 - 12 heavy rainfall in the catchment caused the dam to reach 27.55m with no gates dropping automatically as designed.

Following consultation with the Crest Gate designers GHD and the product manufacturers, Flowgate in South Africa, Wide Bay Water Corporation engineers and fitters were successful in achieving manual operation of two gates in the series of five. This was achieved by applying a small external force (0.6 tonne) to overcome the resistance of the seal.

Following the flood event in February, the gate orifice plate outlet were altered on all five gates to reduce the flow out of the gate and increase the volume of water within the gate during filling to increase the net weight of the gate and allow it to lower. This was trialled and Gate 1 operated without any external assistance.

At this time it was also identified that adjustments would ultimately be required to the seals of the gates.

However, to perform this activity would require the water stored in the dam to fall to below the original wall height or would require the construction of temporary "stop log" barriers to hold back the water whilst the adjustments to the seals are completed.

Given the priority which the Corporation places on completing the commissioning of the dam the planning, design and construction of stop log barriers have already been instigated.

The corporation is currently moving as quickly as possible to construct the stop logs required to enable the seals to be appropriately adjusted so that the gates operate as designed.

In the most recent flood event in May-June 2008 the gates again did not all operate automatically as designed. However, engineers and operational staff were successful in lowering gate 1 manually by applying appropriate external force to help the gate release from the seal. Gate 3 did automatically both open and close, however its opening was later than the designed sequence.

Whilst the gates commissioning process is still being finalised, the gates have already added benefit by improving environmental flows in the river and reducing upstream flooding when compared with the conventional dam design alternative a concrete wall structure.

To manage dam safety Wide Bay Water Corporation has developed a DRAFT emergency action plan.

As a key action of this plan, during the flood event of 12 February, Wide Bay Water Corporation staff undertook an evaluation of the impacts the raised water level had on the surrounding community and in particular if access was lost to any properties.

Two properties lost access for a short period during the peak of the flood, being the [redacted] and [redacted] farms. Access was returned to the [redacted] property after a very short period of time, but a washed out culvert prevented access to the [redacted] property being returned for two days.

The Corporation was notified by [redacted] that there were residents on the property and that access was compromised. The Corporation offered to helicopter food and supplies to the site, or evacuate personnel from the site if required by the owners. Both offers were declined as they were using the neighbour's property ([redacted]) to access their own farm. Additional work has been carried out on the access to the [redacted] property to ensure continued unrestrained entry to their property.

In the smaller flood event in May – June, Wide Bay Water Corporation staff again contacted affected landowners who again declined any assistance. Regular inspections were completed of road conditions and clearing of debris from the road was completed.

As mentioned above, the Corporation and its advisers GHD and Flowgate are prioritising the implementation and finalisation of the commission process through the seal adjustment and once these have been finalised, your office will be notified.

If any additional assistance is required, please do not hesitate in contacting Peter Care on [redacted]

Yours faithfully

[redacted]

CHIEF EXECUTIVE OFFICER

Peter Care

From: Peter Care
Sent: Friday, 15 February 2008 4:59 PM
To: [redacted]@nrw.qld.gov.au'
Subject: Lenthall Dam

Ron,

A quick up date on progress. Water levels are rapidly dropping at the gates and is expected to be 0.5m over the gates by midday tomorrow. GHD have provided a design to enable lowering of the first gate to release water to the design levels. When water levels reach RL 26.0m we will be able to access the gates seals to release pressure on them which will enable the gates to drop as designed in future flood events. We will make a decision early tomorrow morning regarding further action and with additional weather information at hand.

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile:
email:

Peter Care

From: Peter Care
Sent: Monday, 18 February 2008 11:23 AM
To: 'Guppy Ron'
Subject: RE: Lenthall Dam

Ron,

The centre gate dropped on Saturday morning at about 11.00am to release flood levels, it rose again at about 3.00am on Sunday morning as the water level flowing over the gates reached 26.15m which it was designed to do.

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile
Email:

From: Guppy Ron [mailto:[redacted]]
Sent: Monday, 18 February 2008 11:05 AM
To: Peter Care
Subject: RE: Lenthall Dam

Peter,

Thanks for this information

I would appreciate any updating you could give.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

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Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone:
Fax:
Mobile:
email:



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Peter Care

From: Guppy Ron [redacted]
Sent: Wednesday, 5 March 2008 9:49 AM
To: Peter Care
Subject: RE: Lenthall Dam
Attachments: 309_LenthallsDam_FinalConditionSchedule.doc

Peter

Confirming earlier discussions, the safety condition schedule for Lenthall Dam (copy attached) calls for incident reports to be provided to NRW within 30 days when a dam safety incident such as a gate malfunction occurs (DS2).

I suggest in this case it should at least address the reason(s) for the non-operation of the gates, the remedial measures put in place to get the gates operational now, and any further alterations being considered/planned to improve their reliability in the longer term.

Also, the conditions call for the Emergency Action Plan (DS13) and the Gate Operation Manual (DS15) to be submitted to NRW by 30th November 2007. While [redacted] may have browsed through drafts of these documents when conducting the safety condition audit last November and inferred later submission could be accommodated, I now ask that these be provided as soon as practical even if presented as draft or interim documents. You might also consider asking for these dates to be changed if the final documents aren't close to completion.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email: [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

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Sent: Monday, 18 February 2008 11:23 AM
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Wide Bay Water Corporation
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Fax:
Mobile
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To: Peter Care
Subject: RE: Lenthall Dam

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I would appreciate any updating you could give.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email: [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

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Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile:
email:

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Lenthalls Dam (#0309)
Dam Safety Condition Schedule
For: Wide Bay Water

Introduction

Lenthalls Dam is the main water supply for the Hervey Bay area. The dam is sited on the Burrum River at AMTD 34.2km. The nearest township is Howard, approx 30km due west of Hervey Bay.

The construction of the dam was originally completed in 1984. Upgrade works including the installation of Crest Gates to raise the full supply level by 2 metres were completed in 2007.

The conditions as outlined below apply to Lenthalls Dam as constructed in 2007.

Category Assessment:

Failure Impact Assessment Category:	2
Population at risk:	270
Date of Assessment:	August 6, 2002

Basic Description of the Dam:

Location:	Burrum River (AMTD 34.2km)
Property description of lots inundated or partially inundated by storage or covered/partially covered by dam structure	Lot [redacted], Plan [redacted]
Date of completion:	1984 Stage 2 was completed in 2007.
Purpose:	Town Water Supply

MAIN EMBANKMENT

Construction Type:	Zoned earth fill embankment
Total Length:	347 m
Embankment Crest Level	EL 34.6 m
Embankment Crest Width:	6 m
Maximum Embankment Height:	29 m

SPILLWAY

Full Supply Level	EL 26 m
Storage Capacity (at FSL)	28,411ML
Spillway – 75m Gated Ogee crest with 4 x 14.8m wide and 1 x 9.8m wide by 2m high crest gates	
Fixed Crest level	EL 24 m
Max Discharge Capacity (at DCF)	5670 m^3/sec

NOTE:

1. Levels quoted are to the Burrum No. 3 Datum (Add 0.18m to convert to AHD).

Condition DS 0 - General

1. The dam is to be kept safe at all times.

Condition DS 1 - Documentation

1. Any documentation prepared in order to comply with these conditions must be stored securely by the dam owner until such time as the dam is decommissioned.
2. The documentation must be made available for inspection by the Chief Executive, Department of Natural Resources and Water, within seven (7) days of a written request for access being received by the dam owner.
3. On change of ownership of the dam, all documentation prepared in compliance with these conditions must be transferred to the new owner.

Condition DS 2 - Incidents and Failures

1. In addition to the requirements detailed within the Emergency Action Plan, the dam owner must report in writing all incidents and failures (as defined in the *Queensland Dam Safety Management Guidelines – February 2002*) to the Chief Executive, Department of Natural Resources and Water, within seven (7) days of becoming aware of the incident or failure.
2. The dam owner must advise the Chief Executive, Department of Natural Resources and Water of any proposed remedial actions in writing within thirty (30) days of the incident or failure.

Condition DS 3 - Design Report

1. The Design Report prepared by GHD dated February 2006 and titled "*Lenthalls Dam Raising, Design Report, Wide Bay Water*" shall be taken as the final design report for the dam.

Condition DS 4 - Design and Construction

1. In addition to the design report as referred to in condition DS3, copies of drawings and information used for the Lenthalls Dam Raising project shall be delivered to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**. This information shall then be considered as the design and construction information for the dam.
2. Any remedial works or reconstruction of the dam must be carried out in accordance with current engineering practice to ensure that the dam remains generally in accordance with the documentation referred to within this condition schedule.
3. Where remedial, reconstruction or upgrade works are proposed by the dam owner, information describing the final design and construction methodology must be forwarded to the Chief Executive, Department of Natural Resources and Water for their consideration. A written report outlining the design and methodology must be presented to the Chief Executive, Department of Natural Resources and Water, no later than thirty (30) days prior to the signing of any contractural arrangement for such works.

Condition DS 5 - Data Book

1. The dam owner must prepare a Data Book in accordance with this condition and the *Queensland Dam Safety Management Guidelines - February 2002*.
2. The Data Book must be prepared by no later than the **30th day of November 2007**.
3. The Data Book must include all information as is required in the *Queensland Dam Safety Management Guidelines – February 2002* including:
    a. All pertinent records and history relating to the dam.
    b. All available documentation relating to the investigation, design, construction, operation, maintenance, surveillance, monitoring

measurements and any remedial action taken during construction and subsequent operation of the dam.
   c. Known deficiencies such as seepage, cracking.
4. The dam owner must ensure the Data Book is reviewed (and if necessary updated) in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the **1st day of November** of each calendar year.
5. A written notification confirming that the Data Book has been reviewed (and if necessary updated) shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.

Condition DS 6 - As Constructed Documentation

1. As constructed documentation which details the arrangement of the as constructed works is to be provided to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**.

Condition DS 7 - Standing Operating Procedures

1. The dam owner must develop Standing Operating Procedures (SOP) in accordance with this condition and the *Queensland Dam Safety Management Guidelines- February 2002.* The SOP must include the following activities:
   - Personal Training and Procedural Issues
     a. Operator Training
     b. Documentation Control and Review
     c. Setting of Normal Operation Criteria
   - Emergency Action and Incident Reporting
     a. Accident and Incident Reports
     b. Review of EAP including Verification of Emergency Contact Details
     c. Communication procedures and procedures covering loss of Communication during an Emergency Event
   - Critical Operating Procedures
     a. Inspection, testing and maintenance of critical mechanical and electrical equipment
     b. Notification of any spillway discharge
     c. Water Level monitoring procedures
     d. Communication security and failsafe procedures
     e. Bulkhead gate installation and removal, penstock drainage, trash screen removal and installation (where applicable)
     f. Confined Space Access (where applicable)
     g. Diving operations during inspections (where applicable)
   - Monitoring and Surveillance
     a. Water level monitoring procedures and the monitoring of inflow events
     b. Owners routine dam safety inspection including checklists and reporting requirements
     c. Inspection, testing and maintenance of all mechanical and electrical equipment
     d. Dam Safety Annual Periodic Inspections (DS 10)
     e. Dam Safety five (5) yearly Comprehensive Inspection (DS 11)
     f. Inspection during and after flood or seismic events.
   - Maintenance of a Dam Log Book
     a. Equipment Testing
     b. Planned and Unplanned maintenance
     c. Testing of gate functions (if applicable)
     d. Environmental and flood discharge with respective reservoir levels
     e. Incident details
2. The dam owner must submit a copy of the SOP to the Chief Executive, Department of Natural Resources And Water no later than the **30th day of November 2007**.
3. The dam must be operated in accordance with the SOP.

4. The dam owner must ensure the SOP is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any SOP, the updated documents are to be forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.
    b. Where no amendments are necessary, a written notification confirming that the SOP have been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.

Condition DS 8 - Detailed Operation and Maintenance Manuals

1. The dam owner must prepare Detailed Operation and Maintenance Manuals in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*
2. The Operation and Maintenance Manuals must be prepared no later than the **30th day of November 2007**.
3. The dam owner must ensure that the Operation and Maintenance Manuals provide a comprehensive set of instructions on all equipment operated at the dam
4. The dam owner must ensure the Detailed Operating and Maintenance manuals are reviewed and if necessary updated by the **1st day of November** of each calendar year.
5. A written notification confirming that the Detailed Operating and Maintenance Manuals have been reviewed and/or updated shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same Calendar year.

Condition DS 9 - Special Inspections

1. When directed by the Chief Executive, Department of Natural Resources and Water, a Special Inspection must be carried out at the cost of the dam owner and a report must be prepared in accordance with the *Queensland Dam Safety Management Guidelines – February 2002.*
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of inspection and may elect to observe any or all procedures involved in the inspection process.
3. The dam owner must provide one copy of the Special Inspection Report to the Chief Executive, Department of Natural Resources and Water within thirty (30) days of completion of inspection.

Condition DS 10 - Annual Periodic Inspections

1. The dam owner must undertake an annual (periodic) inspection of the dam in accordance with the *Queensland Dam Safety Management Guideline – February 2002* on or before the **1st day of November** of each calendar year.
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of the Annual inspection and may elect to observe any or all procedures involved in the inspection process.
3. The owner must produce a written record of these annual inspections and each written record is to be incorporated into the Comprehensive Inspection Report.
4. A written notification confirming that the Annual inspection has been carried out in accordance with the *Queensland Dam Safety Management Guideline – February 2002* shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same Calendar year.
5. In addition to the items listed in the *Queensland Dam Safety Management Guideline – February 2002*, the Annual Periodic Inspection Reports must address the following:
    a. Evidence of any concrete cracking, spalling, or other identified deficiency.
    b. Evidence of any leakage through the structure.
    c. Test operation of all equipment.

d. Evaluation of all surveillance data.
e. Any other issues the inspecting engineer considers appropriate.

Condition DS 11 - Comprehensive Inspections

1. The dam owner must carry out a comprehensive inspection of the dam in accordance with the *Queensland Dam Safety Management Guidelines – February 2002*, on or before the **1st day of November 2008**, and on or before every fifth anniversary thereafter.
2. The Chief Executive, Department of Natural Resources and Water shall be advised in writing of the date of the Comprehensive Inspection and may elect to observe any or all procedures involved in the inspection process.
3. A Comprehensive Inspection Report detailing the findings of the comprehensive inspection in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* must be submitted to Chief Executive, Department of Natural Resources and Water, within three (3) months after completion of the comprehensive inspection.

Condition DS 12 - Safety Review

1. The dam owner must carry out a Safety Review in accordance with the *Queensland Dam Safety Management Guidelines – February 2002* by the **1st day of November 2023**.
2. The dam owner must prepare a Safety Review Report and provide one copy of the Safety Review Report to the Chief Executive, Department of Natural Resources and Water within three (3) months of completing the review.
3. Further Safety Reviews are to be carried out at twenty (20) year intervals, but may be required at more regular intervals by the Chief Executive, Department of Natural Resources and Water in such cases as:
    a. An absence of adequate documentation;
    b. Detection of abnormal behaviour of the structure;
    c. Changes to design standards, construction standards;
    d. A regulatory requirement.

Condition DS 13 - Emergency Action Plans and Event Reports

1. The dam owner must prepare and maintain an Emergency Action Plan (EAP) in accordance with this condition and the requirements of the *Queensland Dam Safety Management Guidelines – February 2002.*
2. Where the reservoir headwaters are such that inundation of any upstream dwellings is likely, such dwellings must be considered in the preparation of any Emergency Action Plan.
3. The EAP must cover the potential failure of any part of the structure that can put a population at risk either upstream or downstream. The emergency events described in the EAP shall cover those events as outlined in the *Queensland Dam Safety Management Guidelines – February 2002*, and include such failure modes as:
    a. Sunny day embankment failure
    b. Overtopping embankment failure
    c. Failure of control structures such as intake works, outlet works and gated spillways. This failure condition shall include:
        i. Loss of one and all gates in a sunny day event
        ii. Loss of one and all gates in a flood event
4. Inundation mapping shall be developed as outlined in the *Queensland Dam Safety Management Guidelines – February 2002*, and shall be at a sufficiently large scale so as to easily identify those areas subject to possible danger. Mapping shall be developed for all failure modes described in the EAP.
5. The EAP must be disseminated to those who have responsibilities under the EAP and shall:

a. Determine and identify those conditions that could forewarn of an emergency and specify the actions to be taken and by whom;
b. Identify all jurisdictions, agencies and individuals who could be involved in the Emergency Action Plan (for example, local governments, the Queensland Police, State Emergency Services and downstream residents);
c. Identify primary and secondary communication systems, both internal (between persons at the dam) and external (between dam personnel and outside entities);
d. Identify all resources, special tools, equipment, keys and where they can be located if required in an emergency;
e. List and prioritise all persons and entities involved (including contact details) in the notification process and the roles and responsibilities assigned to them (eg. A flow chart may be useful);

6. The dam owner must provide a copy of the EAP to the Chief Executive, Department of Natural Resources And Water by the **30th day of November 2007.**
7. The dam owner must ensure the EAP is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any EAP, a copy of the updated document is to be forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year;
    b. Where no amendments are necessary, a written notification confirming that the EAP has been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources And Water by the **30th day of November** of that same calendar year.
8. If the EAP is changed between the normal review periods, the dam owner must provide one copy of the changed EAP to the Chief Executive, Department of Natural Resources And Water within thirty (30) days of the changes being made.
9. The dam owner must ensure that in addition to any copy or amended copy of the EAP provided to the Chief Executive, Department of Natural Resources And Water in compliance with this condition (DS13), current versions of the EAP are also provided to the following parties : -
    a. Wide Bay Water (owner).
    b. Hervey Bay City Council
    c. Hervey Bay Counter Disaster Coordination Committee.
    d. Any additional group with responsibilities under the Emergency Action Plan.
10. In all emergencies, the dam owner must respond in accordance with the Emergency Action Plan.
11. In the event of an emergency, the dam owner must notify the Chief Executive, Department of Natural Resources And Water within forty-eight (48) hours. The notification shall include a brief description of the event and the time of activation of the Emergency Action Plan.
12. Within thirty (30) days of the event the dam owner must prepare an Emergency Event Report and provide a copy of the report to the Chief Executive, Department of Natural Resources And Water. The Emergency Event Report must include:
    a. A description of the event.
    b. Instrumentation readings (where appropriate).
    c. Description of any observed damage.
    d. Photographs.
    e. Details of communication and actions which took place during the emergency.
    f. How the EAP was implemented during the event and comment on the adequacy of the EAP and any changes proposed.

Condition DS 14 - Decommissioning

1. The dam must not be taken out of service (decommissioned) except in accordance with a Decommissioning Plan accepted by the Chief Executive, Department of Natural Resources and Water.

2. The Decommissioning Plan must indicate how the dam is to be rendered safe in the long term and how the contents are to be drained in a controlled and safe manner.

Condition DS 15 - Spillway Gate Operation

1. The dam owner is to provide the following information in relation to gate operation:
    a. Gate Maintenance routines including gate exercise methodology and frequency
    b. Operator training procedures and frequency of training updates
    c. Details of personnel responsible for gate operations and the numbers of operators available for releases at any given time.
    d. Gate operation methodology during planned river releases.
    e. Gate operation methodology during a flood and/or emergency event. Special emphasis will be required on gate operation in relation to both upstream and downstream river levels.
    f. Details of any alternate or backup operating system should the primary method of gate operation fail.
2. Documentation detailing the procedures as described in this safety condition is to be supplied to the Chief Executive, Department of Natural Resources and Water by the **30th day of November 2007**.
3. The dam owner must ensure the gate operation information is reviewed by the **1st day of November** of each calendar year.
    a. Where amendments are made to any information, a copy of the updated document is to be forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same calendar year;
    b. Where no amendments are necessary, a written notification confirming that the information has been reviewed shall be signed by the dam owner and forwarded to the Chief Executive, Department of Natural Resources and Water by the **30th day of November** of that same calendar year.

Peter Care

From: [redacted]
Sent: Wednesday, 28 May 2008 4:52 PM
To: Peter Care; DL - Executive Team; [redacted]
Subject: Re: Lenthalls Dam - actions to fix dam gates

Peter
Please draft me a response
Thanks
[redacted]

----- Original Message -----
From: [redacted]
To: [redacted]
Sent: Wed May 28 16:09:01 2008
Subject: Lenthalls Dam - actions to fix dam gates

Mr [redacted],

We have had an urgent request from the office of the Deputy Premier regarding the operation of the gates on Lenthalls Dam during the flood event in January 2008 and the subsequent actions to rectify the problem.

This request stems from an incident at the opening of the dam on 21 May and a number of issues subsequently raised with the Deputy Premier.

In order for our department to provide the relevant information to the office of Deputy Premier, it would be appreciated if we could obtain written confirmation of the gate operation during the flow event and the subsequent actions from your organisation. A return email should be sufficient at this time.

Of course, we would expect a full report on the incident as required under the interim resource operations licence in due course.

The sort of information required would be:

- Confirmation that the gates or a number of the gates failed to operate as required during the flood event

- What was found to be the cause of the non operation/failure of the gate/s

- What action has been taken to address the issue and to ensure that the gates will operate correctly during any future flood events

Thanks

[redacted]
Principal Policy Officer, Water Management
Telephone: [redacted] Facsimile: [redacted] Mobile: [redacted]
Email: [redacted]
www.nrw.qld.gov.au <http://www.nrw.qld.gov.au/>

Department of Natural Resources and Water
41 George Street, Brisbane Q 4000
GPO 2454, Brisbane Q 4001

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CLIENTS PEOPLE PERFORMANCE

15 February 2008

Wide Bay Water
29-31 Ellengowan Street
Hervey Bay Qld 4655

Our ref: 41/19335/370564
Your ref:

Attn: [redacted]

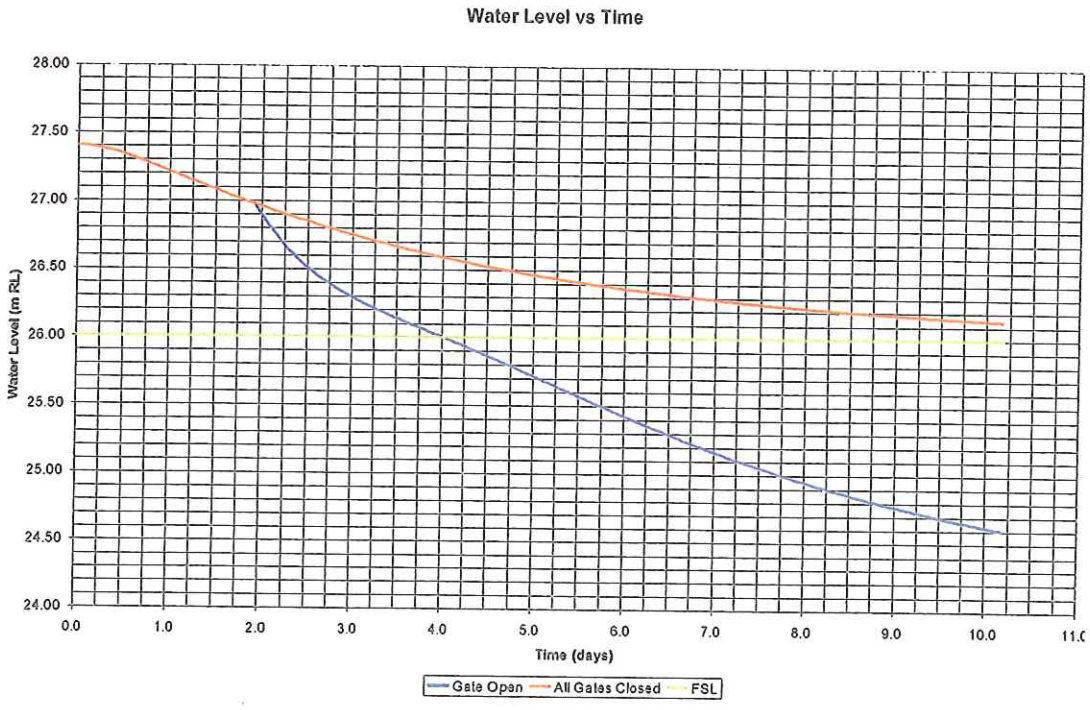
Dear Trevor

Lenthalls Dam Raising
Suggested actions for current dam situation

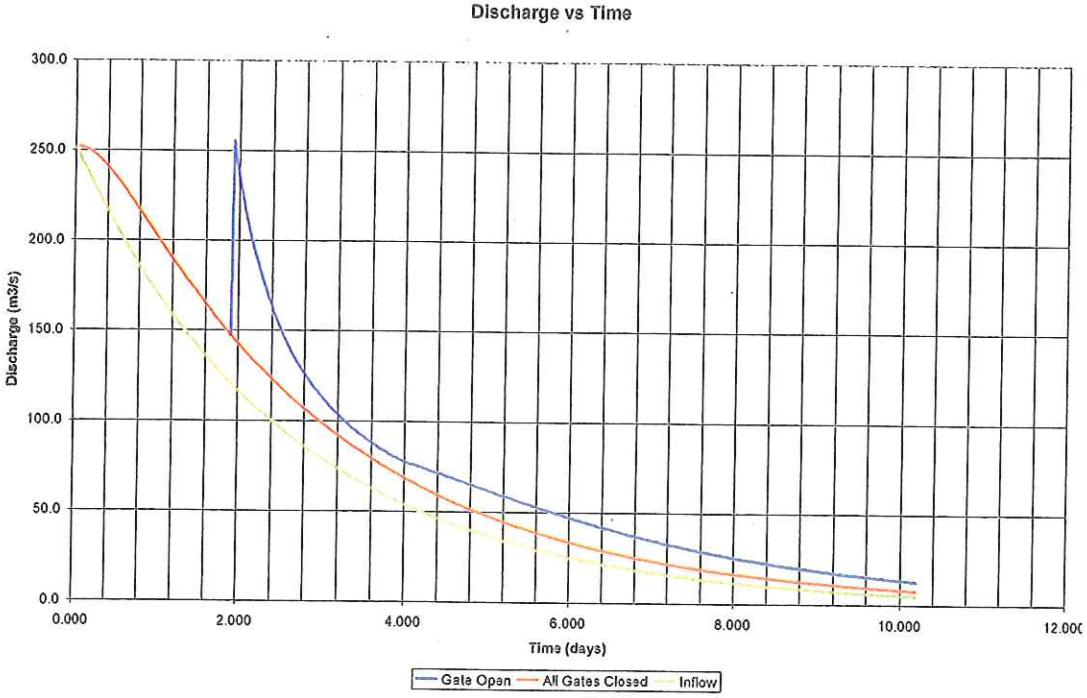
Following our joint site inspection of 08 February 2008 and subsequent discussion between us over the past week I attach a method of lowering the gate/s and a summary of calculations showing the new FSL can be maintained as requested.

1 Reservoir Levels and Discharge

The Lenthalls Dam water level is currently at or close to 27.0 RL with none of the gates open. The current discharge from the dam is around 150 m^3/s. Based upon this situation and with no major rainfall events and only the natural reduction in inflow it would take in excess of 8 days for the dam level to reach 26.2 RL. If one of the 15 m gates was lowered with the water level as it is and the same inflow criteria it would take 2 days for the dam level to reach 26.0 RL. This is shown graphically below, noting that day #2 is 15 February at 08H00.



Opening a single 15 m gate will increase the discharge downstream to close to the discharge reached on the early morning of 13 February. It should be noted that this peak will occur for a short duration at the dam and will be attenuated as the flow passes downstream. The increase in discharge with and without the single gate open and the assumed inflow rate into the reservoir are shown on the chart below.



The need to open a single gate is driven by the urgency in getting the dam level back to or below the FSL of 26.0 RL, which alleviates the inundation upstream, and increases the ability of the reservoir to absorb new rainfall events and minimises the potential for increased downstream inundation in the event that the gates operate at a higher water level. Furthermore this will provide the opportunity for additional commissioning tests of the gates, particularly the measurement of the lintel seal compression directly through the downstream lintel cover plates.

2 Gate Stability

Current calculations indicate that the gates are held in position by the thrust on the gate lintel seal and the resulting friction between the seal and the seal plate. With this constraint the gates are stable up to a water level of at least 27.5 RL. At some point above this level the aeration of the nappe downstream of the gates will cease as the piers becomes further inundated and the buoyant force will be reduced. The opening force generated by the loss of this buoyant force exceeds the maximum possible seal friction and the gates will open. All gates opening at the same time is unlikely but if a large flood event is underway such that dam levels continue to rise after the first gate is open then a second gate could open. The corresponding change in discharge from no gates open to two 15 m gates open at a dam level of 27.55 RL is from 290 m^3/s to 530 m^3/s. This increase in discharge will have an impact on the inundation levels downstream of the dam.

To minimise the possibility of this occurring it is recommended that the dam level is drawn down to 26.0 RL or less by the opening of a single 15 m gate.

3 Gate Opening and Closing

As stated above our understanding of the current situation is that the gates are held in position due to the thrust on the gate lintel seal and the resulting friction between the seal and the seal plate. The magnitude of this thrust can be confirmed by the loading test of one of the gates and the direct compression measurements on the seal once that reservoir is below 26.0 RL. The increased thrust is a result of the combination of the higher than anticipated compression of the gaskets on the gate support arms and the less than anticipated compliance of the lintel seal. As the thrust increases with the depth of water held back by the gates it is possible to get an estimate of the thrust based upon the operation of Gate #3 at a dam level 25.5 RL and its failure to operate at a dam level of 26.2 RL. Based upon these bounds the weight required to unseat one of the 15 m gates is in the range of 2,000 kg to 5,500 kg. The absolute maximum weight required to unseat one of the 15 m gates if the seal is taking the entire horizontal load is in excess of 13,000 kg.

Using the load cell data from the crane the actual weight applied to the gate to unseat the seal can be assessed. This data can then be used to determine the appropriate adjustments to the lintel seals during further commissioning.

Once the gate has moved free of the seal there is no mechanical drag on the gate at all and it moves freely downwards and upwards. In the process of analysing the gate operation an independent check has been made the opening and closing actions of the gates. These calculations are in agreement with those done by Flowgates for the gate design. If the seal is damaged such that it cannot compress upon meeting the seal plate when the gate closes the gate will sit at a level or 400 mm below full up and the dam level will naturally drop to 26.6 RL. The design of the lintel seal is such that this type of damage is very unlikely and the buoyant force available to seat the seal when the gate is in this position is 10 tons for the 15 m gate. Therefore that possibility of the gate not closing fully is remote.

When the gate is in the fully lowered position the buoyancy force available to initiate closure is 9.3 tons for the 15 m gate.

4 Proposed Method of Gate Lowering

The method proposed to safely lower one of the 15 m gates is as follows:

1. Restrict public access to areas of potential inundation eg low level road crossing.
2. The gate to be opened is Gate #5 closest to the right abutment.
3. Open the manual operation valve to ensure maximum filling of gate tank.
4. Position a suitable mobile crane on the right abutment (sufficient reach from the abutment to over the quarter point of the gate).
5. Using a 4.0 ton to 6.5 ton crane counterweight as kentledge, lift the weight over the abutment and lower the weight slowly onto the gate tank. Due to the flowing water care will need to be taken to correctly position the weight so that it contacts the tank in the correct position. Some damage to the paintwork is unavoidable.
6. Crane load cell to be monitored to record the weight at which gate movement occurs.
7. Once the gate is free of the seal drag (lowered by 400 mm) it will open under its own forces and will swing away from the weight and the crane will take up the full load of the weight.

8. Draw dam level down to below 26.0 RL. The final level reached is controlled by the closing of the manual gate control valve.

5 Summary

- The gates have not been wet commissioned and therefore are not operating as intended.
- Adjustment of the seals will form part of this commissioning and the gates will need to be operated to achieve this.
- Our recommendation is to open one gate taking measurements during this operation to provide data for the commissioning process.
- This gate should be kept lowered to drain the reservoir to the new FSL of 26.0 RL.
- Our calculations confirm that the gates can maintain the new FSL after lowering.

If you have any further questions or require assistance please contact myself or [redacted], Manager Dams, on [redacted].

Yours faithfully
GHD Pty Ltd

[redacted]

Principal Engineer
[redacted]

Peter Care

From: [redacted]
Sent: Thursday, 14 February 2008 10:36 AM
To: [redacted]
Cc: Peter Care; [redacted]
Subject: FW: Attention: [redacted] road access road & road repair
Attachments: Signature TJD.JPG

Importance: High

Ms [redacted],

As discussed yesterday, WBWC staff will be inspecting the failed gully crossing on the access road to the [redacted] property with the Contractor today after which I will advise you of when remedial works will be undertaken. If acceptable to yourself I will do this through email. WBWC's Peter Care had looked at the failure on Tuesday morning and it appears as though it has been further damaged by flows from Tuesday mornings rain.

WBWC will endeavour tho have this crossing fixed as soon as possible to restore access to the property. This may involve a temporary crossing next to the failed structure.

As discussed we will also investigate the possible spread of weeds due to construction activities and the safety of the borrow pit on WBWC land.

With regards to the 24 hour contact number, I believe your lawyers have previously been advised of the appropriate phone number. For you records the contact number is [redacted] which is the Corporations "On Call" service.

Regards

[redacted]

TREVOR DEAN
MANAGER - CAPITAL DEVELOPMENT
WIDE BAY WATER CORPORATION
PHONE [redacted]

MOBILE [redacted]
FAX [redacted]
WWW.WIDEBAYWATER.QLD.GOV.AU

From: [redacted]
Sent: Thursday, 14 February 2008 9:16 AM
To: [redacted]
Subject: FW: Attention: [redacted] road access road & road repair
Importance: High

From: [redacted]
Sent: Thursday, 14 February 2008 9:14 AM
To: [redacted]@widebaywater.qld.gov.au
Cc: DL - WBW Requests
Subject: Attention: [redacted] road access road & road repair
Importance: High

Dear [redacted],

I tried to call you to discuss with you the situation of our road access with you but you I was unable to leave a message as your message bank is full. I need to discuss this situation with you urgently.

Can you also supply me with the 24 hours contact number that we were advised that we would be supplied with for situations like this?

Regards

[redacted]

No virus found in this outgoing message.
Checked by AVG Free Edition.
Version: 7.5.516 / Virus Database: 269.20.4/1275 - Release Date: 12/02/2008 3:20 PM

Peter Care

From: [redacted]
Sent: Thursday, 14 February 2008 4:43 PM
To: DL - WBW Requests; Peter Care
Subject: FW: Attention: Peter Care

Importance: High

Dear Peter,

[redacted] phoned today at 4.08pm. He said that he would that he considered that Logbridge Crossing (where the old wooden bridge used to be) is safe and stable. He said that it had only incurred minor scouring. He did not suggested any upgrading or reinforcing of the banks the further prevent erosion and scouring as he considered the crossing safe. He mentioned that he thought that the pipes which are near this crossing (at the end of [redacted] Road) to be stable as he well as this is part of the bank.

In regards the pipe crossing [redacted] offered to rectify the crossing but he did not mention upgrading the crossing.

Old Warrah Road Causeway has also been cut.

The causeway/ crossing on [redacted] Road is also underwater and it is probably damaged as it is made by similar materials to the crossing that was completely washed out and is unusable.

Regards

[redacted]

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Peter Care

From: [redacted]
Sent: Friday, 15 February 2008 8:11 AM
To: Peter Care
Subject: Fw: Lenthall Dam - Allan Property
Attachments: image001.jpg

FYI
[redacted]
Manager Project Delivery
Wide Bay Water Corporation

----- Original Message -----
From: [redacted]
To: [redacted]
Sent: Fri Feb 15 08:00:30 2008
Subject: RE: Lenthall Dam - [redacted] Property

[redacted],

The 3 men left early this morning via [redacted]s property, I haven't spoke to them I have just received a message as their mobile signal keeps dropping out,

Regards

[redacted]

From: [redacted]@widebaywater.qld.gov.au]
Sent: Thursday, 14 February 2008 4:08 PM
To: [redacted]
Subject: Lenthall Dam - [redacted] Property
Importance: High

[redacted],

Heavy earthmoving equipment will be on site tomorrow morning with the aim of re-establishing the access road gully crossing. We will endeavour to have it open as quickly as possible but it may be late tomorrow afternoon when cars can get out.

Do the people on site require supplies to be taken out to them tomorrow morning?

Regards

[redacted]
Manager - Capital Development

Wide Bay Water Corporation
Phone [redacted]

Mobile [redacted]
Fax [redacted]
www.widebaywater.qld.gov.au

From: [redacted]
Sent: Thursday, 14 February 2008 11:28 AM
To: [redacted] Peter Care
Subject: FW: [redacted] Sisters stranded at farm
Importance: High

From: [redacted]
Sent: Thursday, 14 February 2008 11:26 AM
To: DL - WBW Requests; [redacted]@widebaywater.qld.gov.au
Subject: FW:
Importance: High

From: [redacted]
Sent: Thursday, 14 February 2008 11:24 AM
To: [redacted]@widebaywater.qld.gov.au'
Subject: FW:

Subject:

Dear [redacted],

In regards to the road repair I have been advised that 3 individuals are now stranded at the [redacted] Farm and they have very minimal supplies so we need to have the road fixed as urgently as possible as they no means of leaving the property and they cannot be reached by other people as the surrounding roads/ crossings and creeks are inaccessible due to high water levels and flooding.

Regards

[redacted]

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Version: 7.5.516 / Virus Database: 269.20.4/1277 - Release Date: 13/02/2008 8:00 PM

Peter Care

From: Peter Care
Sent: Thursday, 1 May 2008 8:20 AM
To: [redacted]
Subject: RE:

[redacted],

I have chased our staff up over this issue, I was under the impression that the repairs has been completed, I apologise for the delay.

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile
email:

From: [redacted]
Sent: Wednesday, 30 April 2008 5:47 PM
To: Peter Care
Subject:

Dear Peter,

Nothing more has been done with the road and it is impassable for some vehicles and that some of the previous damage is still evident and hasn't been repaired (at the causeway the wash out is still evident) and the other road surface has not stabilised. Can you please let me know when the road work will be completed?

Kind regards

[redacted]

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Version: 7.5.524 / Virus Database: 269.23.6/1404 - Release Date: 29/04/2008 6:27 PM

Peter Care

From: [redacted]
Sent: Friday, 14 March 2008 3:11 PM
To: Peter Care
Subject: FW: road works conducted by WBW

Dear Peter,

Can you please reply to the email below as I still have not heard from you in regards road works mentioned below.

Regards

[redacted]

From: [redacted]
Sent: Wednesday, 5 March 2008 5:52 PM
To: 'Peter Care'
Subject: FW: road works conducted by WBW

Dear Peter,

Could you please let me know when the works on Powell Creek and the causeway at Logbridge Creek will be repaired?

Regards

[redacted]

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Version: 7.5.516 / Virus Database: 269.21.3/1306 - Release Date: 1/03/2008 5:41 PM

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Version: 7.5.516 / Virus Database: 269.21.4/1312 - Release Date: 4/03/2008 9:46 PM

No virus found in this outgoing message.
Checked by AVG.
Version: 7.5.519 / Virus Database: 269.21.7/1328 - Release Date: 13/03/2008 11:31 AM

Peter Care

From: [redacted]
Sent: Wednesday, 5 March 2008 5:52 PM
To: Peter Care
Subject: FW: road works conducted by WBW

Dear Peter,

Could you please let me know when the works on Powell Creek and the causeway at Logbridge Creek will be repaired?

Regards

[redacted]

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Version: 7.5.516 / Virus Database: 269.21.4/1312 - Release Date: 4/03/2008 9:46 PM

Peter Care

From: [redacted]
Sent: Wednesday, 14 May 2008 2:32 PM
To: Peter Care
Subject: RE:

Dear Peter,

A) Referring to my previous we where at the property on the weekend. I note that someone has been out and put spray paint on the road. The road is still in the same state that it was previously so nothing has changed expect for the addition of some spray paint markings. We note that this may mean that the Powell Creek crossing has been inspected by WBW.

1. When the work will commence?
2. When the work will be completed?

B) We didn't see any similar markings at the Logbridge Bridge Crossing. Scouring/ washout/ erosion is still evident on the embankment sides of the causeway and also we note the road surface is scoured. The concrete crossing/ causeway is at a higher level than the road level due to scouring by water. This requires repair. The pipes in the drain where Allan's road connects with the causeway is scoured and eroded and may lead to road collapse in the event of rain. Can you please tell me when;

3 Work will commence?
4. When the work will be completed?

We are extremely glad that the weather has been dry or else we would find that we have no road access.

Kind regards

[redacted]

From: Peter Care [mailto[redacted]
Sent: Thursday, 1 May 2008 8:20 AM
To: [redacted]
Subject: RE:

[redacted]

I have chased our staff up over this issue, I was under the impression that the repairs has been completed, I apologise for the delay.

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone:
Fax:
Mobile
email:

From: [redacted]
Sent: Wednesday, 30 April 2008 5:47 PM

To: Peter Care
Subject:

Dear Peter,

Nothing more has been done with the road and it is impassable for some vehicles and that some of the previous damage is still evident and hasn't been repaired (at the causeway the wash out is still evident) and the other road surface has not stabilised. Can you please let me know when the road work will be completed?

Kind regards

[redacted]

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Version: 7.5.524 / Virus Database: 269.23.16/1431 - Release Date: 13/05/2008 7:55 PM

From: [redacted]
Sent: Monday, 1 December 2008 11:37 AM
To: [redacted]
Subject: FW: WBWC - Lenthalls Dam Dam Saftey Plan - current problems

FYI [redacted],

cheers
[redacted]

[redacted]
Executive Assistant - Mayor
Fraser Coast Regional Council
Telephone: [redacted]
Fax: [redacted]
Web site: http://www.frasercoast.qld.gov.au
Disclaimer: If you receive this email by mistake please notify the sender and do not make any use of it. Council does not waive any privilege, confidentiality or copyright associated with this email or any attachments.

From: [redacted]
Sent: Tuesday, 25 November 2008 7:17 AM
To: [redacted]
Cc: [redacted]
Subject: FW: WBWC - Lenthalls Dam Dam Saftey Plan - current problems

[redacted],

WBWC Dam Safety Plan – current problems requiring immediate attention!

There has been a very distressing fatality with Dam Infrastructure at Blackwater in the last few days. Sunwater the operator is saying they did not think it possible prior to the event. Since February 2008 we have had very little contact with WBWC – no explanation of the gate failure and no inclusion in evacuation planning.

WBWC lawyers have still not responded to our last letter regarding the contact details on the Emergency Action Plan.

WBWC also make claims of infallibility and with this in mind I would be grateful if you could provide:

A. **An immediate update on the issues below and**
B. **Immediate action with respect to the numbered issues below. I remind you that <u>Lenthalls Dam is a Category 2 Dam with 270 People at risk</u> downstream and maybe as many as 30 upstream** – (Paul Lucas has identified 14 properties in speeches to the media)

As far as we are aware this is the current situation with the Lenthalls Dam Safety Plan - and the reason there is a major problem at WBWC.

1. No inundation mapping in the event of dam break/ failure/ flooding has been issued to downstream or upstream residents . Dam Safety NRW was asking for the inundation mapping prior to construction (FOI sources confirm this) but it does not appear that Dam Safety NRW has copies even today. We think WBWC did not bother generating the material let alone distributing it.
   Would you please provide an update on the progress of inundation mapping and distribution?

2. No residents have been updated or notified with respect the failed gates from the time WBWC became aware the gates are not operable to today while the gates are under repair going into the storm season. What is being done about this?

3. The Emergency Action Plan is still not up to date with workable contact numbers and WBWC have not replied to our last letter. WBWC are claiming the EAP as their intellectual property, which is preventing Dam Safety NRW providing the document to us. We think the EAP is still incomplete. Would you please advise?

4. EAP Evacuation Plans – I would be willing to bet the 270 people downstream don't even know there is a threat downstream let alone have a coordinated plan to evacuate if problems occur during bad weather with the jammed gates under remediation. This is a greatly enhanced risk over the next few months. WBWC is extremely negligent in not making the public aware of risk – so that if an announcement needs to be made the public can evacuate in an orderly manner. DON'T FORGET SUNWATER ARE TELLING PEOPLE THEY THOUGHT THE DAM BREAK INCIDENT AT BLACKWATER WAS NOT POSSIBLE PRIOR TO IT OCCURING. WBWC CANNOT USE THE ARGUMENT THAT IT IS UNLIKELY OR WONT HAPPEN – IT CAN AND HAS.
   The Lenthals Dam Gates are still not operable.
   When will the public be consulted regarding the Lenthals Dam evacuation and evacuation routes and when will the public be notified that the Lenthals Gates don't work?

   What will FCRC do to ensure public safety ?
   Please contact Peter Allen Director Dam Saftey NRW if you require further information .

   In short we don't think WBWC – Dam Safety Planning is in any better state that it was in February 2008 or at least not in any way that affects upstream residents or that residents would be aware of as they have not been in any kind of contact with us or included us in Emergency and Evacuation Planning.

WE ARE EXTREMELY CONCERNED THAT WBWC STILL DO NOT HAVE RELEVANT CONTACT DETAILS FOR THE ALLAN FAMILY MEMBERS ON THE EMERGENCY ACTION PLAN. THE LENTHALLS GATES DO NOT WORK AND THE STORM/FLOOD SEASON IS UPON US.

WOULD YOU PLEASE ENSURE THAT WBWC RESPOND TO OUR LAST ENQUIRY WITH RESPECT TO THE EAP, SO THAT WORKABLE CONTACT DETAILS ARE INCLUDED ON THE LENTHALLS DAM EMERGENCY ACTION PLAN? This is a matter of urgency.

Regards

[redacted]

From: [redacted]
Sent: Monday, 17 November 2008 7:14 AM
To: [redacted]
Subject: Definitions of population at risk

FYI .

Please find attached the definition of a population at risk from NRW flood guild lines. Peter Allen Director Dam Safety is of the view – [redacted] should have been relocated prior to construction of Lenthalls Dam latest increase as we are below the wall – Lenthalls Dam wall is at RL34 - house site RL30.3 approx.

It takes 300mm to knock a person on foot of their feet and 300mm to float a car.

WBWC flood modelling is largely wrong and does not include historical data such as the 1970's event - all the modelling by WBWC regarding this event and the 1990's event has hypothetical models not based on evidence – this is the same for the 1990's event at the [redacted] Farm house – prior to the gate installation.

[redacted] GHD consultant to WBWC says the 1970's event was a 1:80 year event. The level at the farm house in 1970 went to around RL28.5/29 the only access out being just above our dam and parallel to the main flow of Logbridge creek which came thru beneath the bank near just adjacent to the slab hut.

The minor / moderate event in Feb reached equivalent or there abouts levels due to A. the impoundment and B. gate failure. The event in Feb was small what we call a fresh say one in 2 or one in 5 prior to the dam increase it would have filled the bed and bank and burbled under our bridge without threat.

This change in our circumstances raises the issue – where will water levels be with a 1 in 80 post dam construction.

Please discuss these issues with Peter Allen Director Dam Safety when assessing the risks and planning risk management

Regards

[redacted]

ITEM 4 & 5

~ 27737

Queensland Government

Department of
Natural Resources and Water

File: DAM/130/000(0309)

5 March 2009

WIDE BAY WATER CORPORATION
TO _____
10 MAR 2009
☐ COPY
COMMENTS _____

Mr [redacted]
Chief Executive Officer
Wide Bay Water Corporation
29-31 Ellengowan Street Urangan
HERVEY BAY, QLD 4655

Dear Mr [redacted]

Lenthalls Dam
Backwater Analysis

As you may be aware, consultants GHD are in the process of completing a backwater study of the effects Lenthalls Dam has on upstream residents during flood events.

NRW was sent a copy of their Draft report on 19th February 2009 after a meeting with them and [redacted] on 18th February 2009 to discuss the project.

While the GHD study still needs confirmation of the backwater analysis model's calibration, the Draft GHD report appears to indicate that the immunity of the [redacted] family house is only of the order of a 5% to 10% AEP flood event. This immunity is further exacerbated by any failure of the spillway gates to open 'as designed' and the fact that the house is separated from higher ground by a lower area which would restrict escape at lower flood levels.

I understand GHD have referred this report to Wide Bay Water to obtain permission to forward it to the [redacted] family in the interests of reviewing the model calibration and finalising the report. I would encourage you most strongly to approve this.

I understand that the problems with the gate opening are essentially resolved following the completion of the project to replace the gate seals. However, the system has not yet been tested under flood conditions and I require Wide Bay Water to continue to have trained personnel on site during flood operations to ensure gates can be operated manually if they fail to operate automatically as designed.

If the findings of the Draft GHD report are confirmed, the flood immunity of the [redacted] house is well in excess of the 1% AEP flood immunity applying on many other major strages in Queensland. I would appreciate receiving your advice as to how Wide Bay Water intend to deal with this situation.

Office of Water Supply regulator
GPO Box 2454 Brisbane
Queensland 4001
Telephone 07 3224 7999
Facsimile 07 32247999
Website www.nrw.qld.gov.au
ABN 83 705 537 586

In the interim, I expect extra care to be taken to provide adequate flood warnings to upstream residents such as the [redacted] as part of the Emergency Action Plan for the dam.

Should you have any further enquiries, please do not hesitate to contact me on telephone [redacted]

Yours sincerely

[redacted]

Peter Allen
Director Dam Safety (Water Supply)

Queensland Government

14 May 2009

[redacted]
A/Chief Executive Officer
Wide Bay Water Corporation
29-31 Ellengowan Street Urangan
HERVEY BAY, QLD 4655

WIDE BAY WATER CORPORATION
TO _____
01 JUN 2009
224930
☐ COPY
COMMENTS _____

Department of Environment and Resource Management

Dear Mr [redacted]

Lenthalls Dam
Backwater Analysis

At a meeting with [redacted] and Peter Care of Wide Bay Water last Tuesday, I was handed a final copy of a report prepared by consultants GHD entitled "Lenthalls Dam Flooding, February 2009".

This report examined the backwater effects Lenthalls Dam has on upstream properties during flood events with some emphasis on the [redacted] property.

This report indicated the following water levels would occur at the [redacted] house on Lot [redacted] of [redacted] While the GHD study applied high Manning's 'n' values, I accept that a better calibration of their model would not alter the basic outcome that the flood immunity of the [redacted] house is only of the order of a 5% to 10% AEP flood event.

Scenario	Feb 08	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Crest Gates closed	28.5	28.93	30.01	30.51	31.07	31.78	32.39
Crest gates fully operational		28.52	29.58	30.18	30.7	31.39	31.87

This immunity is further exacerbated by any failure of the spillway gates to open 'as designed' and the fact that the house is separated from higher ground by a lower area which would restrict escape at lower flood levels.

I do note that that assuming the operation of the gates that the flood immunity of the property has experienced limited change resulting from the raising of the dam in 2006.

I understand that the problems with the gate opening are essentially resolved following the completion of the project to adjust the gate seals.

However, the system has not yet been tested under flood conditions and I require Wide Bay Water to continue to have trained personnel on site during flood operations to ensure gates can be operated manually if they fail to operate automatically as designed.

Because the flood immunity of the [redacted] house is in excess of the 1% AEP flood resumption level applying on many other major storages in Queensland, I would therefore recommend that Wide Bay Water seriously consider taking appropriate actions regarding the [redacted] land and property such that a 1% AEP flood level protection is achieved.

In support of this approach and note that the 1% AEP flood level is also consistent with a risk management approach for 'natural flooding' whereby the risk to life of is of the order of 0.001 times the Population at Risk and the risk to individuals should not be higher than 10^{-6} per annum (as spelt out in our Departmental *Guidelines on Acceptable Flood Capacity for Dams* for major upgrades of existing dams).

I would also recommend that the 1% AEP flood level to be applied is the level that would occur at the house for the 1% AEP flood event with all the spillway gates jammed in the raised position.

Should you have any further enquiries, please do not hesitate to contact me on telephone [redacted]

Yours sincerely

[redacted]

Peter Allen
Director Dam Safety (Water Supply)

21114

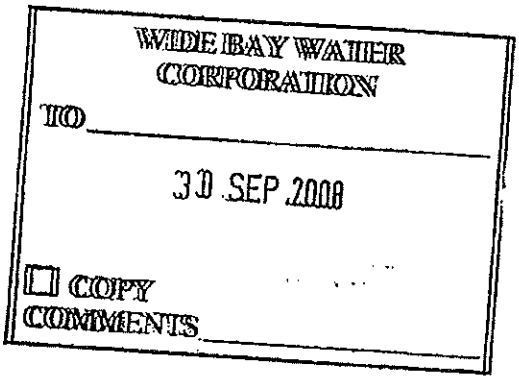
Queensland Government

Department of
Natural Resources and Water

File number DAM/130/000(0301)

29 September 2008

Chief Executive Officer
Wide Bay Water Corporation
29-31 Ellengowan Street Urangan
HERVEY BAY, QLD, 4655



Dear Sir

Crest Gate Control
Lenthall Dam

I acknowledge receipt of your letter of 22 September 2008 and attached Manual Operations Procedure.

Where practical the crest gates should be operated in accordance with this manual and the emergency action plan while the crest gate seal improvement program is underway.

Should you have any questions about this matter, please do not hesitate to contact Ron Guppy of the department on [redacted]

Yours sincerely

[redacted]

Ron Guppy
A/Director, Dam Safety (Water Supply)

Street Address
Level 10, ANZ Building324 Queen St, Brisbane, Qld, 4000

Postal Address
PO Box 2454, Brisbane, Qld, 4001

Telephone + 61 7 3224 7215
Facsimile + 61 7 3224 7999

Website www.nrw.qld.gov.au

ABN 83 705 537 586

18 June 2008

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Department of Natural Resources and Water
GPO Box 2454
BRISBANE, QLD 4001

Dear Ron,

OPERATION OF LENTHALL DAM GATES

The following is an account of the operation of the Lenthall Dam gates and safety precautions taken during the recent heavy rainfall event which commenced 30 May 08.

30 May 08

- Ranger checked Wongi Water holes and instructed visitors leave Wongi Water Holes, day recreation and camping areas. The Lenthall Dam recreation area was closed to the public and a road closed sign was erected at the turn off from the main road into the Dam. Dam level was ~ RL 26.15 and rising. Continuous on site monitoring of the crest gates and Dam level was arranged.
- Treatment Manager called Ranger at 11:05pm and instructed him to open the manual valve for gate number one. Dam level was ~ RL 26.30 and rising. A crew including Peter Care and [redacted] assembled at the Dam. At 11:50pm gate number one opened.

31 May 08

- The Dam level was monitored for ~ one hour immediately following the opening of gate one and appeared to be holding steady. It was decided that no further action was required at that point in time. Contingency plans were developed for crest gate and Dam level monitoring. The Ranger was asked to continuously monitor the gates and Dam level and report any changes to the Treatment Manager.
- At 3:04am the Ranger called the Treatment Manager to report that the Dam level appeared to be rising. Authorisation was given to attempt to manually lower a second gate. By 4:30am the Dam level appeared to have stabilised without a second gate being opened.
- Peter Care reported to Lenthall Dam to conduct an on site inspection. Continuous on site monitoring arrangements were made with operations staff.

1 June 08

- 4:47am Operator called Treatment Manager to report that gate number one had closed. Dam level was ~ RL 26.29m. Continuous on site monitoring of crest gates and Dam level remained in place.
- 11:40am Ranger called Treatment Manager to report that had been heavy rain in the Lenthall Dam catchment which could result in the Dam level rising. Dam level at this point in time was ~ RL 26.26m. Decision was made to proactively open crest gate number one in anticipation of a rise in Dam level.
- 4:30pm Difficulties were experienced with opening gate number one on this occasion. Attempts to manually open gate number one were aborted at ~ 6:30pm. Dam level appeared to be holding steady.

2 June 08

- 2:19am Operator called Treatment Manager to advise that the Dam level appeared to be rising. Dam Level ~ RL 26.29m. Decision made to hold off on continuing to attempt to manually open gate number one until morning. Staff safety was taken into consideration given that conventional manual operation methods had proven to be unsuccessful the previous afternoon. The likelihood was that there would be a greater degree of complexity involved in any ongoing attempts to open gate one and these actions should be well planned and tackled in the light of day.
- 6:34am Mobilising Mechanical Fitters to attempt to open gate number 1. Dam level ~ 26.42 and rising.
- 1:00pm Strategy meeting held on site involving all key personnel. Operational activities planned out and executed. Dam level peaked at ~ RL 26.64m.

3 June 08

- Weather forecast favourable. Dam level was observed to be falling. Dam level was ~ RL 26.40 by late afternoon.
- Operational investigations into crest gate performance being carried out.

4 June 08

- Operational investigations into crest gate performance being carried out. Dam level was ~ RL 26.25 by late afternoon.

5 June 08

- 2:40pm Operator called to advise that gate number 3 had opened without assistance.
- 9:30pm Operator called to advise that gate number 3 had closed on queue.

GHD and Flowgate have commenced preparing final detailed design drawings for manufacture of crest gate stop logs. Crest gate stop logs will enable the gate seals to be accessed for modification. Modification of the seals is required to provide a long term solution to the problems being experienced with automatic operation of the gates.

During the event, access was cut to the [redacted] property upstream of the dam for a short period of time 2 June 08. WBWC was in contact with the owners to offer any assistance required. The water levels at Logbridge Causeway and Doongul Causeway peaked at 400mm and 420mm respectively at ~ 10:00pm 2 June 08. No reports of downstream damage were reported.

If any additional assistance is required, please do not hesitate to contact the undersigned.

Yours faithfully

[redacted]

GENERAL MANAGER – BUSINESS SERVICES
WIDE BAY WATER CORPORATION

Wide Bay Wa

ITEM 10

Wide Bay Water Corporation ABN 98 380 729 010
29-31 Ellengowan Street Urangan HERVEY BAY Q 4655

Enquiries:
Phone: [redacted]
Your Reference:
Our Reference:

NATA
ACCREDITED FOR TECHNICAL COMPETENCE

27 June 2008

Mr Peter Allen
Director Dam Safety (Water Supply)
Water Industry Asset Management & Standards
Department of Natural Resources and Water
GPO Box 2454
BRISBANE QLD 4001

Dear Peter

OPERATION OF LENTHALL DAM GATES

Feb/June Flood Events (Response to request for additional information).

Following the flood event in February, the gate orifice plate outlets were altered on all five gates to reduce the flow out of the gate and increase the volume of water within the gate during filling to increase the net weight of the gate and allow it to open. This was trialled and Gate 1 operated without any external assistance.

In the May/June 08 rainfall event the gates did not all operate automatically as designed. However, Wide Bay Water Corporation engineers and operational staff were successful in lowering Gate 1 manually by applying appropriate external force to help the gate release from the seal. Gate 3 did automatically open and close, however its opening was later than the designed sequence. Gate 3 opened 5 June 08 as the Dam level was falling. This tends to substantiate the current seal friction theory that is suspected to be the root cause of the current pre commissioning teething issues that are being experienced.

Advice from GHD indicates that the current issues with gate operation are caused by too much horizontal load on the lintel seal resulting in too higher friction between the seal and the seal plate.

The friction and movement due to the horizontal load is so high that the gate hangs in place even when flooded with water well above the design filling level. This situation is caused by combination of a very stiff seal arrangement and more than predicted downstream movement of the gate under load.

Headwater gauges are in place at the two main causeways that feed into Lenthall Dam. (i.e. Logbridge and Doongul). It is not considered necessary to have headwater gauges installed at the minor upstream crossings as most minor tributaries flow into either Logbridge or Doongul prior to entering the Dam. Closure of the crossings is considered to be a SES responsibility. The EAP includes an action for notifying the SES of this requirement. A headwater gauge will be ordered this week and installed adjacent to the crest gates in the vicinity inlet weirs as soon as it is available. This will enable the Dam level to be continuously monitored by operations staff when on site. Headwater levels can be predicted using rainfall stations that are based in the Dam catchment area. Musket Flats is an example of this arrangement. Musket Flats rainfall data is monitored and reported internally at WBW on a daily basis. If significant rainfall is occurring in the catchment there is a delay period prior to inflows reaching the Dam. Lenthall Dam Rangers are deployed during this delay period to carry out an assessment of the magnitude of the runoff and subsequent potential inflow event.

INNOVATION
QUALITY ASSURANCE
WATER WISE
CONTINUOUS IMPROVEMENT

Lenthall Dam Rangers communicate their findings to WBW operations staff who are responsible for Dam operations. If it is suspected that inflow into the Dam will be sufficient enough to cause the Dam level to rise above the level that initiates automatic operation of the gates, continuous on site monitoring of the Dam level and crest gate system commences.

The Lenthall Dam and Wongi Water holes recreation areas were closed to the public and a road closed sign was erected at the turn off from the main road into the Dam. This action was carried out when the Dam level was ~ RL 26.15 and rising. The nominated trigger level for initiating these actions on this occasion was conservative when compared to the requirements stated in our EAP. This conservative trigger level will be adopted as an interim EAP measure until the crest gate seal improvements have been carried out. The current DRAFT EAP will be updated to reflect this intention. Arrangements will also be made to post road closed signs at any causeways that are considered to be impassable. Note that RL 26.15 will double as the interim trigger level for proactive warning of upstream residents/landholders.

Manual Gate Operations

Due to the current crest gate seal friction issues a modified manual operation procedure is in place. Normally operations staff would be required to follow Section 5.5 of the EAP to overcome any anomalies experienced with automatic operation of the gates. This section of the EAP describes the actions that need to be taken at nominated Dam trigger levels based on the observed performance of the gates whilst in automatic mode. Operations staff are required to follow the procedure below: (Extract from EAP).

- When water level is between 26.1m and 26.3m check inlets to confirm if the water is flowing.
- If water is not flowing into the inlet weirs, clear the blockage if this can be done safely.
- Remove debris if this can be done safely.
- Check if the gates are opening at the required levels in the following sequence

Gate No	Inlet level	Operate level
3	26.1	26.3
2	26.15	26.35
4	26.2	26.4
5	26.25	26.45
1	26.3	26.5

If the gates are not opening at required levels, operate manually in accordance with the sequence described above.

The interim procedure for manual operation of the crest gates will be lead on site by the Treatment Manager/Incident Manager.

A summary of actions currently planned to be taken is as follows:

If inflow into the Dam is occurring, all appropriate monitoring will be being carried out. (Radar monitoring using BOM web site, rainfall monitoring in the Lenthall Dam catchment, upstream visual inspections, flood slope monitoring, Dam level monitoring etc).

If a rise in Dam level above RL 26.0m is observed, crest gate No.2 will be proactively manually opened and continuous on site monitoring of the Dam level and crest gates will commence. (This gate is able to be manually opened by use of the manual override valve as demonstrated on site 19 June 08).

If the Dam level is observed to continue to rise, crest gate No.1 will be manually lowered. The manual valve will be opened to fill and hence cause the gate to open. This gate can have an external force applied if required to drive it open.

If the Dam level is observed to continue to rise, the manual valves on the remaining gates will be opened.

The EAP will be constantly referred to during any such event and actions will be carried out in accordance with the requirements stated in the document.

A summary of actions planned to be taken following installation of the hydraulic jacking devices on gates 1 and 5 is as follows:

If inflow into the Dam is occurring all appropriate monitoring will be being carried out. (Radar monitoring using BOM web site, rainfall monitoring in the Lenthall Dam catchment, upstream visual inspections, flood slope monitoring, Dam level monitoring etc).

If a rise in Dam level above RL 26.0m is observed, crest gate No.2 will be proactively manually opened and continuous on site monitoring of the Dam level and crest gates will commence. (This gate is able to be manually opened by use of the manual override valve as demonstrated on site 19 June 08).

If the Dam level is observed to continue to rise, crest gate No.1 will be manually lowered. The manual valve will be opened to fill the gate and hence cause it to open. The gate will have an external force applied using the hydraulic jacking device, if required, to drive it open.

If the Dam level is observed to continue to rise, crest gate No.5 will be manually lowered. The manual valve will be opened to fill the gate and hence cause to open. The gate will have an external force applied using the hydraulic jacking device, if required, to drive it open.

If the Dam level is observed to continue to rise, the manual valves on the remaining gates will be opened.

The EAP will be constantly referred to during any such event and actions will be carried out in accordance with the requirements stated in the document.

Operational knowledge of the crest gate system is being rapidly acquired as a result of the trouble shooting activities that have been and are being carried out at this site. It is a well recognised fact that the best opportunity for gaining operational knowledge about Water Industry infrastructure is when operational problems are being experienced. This type of challenge significantly accelerates the learning process. As a result of the Feb and May/June 08 events we now how a team of people with the skills, knowledge and experience to competently and confidently tackle operational problems if they arise.

The following WBW operations employees are considered competent in the operation of the crest gate system:

- [redacted] – General Manager Business Services
- [redacted] – Operations Manager
- [redacted] – Treatment Manager
- [redacted] – Water Treatment Plant Supervisor
- [redacted] – Asset Maintenance Supervisor
- [redacted] – Mechanical Fitter

- [redacted] – Mechanical Fitter
- [redacted] – Mechanical Fitter
- [redacted] – WBW Lenthall Dam Ranger

In addition to the above operations personnel, there are a number of WBWC and Consultant Engineers who are proficient in the operation of the crest gates.

As discussed during the site meeting held 19 June 08 and documented in the May/June 08 Incident Report, our strategy for controlling operation of the gates is to ensure a senior management representative is available on site at all times during an event to issue instructions. "Senior Corporation staff including: The Director of Engineering, General Manager Business Services, Operations Manager and Treatment Manager were onsite monitoring activities and directing actions required throughout the rainfall event." This level of attendance by senior staff ensures communication is clear and concise. Mobile telephone service is available on site at the Dam if this type of communication is required. Two way radios is the backup system in place for remote communication.

It is not considered possible for all forms of access to the Dam to be lost. Employees of WBWC, including senior corporation staff have access to four wheel drive vehicles as required. The Lenthall Dam Ranger is highly experienced in negotiating river crossings and communicates road conditions around the Dam to corporation staff regularly during rainfall events. Should road access be cut, WBW has the contingency plan in place to utilise a local helicopter service provider.

When work is being carried out on the crest gates, the standard arrangement is to have a minimum of three staff on the coal face with activities being overseen by a Manager and or Executive. Under circumstances where site monitoring only is required, it is considered acceptable to have this function carried out buy one person.

BoM Gauge

The Treatment Manager has been in contact with the Brisbane Office of the Bureau of Meteorology to commence making arrangements to have a calibration carried out on the BoM level monitoring instrument located at Lenthall Dam. This call was made 26 June 08.

Mr [redacted] working in the Hydrology Department of the BoM indicated that he will be able to perform a remote recalibration as an interim measure until the next site field inspection is due to be conducted. The Treatment Manager will provide the necessary information to enable this remote recalibration to be carried out. The Treatment Manager has nominated himself as the WBW Corporation contact for providing access to the site for the BoM Senior Field Technician, Mr [redacted]

Note: The BoM has a standard arrangement in place to carry out annual servicing and calibration of the level indicator. If additional calibrations are deemed to be necessary the Treatment Manager will initiate the request.

EAP

The Lenthall Dam DRAFT Emergency Action Plan (EAP) was reviewed and updated following the event in February by Treatment Manager James Castle and this document was used as a guide for the management activities undertaken during the May/June event. It is intended to again review the EAP following the activities of the rain event in May/June. The documentation is currently being finalised and it is expected that it will be available to be forwarded through to the DNRW within the next two weeks. Continuous improvement of this documentation will occur on an ongoing basis and any updates will be reported in accordance with Condition DS 13 item No.7 of the Lenthall Dam, Dam Safety Condition Schedule.

It is acknowledged that there is potential for upstream residents to be impacted as a result of the Dam level rising. Condition DS 13 item No.2 of the Lenthall Dam, Dam Safety Condition Schedule has been complied with to address this issue.

Residents/land holders who may potentially become affected by a rise in Dam level can expect the following communication:

- Contact established with potentially effected people by WBW at RL 26.15 with dam level is rising
- WBW to establish if potentially effected residences are currently inhabited
- Advise that road closed signage is being erected to exclude general traffic form the Dam area
- Advise them that Logbridge and Doongul causeway pavement levels are set at RL 26.40 and to observe gauge boards for water level over the causeways if attempting to cross. Advise them to observe road closed signage at causeways if in place.
- Discuss Dam level rate of rise and current weather forecast.
- Offer to provide any assistance required for access to property, egress or for provision of supplies.
- Advise them that they will be kept informed, particularly if there are any significant changes in the situation.

It is noted that the [redacted] Family has a preference for their contact details to be obtained through their Lawyers.

The BoM Hydrology Department can provide up to date flood warning information upon request. This information can be obtained by forwarding an email to flood.qld@bom.gov.au. It is the Corporation's intention to utilise this resource as required. Section 5.5 of the EAP makes reference to the options available for obtaining weather forecast updates.

Note: Flood slope levels have been estimated for Dam levels up to RL 26.20m.

Note: A meeting was organised on site at Wongi Water Holes 25 June 08 between QPWS Rangers including [redacted], (Senior Ranger) and key WBWC staff. The purpose of this meeting was to share knowledge of each organisations operational experiences and key operational objectives. Contact details of key personnel were exchanged to ensure they are current.

Fixing the problem

GHD and Flowgate have commenced preparing final detailed design drawings for manufacture of crest gate stop logs. Crest gate stop logs will enable the gate seals to be accessed for improvements to be carried out. Improvement of the seals is required to provide a long term solution to the problems being experienced with automatic operation of the gates.

In preparation for these alterations, GHD and Flowgate have undertaken tests on the lintel seal detail to formulate the best improvement option for the seal. Design discussions underway with Trelleborg (seal manufacturer) about alternate seal profiles indicate that exchanging the lintel seal for the revised extrusion is likely to be the preferred option.

Refer to Crest Gate Seal Improvement project program for details of the work required and timeframes involved. (Forwarded to Mr Peter Allen via email 26 June 08).

The intention is to verify this seal adjustment through the production of a full commissioning report for all gates. This report will include setting positions of orifice plates, measurement of seal compression and operating log for each gate with characteristic operating times. These will be the start of each gates "log book" which will be maintained for the life of the gates.

If any additional assistance is required, please do not hesitate to contact our Treatment Manager, [redacted] on [redacted]

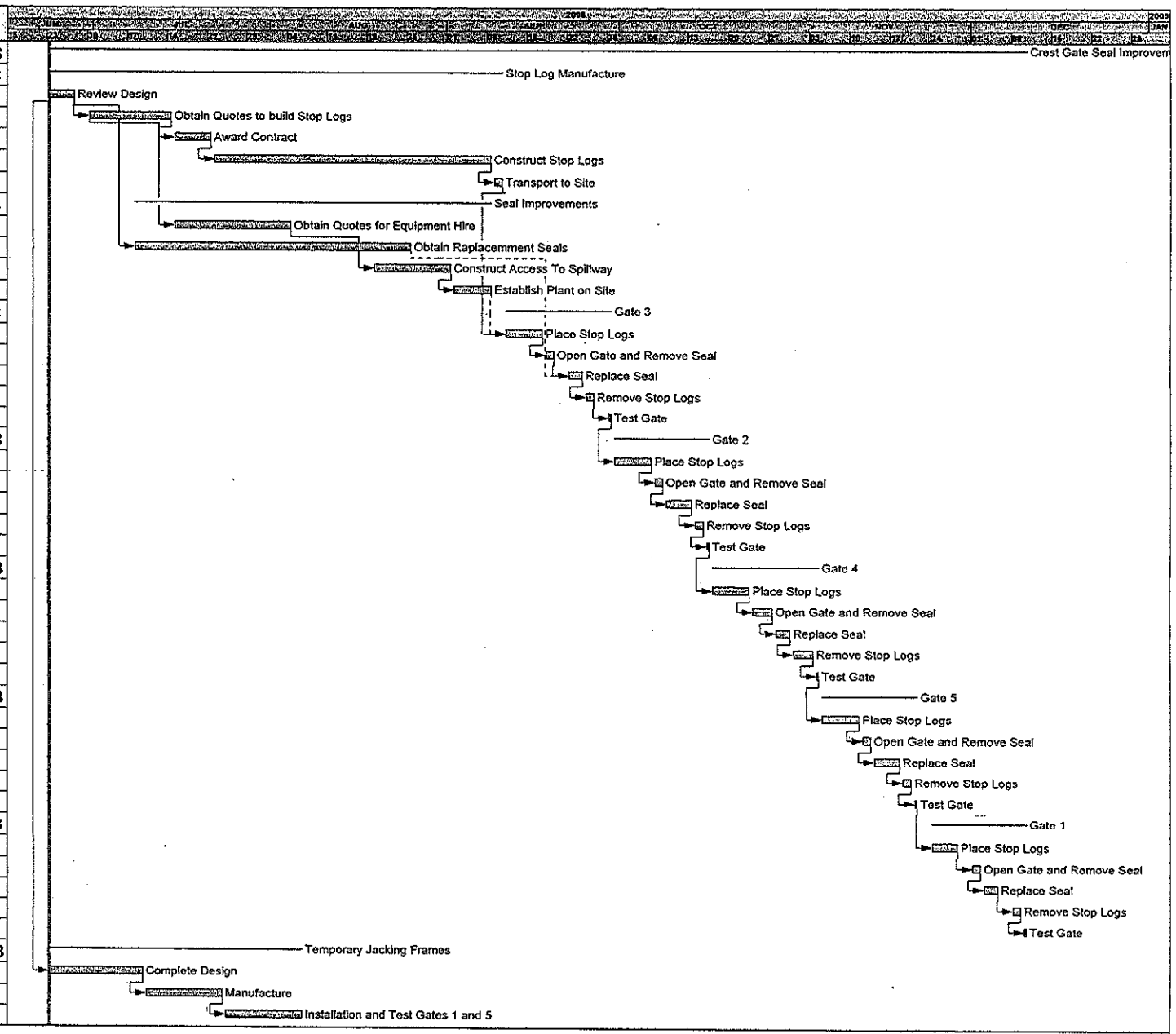
Yours faithfully

[redacted]

[redacted]

ACTING CHIEF EXECUTIVE OFFICER
WIDE BAY WATER CORPORATION

Description	Orig Dur	Rem Dur	Early Start	Early Finish
Crest Gate Seal Improvement	**22d**	**22d**	**23JUN08**	**10DEC08**
Stop Log Manufacture	**57d**	**57d**	**23JUN08**	**10SEP08**
Review Design	5d	5d	23JUN08	27JUN08
Obtain Quotes to build Stop Logs	10d	10d	30JUN08	14JUL08
Award Contract	5d	5d	15JUL08	21JUL08
Construct Stop Logs	35d	35d	22JUL08	08SEP08
Transport to Site	2d	2d	09SEP08	10SEP08
Seal Improvements	**45d**	**45d**	**08JUL08**	**08SEP08**
Obtain Quotes for Equipment Hire	15d	15d	15JUL08	04AUG08
Obtain Raplacemment Seals	35d	35d	08JUL08	25AUG08
Construct Access To Spillway	10d	10d	19AUG08	01SEP08
Establish Plant on Site	5d	5d	02SEP08	08SEP08
Gate 3	**13d**	**13d**	**11SEP08**	**29SEP08**
Place Stop Logs	5d	5d	11SEP08	17SEP08
Open Gate and Remove Seal	2d	2d	18SEP08	19SEP08
Replace Seal	3d	3d	22SEP08	24SEP08
Remove Stop Logs	2d	2d	25SEP08	26SEP08
Test Gate	1d	1d	29SEP08	29SEP08
Gate 2	**13d**	**13d**	**30SEP08**	**16OCT08**
Place Stop Logs	5d	5d	30SEP08	06OCT08
Open Gate and Remove Seal	2d	2d	07OCT08	08OCT08
Replace Seal	3d	3d	09OCT08	13OCT08
Remove Stop Logs	2d	2d	14OCT08	15OCT08
Test Gate	1d	1d	16OCT08	16OCT08
Gate 4	**13d**	**13d**	**17OCT08**	**04NOV08**
Place Stop Logs	5d	5d	17OCT08	23OCT08
Open Gate and Remove Seal	2d	2d	24OCT08	27OCT08
Replace Seal	3d	3d	28OCT08	30OCT08
Remove Stop Logs	2d	2d	31OCT08	03NOV08
Test Gate	1d	1d	04NOV08	04NOV08
Gate 5	**13d**	**13d**	**05NOV08**	**21NOV08**
Place Stop Logs	5d	5d	05NOV08	11NOV08
Open Gate and Remove Seal	2d	2d	12NOV08	13NOV08
Replace Seal	3d	3d	14NOV08	18NOV08
Remove Stop Logs	2d	2d	19NOV08	20NOV08
Test Gate	1d	1d	21NOV08	21NOV08
Gate 1	**13d**	**13d**	**24NOV08**	**10DEC08**
Place Stop Logs	5d	5d	24NOV08	28NOV08
Open Gate and Remove Seal	2d	2d	01DEC08	02DEC08
Replace Seal	3d	3d	03DEC08	05DEC08
Remove Stop Logs	2d	2d	08DEC08	09DEC08
Test Gate	1d	1d	10DEC08	10DEC08
Temporary Jacking Frames	**32d**	**32d**	**23JUN08**	**06AUG08**
Complete Design	12d	12d	23JUN08	09JUL08
Manufacture	10d	10d	10JUL08	23JUL08
Installation and Test Gates 1 and 5	10d	10d	24JUL08	06AUG08



Start date	23JUN08
Finish date	10DEC08
Data date	23JUN08
Run date	26JUN08
Page number	1A
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Wide Bay Water
Crest Gate Seal Improvements

Early bar
Progress bar
Critical bar
Summary bar
Start milestone point
Finish milestone point

Peter Care

From: Guppy Ron [redacted]
Sent: Wednesday, 4 June 2008 11:33 AM
To: Peter Care; [redacted]
Cc: Allen Peter
Subject: Visit re Lenthalls Dam

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Red Category

Peter, [redacted]

Peter Allen, Director Dam Safety and myself would like to pay a visit at the end of next week (either Thursday or Friday). Aside from giving us the opportunity to have a first hand look at the dam and gates, topics we would like to discuss include

- The reasons for the past operating problems
- Prospects/timing for getting the gates operating 'automatically'.
- Ongoing operation of the gates in their current condition
- The Emergency Action Plan
- Other documentation (construction documentation, operating procedures, O & M manuals)

Do you want to pick a day? I think it would be up and back for us in the one day so us arriving there about 10.30.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

****
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Peter Care

From: Guppy Ron [redacted]
Sent: Monday, 16 June 2008 3:07 PM
To: Peter Care
Cc: Allen Peter
Subject: RE: Visit re Lenthalls Dam
Attachments: Lenthalls Dam Issues 19June.doc

Peter,

Peter Allen and I are still planning a visit on this Thursday 19th. I suggest we meet at the dam at 10.30am to give us a chance to have a first hand look at the dam and gates.

We have had a bit of a brainstorming session to expand on the topics I outlined in the earlier email with some more specific questions/issues – see attached list. There hasn't been much culling of thoughts, so the list goes across a couple of pages with a bit of overlap. It might help you get you thoughts together prior to us being there.

I am out of the office tomorrow, but Peter [redacted] should be here if your have any queries.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email: [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: Peter Care [mailto [redacted]
Sent: Thursday, 5 June 2008 8:16 AM
To: Guppy Ron
Subject: RE: Visit re Lenthalls Dam

Ron,

Thursday the 19th is OK with me, I will let [redacted] know.

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile
email:

From: Guppy Ron [redacted]
Sent: Wednesday, 4 June 2008 4:14 PM
To: Peter Care
Subject: RE: Visit re Lenthalls Dam

How about we try for Thursday 19th then, second choice Friday 20th.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
Email: [redacted]
www.nrw.qld.gov.au
Department of Natural Resources and Water
ANZ Building, 324 Queen Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: Peter Care [mailto[redacted]
Sent: Wednesday, 4 June 2008 3:50 PM
To: Guppy Ron
Subject: RE: Visit re Lenthalls Dam

Ron,

I am on leave next week, any chance making it the following week?

Regards

Peter Care
Director Engineering
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile
email:

From: Guppy Ron [redacted]
Sent: Wednesday, 4 June 2008 11:33 AM
To: Peter Care; [redacted]
Cc: Allen Peter
Subject: Visit re Lenthalls Dam

Peter, [redacted]

Peter Allen, Director Dam Safety and myself would like to pay a visit at the end of next week (either Thursday or Friday). Aside from giving us the opportunity to have a first hand look at the dam and gates, topics we would like to discuss include

- The reasons for the past operating problems
- Prospects/timing for getting the gates operating 'automatically'.
- Ongoing operation of the gates in their current condition
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- Other documentation (construction documentation, operating procedures, O & M manuals)

Do you want to pick a day? I think it would be up and back for us in the one day so us arriving there about 10.30.

Ron Guppy
Principal Engineer (Dam Safety), Water Industry Regulation
Telephone [redacted] **Facsimile** [redacted] **Mobile** [redacted]
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Issues for Lenthalls Dam – WBW site visit 19th June 2008

Feb/June Flood Events

- A gate failing to operate on demand constitutes an 'incident' and should be acted upon as per safety condition DS 2.
- Incident report details – Not formally advised of June event yet
- What process was followed to fix the gates?
- What modifications were done to the gate operating mechanisms post Feb event?
- How do you determine whether a gate is 'ready to open'?
- What records are there of headwater levels during events?
- Did the operators have access to the EAP and was it used during the June event?
- What access restrictions were in place during the June event?

Manual gate operations

- Can the gates be operated manually in accordance with the automatic procedure or are separate instructions available. Is there any restrictions such as order of opening or time between gate openings?
- What training in gate operations has been done?
- How many trained operators are there for manual operations?
- Are the gate operators authorised to operate the gates if communication with managers is lost?
- When will operators take control of the gate openings?
- What is the minimum attendance of trained gate operators at the dam?

  (a) When gate operations are unlikely?

  (b) When gate operations are likely?
- What access to the dam is there is wet weather?
- What alerts/warnings are available of possible inflows?
- What methodologies are used to assess potential inflows and probable gate operations?

BoM Gauge

- Is there a gauge board at site for reading actual levels?
- Who is responsible for checking/servicing the gauge?
- Who checks the calibration?
- What is the frequency of checking of calibration?

EAP

- What is the status?
- When will NRW get a copy of final EAP?
- Failure for gates to open on demand requires action under the EAP.

  (a) What is the impact on upstream residents? – risk to Allan's is claimed.

  (b) Has any attempt been made to estimate the flood slope upstream of the dam?

  (c) How are the upstream residents/landholders incorporated in the EAP?

  (d) What arrangements are there with EPA re: Wongi Waterholes? How are they warned?

  (e) What warning is available?

  (f) What messages are given to those affected?

  (g) How are the impacts quantified?

  (h) What access/egress restrictions are there?

  (i) What information is provided to people contacted through EAP?

- Allan family prefers WBW to get their contact details from their Lawyers??
- Do the operators at the dam have up to date copies of the EAP? Are they familiar with it?
- Do the operators action the EAP? (Are they qualified to?)

Fixing the problem

- What is involved?
- Who is determining the required fix?
- What is the cause of the problem?
- How will it be demonstrated to be fixed? What certification will be provided?

- What is the timing?
- What flexibility is there is adjusting the opening triggers for the gates?

If it can't be fixed – I am prepared to issue a direction that the gates are always held in the fully open position.

Other Documentation

- What is the status of SOPs?
- What is the status of Data Book etc.?
- What is the status of construction documentation and certification?

Future Correspondence

- Verbal reports are to be confirmed in writing

Lenthall Dam Maintenance Log – November 2010

Time	Comment
18/11/10	
9.01am	Gate 4 – open Manual valve
9.05am	Gate 3 – open Manual valve
9.33am	Gate 3 – closed
9.35am	Gate 4 – closed
	Water not observed to be discharging from tell tale on either gate
9.45am	Water discharging from outlet orifices, noticeably reduced flow
10.00am	Fitters moving across crest to gate 3 and 4 Air vent screens being removed.
10.05am	Water discharging from OO's coming to a stop.
10.10am	Gate 2 Pier 3A – vent blocked Pier 3B – vent blocked 3A – high air pressure then release 3B – gurgling noise then vacuum commenced due to gate draining out
10.23am	Screen back on face of pier 3 Moving on to Pier 4
10.28am	Commenced removing screen over air vents from Pier 4
10.35am	Pier 4 vents blown out. Both A and B seemed relatively clear. Gate 3 tell tale checked and confirmed to be clear. Gate 4 tell tale checked – blocked then cleared Pier 5 vents – Gate 4 vent blocked – Gate 5 vent clear
11.06am	Gate 4 Manual valve open
11.07am	Gate 3 Manual valve open
11.21am	Gate 3 Manual valve closed
11.30am	Gate 4 Manual valve closed
	Water issuing from tell tales
11.45am	Gate 3 drain speed accelerated by loosening outlet restrictor plate below pier 3
	Gate 3 blow up plugs inserted
12.02pm	Gate 3 manual valve opened
12.14pm	Discharge from tell tale
12.15pm	Close gate 3 manual valve
12.16pm	Deflate blow up plugs

12.20pm	Gate empty
	Full six inch flow from both outlet pipes
12.42pm	Gate 4 inlet valve open
12.58pm	Discharge from tell tale
1.00pm	Close gate 4 manual valve
1.02pm	Deflate blow up plugs
1.12pm	Gate empty
1.56pm	Manual valve open gate 4 1.56pm – 29minutes – 2.25pm
2.00pm	Manual valve open gate 3 2.00pm – 19 minutes – 2.19pm
2.28pm	Gates 3 and 4 – manual valves closed
3.02pm	Gate 3 close. Gate 3 closed in one smooth movement over last 6 inches of travel
2.46pm	Gate 4 close 21 minutes to close Last 6 inches in one smooth movement
	Scour outlets on Pier 1 0 1 0 2 0 4 0 5 0 3
26/11/10	
10.30am	Blew pier 5 for gate 5 No blockage
10.52am	Open manual valve gate 5 17 turns 23minutes wet test
11.10am	Water at tell tale Close manual valve
11.12am	Deflate blow up plugs Furtherest outlet orifice observed to discharge sediment for the first 2 to 3 seconds
11.20am	Gate drained out
11.21am	Opened manual valve to flush inlet pipework
11.23am	Full flow from first outlet orifice
11.23am	Close manual valve
11.24am	Insert and inflate plug in first outlet orifice
11.25am	Open manual valve
11.30am	Close manual valve and deflate plug
11.35am	Restrictor plates replaced.
	Gate 1 Pier 2 A – partial blockage water mud Gate 2 Pier 2 B – clear
12.08pm	Gate 2 manual valve open
12.22pm	Gate 2 tell tale flow
12.23pm	Gate 2 manual valve closed

12.28pm	Empty
	Scour plate below gate 1 beside pier 2 observed to be leaking when gate 2 manual valve opened. Note: leak ceased when valve closed
1.00pm	Gate 1 manual valve open Gate 1 tell tale flow
	High air flow observed to be discharging from air vent on Pier 1 and tell tale. Water discharging from Pier 1 vent. Spray and spitting, not full flow.
1.15pm	Gate 1 water from tell tale
1.16pm	Manual valve closed
1.20pm	Gate empty
	Exercise gates 1, 2 and 5
1.39pm	Gate 1 manual valve open
2.04pm	Gate 1 partial open
2.05pm	Gate 1 full open
2.10pm	Manual valve closed
2.29pm	Gate fully closed Closed in 3-4 movements
2.14pm	Gate 2 manual valve open
2.40pm	Gate 2 open
2.45pm	Gate 2 manual valve closed
3.02pm	Gate 2 fully closed in 1 smooth movement
2.47pm	Gate 5 manual valve open
3.36pm	Gate partial open
3.53pm	Gate 5 manual valve closed - aborted
end	

From: [redacted]
Sent: Tuesday, November 02, 2010 05:52 AM
To: [redacted]
Subject: Testing of Gate 5

[redacted]

As discussed yesterday evening, I am seeking your authorisation for [redacted] and the Operations Team to exercise Gate 5 at Lenthalls Dam today.

The proposed activity will be as follows;

The gate will be opened (by opening the manual inlet valve) and immediately closed resulting in a release from Lenthall Dam of between 160 to 220 ML depending on whether the gate closes in 30mins or up to 45mins which has been observed on one occasion.

During this exercise we will operate Burrum 2 Weir at full capacity and overtop this storage into Burrum 1 Weir using the water released from the dam.

We currently have sufficient storage in Burrum 1 weir to enable a crest gate to be exercised and for the city not to lose any water down the river.

We believe that it is important that we operate and test gate 5 as it is the gate which we have had the most trouble with.

Gate 5 has only operated once (in the last major rain event earlier this year) and only with external force exerted on the gate.

We are hoping that the previous exercising of the gate in the last rain event will have freed the gate (so that it will operate as designed)

However, conducting a manual operational test today will help us to verify the gates operability prior to upcoming storm season. (thereby giving us the highest certainty possible that the gates will perform as designed in any upcoming rain events.)

Other benefits of todays' proposed activity would be:

1. Further operator experience using crest gate technology
2. Development of crest gate operational history/reliability
3. Crest gates are exercised regularly (The dam design manual suggests regular testing)
4. Improved raw water quality in Burrum 1 for production of potable water will reduce chemical costs and sludge production.

Appropriate safety plans for both the public and staff have been prepared and the WSHO will do an external review on site prior to any activity occurring.

Staff will be on site monitoring public safety downstream particularly at Burrum 2.

[redacted] I am happy to provide further briefing or discuss further this morning at your convenience.

[redacted]
General Manager - Business Services
Wide Bay Water Corporation

Phone: [redacted]
Fax: [redacted]
Email; [redacted]

www.widebaywater.qld.gov.au

ITEM 4

Lenthall Dam - Exercising of Crest Gates 12 Nov. 2010

Time	Gate Number	Gate Position	Manual Valve Position	Comments
7:23am	5	closed	open	Dam at crest level
8:03am	5	partial open	open	
8:26am	5	partial closed	closed	Attempt to operate aborted
8:56am	5	closed	closed	Fully closed
8:35am	3	closed	open	
9:37am	3	closed	closed	The position indicator on the pneumatic valve actuator did not move to the fully open position. (~25% open was being indicated) It is suspected that the butterfly valve was not open sufficiently enough to cause the gate to fill. The actuator will be removed for maintenance and Gate 3 will be retested with the valve in the fully open position. Gate 3 drained out through the outlet orifices in a short time frame after the manual valve was closed. This supports the theory that the gate was receiving insufficient flow to cause it to fill to the required operating level.
9:43am	2	closed	open	
10:11am	2	open	open	26 mins to open
10:13am	2	open	closed	
10:27am	2	partial close	closed	
10:29am	2	closed	closed	16 mins to close
10:36am	4	closed	open	
11:18am	4	closed	closed	42 mins were allowed to elapse after opening the manual valve. The Ranger (Justin) observed that air bubbles were rising to the water surface above the centre of the gate. Justin's Wife, who was observing from the viewing platform commented that the air bubbles commenced shortly after the manual valve was opened. The attempt to operate the gate was aborted when the air bubbles were reported. The Treatment Manager made this decision to enable WBW Engineers to be consulted about any potential operational risk associated with the presence of said air bubbles. The air bubbles ceased to continue within a few minutes of closing the manual valve.
12:00pm				Dam level virtually unchanged

Lenthall Dam - Exercising of Crest Gates 15 Nov. 2010

Time	Gate Number	Gate Position	Manual Valve Position	Comments
1:22pm	3	closed	open	Fitter on site was able to sucessfully operate pneumatic valve actuator to fully open position according to position indicator. Increased flow was observed to be discharging from outlet orrifaces compared to 12 November attempt to operate gate.
3:02pm	3	closed	closed	Attempt to open aborted after having manual valve open for 100 minutes. Inspection and measurement of outlet orriface positions, air vents and seal gap required. It is recommended that these inspections and measurements be carried out as soon as safe access can be gained. It is also recommeded that the tell tail bolt be removed from the face of crest gate 3 whilst the other inspections and measurements are being conducted. This will enable verification during the next wet test that the water level in the gate is reaching the tell tale height.
2:43pm	1	closed	open	
3:10pm	1	partial open	open	
3:12pm	1	open	open	
3:15pm	1	open	closed	
4:12pm	1	closed	closed	Gate 1 was observed to closed very gradually over a 57 minute period. The last movement to the fully closed position was smooth over a distance of approximately 100mm.
4:15pm				Dam level reduced by approximately 10mm (Burrum 1 has ample buffer storage capacity ~300ML)

[redacted]

ITEM 3

From: [redacted]
Sent: Thursday, 18 November 2010 6:24 PM
To: [redacted]
Subject: FW: Lenthall Dam - Exercising of Crest Gates
Attachments: Burrum Weirs Capacity.xls

[redacted]

The work plan described 16 November 2010 has been divided up into bite sized chunks after further detailed planning was carried out leading up to 19 November 2010.

On Wednesday 17 November 2010 testing of air flow from the crest gate air vents was carried out. Air flow was able to be detected from two out of the ten vents. (Gate 2 one vent working and Gate 5 one vent working) It should be noted that the stainless steel screens on the downstream face of the concrete support piers were not removed during this test. This could have impacted on my ability to detect very low air flows. I can recollect the amount of air flowing from these vents when checked during the 22 April 09 wet testing and I'm confident that the current air flow is substantially less now than what it was then.

This afternoon we checked inlet valve operation. This required us to remove the PVC screw caps ("cams") from the scour pipes located under the steel protection plate on the downstream face of Pier A. (i.e. Under the access catwalk to the inlet weir area). The cams were removed and each manual valve was operated in turn to check inlet valve operation and scour this pipework. There wasn't any significant accumulation of deposited material in this pipework and the flow volume through the manual inlet valves appeared to be acceptable.

Tomorrow we're planning to focus our energy on gates 3 and 4. (The gates that we have not been able to recently successfully manually operate) The tell tale bolts will be removed from these gates to enable fill times to tell tail level to be checked and compared to the 22 April 09 records for the same test. The results of this test will drive inspection and maintenance activities planned for tomorrow which we are expecting will consist of the following:

1. Blow out air vents using compressed air
2. Retest air flow from air vents and fill time to tell tail level
3. Remove outlet orifice restrictor plates
4. Plug outlet pipework x 2 using blow up plugs
5. Open manual valve and fill gate to tell tail level
6. Close manual valve
7. Deflate blow up plugs allowing them to be ejected by the head pressure in the gate
8. Allow gate to empty flushing discharge system
9. Flush inlet pipes
10. Replace outlet orifice restrictor plates (ensure original settings are restored – 14mm setting)
11. Check seal gap
12. Exercise gates

On successful completion of the above work on gates 3 and 4 we're planning to move on to the remaining gates commencing Monday next week.

From: [redacted]
Sent: Tuesday, 16 November 2010 11:55 AM
To: [redacted]
Subject: FW: Lenthall Dam - Exercising of Crest Gates

[redacted],

The next steps: (To proceed with approval 19 November 2010)

We will be gaining access to the crest below the crest gates to conduct the following inspections and measurements in the order specified below. The water level is now sufficiently below crest level to enable safe access to this area. Weather conditions may impede our ability to proceed with this work.. Wind speed sufficient enough and from the correct direction may cause wave action on the Dam that could result in water lapping over the top of the crest gates. The preference is to be working on a dry surface if at all possible. If the surface below the crest gates is wet an assessment of the slipperiness shall be carried out before work proceeds.

1. Tag out and lock out all crest gate manual control valves. (Treatment Manager or his delegate to be sole authorised officer for operation of manual valves)
2. Access spillway from right abutment in accordance with requirements of JSA
3. Check inlet valve operation. (Follow procedure in Section 7.5.1 GHD Wet Test Report)
4. Proceed to gate 5 around base of concrete support pillars using the fall arrest buddy system (Refer to JSA)
5. At gate 5, measure seal gap and record, check for correct operation of gate air vents, measure outlet orifice positions and record. (JSA to be followed for checking operation of air vents) Note: Flush discharge system (Procedure in Section 7.7 GHD Wet Test Report) will be modified to control risk. Flush inlet pipes (Follow procedure in Section 7.5 GHD Wet Test Report).
6. Move to gate 4
7. At gate 4, measure seal gap and record, check for correct operation of gate air vents, remove tell tale bolt from face of gate, measure outlet orifice positions and record. (JSA to be followed for checking operation of air vents). Note: Flush discharge system (Procedure in Section 7.7 GHD Wet Test Report) will be modified to control risk. Flush inlet pipes (Follow procedure in Section 7.5 GHD Wet Test Report).
8. Move to gate 3
9. At gate 3, measure seal gap and record, check for correct operation of gate air vents, remove tell tale bolt from face of gate, measure outlet orifice positions and record. (JSA to be followed for checking operation of air vents) Note: Flush discharge system (Procedure in Section 7.7 GHD Wet Test Report) will be modified to control risk. Flush inlet pipes (Follow procedure in Section 7.5 GHD Wet Test Report).
10. Move to gate 2
11. At gate 2, measure seal gap and record, check for correct operation of gate air vents, measure outlet orifice positions and record. (JSA to be followed for checking operation of air vents) Note: Flush discharge system (Procedure in Section 7.7 GHD Wet Test Report) will be modified to control risk. Flush inlet pipes (Follow procedure in Section 7.5 GHD Wet Test Report).
12. Move to gate 1
13. At gate 1, measure seal gap and record, check for correct operation of gate air vents, measure outlet orifice positions and record. (JSA to be followed for checking operation of air vents) Note: Flush discharge system (Procedure in Section 7.7 GHD Wet Test Report) will be modified to control risk. Flush inlet pipes (Follow procedure in Section 7.5 GHD Wet Test Report).
14. Staff to then clear the area below the crest gates
15. Manual valve for gate 4 to be operated to the fully open position. (Follow applicable JSA) Time opened, number of turns to fully open to be recorded. Allow gate to fill to tell tale level and record time. Continue to allow to fill until gate opens or 60 minutes has elapsed. Close manual valve and record time for gate to close and number of turns to close manual valve.
16. Manual valve for gate 3 to be operated to the fully open position. (Follow applicable JSA) Time opened, number of turns to fully open to be recorded. Allow gate to fill to tell tale level and record time. Continue to allow to fill until gate opens or 60 minutes has elapsed. Close manual valve and record time for gate to close and number of turns to close manual valve.
17. Replace tell tale bolts for gate 3 and 4 when safe to do so.

18. Report to be prepared by Treatment Manger off site.

Recommendations for next phase of actions will be prepared at the conclusion of the above work.

JSA's required for this work will be tabled for approval prior to work commencing.

From: [redacted]
Sent: Friday, 12 November 2010 5:43 PM
To: [redacted]
Subject: FW: Lenthall Dam - Exercising of Crest Gates

[redacted],

Following on from the original plan mapped out below.

Monday morning 15 November a memo will be prepared officially advising Peter Care that air bubbles have been observed on the surface of the water above crest gate 4 when the gate is filling. A request will be made for advice on how this observation should be dealt with. Operational risk associated with the presence of this anomaly is of primary concern.

On Monday afternoon 15 November crest gates 3 and 1 will be exercised. The pneumatic valve actuator that operates the manual valve for gate 3 will be removed for servicing to enable the manual valve to be operated to the fully open position. Gate 1 will be manually operated in accordance with stand operating procedures.

Depending on the prevailing weather conditions there should be over 200ML of storage capacity available in Burrum 1 Weir on Monday morning. Based on experience gained from recent exercising of the gates we'll comfortably be able to exercise crest gates 3 and 1 with this amount of buffer storage available.

Please confirm that we have approval to execute the above plan for exercising the remaining crest gates.

Thank-you.

From: [redacted]
Sent: Thursday, 11 November 2010 4:06 PM
To: [redacted]
Subject: Lenthall Dam - Exercising of Crest Gates

[redacted],

Crest gate 5 has been operated on two occasions recently. (2 and 9 November 2010)

Application of external force has been required on both occasions. Encouragingly significantly less force was required on the second operation. This could possibly indicate that seal friction has been reduced as a result of the gate being exercised. At least one more manual operation of gate 5 is recommended and this is being planned for tomorrow morning. The manual valve will be opened and sufficient time (~40mins) will be allowed to elapse to cause the gate to reach the required fill level to cause it to open. If gate 5 fails to fully open with operation of the manual valve only, the opening attempt will be aborted after 60mins. (i.e. External force will not be applied).

There is currently over 200ML of storage capacity available in Burrum 1 Weir. Based on experience gained from recent exercising of gate 5 we'll comfortably be able to exercise two crest gates. If operation of crest gate 5 has not been successful we'll move on while on site tomorrow and exercise crest gates 3 and 2 in that order.

Crest gates 4 and 1 will be exercised Monday afternoon 15 November 2010 weather and buffer storage volumes permitting.

On completion of the above, crest gate 5 will be revisited if it fails to operate tomorrow.

Please confirm that we have approval to execute the above plan for exercising our crest gates.

Thank-you.

From: [redacted]
Sent: Monday, 1 November 2010 5:08 PM
To: [redacted]
Subject: Burrum 2 Top Up

[redacted],

I recommend that we introduce a new operating regime for transferring raw water from Lenthall Dam to Burrum 1 Weir.

The recommendation is that we operate Burrum 2 Weir at full capacity and overtop this storage into Burrum 1 Weir by exercising crest gates. We currently have sufficient storage in Burrum 1 weir to enable a crest gate to be exercised.

Can I please have your authorisation to operate crest gate 5 tomorrow. The gate will be opened and immediately closed resulting in a release from Lenthall Dam of between 160 to 220 ML depending on whether the gate closes in 30mins or up to 45mins which has been observed on one occasion.

Some of the benefits of implementing this new operating regime are:

1. Operator experience using crest gate technology
2. Development of crest gate operational history/reliability
3. Crest gates are exercised regularly
4. Improved raw water quality in Burrum 1 for production of potable water will reduce chemical costs and sludge production.

Please confirm that I have your authorisation to proceed.

Thank-you.

[redacted]
Treatment Manager - Business Services
Wide Bay Water Corporation
Phone: [redacted]
Fax:
Mobile:

e-mail: [redacted]

	Gate time down (Min)	Seconds	Seconds Sunberged	m^3 / Sec Flow	Total m^3	ML	Number of times exercised	ML
Gate 1	30	60	1800	90	162000	162	2	324
Gate 2	30	60	1800	90	162000	162	2	324
Gate 3	30	60	1800	70	126000	126	1	126
Gate 4	30	60	1800	90	162000	162	1	162
Gate 5	30	60	1800	90	162000	162	1	162
						774		1098

	Max Cap (ML)	% Full			
Burrum 1	1700	88%	Spare Cap	204.00	ML
Burrum 2	2200	99%		22.00	
				226.00	Capacity Available (ML)

From: [redacted]
Sent: Thursday, 16 December 2010 4:37 PM
To: Peter Care
Cc: [redacted]
Subject: Lenthall Dam - Crest Gates 2010

Peter,

In preparation for the wet season this year routine preventative maintenance was carried out on the crest gate system. This work was completed by the end of November 2010.

Crest gate 5 has been exercised on three occasions in an attempt to improve operational reliability. Gate 5 was the only gate that failed to open during the first wet weather event after completion of the seal improvement project. (6 – 8 March 2010). All other gates opened automatically in accordance with expectations. Controlled external force was applied to gate 5 in an attempt to move it off the seal and cause it to open during the March event. The attempt to assist gate 5 to open failed. At the tail end of the March 2010 event another attempt was made to manually operate gate 5. After opening the manual valve and allowing sufficient time for the gate to fill, the gate was successfully opened when assisted with external force.

The annual maintenance routine carried out on the crest gate system consisted of flushing procedures, clearing of air vents and exercising all gates. Prior to commencing this work, air flow for each gate was tested. Two of the ten vents were found to be functioning correctly. Air flow was not detectable from the eight air vents. This prompted a check to be conducted on the fill time to tell tale level for each gate. The times differed significantly from the wet test report records. Time to tell tale testing was aborted.

All air vents for the crest gates were then blown clear using compressed air. Time to tell tale was retested and the times were found to closely match the wet test report records. All gates were then flushed and gates 1 – 4 were successfully exercised. Gate 5 failed to operate but we were confident that it could be opened with assistance if required.

During the most recent wet weather event an attempt was made to open gate 5 when 140mm of water was flowing over the crest. The attempt failed. The dam level continued to rise and at160mm above the crest, gate 3 was considered to have failed. This prompted immediate manual operation intervention. Gates 1 and 4 were manually opened with gate 2 automatically opening before a manual operation attempt was made.

Gates 1, 2 and 4 were technically open during the entire event. Gate 3 and 5 remained closed for the entire duration of the event. Gate 1 closed when the dam level was 550mm above the crest and reopened some hours later as the dam level continued to fall.

During the day on Tuesday 14 December 2010 all gates closed in accordance with expectations. On Wednesday 15 December, unsuccessful attempts were made to manually operate gates 1, 2 and 4. Late Wednesday afternoon the air vent for gate 1 (accessed via pier 1) was blown clear. Gate 1 was then

successfully manually operated. The gate was held in the manual open position for ten hours through until 7:00am Thursday 16 December 2010. The dam level was reduced by 200mm during this time.

At 3:30pm Thursday 16 December another unsuccessful attempt was made to manually operate gate 1. Arrangements are being made to report to site now with the compressor to clear the air vent for gate 1 that can be safely accessed from pier 1. We should then be able to manually operate this gate.

[redacted]
Treatment Manager - Business Services
Wide Bay Water Corporation
Phone:
Fax:
Mobile: [redacted]

e-mail: [redacted]

ITEM 4 & 5

WIDE BAY water
CORPORATION

31 Ellengowan St, PO Box 5499
Hervey Bay Queensland 4655
1300 808 888 : 07 4125 5118
wbw@widebaywater.qld.gov.au
www.widebaywater.qld.gov.au
98 380 729 010

Reference: [redacted]
Phone No:

10 June 2011

Mr Peter Allen
Director Dam Safety
Office of the Water Supply Regulator
Department of Environment and Resource Management
GPO Box 2454
Brisbane Qld 4001

Dear Mr Allen

Lenthalls Dam – December 2010 Flood Event

Lenthalls Dam experienced a significant flood event over the period 22 December to 29 December 2010, as detailed in the incident report previously sent to the Office of the Water Supply Regulator (the Office).

Following the event, GHD were commissioned by the Wide Bay Water Corporation (the Corporation) to undertake an assessment to ascertain whether the crest gates operated as intended.

GHD has now provided the Corporation with a report, Lenthalls Dam Flooding – December 2010 Event (June, 2011) (the GHD Report). A copy of the GHD Report is attached.

In providing a copy of the GHD Report, we provide notification of all circumstances surrounding gate operations during the period 22 December to 29 December 2010 as is now known by the Corporation.

The Corporation additionally advises:

1. it now proposes to engage independent consulting engineers to undertake a review of the dam's hydrological modelling to verify the conclusions reached by GHD; and
2. in addition to that review, a further independent review of the gate design is likely to be undertaken to inform the development of options for possible rectification works (if required).

The Corporation proposes to forward a draft scope of work and project timeline for item 1 above for review and comment by the Office. Please advise us whether the Office is agreeable to such a process and to whom the draft proposal should be directed.

Yours faithfully

[redacted]

[redacted]
CHIEF EXECUTIVE OFFICER

From: Allen Peter [mailto:Peter.Allen@derm.qld.gov.au]
Sent: Tuesday, 14 June 2011 9:08 AM
To: [redacted]
Cc: Peter Care; [redacted]; Guppy Ron; [redacted]
Subject: Lenthalls Dam December 2010 flood event - re: Letter to Peter Allen

[redacted],

Thank you for your letter and the copy of GHD's report on the December flood event at Lenthalls Dam. On the basis of this report, it would seem that Run 2D (All Gates Closed) mimics what is reported to have occurred quite well.

I note that Wide Bay Water intends to:

1. engage independent consulting engineers to undertake a review of the dam's hydrological modelling to verify the conclusions reached by GHD; and
2. probably undertake a further independent review of the gate design to inform the development options for possible rectification works (if required).

In undertaking these studies, I would suggest that:

1. Any evidence that gates 1 to 4 were actually open at any time should be notes and taken into account. E.g. were observations made during daylight hours which would support the opening of the gates? I understand the levels at Howard reflect increases/decreases in discharge which probably reflect gate operations. It might be a case that they were jammed shut as the water level was rising but that as the friction forces reduced with falling headwaters, they were able to open.
2. Mention be made as to how the rating curve at the Howard gauge was derived ... to lend credibility to the Howard rating. How long does the discharge take to get to Howard? What degree of attenuation is there between Lenthalls and Howard? Could this indicate how long it took for the gates to open/close or when they opened/closed?
3. What was the weather radar indicating during the event? Was the available rainfall data

representative of catchment rainfalls?

4. Were the rates of rise at the dam reflected in the rates of rise upstream of the dam? If there were larger inflows the upstream backwater effects may have reflected the higher inflows.
5. It would seem necessary to establish a model to adequately accommodate the opening and closing mechanism for the gates. From my observation, it would seem that the gates may have been able to trigger properly when the rate of rise in the reservoir is relatively 'slow'. This would give the buoyancy chambers time to fill and overcome the 'friction' forces before the headwater levels get too high. If there is a rapid headwater rise, the friction may become too high before the weight of the gate with the buoyancy tanks filled is able to drop the gate open.
6. If the rate of fill of the buoyancy tank is the critical factor, the 'rectification' works might involve increasing the inflow rates or adjusting the balance of inflows and outflows to the tank. However, it would also open the case of whether the gates are likely to open in really big flood events.
7. It would also be good to see the 'best guess' of estimated inflow hydrograph to enable it's comparison with larger events.

What is the proposed timetable for these investigations? Can you also let me know the outcomes of your investigations?

Many thanks,

Peter

Peter Allen
Director Dam Safety (Water Supply)
Office of the Water Supply Regulator
Telephone [redacted] **Mobile** [redacted] **Facsimile** [redacted]
Email [redacted]
www.derm.qld.gov.au

From: [redacted]@widebaywater.qld.gov.au]
Sent: Friday, 10 June 2011 4:02 PM
To: Allen Peter
Cc: Peter Care [redacted]
Subject: FW: Letter to Peter Allen
Importance: High

Dear Peter,

As discussed please find attached my letter of notification and report on same from GHD.

Please don't hesitate to contact me on this and I will be in touch with further information on the next steps as the Corporation proposes to take subject of course to your agreement.

Regards.

[redacted]
Chief Executive Officer

t [redacted]
r
e
f

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Peter Scott

From: [redacted]
Sent: Friday, 10 June 2011 3:50 PM
To: [redacted]
Subject: Letter to Peter Allen

Hi [redacted]

Signed letter and attached for you to email to Peter.Allen@derm.qld.gov.au

[redacted]
Executive Officer

[redacted]

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Reference: [redacted]
Phone:

5 September 2011

Peter Allen
Director Dam Safety
Office of the Water Supply Regulator
Department of Environment and Resource Management
GPO Box 2454
Brisbane QLD 4000

Peter.

Dear Mr Allen

Lenthall's Dam - December 2010 Flood Event

We refer to our letter dated 10 June 2011, enclosing a copy of the draft Lenthall's Dam Flooding – December 2010 Event report (June, 2011) prepared by GHD, and your response by email dated 14 June 2011.

In your email, you suggested a number of matters to be addressed in the further studies proposed. Wide Bay Water Corporation (***the Corporation***) commissioned GHD to update its June 2011 report to address the matters you identified. We ***enclose*** a copy of the updated report for your review.

The Corporation separately commissioned GHD to prepare a report on the operational issues associated with the crest gates at the Lenthall's Dam. A copy of the Report for Lenthall's Dam – Crest Gate Operational Issues and Modifications (June, 2011) is also ***enclosed*** for your reference.

As indicated by our letter of 10 June 2011, we confirm that the Corporation has engaged:

(a) [redacted] of Sinclair Knight Merz (***SKM***), to undertake an independent review of the hydrological modelling for the Lenthall's Dam; and

(b) [redacted] of Glenn Hobbs & Associates, to undertake an independent review of the gate design to inform the development of options for possible rectification works (if any).

These independent reviews are underway, and the Corporation will provide a further update on the status of these reviews prior to 30 September 2011. The Corporation will also provide the Department with copies of each of these reviews when they become available.

Yours sincerely

[redacted]

Peter Scott
Chief Executive Officer

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