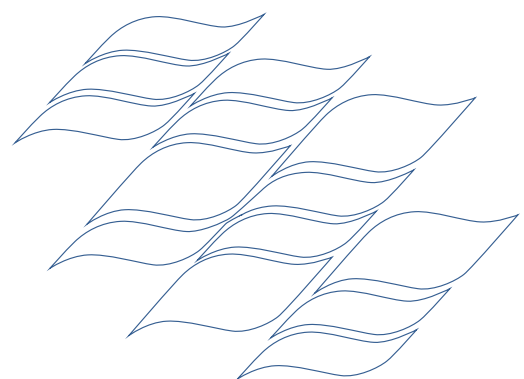


Appendix 13

[RETURN TO APPENDICES LIST](#)

Awoonga Dam Safety Condition Schedule (Department of Environment and Resource Management)



AWOONGA DAM (ID # 0211)

Dam Safety Condition Schedule

For: Gladstone Area Water Board (GAWB)

Description

Awoonga Dam was originally built in the early 1950's as a low mass concrete structure of approximately 12m high. The dam was raised soon after with an additional 6m high prestressed concrete to the crest. In the early 1980's, the dam was raised by 24m approximately with a 1.5m parapet wall, and this time as a concrete faced rockfill dam with the open cut spillway on the left abutment. The dam was recently raised again by 11m to the current height in 2002.

The dam is owned and operated by the Gladstone Area Water Board (GAWB) to supply water for industrial and urban uses in Gladstone areas.

The following conditions apply to the current stage of Awoonga Dam being a concrete faced rock-fill dam of 53 metres high, located on Boyne River on Lot 90 on plan SO223051, Parish of Iveragh, County of Clinton, in the Local Government Area administered by the Gladstone Regional Council.

Category Assessment:

Failure Impact Assessment Category: 2 (Deemed by Regulation, 19 April 2002)

MAIN DAM – Left Abutment Wall:

Population at Risk (PAR & Inc PAR): > 2,000 (Sunny-Day & Flooding failures)

Incremental Flood Hazard Category (IFHC): **Extreme**

Acceptable Flood Capacity (AFC): **PMF**

Current Flood Discharge Capacity: **62% of the AFC (PMF)**

Timing of Minimum AFC Upgrades: **Oct 2025**

SADDLE DAM No. 3:

Population at Risk (Inc PAR): > 500 (Flooding failure)

Incremental Flood Hazard Category (IFHC): **High A**

Acceptable Flood Capacity (AFC): **PMP-DF**

Current Flood Discharge Capacity: **37% of the AFC (PMP-DF)**

Timing of Minimum AFC Upgrades: **Oct 2015**

Basic Description of the Dam:

Location: Boyne River (AMTD 22.7km)
 Co-ordinates: Latitude 24° 04' 12" S; Longitude 151° 18' 39" E
 Catchment & Storage Areas: 2,230km² (approx); 67.8km² (area of inundation, approx)
 Purpose: Town Water Supply
 Full Supply Level: EL 40m
 Storage Capacity: 777,000ML
 Total Length: 828m

MAIN EMBANKMENT & ABUTMENTS

Construction Type: Concrete Faced Earth and Rock-fill Embankment
 Total Length: 658m (approx)
 Embankment Crest Level: EL 55.4m
 Embankment Crest Width: 6m
 Maximum Embankment Height: 53m
 Concrete Abutments Levels: EL 52m (Left Abutment); EL 54.5m (Right Abutment)

SADDLE DAMS No. 3 (Pseudo Auxiliary Spillway for Extreme Flood)

Construction Type:	Road Embankment (sealed surface & grassed batters)
Total Length:	380m (approx)
Embankment Crest Level:	EL 47.9m
Embankment Crest Width:	6.6m
Maximum Embankment Height:	2.9m (approx)
Estimated Discharge capacity:	6,155 ³ /s (approx at EL 52m assuming no overtopping failure)

SPILLWAY – Fixed Ogee Crest

Fixed Crest Level:	EL 40m
Spillway Length:	111m
Estimated Max Discharge capacity:	9,350 ³ /s (approx at Left Abutment Crest EL 52m)

Note: Levels (EL) quoted are to Australian Height Datum (AHD).

Condition DS 0 – General

1. The dam is to be kept safe, and be maintained and operated in accordance with the current versions of the following guidelines issued in Queensland under the **Water Supply (Safety and Reliability) Act 2008** (where specifically referred to in this dam safety condition schedule):
 - *Queensland Dam Safety Management Guidelines.*
 - *Guidelines for Failure Impact Assessment of Water Dams.*
 - *Guidelines on Acceptable Flood Capacity for Dams.*
2. The current **Dam Safety Regulator** in the State of Queensland is the **Chief Executive, Department of Environment and Resource Management** (DERM) or the Department's Delegate Officers.

Condition DS 1 - Documentation

1. Any documentation prepared in order to comply with these conditions must be stored securely until such time as the dam is decommissioned.
2. The documentation must be made available for inspection by the Dam Safety Regulator within seven (7) days of a written request for access being received by the Dam Owner.
3. The Dam Owner shall maintain a dedicated storage area and index system for all dam related documentation.
4. On change of ownership of the dam, all documentation prepared and stored 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 (EAP), the Dam Owner must report all incidents and failures (as defined in the *Queensland Dam Safety Management Guidelines*) in writing to the Dam Safety Regulator within forty-eight (48) hours of becoming aware of the incident or failure.
1. The Dam Owner must develop a remedial action plan and provide it to the Dam Safety Regulator within thirty (30) days of the incident or failure.

Condition DS 3 - Design Reports

1. The current Design Report for the dam is the Gladstone Area Water Board documents "*Awoonga Dam Spillway Crest EL 40.0m - Design Report (Folder 3, dated June 2002, prepared by the Awoonga Alliance)*", and shall be referenced in the Data Book.
2. Future dam upgrades require a Design Report to be prepared for reference in the Data Book and submitted to the Dam Safety Regulator, at least one (1) month prior to the signing of any contractual construction agreement for such works.
3. Upgrade construction works may not be commenced without approval of the Dam Safety Regulator.

Condition DS 4 - Design and Construction

1. Any remedial works or reconstruction of the dam must be carried out in accordance with current engineering best practice and ensure that the dam remains generally in accordance with the following documentation:
 - a. Drawings: *Awoonga Dam Spillway Crest EL 40.0m - Drawings No. GN1002 Rev Z - As Built* (Folder 6, dated June 2002, prepared by the Awoonga Alliance).
2. Where remedial, reconstruction or upgrade works are proposed, a copy of the construction methodology report must be forwarded to the Dam Safety Regulator, at least one (1) month prior to the commencement of construction works.

Condition DS 5 - Data Book

1. The Dam Owner must maintain and update the existing "*Gladstone Area Water Board – Awoonga Dam Spillway Crest FSL 40.0m - Dam Crest EL 55.4m - Data Book*" in accordance with the *Queensland Dam Safety Management Guidelines*.
2. The Data Book must contain all pertinent records and history relating to the dam including the documentation of investigation, design, construction, operation, maintenance, surveillance, monitoring measurements and any remedial action taken, and any other issues addressed in the *Queensland Dam Safety Management Guidelines*.
3. The Dam Owner must ensure the Data Book is reviewed, and updated if necessary to incorporate the latest identified dam safety issues or required upgrade works in accordance with the *Queensland Dam Safety Management Guidelines*, by the **1st day of June** of each year.
4. 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 Dam Safety Regulator by the **30th day of June** of that same calendar year.

Condition DS 6 - As Constructed Documentation

1. The As Constructed documentation for the dam is the Gladstone Area Water Board documents prepared by the Awoonga Alliance:
 - a. *Awoonga Dam Spillway Crest EL 40.0m - Construction Report* (Folder 5, dated September 2002), and
 - b. *Awoonga Dam Spillway Crest EL 40.0m - As Built Drawings* (Folder 6, dated September 2002).
2. All future upgrade works must produce "As built" drawings for inclusion in the Data Book.
3. The 'As Constructed' plans including future upgrade works must be securely maintained, preferably in the Data Book along with relevant photographic records to ensure future availability for reference when required.

Condition DS 7 - Standing Operating Procedures

1. The dam must be operated in accordance with the following existing Standing Operating Procedures that are contained in "*Gladstone Area Water Board – Awoonga Dam Spillway Crest FSL 40.0m - Dam Crest EL 55.4m - Standing Operating Procedures*". Specifically the following existing SOPs:
 - SOP 001 Verification of Emergency Contact Numbers
 - SOP 002 Routine Safety Inspections
 - SOP 003 Routine Instrument Surveillance
 - SOP 004 Accident and Incident Reporting
 - SOP 005 5 Yearly Comprehensive Dam Safety Inspections
 - SOP 006 Inspection, Testing and Maintenance of Mechanical and Electrical Equipment
 - SOP 007 Test and Tag Electrical Equipment
 - SOP 008 Operation and Maintenance of Spillway
 - SOP 009 Spillway Gallery Ventilation and Access
 - SOP 010 Old Intake Tower – Operate and Remove Regulating Valves, Operate the Gantry Crane and Dewater and Refill the Intake.
 - SOP 011 Old Intake Tower Ventilation and Access
 - SOP 012 Old Intake Tower Water Proofing
 - SOP 013 Auxiliary Intake - Relocate the Open Bulk, Replace Tension Pin, Install and Remove the Trash Screens, Operate Bulkhead Gate
 - SOP 014 River Outlet - Regulated Water Releases
 - SOP 015 Dam Operator Training Requirement

- SOP 016 Confined Space Entry
 - SOP 017 Dam Log Book
 - SOP 018 Document Control and Review
 - SOP 019 Emergency Action Plan
 - SOP 020 Communication Procedures
 - SOP 021 Attendance at Dam
 - SOP 022 Notification of Spillway Discharge
 - SOP 023 Penstock Drainage
 - SOP 024 Water Level Monitoring
 - SOP 025 Annual Dam Safety Inspections
 - SOP 026 Special Inspections
 - SOP 027 Shotcrete Crack Inspection
 - SOP 028 Monitoring Drain Holes in The Left Abutment Monoliths
 - SOP 029 Cleaning of Drain Holes in The Spillway Apron
 - SOP 030 Cleaning of Expansion Joints on The Spillway Bridge
2. The SOPs must be kept up to date at all times to cover the following activities (Note that in some cases the Dam Owner may prefer to incorporate the information in other dam safety documentation such as an Operation and Maintenance Manual):
 - a. Personnel training and procedural issues.
 - b. Emergency Action Planning (including regular review/update of the Emergency Action Plan) and Incident Reporting.
 - c. Critical Operating Procedures.
 - d. Monitoring and Surveillance.
 - e. Maintenance of a Dam Log Book.
 3. The Dam Owner must ensure the SOPs are reviewed annually by the **1st day of June** of each calendar year and:
 - a. where amendments are made to any SOP, the updated documents are to be forwarded to the Dam Safety Regulator by the **30th day of June** of that same calendar year.
 - b. where no amendments are necessary, a written notification confirming that the SOPs have been reviewed shall be signed by the Dam Owner and forwarded to the Dam Safety Regulator by the **30th day of June** of that same calendar year.

Condition DS 8 - Detailed Operating and Maintenance Manuals

1. The dam must be operated and maintained in accordance with the Detailed Operating and Maintenance Manuals.
2. The Dam Owner must maintain and update the "*Gladstone Area Water Board - Awoonga Dam Spillway Crest FSL 40.0m - Dam Crest EL 55.4m - Operation and Maintenance Manual*" in accordance with the *Queensland Dam Safety Management Guidelines*.
3. The Dam Owner must ensure that the Operation and Maintenance Manuals include a comprehensive set of instructions for any equipment operated at the dam that is necessary for the safety management and operation of the dam. This includes data reporting forms and procedures.
4. The Dam Owner must ensure that the Operation and Maintenance Manuals also provide a comprehensive set of instructions for the dam deformation survey procedure, to ensure future consistent approach to and control of dam deformation surveys.
5. The Dam Owner must ensure the detailed Operating and Maintenance Manuals are reviewed and if necessary updated by the **1st day of June** of each calendar year.
6. 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 Dam Safety Regulator by the **30th day of June** of that same Calendar year.

Condition DS 9 - Special Inspections

1. When directed by the Dam Safety Regulator, 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.
2. The Dam Safety Regulator shall be advised in writing of the date of the 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 Dam Safety Regulator within thirty (30) days of completion of inspection.

Condition DS 10 - Annual Periodic Inspections

1. The Dam Owner must undertake a Periodic Inspection of the dam in accordance with the *Queensland Dam Safety Management Guidelines* on or before the **1st day of June** of each calendar year. When a Periodic Inspection falls in a year that a Comprehensive Inspection is also required, this shall be undertaken as part of the Comprehensive Inspection.
2. The Dam Safety Regulator shall be advised in writing of the date of the Periodic Inspection and may elect to observe any or all procedures involved in the inspection process
3. The Dam Owner must produce a Periodic Inspection Report and provide one copy of the report to the Dam Safety Regulator within thirty (30) days of completion of inspection.
4. A written notification confirming that the Periodic Inspection has been carried out in accordance with the *Queensland Dam Safety Management Guidelines* shall be signed by the Dam Owner and forwarded to the Dam Safety Regulator by the **30th day of June** of that same calendar year.
5. In addition to the items listed in the *Queensland Dam Safety Management Guidelines* the 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.
 - f. Status of review and updates of Dam Safety documentation.
 - g. Review the status of recommendations from the previous annual inspection.
 - h. Compliance with SOP.

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*, on or before the **1st day of June 2012**, and on or before every fifth (5th) anniversary of that date thereafter. When a Comprehensive Inspection falls in a year that a dam Safety Review is also required, this shall be undertaken as part of the Safety Review.
2. The Dam Safety Regulator 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. The Dam Owner must ensure the Comprehensive Inspection Report incorporates a review of dam safety standards of the existing dam against current standards, a review of the adequacy of the dam safety documentation for the dam, and a review of the status of recommended actions from previous inspections.
4. A Comprehensive Inspection Report detailing the findings of the Comprehensive Inspection in accordance with the *Queensland Dam Safety Management Guidelines* must be submitted to the Dam Safety Regulator **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* by the **1st day of June 2022** or **prior to any future upgrade works for dam safety requirements**.
2. The Dam Owner must prepare a Safety Review Report and provide one copy of the Safety Review Report to the Dam Safety Regulator **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 Dam Safety Regulator in such circumstances as:
 - a. There is an absence of adequate documentation.
 - b. Abnormal behaviour of the structure has been detected.
 - c. Changes to design and/or construction standards warrant dam safety investigations.
 - d. The need to comply with a Regulatory requirement.

Condition DS 13 - Emergency Action Plans and Event Reports

1. The Dam Owner must maintain and update the Emergency Action Plan (EAP) in accordance with this condition and the *Queensland Dam Safety Management Guidelines*, and provide one copy to the Dam Safety Regulator.
2. Where the reservoir headwaters are such that inundation of any upstream land upon which dwellings are situated 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 and include such failure modes as:
 - a. Sunny day failure.
 - b. Overtopping failure of the main dam under extreme flooding conditions.
 - c. Overtopping failure of saddle dams under extreme flooding conditions.
 - d. Failure of control structures such as intake and outlet works.
4. Inundation mapping shall be developed as outlined in the *Queensland Dam Safety Management Guidelines*, and shall be at a sufficiently large scale to easily identify those areas subject to possible danger. Mapping shall be developed for critical failure modes identified 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, entities and individuals who could be involved in the EAP (for example, local governments, the Queensland Police, State Emergency Services and downstream residents), including:
 - Gladstone Regional Council.
 - Gladstone District Disaster Coordination Committee.
 - Any additional group with responsibilities under the Emergency Action Plans.
 - c. Identify primary and secondary communication systems, both internal (between persons at the dam) and external (between dam personnel and outside entities).
 - d. Identify key resources, special tools, equipment, keys and where they can be located if required in an emergency.
 - e. List and prioritise key persons and entities involved (including contact details) in the notification process and the roles and responsibilities assigned to them.
6. The Dam Owner must ensure the contact details in the EAP are up to date at all times and are reviewed by the **1st day of June** of each calendar year:

- a. Where amendments are made to any EAP, a copy of the updated document is to be forwarded to the Dam Safety Regulator by the **30th day of June** 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 Dam Safety Regulator by the **30th day of June** of that same calendar year.
7. The Dam Owner must ensure the readiness of dam operators with an annual desktop or field emergency training exercise to be undertaken in conjunction with the annual review above.
 8. In all emergencies, the Dam Owner must respond in accordance with the EAP, and must notify the Dam Safety Regulator within forty-eight (48) hours. The notification shall include a brief description of the event and the time of activation of the EAP.
 9. 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 Dam Safety Regulator. 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) without a Decommissioning Plan prepared in accordance with the *Queensland Dam Safety Management Guidelines*, and approved by the Dam Safety Regulator.
2. The Decommissioning Plan must address how the dam is to be rendered safe, and consider the environmental, water resource security, social and long term management issues associated with the decommissioning.

Condition DS 15 – Spillway Adequacy Conditions

1. The dam owner is to provide the following information to Chief Executive, Department of Natural Resources and Water in relation to the Spillway Adequacy of the dam:
 - a. An Acceptable Flood Capacity (AFC) Assessment Report for the dam prepared in accordance to NRW Guidelines on Acceptable Flood Capacity for Dams (Feb-2007).
 - b. The AFC Assessment Report should include the information outlined in Appendix (A) and conform to the written format requirements of the Guidelines.
 - c. Flood estimations shall be performed in accordance with the provisions of ARR (IEAust-2001); CRC-FORGE (DNRW-2003); GSDM (BoM-2003) or GTSMR (BoM-2003) as detailed in the Guidelines.
 - d. The Report shall include an assessment of the identified current flood discharge capacity of the dam expressed as a percentage of the required AFC. This is of the form:

$$K(\%) = \frac{\text{Peak inflow for flood able to be currently passed}}{\text{Peak inflow for the AFC}}$$

- e. Where the dam cannot pass the AFC, the Report is to include preliminary proposal of the necessary upgrade works, cost estimates and the timing to upgrade the dam to meet the minimum AFC requirement.
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 **31st day of October 2008***

*** Note: This date has been met by the Dam Owner (GAWB) in 2009**

Condition DS 16 - Dam Upgrade to Minimum AFC Requirements

1. Gladstone Area Water Board (the Dam Owner) is to undertake and complete at least the minimum dam safety upgrade requirements to address the AFC deficiencies identified in the GAWB's Reports:
 - a. *Gladstone Area Water Board - Awoonga Saddle Dam No. 3 Acceptable Flood Capacity Assessment (2009)*, by **1 October 2015**.
 - b. *Acceptable Flood Capacity Study - Awoonga Dam - Gladstone Area Water Board (Oct 2008)*, by **1 October 2025**.

The AFC is the level of flood capacity acceptable under the *Guidelines on Acceptable Flood Capacity for Dams* in Queensland.

2. The required dam safety upgrade works can be undertaken in one stage to safely pass one hundred percent (**100%**) of the AFC by **1 October 2015** for both the Saddle Dam No.3 and the Main Dam Left Abutment as proposed in these Reports.
3. Alternatively, the minimum required dam safety upgrade works referred to in Clause (1) above can be staged to occur no later than the following dates for minimum AFC compliance (as stated in Table 3 of the *Guidelines on Acceptable Flood Capacity for Dams*):
 - a. To safely pass at least **50% of the AFC** (in the case of Saddle Dam No. 3) by **1 October 2015**.
 - b. To safely pass **75% of the AFC** by **1 October 2025**.
 - c. To safely pass **100% of the AFC** by **1 October 2035**.
4. The purposes of final completion of the required dam safety upgrade works for 100% of AFC compliance are to:
 - a. Ensure adequate spillway capacity to safely achieve the AFC in accordance with the *Guidelines on Acceptable Flood Capacity for Dams*;
 - b. Ensure the risk of instability or piping failure of the dam embankment when water levels approach the crest of the dam is reduced to an acceptable level;
 - c. Ensure the risk of erosion of the downstream toe and abutments of the dam during the extreme flood events, which may be caused by dam overtopping is reduced to an acceptable level; and
 - d. Ensure the risk of excessive erosion in the plunge pool of the spillway(s) is reduced to an acceptable level.
5. These works are to be carried out in accordance with current engineering best practice at the time the works commence.
6. The works shall be designed either to progressively reduce or alleviate the risk of dam failure from all causes to satisfy the limit of tolerability set out in the *Guidelines on Acceptable Flood Capacity for Dams*.
7. The Dam Owner shall provide the following documents to the Dam Safety Regulator in accordance with the time limits set out below:
 - a. A revised AFC assessment prepared no more than three years old, together with the concept design report and the cost estimate of the proposed works, at least twelve (12) months prior to the planned commencement of construction.
 - b. A program of works, together with a planning report detailing how the completion date is to be achieved, and how the risks of dam failure are to be managed during the works to minimise additional risk to downstream communities at least six (06) months prior to the planned commencement of construction.
 - c. An update of this program of works and progress reports, describing progress up to that time and planned progress to the practical completion of the works at three (03) month intervals during construction.
 - d. A detailed design report of the selected dam upgrade option at least one (01) month prior to the planned commencement of construction.

- e. An update of the final design report together with the as-constructed design documentation which reflect the works actually undertaken, within three (03) months after the practical completion of the works. The design reports and as-constructed documentation are to be prepared by a Registered Professional Engineer(s) in accordance the Guidelines.
8. If there is any conflict between the requirements of DS 16 and any other safety condition, the requirements of DS 16 shall prevail.

DRAFT for discussion with the GAWB