

# **GLADSTONE AREA WATER BOARD**

## **DROUGHT MANAGEMENT PLAN**

*DNRW Registered: 12 September 2007*

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## 1. DEFINITIONS

**'Act'** means the *Water Act 2000* (Qld).

**'AHD'** means Australian Height Datum as determined by Australian Survey and Land Information Group, Commonwealth of Australia, 2000.

**'Boyne ROP'** means the *Boyne River Resource Operations Plan 2003*.

**'Connections'** has the meaning given to it by the Water Services Association of Australia.

**'Customer'** means a person to whom GAWB supplies water. It includes prospective customers who, in accordance with GAWB's *Forward Water Sales Policy*, have water demand included in GAWB's forward projections (see Table 4).

**'Dead Storage'** is the volume of water remaining in Lake Awoonga below the level of the lowest offtake and which cannot be used without the use of pumps or other means to extract it from the Lake.

**'Drought'** means a period of time where, having regard to predicted inflows, there is insufficient water stored within Lake Awoonga to provide Contracted Supply (which includes meeting Customer Reservations) some time within the next 60 months as predicted using the Model.

**'DNRMW'** means Department of Natural Resources and Water.

**'End of the Wet Season'** means 30 April each year.

**'GAWB'** means the Gladstone Area Water Board.

**'HNFY'** means Historic No Failure Yield.

**'IQQM'** means Integrated Quantity and Quality Model.

**'ML'** means mega litre of water.

**'Mlpa'** means megalitre per annum.

**'Contracted Supply'** means the volume of water which GAWB reasonably determines to be necessary to meet the lawful demands for water of all Customers over 12 months.

**'Notice'** means written notice.

**'Model'** means the model developed by GAWB which utilises historical data for inflows into the Boyne River catchment since 1938, models evaporation and seepage from Lake Awoonga and shows the rate at which the water level in Lake Awoonga will vary for estimated inflows and predicted outflows.

**'Plan'** means this Drought Management Plan.

**'Reservation'** for any Customer means the volume of water which is reserved under contract to meet the lawful demands for water by that Customer over a period of 12 months.

**'Trigger Levels'** are expressed in terms of Time Frame from Failure and are milestones that represent a prediction of remaining volume in storage for a period of supply from Lake Awoonga using the Model based on an assumed level of inflow and supply.

**'Time Frame from Failure'** means the number of months that Contracted Supply can be maintained until Dead Storage is reached as calculated by the Model.

## 2. OVERVIEW

This Plan sets out the processes that GAWB uses to identify the occurrence of Drought and the actions that will be initiated to mitigate the consequences of Drought (on the volume of water available for supply).

GAWB has carefully reviewed experiences from the imposition of water restrictions in 2002 and consulted with Customers in setting its approach to managing the impact of Drought on the volume of water available for supply.

GAWB acknowledges Customers' advice that there has been long term modification of water usage by them, reducing their demand to the extent that there is now a serious question as to whether Customers have the ability to cope with any further restrictions imposed to mitigate the effects of a future Drought.

As a result, GAWB's preferred approach is to respond to severe droughts through prudent supply responses, rather than restrictions. This proposed supply response is the Gladstone - Fitzroy Pipeline, with preparatory works completed to enable water to be delivered from this project from two years of a defined trigger such as projected period to failure.

The Queensland Competition Authority is currently reviewing this proposal, and in particular

- the selection of the Gladstone – Fitzroy Pipeline as the preferred contingent source;
- the prudence of the preparatory expenditures associated with this option;
- the trigger point(s) for this augmentation (including construction) such as drought triggers; and
- the implications upon pricing principles of this investment for customers.

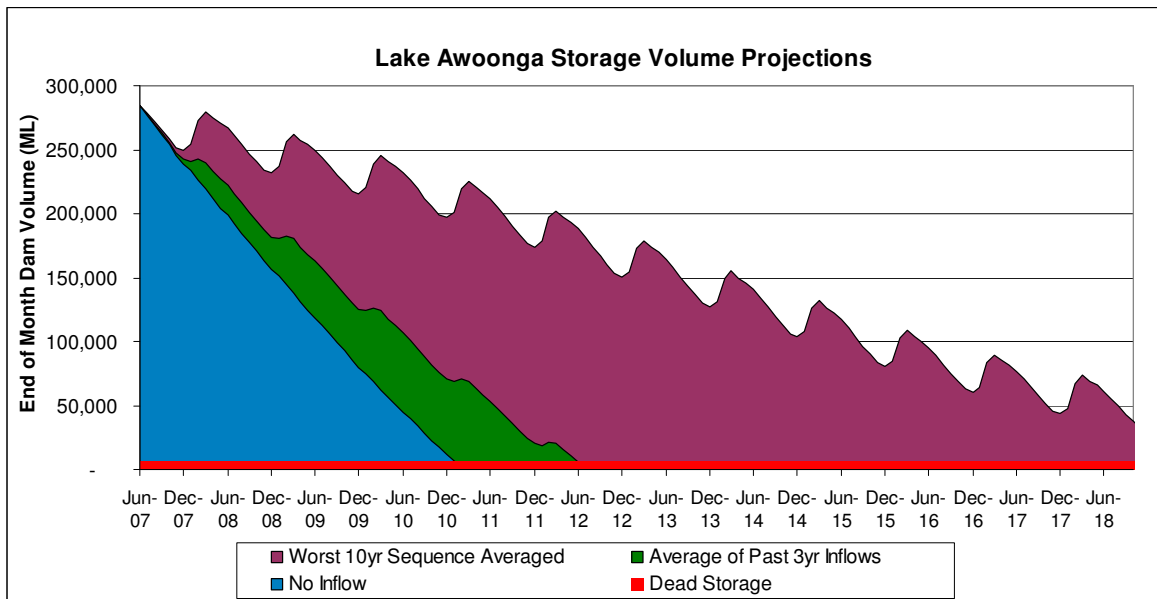
The following is an overview of the actions that GAWB will take (as detailed in section 9 of this Plan):

- At the Trigger Level of 60 Months Time Frame from Failure GAWB will take action to access an additional source of water (as is currently occurring), and will issue a Low Supply Alert seeking a voluntary reduction from customers in their water demands;
- Despite GAWB's focus upon supply augmentation, should the Trigger Level of 48 Months Time Frame from Failure be reached GAWB will impose restrictions of 10% on the Reservation of each Customer and plans to commence construction of the Gladstone-Fitzroy Pipeline with the objective that it be operational at the conclusion of (a further) 24 months; and
- Despite GAWB's focus upon supply augmentation, should the Trigger Level of 6 Months Time Frame from Failure be reached GAWB will cease supply to Customers other than Municipal Customers. GAWB will impose restrictions of 50% on the Reservation of Municipal Customers.

The above actions are based upon the following assumptions used in the Model:

- Inflows – are based upon the annual average of the total inflows during the worst 3 year historical sequence (2004 – 2007) – some 23,633ML; and
- Outflows – including evaporation, seepage, water losses and future Contracted Supply.

**Table 1 Possible Future Inflows into Awoonga Dam**



**This plan sets out an exercise in risk management rather than a forecast for the future.**

In particular, assumptions as to the pattern of inflows as well as the volume of inflows significantly impact modelling outputs and a number of scenarios need to be understood in forming a view as to the assumptions to adopt for the purpose of determining Trigger Levels. Adoption of assumptions following each End of the Wet Season review will be informed by expert analysis as well as the timing and cost of developing ready to implement supply augmentation initiatives and the lead time and cost to implement such augmentation solutions.

**It is emphasised that the eventual outcome (as to the impact of Drought on the availability of water) will depend on actual experience rather than assumptions highlighting the criticality of timely review and response as circumstances develop.**

### 3. BACKGROUND

GAWB is a Category 1 water authority established in accordance with the Act and created as a body corporate pursuant to that Act. GAWB is also a registered water service provider under the Act.

The characteristics of the water supply system managed by GAWB are described in sections 7 and 8 of this Drought Management Plan.

Section 1084 of the Act provides that GAWB is to carry out water activities generally in the State. GAWB, however, only provides a water service (as defined in the Act) to the areas to which its infrastructure is able to transport water within the Gladstone Region as detailed in Appendix “A”.

Under the Act, GAWB’s functions include the conservation and supply of water as well as anything else in relation to water management.

The procedures set out in this Plan seek to inform how GAWB will give effect to the exercise of the powers that are reposed in it under Section 388 of the Act in circumstances of Drought.

## 4. PURPOSE AND OBJECTIVES

The Plan describes how GAWB will respond to circumstances of Drought and by so doing address the requirements of sections 429C of the Act.

Some key principles that GAWB has adopted in the development of the Plan are:

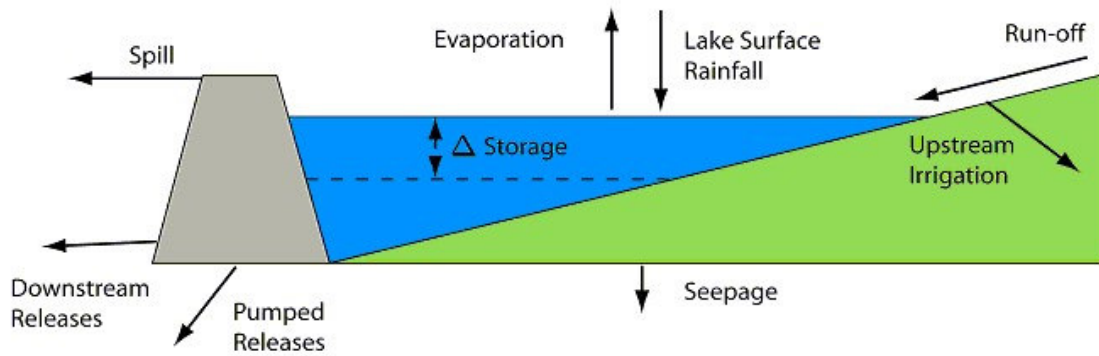
- For the reasons detailed in the *Strategic Water Planning Study* (November, 2004) GAWB accepts Customers representations that Customers have limited capacity to operate with water supply restrictions;
- As a commercialised water service provider GAWB operates in accordance with National Competition Policy and is subject to regulation by the Queensland Competition Authority of the prices that it charges to its Customers. In response GAWB is developing a strong commercial and contractual framework for the supply of water. Under this framework, Customer's Reservation are progressively being aligned with their consumptive requirements, further limiting Customers capacity to operate with restricted water supply;
- GAWB's primary focus to mitigate the effect of Drought should be upon supply augmentation, not demand restrictions. Customers have acknowledged that although GAWB will pursue the least cost method of supply augmentation, increased water costs will result. This is now the matter of regulatory review by the Queensland Competition Authority, with the outcomes driving GAWB's ability to implement supply responses in a timely manner;
- Notwithstanding this, in circumstances where restrictions are to be imposed by GAWB (in accordance with this Plan) such restrictions are to be uniform for all Customers in line with the consistent application of pricing principles for the storage and reservation of water at Awoonga Dam;
- Trading of water is intended to facilitate the use of water to its greatest potential, which is especially important in any period of restricted supply;
- While it is impossible to predict future inflow volumes, in the interest of certainty for Customers, it is important for the assessment of Trigger Levels to be objective and transparent.

## 5. MODEL

The Model that GAWB has developed uses information derived from a number of sources to estimate the volume of water that would be prospectively available from the Awoonga Dam.

The Model identifies 'Trigger Levels' that represent a prediction of remaining volume in storage for a period of supply from Lake Awoonga. Trigger Levels are quoted in 'Time Frame from Failure' to determine the respective levels in Lake Awoonga at which GAWB calculates that it will be able to provide the Contracted Supply each year.

The Model operates on assumptions concerning inflows from Awoonga Dam, depicted diagrammatically below:



The Model is based on various assumptions. The key assumptions are as follows:

- Inflow – is based upon the annual average of the total inflow during the worst three year inflow sequence (2004 to 2007), being 23,633ML;
- Pumped releases (Supply) – is based upon GAWB’s forward estimates. These estimates reflect the demand that is determined by current Customer Reservations or the demand that GAWB considers probable. As GAWB further develops its commercial operations, it plans to base forward estimates of demand on Customer Reservations alone; and
- Losses – these include matters such as environmental releases, evaporation and seepage that vary subject to the level of water stored in Awoonga Dam. The rate of evaporation decreases as the amount of inundated land decreases. Additionally, environmental releases halt when water levels are below 30 m AHD (circa 282,000ML). As a consequence, based upon water levels of 30m AHD, losses reduce to the order of 30,000Mlpa. (see Section 8.4)

**Table 2 Key Inflows into Awoonga Dam from 1938 to 2006<sup>1</sup>**

	Mlpa		Mlpa
<b>Minimum</b>	<b>6,138<sup>2</sup></b>	<b>Average single year flow</b>	<b>325,850</b>
<b>5%ile single year flow</b>	<b>12,933</b>	<b>75%ile single year flow</b>	<b>378,731</b>
<b>25%ile single year flow</b>	<b>50,032</b>	<b>95%ile single year flow</b>	<b>1,369,794</b>
<b>Median single year flow</b>	<b>212,768</b>	<b>Maximum single year flow</b>	<b>2,114,674</b>

The decision to use assumed inflows based upon the average of lowest three-year inflow sequence was made with due acknowledgement of the unquantifiable effect that climate variability will have upon the use of historic inflow data. Statistical tests that GAWB commissioned indicate a strong downward trend for inflows to Awoonga Dam. These tests

<sup>1</sup> Based on the year 1 October to 30 September

<sup>2</sup> Previous minimum inflow of 1,211 Mlpa was reviewed and deemed erroneous from inspection of monthly inflows for the period. Several months of zero inflows were observed in the record, which is inconsistent with rainfall record of same period.

suggest that it is *possible* that the Boyne Catchment may presently be in the midst of a period of inflows that are 10% to 30% worse than the prior worst 10 year inflow.

The positioning of the Trigger Level that commits GAWB to commence supply augmentation at 60 months Time Frame from Failure, seeks to balance considerations involving risk of climate variability upon assumed inflows and the resultant costs to Customers arising from supply augmentation being triggered prematurely.

GAWB will review this three year sequence following the 2007/08 wet season, as it is possible that a further year of very low inflows may lead to a new lowest three-year period (2005-2008).

In arriving at the three-year inflow assumption, GAWB has been mindful of the need to commence drought management activities whilst there is sufficient storage reserve to cater for an unpredicted event, such as one or more years of even lower (or zero) inflows.

The Model has been reviewed by suitably qualified consultants who have advised GAWB that the Model is fit for the purposes for which it is intended to be used. The Trigger Levels are also consistent with the requirements and conditions contained in the Water Resource Plan, the Boyne ROP and GAWB's Resource Operating License.

GAWB will demonstrate the operation of the Model to Customers upon request, at a time and place to be agreed.

## **6. APPLICATION**

This Drought Management Plan applies to Customers and to any other persons who GAWB may be permitted by the Act or authorised to restrict in their use of water. In addition, the Minister is authorised under the Act to take certain measures under a water supply emergency declaration or take any action in the public interest.

## **7. SERVICE AND SYSTEM OVERVIEW**

### **7.1 TYPE OF WATER SERVICES**

GAWB is the major bulk water provider for the Gladstone region, which comprises Gladstone City and the adjoining Calliope Shire, extending south to Miriam Vale Shire and west to Biloela. Specifically, GAWB supplies water services to:

- the city of Gladstone, the towns of Calliope, Tannum Sands, Benaraby and Mt Larcom in Calliope Shire;
- major industrial facilities located within Gladstone, the Gladstone State Development Zone (to the North of Gladstone) and Boyne Island; and
- the power stations near Biloela.

The Gladstone City Council and the Calliope Shire Council are responsible for determining drought management practices concerning their customers, but are themselves subject to GAWB actions pursuant to this Plan.

### **7.2 NATURE OF THE BULK WATER SERVICES**

#### **7.2.1 Untreated water**

Water supplied by GAWB from Lake Awoonga is predominantly untreated water, supplied to Gladstone and Calliope industrial users and to the Callide power stations.

Approximately 40% of that supply is to major industrial users in Gladstone City and the Calliope Shire.

A further 40% is supplied to Callide B and Callide C power stations via an inter-basin pipeline into the catchment of Callide Creek Dam. Local inflows into this dam have occasionally allowed supply from Lake Awoonga to be halted for periods of several months. These local inflows generally do not occur when the adjoining Boyne River catchment is experiencing drought conditions.

These power stations are significant to the State electricity grid. Any reduction in supply to the Callide power stations may thus have an impact throughout Queensland—the size of the impact would depend on surplus generating capacity available at other Queensland power stations.

The number of Connections served by GAWB's untreated water service is approximately 19.

### **7.2.2 Treated water**

Treated water comprises approximately one fifth of the total supply (approximately 11,012 Mlpa). Water supplied to the municipal reticulation systems is principally for domestic use. GAWB understands that 50% of this water supply is for potable use.

Gladstone Power Station, Orica, Comalco, QAL and BSL also use treated water for potable and industrial purposes. Other industrial sites treat raw water on-site for potable uses.

There are approximately 26 Connections to GAWB's treated water service.

### **7.2.3 Irrigation and environmental releases**

Releases from the Boyne River for irrigation use (regulated by DNRMW) are currently less than 400 Mlpa, may be halted during Drought, and are assumed negligible for planning purposes.

Environmental releases cease when water levels are below 30 m AHD.

## **7.3 CURRENT AND PROJECTED DEMAND**

While the municipal usage rate varies seasonally, industrial usage is generally not seasonal. It is anticipated that the current (approximate) 80/20 proportions of untreated/treated water supply from Lake Awoonga will remain relatively constant.

GAWB regularly examines possible long-term industrial development and urban growth scenarios. These scenarios take into account the existing industries and their likely expansion, the region's resources, and synergies that may exist between industries. The scenario adopted becomes the Preferred Planning Scenario (developed by GAWB in 2003/04 as part of its *Strategic Water Planning Project*) which is updated annually.

History indicates that water supply to the Gladstone Region is characterised by long periods of relatively stable demand interposed by intervals of growth because it is uniquely driven by industrial water demand (not agricultural or urban). GAWB acknowledges the limitations inherent in even its most robust forward demand projections.

As projected demand is a key input into the operation of the Model to identify Trigger Levels, GAWB appreciates the importance of ensuring that these estimates are as accurate as possible. Accordingly, as GAWB continues to develop its commercial framework it will aim to ensure that all forward demand that is used by the Model is underpinned by Reservations (ie contractual obligation) with Customers.

Upon the declaration of a Supply Restriction by GAWB (in accordance with 9.3 of this Plan) GAWB will provide Notice to Customers that do not have a Reservation, but who have

demand included in Projected Water Demand as permitted by GAWB's *Forward Water Sales Policy* (see Table 4), to elect:

- To enter into a contract to secure their identified water demand for each year; or
- Allow their identified water demand to lapse within a defined time period (expected to be 30 days).

This approach will improve the reliability of demand projections as they are used in the Model. GAWB considers this approach to be necessary to ensure equity between all Customers.

For similar considerations of equity, subject to the Act, GAWB will not increase the volume of water it is obligated to supply upon the declaration of a Supply Restriction until such time as it has declared that the Supply Restriction has ended (in accordance with section 9.6 of this Plan).

From 2010 onwards, GAWB plans to have access to an additional 30,000 Mlpa from the Lower Fitzroy. This additional water supply will be necessary to meet additional demand that GAWB will be unable to supply due to conditions in the Boyne ROP limiting GAWB's present ability to supply water in excess of approximately 70,000 Mlpa from Awoonga Dam (as detailed in section 8). Until such time as this additional source is certain GAWB is not able to commit itself to Contracted Supply that exceeds this volume of water.

**Table 3 Projected Water Demand (Preferred Case Scenario – Updated 1 July 2007)**

Year	Total Water Supply Mlpa
2007/08	53,337
2008/09	52,775
2009/10	53,682
2009/10	60,258
2010/11	63,653
2011/12	65,465
2012/13	67,339
2013/14	69,276
2014/15	70,000*

\*each year thereafter is deemed to be 70,000Mlpa for the reasons canvassed at section 7.3.

## 7.4 INFRASTRUCTURE DETAILS

The infrastructure used to deliver the registered services to which this Plan applies is outlined in Appendix B. A diagram illustrating the linkages between each of these major infrastructure elements is included at Appendix A., and schematic diagrams of GAWB's treated and raw water systems are included in Appendix C & Appendix D.

## 8. CURRENT WATER SOURCE

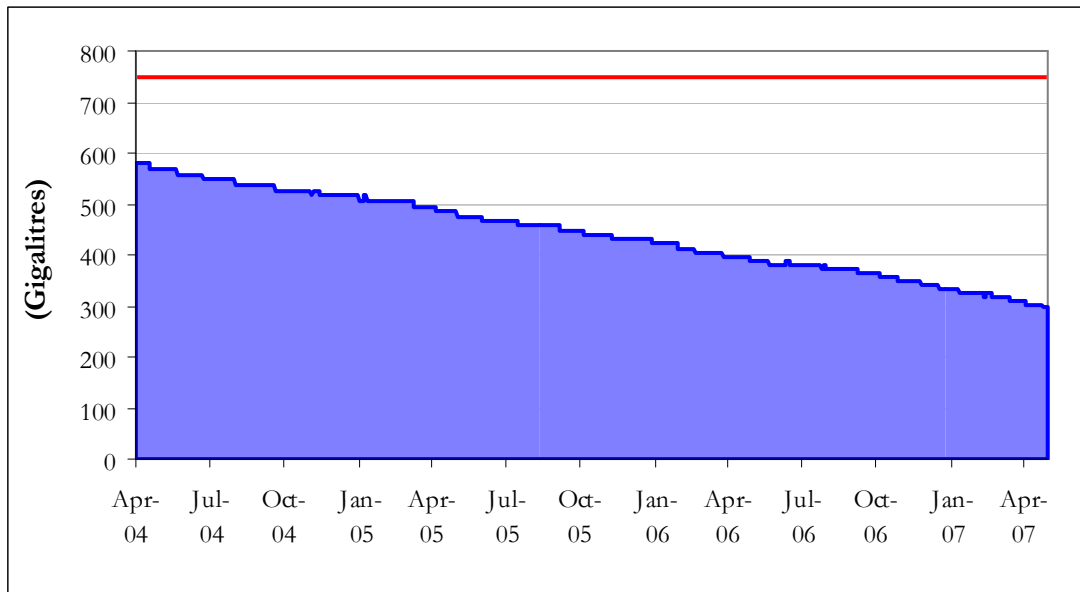
### 8.1 OVERVIEW

GAWB currently sources all of the water delivered to its municipal and industrial Customers from Lake Awoonga. Lake Awoonga is formed by Awoonga Dam, which is located on the Boyne River approximately 22.7 km upstream of its mouth.

The major characteristics of the Boyne River and Lake Awoonga system are as follows:

- The total annual inflows to Lake Awoonga are highly variable from year to year.
- Rainfall and runoff are seasonal and summer/autumn dominant.
- Significant inflows occur in more than 75% of years.
- Dead Storage level in Lake Awoonga is 13.6 m AHD. This level is determined by the (fixed) level of the lowest water intake. Approximately 6,400 ML remains in the storage at this level.
- Current full supply level of 40 m AHD corresponds to a full storage volume of approximately 776,800 ML. The effective storage is therefore approximately 770,400 ML.
- A hydrographic survey in October 2002 confirmed the previously calculated capacity of Lake Awoonga at water levels at and below 22.3 m AHD (the water level at the time this survey was carried out).
- GAWB holds a water allocation of 70,000 ML from Awoonga Dam, which will increase to 78,000 ML upon the dam filling to 40m AHD. This water allocation is the current basis upon which GAWB supplies its customers.

**Table 4 Volume of Water Stored at Awoonga Dam (from April 2004 to April 2007)**



GAWB’s long-term planning aims to provide a reliable supply of water to Customers. The long-term simulated performance of GAWB’s water allocations is set by the Department of Natural Resources and Water using the Integrated Quantity and Quality Model (IQQM) of the Boyne River catchment. This IQQM model uses rainfall records since 1892 and a shorter period of Boyne River flow data and provides a simulated inflow history from the Boyne River into the Dam.

Importantly, the Department sets the standards for water allocations from various storages through the Water Resource Plan (WRP). In the case of Awoonga Dam, the WRP sets a performance benchmark for GAWB’s water allocations at 100% monthly reliability whilst the Dam is constructed to above 30m AHD<sup>3</sup>.

GAWB completed the raising of Awoonga Dam to 40m AHD in June 2002. The Boyne ROP set by the Department grants to GAWB a water allocation of up to 78,000 ML based on Awoonga Dam constructed to 40m AHD.

This full allocation is not made to GAWB until the 40m spillway is first overtopped. This allocation will increase by 2,500 Mlpa for every metre increase in the maximum water level recorded up to the current 40m AHD spillway height.

GAWB’s current water allocation, based on the maximum storage height reached since the 40m raising, is 70,000 ML.

For the avoidance of doubt, GAWB will not enter into contractual obligations to sell more water in a year than permitted by the Boyne ROP and its water allocation. Additionally, for reasons including the constraints imposed upon GAWB by the Boyne ROP, GAWB does not permit “water banking”.

The benchmark reliability for GAWB’s allocations set in the WRP is based on historic simulated conditions, and is applied to determine water management arrangements for the storage. Hence, the WRP does not imply that GAWB’s allocations are ‘safe’ as there is still the

<sup>3</sup> This is referred to as the Water Allocation Security Objective.

possibility of failure of the Gladstone Region's water supply due to future inflows being different to those inferred from the historical data.

GAWB periodically reviews the estimation of HNFY with recent years' data to ensure that its planning is current and up to date.

## **8.2 IQQM**

The best available hydrologic data for the Boyne River system is derived from the IQQM analysis initially used in the preparation of the Boyne ROP. This work was completed in 2003 and includes inflows to the end of January 2003 (immediately prior to the breaking of the drought).

GAWB engaged Hydro Tasmania to review this data set for the purposes of drought management, resulting in some adjustments to historic data for use in the drought model.

The available data, including the impact of climate variability, will continue to be reviewed and any changes used to update this Plan.

## **8.3 HISTORICAL RAINFALL RECORDS AND FREQUENCY OF DROUGHT**

There are two types of droughts (as the term is colloquially understood, not as Drought is referred to in this Plan) on the rainfall record. There are "short-term" droughts where there was a severe rainfall deficit over periods of up to 12 months and typically with several months with zero rainfall and zero or very low flows in the Boyne River. The worst short-term droughts with annual rainfall less than one half of the annual mean rainfall were in 1941 and 1969.

There are also "long-term" droughts with a series of very weak wet seasons and subsequently low annual flows in the Boyne River, sometimes (but not always) coinciding with short-term droughts. The long-term droughts on record occurred during 1964–67<sup>4</sup>, 1969–70, 1984–85, 1993–95, and 1997–2003.

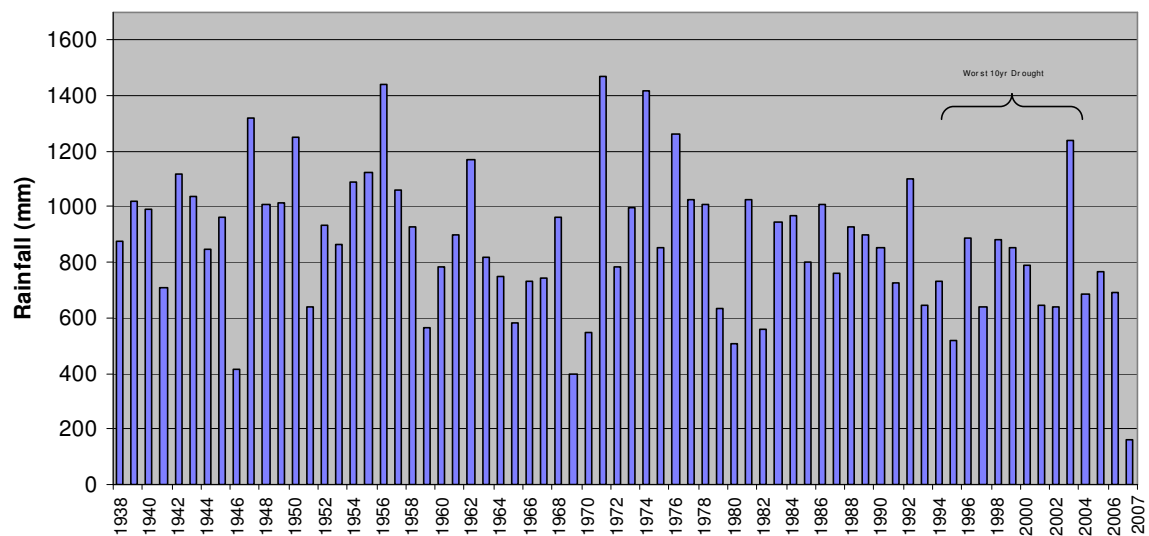
The current HNFY of Lake Awoonga is determined by the long-term drought that ended in 2003.

The decades of the 1950s and 1970s had relatively high rainfall.

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<sup>4</sup> The severity of this drought, as indicated in streamflow estimates and data, has been assessed as being overstated. Following recent review, this sequence was not included in the assessment of historic low flow sequences used for determining the inflow assumption.

**Table 5 Rainfall Events since 1938**



Note: 2007 rainfall up to 31 April 2007.

## 8.4 LOSSES

Losses from Lake Awoonga comprise evaporation losses from the Lake surface, and seepage into deep aquifers and through the Dam wall. Mean evaporation varies from 3.1 mm per day in June to 7.1 mm per day in December, and averages 5.2 mm per day. Seepage is assumed to be 300 mm per annum (which is typical for a major water storage), that is, less than 1 mm per day. Net effective loss volume is assumed as being evaporation plus seepage less direct rainfall over the Lake’s actual surface area.

Losses from the raw water supply system, which is fully piped, are assumed to be immaterial.

## 8.5 PREVIOUS WATER RESTRICTIONS

The Gladstone region suffered a very significant drought between 1996 and 2003 which saw the implementation of water restrictions for the first time.

The 30m Awoonga Dam was last overtopped in October 1996. Inflows to the Dam in each of the following six water years (ended 30 September) were less than the driest 25% of years since rainfall records began in 1891. No significant inflows were received from October 1996 until February 2003.

The water level in the Awoonga Dam fell throughout this period, to 106,000 MI (38% capacity) in April 2002, 73,000 MI (9.4% of the capacity of the raised 40m Dam – as completed on 31 October 2002) in November 2002 and 59,000 MI (7.6%) in January 2003.

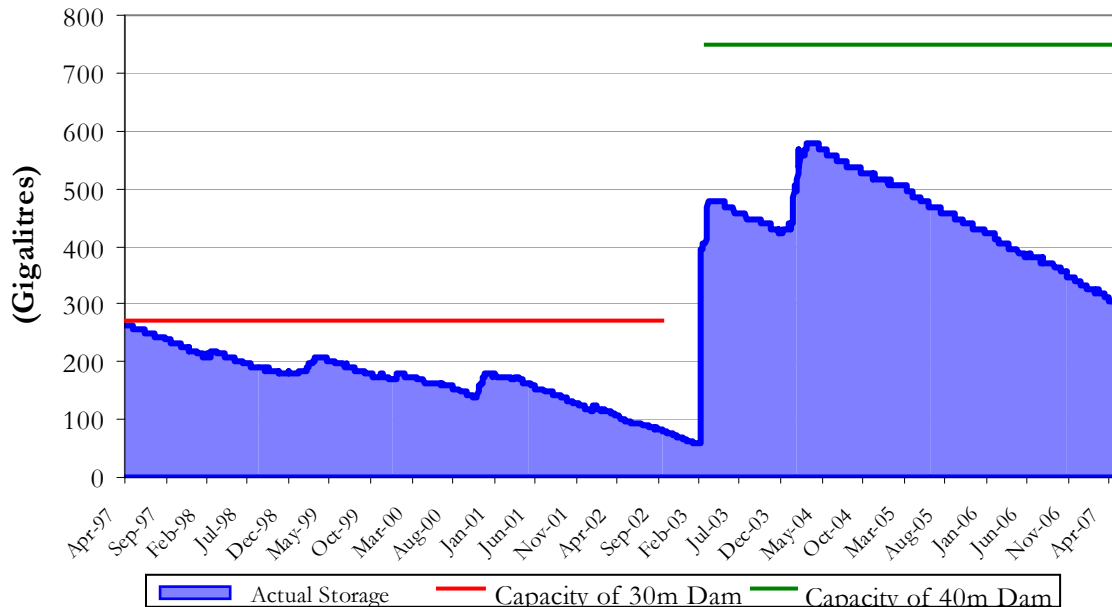
Accordingly, GAWB imposed the following water restrictions as follows:

- Stage 1 April 2002 - 35% reduction in supply to municipal Customers and 10% reduction in supply to industrial Customers; and
- Stage 2 November 2002 - 50% reduction in supply to municipal Customers and 25% reduction in supply to industrial Customers.

Rainfall events following Cyclone Beni led to an increase in the water level at Awoonga Dam in February 2003 to 484,000 MI (approximately 62% of its full supply capacity) as well as the

lifting of water restrictions on 13 February 2003. Subsequent significant inflows during the 2003/04 wet season resulted in further increases in the water level to 580,000 ML (75% capacity) in April 2004.

**Table 6 Awoonga Dam Storage at End of Month, 1996–2007**



Industrial and municipal Customers were able to comply with Stage 1 restrictions, principally through more stringent control over water use and the imposition of quantity restrictions on the Councils' domestic and light industrial Customers. Compliance with Stage 2 restrictions was considerably more difficult for all GAWB's Customers. A number of industrial customers invested in additional capital equipment (desalination plants, grey-water reuse pipelines etc.) to improve their water-use efficiency.

As a consequence of the drought there appears to have been long term modification of water usage by Customers, reducing their demand to the extent that there is now a serious question as to whether Customers have the ability to cope with any further restrictions imposed as a result of a future Drought.

## 8.6 WATER QUALITY IMPACTS

Water quality in Lake Awoonga is normally very good. As water levels fall, general impacts are:

- Water temperature variations are expected to increase;
- Oxygen levels are expected to decrease;
- Nutrient levels are expected to increase and therefore the risk of algal blooms will increase;
- Salinity may progressively increase; and
- High or very high turbidity levels may be expected following initial "first flush" inflows after a lengthy period of minimal inflows.

Water quality in general is therefore expected to decline.

Anticipated impacts from lower water quality include:

- GAWB water treatment plants may:
  - require additional treatment chemical inputs;

- increase water use due to increased backwashing resulting from higher influent turbidity; and
- have reduced maximum capacity; and
- Industrial sites with their own water treatment plants for potable supply may be similarly or more negatively affected.

## 8.7 ENVIRONMENTAL IMPACTS

Reduced water levels will have a major impact on the Lake Awoonga aquatic environment. Environmental impacts will be proportional to water level, but are expected to increase significantly when water levels fall below approximately 16.0 m AHD when average water depth reduces to below 3.0 m.

Due to the size of the remaining pool and decreasing water quality it will be necessary to increase environmental monitoring and including reviewing whether to discontinue the fish stocking program (at some stage) until fresh inflows raise the water level.

## 9. DROUGHT MANAGEMENT STRATEGY

### 9.1 OVERVIEW

The supply of water from Lake Awoonga has been sufficient to satisfy demands through previous short-term droughts. The drought management strategies in this Plan are designed to respond to longer term dry periods over five years or more.

With the increasing acceptance of the impact of climate change/variability there is uncertainty concerning the ability of Lake Awoonga to be a reliable water source during long term droughts.

It is GAWB's preference to apply an *adaptive strategy*<sup>5</sup> to the risk posed by climate change/variability by defining the circumstances in which GAWB will access a supplementary supply and impose restrictions (if necessary). As discussed in earlier sections, this is currently the subject of a regulatory review and following this review GAWB anticipates that additional trigger levels will be determined for supply augmentation (provided there is sufficient certainty over the commercial arrangements surrounding such an investment). Hence this Drought Management Plan will be reviewed following the conclusion of this review, and depending on the outcomes, may lead to adjustments to the restriction regime and trigger points.

GAWB will present its proposals to customers via the Queensland Competition Authority's process. GAWB welcomes direct discussion on these matters with customers, and also notes that customers will be able to make direct submissions to the Authority on the matters under review, including trigger points for a supply response (Gladstone-Fitzroy Pipeline).

Historical rainfall records for the Boyne catchment reveal that the wet season is concluded by 30 April each year. For the purpose of this Plan, GAWB has assumed that the wet season ends on 30 April (End of the Wet Season).

Following the End of the Wet Season, but by no later than 30 June each year, GAWB will review and update the data inputs to the Model and recalculate Trigger Levels.

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<sup>5</sup> As discussed in *Climate Change, Risk and Vulnerability. Promoting an efficient adaptation response in Australia*. Australian Greenhouse Office. Department of Environment and Heritage. Australian Government. March 2005.

## 9.2 LOW SUPPLY ALERT

In the event that circumstances develop where the Model indicates 60 months or less as the Time Frame from Failure GAWB will declare a Low Supply Alert and will provide Notice to Customers:

- Informing Customers of the declaration of a Low Supply Alert; and
- Seeking their voluntary adoption of additional demand management strategies/techniques; and
- Providing Customers with comprehensive details of GAWB's plans to access the supplementary water source, including the associated cost and estimated time for completion of these works. This information is available to customers in the form of GAWB's submission to the QCA on the Gladstone-Fitzroy Pipeline.

When GAWB is reasonably certain of the timeframe for water from the augmented supply being available to supply to Customers, GAWB will incorporate this supply into the operations of the Model.

Notwithstanding that GAWB will endeavour to ensure that it is not required to impose restrictions (by accessing additional water supplies) having regard to requirements of the Act and also recognising that circumstances may develop which are not reasonably foreseeable, this Plan makes provisions for the imposition of water restrictions.

## 9.3 SUPPLY RESTRICTIONS

If the Model indicates **48 months or less** as the Time Frame from Failure GAWB will declare the imposition of restrictions and will provide Notice to Customers:

- Informing Customers of the decision to impose restrictions on water supply in accordance with section 389 of the Act; and
- Setting restrictions at 10% of their Reservation; and
- That it will commence construction of the Gladstone-Fitzroy Pipeline with the objective that it be operational at the conclusion of (a further) 24 months.

In implementing supply restrictions, GAWB's objective is to reduce the consumption of water so that the probability of exhaustion of the existing supply is reduced, while seeking to minimise, for the duration of the supply restrictions, the unavoidable economic and social impacts that flow from the targeted reduction of consumption.

GAWB accepts the feedback that it has received from Customers following the last imposition of restrictions (see section 8.5 of this Plan) that Customers are unable to tolerate any higher level of restriction (than 10%) and operate effectively. As a consequence of the level of savings that are achievable via restrictions being relatively low, the extension of the time in which water supply can be prolonged by such restrictions is commensurately limited.

On current demand data, GAWB believes that reductions in demand due to both voluntary and non-voluntary demand reductions will extend the available supply of water by no more than 3 months, under the current inflow assumption.

GAWB will work with Customers to develop their own plans to reduce water consumption.

## 9.4 EMERGENCY RESTRICTIONS

While GAWB is committed to responding to Customers' needs by introducing the Gladstone-Fitzroy Pipeline, if the Model indicates **6 months or less** as the Time Frame from Failure GAWB will declare Emergency Restriction and will provide Notice to Customers:

- Informing Customers of the decision to impose Emergency Restrictions on their water supply in accordance with section 389 of the Act;
- Informing all non-Municipal Customers that their water supply will cease;
- Informing Municipal Customers that restrictions will be set at 50% of their Reservation; and
- Providing details of ongoing action that GAWB will take to monitor water levels as well as updated estimates of the timing for completion of works allowing access to additional supplies of water, including possible access to water in Dead Storage by utilisation of additional pumping and other equipment.

These restrictions are intended to facilitate supply by Municipal Customers to residents for essential uses only. On current projected demand data, GAWB believes that resultant reductions in demand would extend the available supply of water in excess of 2 years.

## 9.5 TRADING

In line with its Trading Policy, GAWB will permit physical trading of Reservations and delivery arrangements between Customers (on a temporary basis) to ameliorate the effects of water restrictions, subject to GAWB approval (not to be unreasonably withheld).

## 9.6 END OF RESTRICTIONS OR LOW SUPPLY ALERT

Should an inflow or augmented supply occur that results in a rising of the Trigger Level from either 60, 48 or 6 months Time Frame from Failure, any decision to ease restrictions will be made only after consideration of:

- Volume of water above the Trigger Level;
- Base flows in the Boyne River, and catchment moisture conditions generally;
- Projected demand;
- Minimum projected period until re-application of supply restrictions and timing of these restrictions with respect to the next wet season;
- Seasonal and climatic conditions generally, and probability of further rainfall;
- The impact of existing water use restrictions and the benefits of easing restrictions for (potentially) a short period;
- Attributes of any supplementary supply; and
- Possible changes to Trigger Level which may be required by a review of this Plan.

Any decision to ease restrictions is subject to GAWB's overriding discretion to ensure that demand projections demonstrate that a reasonable level of supply will be available to protect against the reimposition of lifted restrictions in the short term.

A decision to end any level of restrictions or a Low Supply Alert will be the subject of immediate Notice to Customers.

## 10. REVIEW OF PLAN

GAWB will review this Plan as necessary to ensure that it:

- continues to meet the requirements of the Act;
- provides sufficient detail given the nature, size and complexity of the infrastructure and services provided;
- is appropriate for the GAWB's circumstances and infrastructure;
- minimises economic and social impact on the customers and the community;
- remains relevant having regard to any recent Drought events and current industry best practice;
- is based upon reliable assumptions (incorporated into the Model);
- addresses any changes to a water resource plan, interim resource operations licence or resource operations licence or the Boyne ROP;
- meets the requirements of DNRW;
- if the 2008 wet season generates a new record three-year inflow sequence; and
- following completion of the QCA's review into the Gladstone-Fitzroy Pipeline as a contingent supply source.

## **11. MANAGEMENT AND COMMUNICATIONS STRATEGY**

As a Category 1 water authority, GAWB is a body corporate. The Board of GAWB is ultimately responsible for the making of decisions in relation to this Plan.

Notice of such decisions will be in writing sent to each Customer to the address listed in their contract of supply to each customer or otherwise to their registered office (as defined by the Corporations Act) of Customers or their usual postal address.

GAWB recognises that effective communication with Customers and stakeholders is critical to GAWB's achieving the best outcomes from this Plan.

In addition to the provision of the Notice detailed above, GAWB will employ communication strategies that are designed to effectively and interactively communicate with Customers and will actively review these strategies on a regular basis.

GAWB's Chief Executive Officer and other members of the management team will have responsibility for discharging GAWB's communication strategy.

The communications strategy includes:

- (a) updating Customers on water storage levels and pending drought conditions prior to reaching either a Low Supply Alert or other Trigger Levels;
- (b) increasing the frequency of communications following the issue of a Low Supply Alert and for the period of any restrictions;
- (c) liaising with Customers in respect to the predictions, mitigations measures and other issues which may impact on them;
- (d) consulting with Customers on the terms of this Plan and associated matters;
- (f) conducting a public education program, such as Waterwise, to educate Customers about the economic and ecological benefits of reducing water consumption, most particularly for the duration of restrictions; and
- (g) publishing information about Lake Awoonga water levels, inflow and water usage on GAWB's Web Site.

Following the declaration of a Low Supply Alert (in accordance with section 9.2) the GAWB Chief Executive Officer (Jim Grayson) shall lead the Drought Management Team, comprising the following staff:

- Operations Manager – Philip Surtees;
- Engineering Projects Manager – James Stewart;
- Land and Recreation Manager – Peter Collier;
- Corporate Counsel – Bernadette Le Grand; and
- Environment Engineer – David Spralja.

The Drought Management Team will coordinate the implementation of the Plan by drawing upon the available expertise and resources within each of their areas of responsibility. The Drought Management Team will meet weekly during the implementation of the Plan and twice weekly if GAWB has imposed water restrictions in order to monitor the impact of the restrictions, environmental conditions and Customers' responses to the restrictions.

## **12. RELEVANT AGENCIES**

In the implementation of this Plan, GAWB recognises that various agencies may be able to assist in maintaining supply, or alternatively, may have controlling responsibilities for access to alternative or emergency sources of water supply. Specifically, these agencies include:

- Department of Natural Resources and Water, in relation to the allocation of resources;
- Department of Local Government, Planning, Sport and Recreation, in relation to drought assistance funding;
- Environmental Protection Authority, in relation to access to water from environmentally sensitive areas and concerning the impact of low volumes of water in Awoonga Dam;
- Department of Infrastructure, in relation to infrastructure development;
- Queensland Competition Authority in relation to the application of pricing principles to investments to augment supply; and
- Treasury (and Queensland Treasury Corporation) concerning financial advice and approvals for borrowings for infrastructure development.

## **13. SANCTIONS**

GAWB expects Customers to abide by restrictions and regulate their demand accordingly.

If a Customer does not so regulate its demand, as permitted by the Act or contract, GAWB may construct or install such infrastructure as may be required to regulate demand and may recover from the Customer the cost of constructing, installing and operating the infrastructure required as a result of the Customer's failing to regulate its demand.