Banksia Beach Borefield

Borefield Environmental Management Plan (BEMP)

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13	Amended Version	Tonia Selman	Refer to supporting Info in Q-Pulse	Harry Gordon, Principal Environmental Management	Refer to supporting Info in Q-Pulse	20/05/2022

SOURCE STORE SUPPLY

Revision Schedule

Revision #	Date	Description	Prepared by	Reviewed by	Approved by
1	16 February 08	Additional data	SEM	KB	SEM
2	22 February 08	Minor amendments	SEM	PE	SEM
3	10 April 08	Insertion of EPBC conditions and amendment to reflect change of ownership to QBWSA	SEM	KB	SEM
4	12 August 2008	Included changes outlined in EPBC approval (6 / 8 / 08)	SC	SEM	SEM
5	18 February 2009	Addition of observation bore T and associated amendments	SC	SEM	SEM
6	31 March 2009	Amendment of flora and frog monitoring site 3 to site 3R	SC	SEM	SEM
7	January 2013	Major revisions following 3 year review (refer REF-0253)	SKM	Andrew Smolders Sean Kadel	Andrew Watkinson
8	March 2014	Integration of original BOMP and BEMP to form new document “BEMP”	SKM, Simon Clements, Andrew Smolders, Sean Kadel.	Simon Clements Andrew Smolders, Sean Kadel.	Andrew Watkinson Harry Gordon
9	August 2015	Addition of “Moreton Bay Ramsar wetland” to section 6.3 MNES after DoE review and new condition variation to Appendix A	Simon Clements	Simon Clements, Harry Gordon	Harry Gordon
10	February 2016	Update of monitoring during cold standby shutdown (shutdown >12 months)	Simon Clements	Simon Clements, Harry Gordon	Harry Gordon
11	March 2016	Addition of minor changes after DoE review.	Simon Clements	Simon Clements, Harry Gordon	Harry Gordon
12	May 2020	Update of document owner, amendment of footer and update of Environment and Sustainability Policy	Tonia Selman	Harry Gordon	Harry Gordon
13	April 2021	Removal of remote sensing from Ecological Monitoring Program	Karen Kolb	Tonia Selman	Harry Gordon

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Executive Summary

This Borefield Environmental Management Plan (BEMP) addresses the conditions set out in the then Department of the Environment, Water, Heritage and the Arts (DEWHA) (now the Department of Agriculture, Water and the Environment – DAWE) approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In accordance with the approval conditions, this BEMP sets out a methodology for undertaking all monitoring required by the approval, records all initial benchmark descriptions of the monitoring parameters, and documents objectives, targets for performance, management actions, responsibilities, timing, review and corrective actions required.

This BEMP sets out a series of procedures to:

- Ensure the safe and sustainable operation of the Bribie Island Groundwater Development Unit (GDU) that provides water to the Banksia Beach WTP; and
- Provide guidance on managing associated potential environmental impacts of borefield operation.

1. Introduction

1.1 Background

The Queensland Government mandated the implementation of a series of water infrastructure projects as part of a regional drought management strategy in response to the millennium drought (2001-2009) and the lack of security of potable water supplies in South East Queensland (SEQ).

In 2006, a new Part 8 was inserted in the *Water Regulation 2002*, which outlined measures to be undertaken and outcomes to be achieved by service providers to ensure security of essential water supplies for the SEQ Region. One of the specified measures was the development of underground water resources at Bribie Island and in the area around Brisbane. Schedule 10B of the *Water Regulation 2002* required that this measure with respect to Bribie Island be completed by 31 December 2007, with the initial outcome of 10 megalitres (ML) of water production per day.

Investigation of the aquifer and groundwater modelling for Bribie Island clearly demonstrated that the sustainable combined production level at the proposed Banksia Beach water treatment plant (WTP) and the then existing Woorim WTP is limited to about 8 ML/d. The Queensland Government acknowledged this and the proposed extraction rate for the northern and southern borefields was formally revised on the 2nd November 2007 to 5 ML/day.

The Banksia Beach WTP was therefore developed for production of water not exceeding 4.32 ML/day (annual daily average) at a maximum daily rate of 5 ML/day and totalling no more than 1580 ML/year. The WTP sources water from the associated northern borefield via a reticulation pipeline to convey water extracted from the lower (regional) sand mass aquifer. The WTP at Woorim was decommissioned in 2008 by Seqwater due to poor infrastructure condition and poor source water quality to the plant. The balance of supply to Bribie Island is dictated by the regional supply model which outlines the supply and bulk water transfer arrangements intended to meet forecast demands, water security and cost. This plan ensures supply on the island is adequately met via the Banksia Beach WTP, the bulk water supply network or a combination of the two depending on the current grid arrangement.

As this development lies in close proximity to a site of national environmental significance, namely the Moreton Bay Ramsar Wetland, the project was referred to the Commonwealth Department of the Environment and Water Resources (DEWR) (Subsequent to the Referral the Department of the Environment, Water, Heritage and the Arts (DEWHA) pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act). The relevant department is currently the Department of Agriculture, Water and the Environment (DAWE) as of July 2021. For the purposes of clarity, the acronym DEWHA will be used to describe process of approval and initial assessment and DAWE will be used for current relationships throughout this document. The EPBC Act referral comprised a comprehensive Review of Environmental Factors (REF). The DEWHA subsequently declared the project a controlled action under the EPBC Act section 95a under the controlling provision – Wetlands of international importance (sections 16 and 17B).

1.2 Purpose

This Borefield Environmental Management Plan (BEMP) has been developed to ensure both protection of sensitive ecological communities, including the Ramsar Wetland, and careful management and monitoring of groundwater levels and quality to ensure long-term sustainability of the Groundwater Development Unit (GDU). Water will only be extracted from the deep aquifer on the island in accordance with operational guidelines designed to avoid risks of impacts to groundwater dependent ecosystems (GDEs) or integrity of the GDU (through prevention of saline intrusion to the aquifer).

1.3 Objectives

The objectives this BEMP are to:

- Consider aspects of the operation of the Banksia Beach WTP and Borefield that may have a significant environmental impact, outline necessary control measures and specify appropriate mitigation strategies;
- Ensure that any maintenance or works are undertaken in accordance with the requirements of legislation and meet government, client and community expectations for protection of the environment;
- Define environmental roles, responsibilities and accountabilities of relevant stakeholders;
- Specify relevant monitoring and reporting procedures;
- Provide adequate information and instruction to ensure personnel comply with this BEMP, including effective management of environmental incidents and non-conforming events; and,
- Outline the review and audit process of the BEMP to ensure effective management of impacts and continuous improvement in environmental performance.

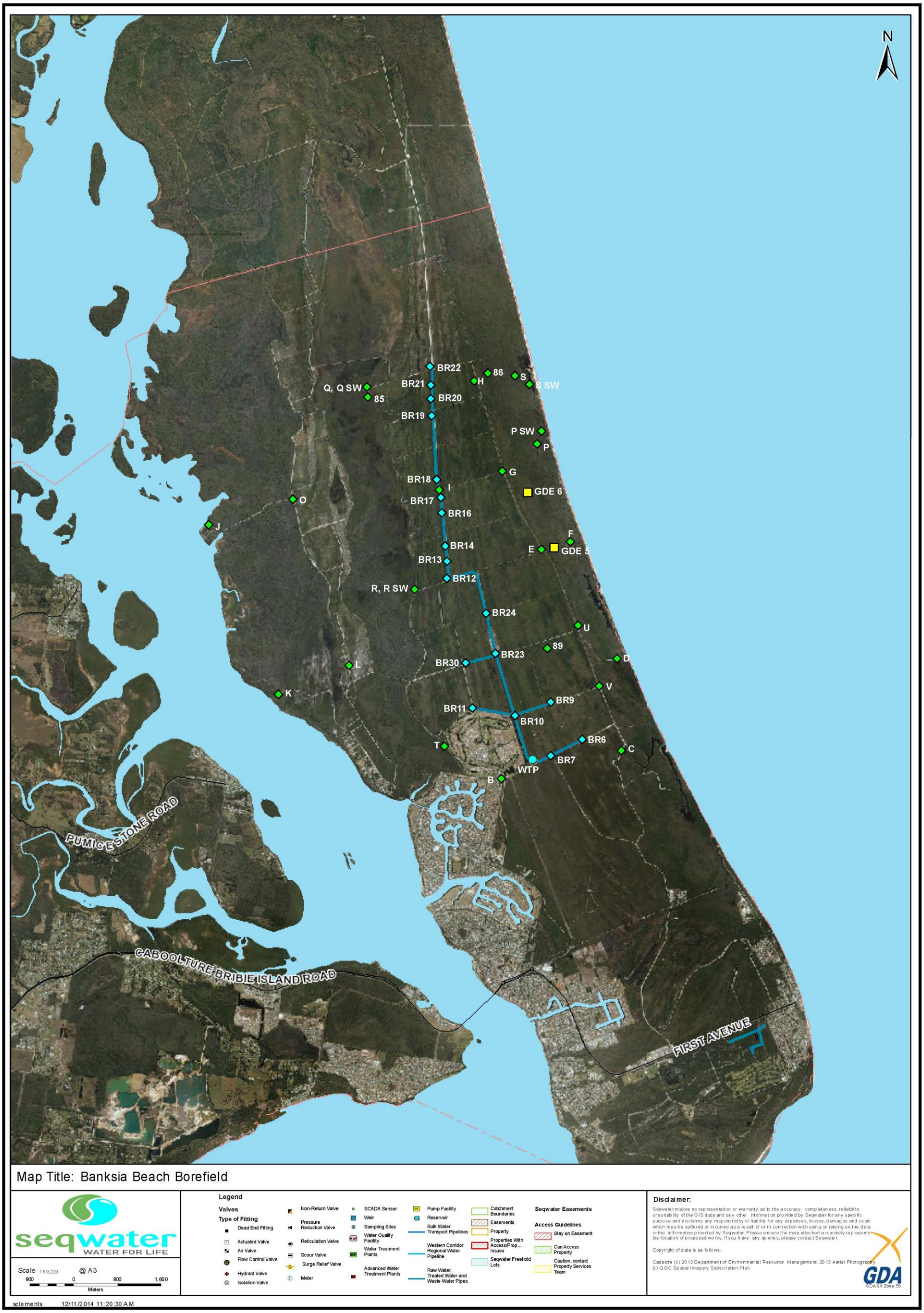

Figure 1: Banksia Beach Borefield

2. 2013-14 Monitoring Program Review

2.1 Overview

The BEMP monitoring program has been designed primarily using the outputs of groundwater modelling, which predict aquifer performance and areas of the island likely to be affected by borefield pumping. A number of assumptions were built into the original modelling and an adaptive management approach has been adopted for the BEMP in order to mitigate the risk that these assumptions were inaccurate.

The adaptive management approach seeks to improve environmental management as understanding of the aquifer performance is improved, and as key physical variables (such as climate and recharge) are better characterised. The key milestones in the adaptive management approach are the annual reviews, the completed 3-year internal review, and the 5-year DAWE review of reporting requirements (Annexure 1 of EPBC Approval 2007/3396). These reviews allow the monitoring data, the aquifer performance, and the borefield performance to be interrogated. The review process has led to adaptation of the BEMP in order to maintain an effective strategy in terms of monitoring locations, frequency, and trigger level thresholds in light of revised or improved predictions of impacts. The reviews also allow the BEMP to be considered in the light of changing industry best practice.

2.2 Three Year Internal Review

In 2012 Seqwater engaged SKM (now Jacobs) to undertake the initial three year review of the BOMP which included a full review of all the environmental monitoring data and borefield extraction data gathered at that time. The work also included the development and calibration of a whole-of-island numerical groundwater model, incorporating the latest geological information, to refine predictions of groundwater drawdown arising from operation of the borefield. The model was calibrated using data collected over the first 3 years of borefield operation. The updated groundwater model was used predictively to evaluate groundwater level impacts from continual operation of the borefield at maximum licensed extraction rates under both “average” and “dry climate” scenarios based on local historical climate data.

This work is described in detail in the Review of Banksia Beach Borefield Operating Management Plan (TRIM D14/133312) (Barlow et al. 2012). The key elements of SKM’s 3 year review comprised:

- Evaluating the hydrological and hydrogeological monitoring data gathered to assess the hydrogeological impact of borefield extraction to date;
- Development of a whole of island transient groundwater flow model incorporating the current geological model developed by the Queensland University of Technology (QUT). This included the assessment of other island extractions and transient model calibration;
- Using the calibrated model to predict hydrogeological impacts from maximum borefield extraction under both average recharge conditions and a drought condition;
- Evaluating the current ecological monitoring regime in the context of the revised predictions of impacts on shallow groundwater levels; and,
- Preparation of a technical report including recommendations for modifications to the current monitoring program.

The scenarios of the borefield pumping at its full licensed rate under both average and dry weather conditions were evaluated in predictive modelling runs. Despite the breaching of trigger levels (partly set on the basis of early modelling work), there do not appear to have been any significant impacts to the borefield in the first three years of operation (saline intrusion in the deep aquifer or observed linked effects on GDEs).

With regard to the issue of saline intrusion resulting from long term borefield extraction at licensed rates, the three year review identified the potential for significant saline intrusion along the eastern coastline and recommended the installation of two additional monitoring bores in the deep aquifer on the eastern coastline for early detection of potential saline intrusion.

The three year review also highlighted gaps in the knowledge about potential and known GDEs within the predicted drawdown zone of the borefield, including their value, the potential threat to the ecosystems, their relationship with groundwater, and resilience to changes in the groundwater system. The review recommended re-evaluation of the GDEs in alignment with the National Water Commission's GDE Toolbox, at which point appropriate modifications or additions to the ecological monitoring could be made. The GDE Toolbox emphasises a data-driven approach to the development of management responses, including monitoring, and is considered current best practice within the industry.

In undertaking the review, best practice was considered, namely:

- Australian Groundwater Modelling Guidelines. Waterlines Report, National Water Commission, Canberra. (2012)
- Australian Groundwater Dependent Ecosystem Toolbox Parts 1 and 2, Waterlines Reports, Sinclair Knight Merz, National Water Commission, Canberra (2011).

To address the findings and recommendations of the three year BOMP review, Seqwater commissioned SKM (now Jacobs) to undertake further groundwater model refinement together with as assessment of the GDEs and associated ecological monitoring. Additional modelling was required to address issues with the accuracy of individual bore extraction rates identified in the 3 year BOMP review.

The previous predictive model scenarios evaluated by SKM in 2012 were re-run using revised estimates of future borefield pumping, based on assumed constant pumping rates from each bore with the rate assigned to each bore from recent measurements (2012) of the maximum groundwater extraction rate at each bore. The model predictive scenarios illustrate drawdown of over 6 m in the lower aquifer near the centre of the borefield for the worst case (dry future climate) scenario. Much smaller levels of drawdown are predicted in the shallow aquifer, generally less than 0.15 m. Two model scenarios were run to assess the influence that the coffee rock has on the propagation of impacts into the shallow sand aquifer from pumping the deep sand aquifer; the results indicated that the coffee rock is the principal control on shallow aquifer drawdown related to borefield pumping and not the pumping intensity or location itself.

The GDE assessment was undertaken in accordance with the best practice guidelines set out in the National Water Commission GDE Toolbox. The vast majority of ecosystems on the Island (terrestrial vegetation deep and shallow rooted, ICOLs and freshwater lagoons and swales) are connected to shallow groundwater and are therefore considered GDEs. However, the estimated potential 0.15m maximum drawdown impact on the shallow sand aquifer from extraction in the deep sand aquifer is small by comparison with the average 1.5m natural seasonal fluctuation in groundwater levels resulting from rainfall variation. Additionally, the vast majority of the Island is not influenced by the predicted borefield drawdown, and it is likely that any alteration to the groundwater system is likely to be reset during average rainfall conditions.

The Groundwater Model Refinement, GDE Assessment and Monitoring Review (TRIM D14/133360) (Barber, Barnett, Fawcett 2013) indicated that the overall risk to ecosystems from groundwater extraction is low to medium. However the existing ecological monitoring program was identified as not providing a suitable framework to monitor future risk. Three forms of GDE monitoring were proposed:

1) groundwater levels – the first measurable change due to pumping;
2) surface water levels and salinity – potentially affected by a change in groundwater levels; and
3) the condition of vegetation or aquatic species that rely on groundwater, or surface water bodies supported by groundwater.

Six new sites, in addition to existing groundwater and surface water monitoring, were proposed for monitoring GDEs based on their characterisation and the potential risk / location of borefield induced drawdown in the shallow sand aquifer (Figure 2). Four of these six new sites comprise two groundwater monitoring bores at each location, one targeting the shallow aquifer and the other targeting the deep aquifer. Two locations were also selected for both vegetation and soil moisture monitoring.

Based on the outcomes from the GDE assessment, significant changes have been made to the ecological monitoring program, including the establishment of vegetation monitoring transects within the eastern Ramsar, concentrating ICOL monitoring to Welsby and South Welsby Lagoon, and removal of the frog monitoring. The result is ecological monitoring designed to concentrate efforts in areas where maximum aquifer drawdown is expected. Changes in the ecological/GDE monitoring program arising from the SKM review in 2013 are summarised below in Table 1 (Barber, Barnett, Fawcett 2013).

Table 1: Comparison of initial and revised ecological/GDE monitoring program.
Source: (Barber, Barnett, Fawcett 2013)

Monitoring Program Component	Initial Monitoring Program	Revised Monitoring Program
Groundwater	• Groundwater level monitoring across the borefield network (Figure 1), including: ▪ Observation bores ▪ DNRM observation bores ▪ Production bores	• In addition to initial program, nested observation bores installed at key locations with direct relevance to GDEs in the eastern Ramsar).
Vegetation	• Quarterly monitoring at quadrats in western Ramsar, and control in north	• Quarterly monitoring at 2 transects installed at key locations with direct relevance to GDEs in the eastern Ramsar.
Frog Monitoring	• Quarterly at quadrats in western Ramsar, and control in north	• Discontinued
Surface Water	• Not undertaken	• Surface water monitoring at 1 key wetland in the eastern Ramsar, and 1 key site in the central swale.
ICOLs	• Quarterly survey using benchmarks at Welsby, South Welsby, Mermaid and South Lagoon as means of identifying water level changes over time. Quarterly EC monitoring	• Quarterly survey using benchmark and surface water monitoring at Welsby lagoon. Monitoring of tidal heights and patterns.
Soil	• Not undertaken	• Soil moisture monitoring via data loggers at vegetation monitoring transects
Remote Sensing	• Not undertaken	• Annual assessment of changes in vegetation across Bribie Island utilising remote sensing

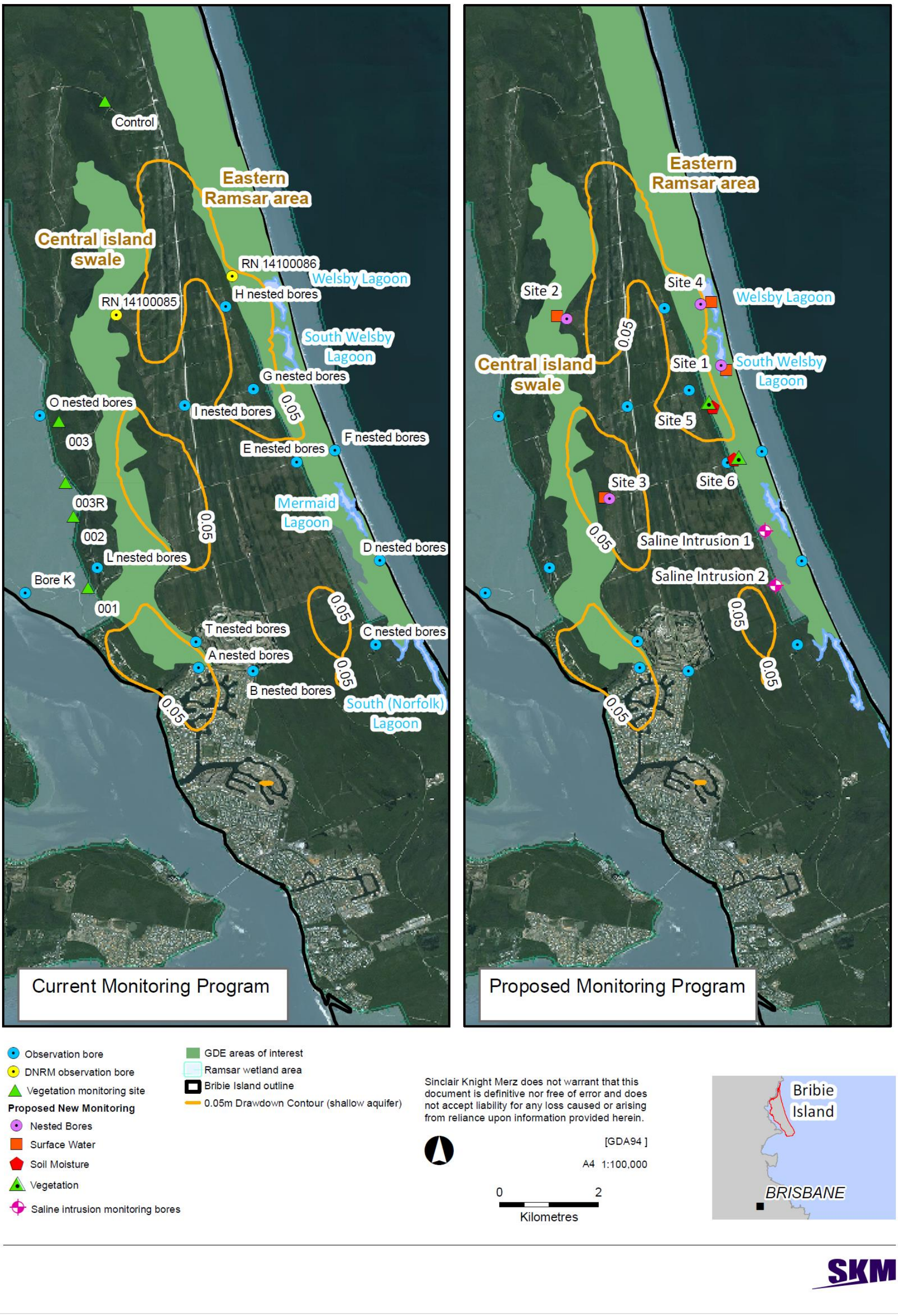

Figure 2: Aerial Overview of Comparison of initial and revised ecological/GDE monitoring program
Source: (Barber, Barnett, Fawcett 2013)

Recommended modifications for the monitoring program, including ecological monitoring, have been carried forward to the BEMP in this revised version.

2.3 Five Year Review of Monitoring Requirements and Installation of New Monitoring Assets

The revised BEMP, incorporating the recommendations of the three year review and the subsequent GDE orientated review of the monitoring network, was presented to the Commonwealth Department of the Environment (DotE), former name of DAWE, in January 2014. This revised BOMP received in-principle approval and as a result, Seqwater appointed Jacobs in April 2014 to specify and manage the installation of the additional monitoring assets.

A summary of the additional monitoring sites, monitoring objectives, the assets installed and ongoing monitoring tasks is presented in Table 2 (Barlow, Lyons, Johnson 2014).

Table 2: New Monitoring Assets
Source: (Barlow, Lyons, Johnson 2014)

Site	Monitoring Objective	Monitoring asset to be installed as part of this contract	Ongoing monitoring tasks
GDE Site 1 "P" Freshwater wetlands - South Welsby Lagoon	To quantify the groundwater flux into the wetland / swale and to identify any relationship between the surface water level and saturations of the wetland and or swale with groundwater levels.	Twin monitoring bores (deep sand aquifer and shallow sand aquifer)	Shallow and deep aquifer water level and EC monitoring Groundwater flux calculations Surface water level monitoring (through existing Seqwater asset)
GDE Site 2 "Q" Freshwater wetlands – Northern Swale		Twin monitoring bores at each location (deep sand aquifer and shallow sand aquifer) Surface water level monitoring at each location	Shallow and deep aquifer water level and EC monitoring Groundwater flux calculations Surface water level monitoring
GDE Site 3 "R" Freshwater wetlands - Central Swale			
GDE Site 4 "S" Intermittent opening and closing lagoons (ICOLs) - using Welsby lagoon as the representative site	Assess the groundwater flux into the ICOL. Identify relationship between the tide, opening events and groundwater levels with the rate of groundwater flux into the ICOL. To understand the relationship between the water quality of the ICOL and groundwater flux.	Twin monitoring bores (deep sand aquifer and shallow sand aquifer)	Shallow and deep aquifer water level and EC monitoring Groundwater flux calculations Tidal patterns
GDE Site 5 – SMP North Terrestrial Vegetation (Eastern Ramsar)	To determine the water use patterns of terrestrial vegetation and partition the dominant water source of shallow and deep rooted vegetation. To establish the relationship between seasonal high water tables and water availability for shallow rooted vegetation.	Soil moisture probe at each location	Vegetation transect survey Shallow groundwater levels Soil moisture Seasonal NDVI
GDE Site 6 – SMP North Terrestrial Vegetation	To act as a control site and provide comparative information for Site 5		
Site "U"	Monitor the deep sand aquifer for signs of saline intrusion	Monitoring bore in the deep sand aquifer at each location	Groundwater level and EC monitoring
Site "V"			

3. Legislation and Regulatory Requirements

Extraction of water from the aquifer and operation of the Banksia Beach WTP will be undertaken in accordance with relevant Commonwealth, State and Local government environmental legislative requirements. The following legislation relates to the extraction and treatment operations and must be adhered to throughout the project. A summary of key legislation relevant to the Project is presented in Table 3.

Table 3: Summary of Key Legislation

Legislation	Application	Administering Authority
Aboriginal Cultural Heritage Act 2003 (Qld)	Management of Aboriginal cultural heritage	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA)
Environment Protection and Biodiversity Conservation Act 1999 (Cth)	As a controlled action, the project is subject to assessment and approval under this Act	Department of Agriculture, Water and the Environment (DAWE)
Environmental Protection Act 1994 (Qld)	Overall environmental planning and protection	Department of Environment, Heritage and Protection (DEHP)
Environmental Protection Regulation 2008 (Qld)	As above, including waste generation, handling and disposal	Department of Environment, Heritage and Protection (DEHP)
Fisheries Act 1994 (Qld)	Management of fisheries' resources and habitats	Department of Agriculture, Fisheries and Forestry (DAFF)
Sustainable Planning Act 2009	Environmental planning and assessment	Department of State Development, Infrastructure and Planning (DSDIP)
Land Protection (Pest and Stock Route Management) Act 2002 (Qld)	Management of weeds, pest animals and the stock route network	Department of Agriculture, Fisheries and Forestry (DAFF)
Native Title (Queensland) Act 1993 (Qld)	Management of native title	Department of Natural Resources and Mines (DNRM)
Native Title Act 1993 (Cth)	Management of native title	Department of Natural Resources and Mines (DNRM)
Nature Conservation Act 1992 (Qld)	Management and protection of plants and animals and management of Protected Areas	Department of Environment, Heritage and Protection (DEHP)
Nature Conservation Regulation 1994 (Qld)	As above	Department of Environment, Heritage and Protection (DEHP)
Vegetation Management Act 1999 (Qld)	Management of vegetation clearing	Department of Natural Resources and Mines (DNRM)
Water Act 2000 (Qld)	Management of water usage, protection and treatment	Department of Natural Resources and Mines (DNRM)
Work Health and Safety Act 2011 (Qld)	Management of workplace health and safety and hazardous chemicals	Department of Justice and Attorney-General

3.1 Commonwealth Legislation

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act controls activities within areas over which the Commonwealth has a direct (ownership) or indirect (international treaties and agreements) jurisdiction in the national interest. Under the assessment and approval provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of national environmental significance are subject to a rigorous assessment and approval process. An action includes a project, development, undertaking, activity or series of activities as defined by the EPBC Act.

The EPBC Act promotes the conservation of biodiversity by providing protection for:

- listed species and communities in Commonwealth areas (this includes listed threatened species and ecological communities, listed migratory species and listed marine species);
- cetaceans (all whales, dolphins and porpoises) in Commonwealth waters and outside Australian waters;
- protected species in the Territories of Christmas Island, Cocos Islands and Coral Sea Islands;
- protected areas (World Heritage properties, Ramsar wetlands, Biosphere reserves, Commonwealth reserves and conservation zones; and
- wildlife species and wildlife products subject to international trade.

Under the EPBC Act, a person must not take an action that has, will have or is likely to have a significant impact on any of these matters of national environmental significance without approval from the Commonwealth. There are penalties for taking such an action without approval.

The project triggered assessment under the EPBC Act as Bribie Island lies at the northern extremity of the Moreton Bay Ramsar Wetland. The project was declared a controlled action under the EPBC Act section 95a under the controlling provision – Wetlands of international importance (sections 16 and 17B). A discussion of the conditions of approval under the EPBC Act as obtained in April 2008 is provided in section 9.

Compliance with the provisions of this BEMP throughout the operation of the WTP, and ensuring groundwater extraction volumes are within the calculated sustainable level, will ensure that the potential for adverse impacts to this wetland are minimised. Furthermore, the extensive water and ecosystem monitoring program will ensure any actual/potential adverse impacts are promptly identified, and contingency measures can be adopted to prevent any further impacts.

3.2 State legislation

3.2.1 Environmental Protection Act 1994 (EP Act)

The aim of the EP Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends ('ecologically sustainable development').

A set of key strategies attach to the implementation of the EP Act through:

- integrating environmental values into land use planning and management of natural resources; ensuring all reasonable and practicable measures are taken to protect environmental values from all sources of environmental harm;
- monitoring the impact of the release of contaminants into the environment; and
- requiring persons who cause environmental harm to pay costs and penalties for the harm.

Section 319 of the EP Act outlines the 'General Environmental Duty' which provides that a person must not carry out an activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.

The *Environmental Protection Regulation 2008* prescribes a series of Environmentally Relevant Activities (ERAs) that require specific approval under the EP Act for their operation. Previously the Banksia Beach WTP required approvals for chemical storage (ERA 7) and Municipal Water Treatment (ERA 16). However, since January 2009, due to the updated trigger thresholds and conditions for the Chemical Storage and Water Treatment ERAs, the Banksia Beach WTP no longer requires an environmental authority under the EP Act. However, there is still a requirement to comply with the General Environmental Duty.

The provisions of subordinate legislation to the EP Act, particularly the Environmental Protection (Water) Policy 2009 (Water EPP), are also considered relevant to this project. The Water EPP provides a framework for identifying Environmental Values (EVs) for Queensland waters, and deciding the Water Quality Objectives (WQOs) to protect or enhance those EVs.

The Queensland Water Quality Guidelines (2009), made pursuant to the Water EPP, are relevant to the management of Queensland groundwaters where there is groundwater interaction with surface waters. In this respect, groundwater quality should be managed in a manner that ensures that identified EVs and WQOs for connected surface waters are not compromised. Where the Bribie Island aquifer is concerned, the relevant connected surface water is Pumicestone Passage. The DEHP has prescribed specific Environmental Values and Water Quality Objectives for the waters of the Pumicestone Passage catchment, which are available on their website (www.ehp.qld.gov.au).

Should any groundwater contamination be detected throughout the groundwater monitoring program for this project, or conditions indicating adverse impacts to the environmental values of Pumicestone Passage arise, applicable internal and regulatory reporting processes will be implemented and, wherever practicable, measures taken to ensure prevention of any further groundwater contamination

3.2.2 Water Act 2000 (Water Act)

The Water Act provides for the following.

- Water Allocation and Management System – the sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water.
- Regulation for Service Providers – the provision of (a) a regulatory framework for providing water and sewerage services in Queensland, (b) functions and powers of service providers, (c) protecting the interests of customers of service providers, (d) regulation of referable dams, and (e) flood mitigation responsibilities.
- Water Authorities Establishment and Operation – the provision of a framework for the establishment and operation of water authorities.
- Investigations, Enforcement and Offences – the functions and powers of authorised officers, enforcement matters, and offences under the Act.

There is currently no requirement for landowners to license bores because groundwaters associated with Bribie Island are not located in a Declared Groundwater area for the purposes of the Water Act.

The Queensland Government also amended the Water Act (Water Act and Other Legislation Amendment Act 2007 [WOLA Act] – 13 November 2007) to permit regulation over private water bores where the groundwater is being taken from the same aquifer as supplies for town water systems. Formal application has to be made through the Department of Natural Resources and Mines to enact this provision which can apply to a Water Service Provider (WSP). This provision is not currently applicable for Bribie Island but remains as a further safeguard to strategies set out in this BEMP to ensure the sustainability of the Bribie Island aquifers.

3.2.3 Land Protection (Pest and Stock Route Management) Act 2002

This legislation provides a framework for managing weeds and other pests that have, or could have, serious economic, environmental or social impacts. Pest management under this legislation aims to help protect Queensland's economy, biodiversity and people's lifestyles by:

- preventing the introduction and establishment of new pest plants in Queensland;
- preventing the spread of established pest plants into new areas; and
- reducing the extent of existing infestations where feasible.

Management of weeds is particularly relevant where groundwater-dependent ecosystem monitoring is proposed, to assess any establishment of weeds associated changes in vegetation assemblages, should they arise. The Land Protection Act provides declaration of specific weed species, which are listed under three different categories (Class 1 – Class 3). Declaration of weed species imposes a legal responsibility for implementing certain control measures for all landowners on land under their management. Knowledge of particular weed species declared under this legislation and the applicable control measures provided for those species is essential to ensure appropriate management of any vegetation communities affected by the groundwater extraction process, and the establishment of associated plant and equipment (e.g. bores and reticulation network).

3.3 Approvals, Licenses and Permits

All approvals, licences and permits in relation to the project are available to all Seqwater staff via the corporate document management system (REX). The electronic version is the 'master'.

3.4 Environmental Policy

As outlined in Seqwater's Environmental Policy (Figure 3), Seqwater is committed to continuous improvement of environmental performance. Seqwater will comply with environmental performance requirements set by relevant legislation, monitor environmental performance and continually improve our environmental management practise through our Environmental Management System certified to the International Standard (ISO 14001:2004). This policy applies to all of our employees and contractors and to any person or organisation that acts for or represents us.

Policy Statement

Environment and Sustainability

Seqwater delivers a safe, secure, and cost-effective water supply for over 3 million people across South East Queensland. We provide irrigation water to 1,200 rural customers in seven water supply schemes, as well as essential flood mitigation services, catchment management and recreation facilities.

On behalf of our communities, we manage and maintain water supply assets, including dams, weirs, conventional water treatment plants, reservoirs, pumps and pipelines, as well as climate resilient water sources, such as the Gold Coast Desalination Plant and the Western Corridor Recycled Water Scheme.

Our operations extend from the New South Wales border to the base of the Toowoomba ranges and north to Gympie.

We are committed to a positive culture of environmental responsibility and recognition of cultural heritage values.

To demonstrate our commitment we will:

- ✓ prevent (by avoidance, reduction and/or control) pollution and harm to the environment
- ✓ apply sustainability principles across all organisational activities to enhance and protect environmental, cultural, economic and social values
- ✓ minimise resource consumption and generation of waste
- ✓ preserve and, where possible, enhance biological diversity and ecological integrity
- ✓ adopt innovative, knowledge driven and risk based decision making in environmental management and climate change response
- ✓ promote and communicate continuous improvement and a positive culture of environmental and cultural heritage responsibility.

We will comply with environmental performance requirements set by relevant legislation, monitor environmental performance and continually improve our environmental and cultural heritage management practice and performance through our Environmental Management System certified to the International Standard ISO 14001.

This policy applies to all of our employees and contractors and to any person or organisation that acts for or represents us.

Mr Neil Brennan
Chief Executive Officer
28 January 2020

Dr David Hamill AM
Chairman
28 January 2020

seqwater
WATER FOR LIFE

Figure 3: Seqwater Environmental Policy

4. Roles and Responsibilities

4.1 General Manager Operations

The General Manager Operations Treated Water is responsible for ensuring;

- the operation and maintenance of water extraction, treatment and distribution assets to the point where product water enters the existing distribution network,
- applicable monitoring programs as provided in this BEMP are implemented,
- the implementation of the BEMP and the preparation of various regular and ad-hoc reports are undertaken,
- regular review of environmental performance of the project in accordance with BEMP provisions, and

4.2 Bribie Island Community Reference Group (CRG)

To ensure informed and balanced decisions are made relating to the sustainable operation of Bribie Island aquifer, a Bribie Island CRG has been formed. The CRG will consist of:

- Chair (to be appointed by Seqwater)
- Secretary (to be defined by Seqwater to meet management requirements)
- Seqwater – Manager, Northern Supply Operations
- Seqwater – Manager, Water Quality and Environment
- Seqwater – Environmental Coordinator
- Seqwater – Water Quality Scientist
- A minimum of four members of the public**
- Forestry Plantations Queensland
- DEHP - Environment Representative
- DNRM Representative
- NPRSR - Parks and Wildlife Representative
- Unity Water Representative
- Moreton Bay Regional Council Representative
- Specialist Hydrologist*
- Other Specialists/experts as required*

* These representatives will only be on the group as required to provide advice on relevant issues as they arise.
** The four community representatives will be sought via public advertisement every 2 years.

Term of Appointment
Nomination from relevant government agencies and industries will be sought directly every 2 years from these organisations.

The CRG will be provided with quarterly operational reports and an Annual Compliance Report including applicable technical reports. The annual compliance report will be presented to the CRG on an annual basis at regional forums facilitated by Seqwater, or more frequently if necessary where specific issues arise.

Where the Banksia Beach WTP and Borefield is in cold standby shutdown (shutdown for >12 months) the CRG will be provided with the Annual Compliance Report including applicable technical reports. Whilst in cold standby shutdown (shutdown for >12 months) no quarterly operational reports will be generated and presentation of the annual compliance report will only occur if necessary where specific issues arise.

The CRG may make recommendations and provide information and advice to Seqwater's Executive Team via the CRG engagement process. The Executive Team will be responsible solely for making strategic decisions relating to the rates of extraction, groundwater levels that trigger pumping reduction or cessation, proposals for aquifer recharge and amendments to the overall aquifer management strategy and operating parameters. Where technical issues arise in relation to hydrological performance of the aquifer that cannot be resolved by the Executive Team, a third party expert opinion may be sought to resolve the issue**.**

4.3 Appropriately Qualified Persons

Monitoring, operation and management of the Banksia Beach WTP and Borefield will be undertaken by qualified staff with the appropriate training and experience. All staff must be trained in incident reporting and environmental awareness.

4.4 Site Induction and Training

All persons working for or on behalf of Seqwater must complete the Site Specific Induction prior to visiting and/ or commencing work onsite. This Induction includes environmental risks and legal obligations associated with the Banksia Beach WTP and Borefield. Training and inductions are captured within the Learning Management System (LMS).

4.5 Site Visitors

Any visitors to the site will be given a Site Specific Induction and will be escorted around the site by an authorised person. Visitors must remain with an authorised person at all times. The escort will alert the visitors to hazards on site *(including workplace health and safety issues and expected behaviours).*

4.6 BEMP Decision Making Process

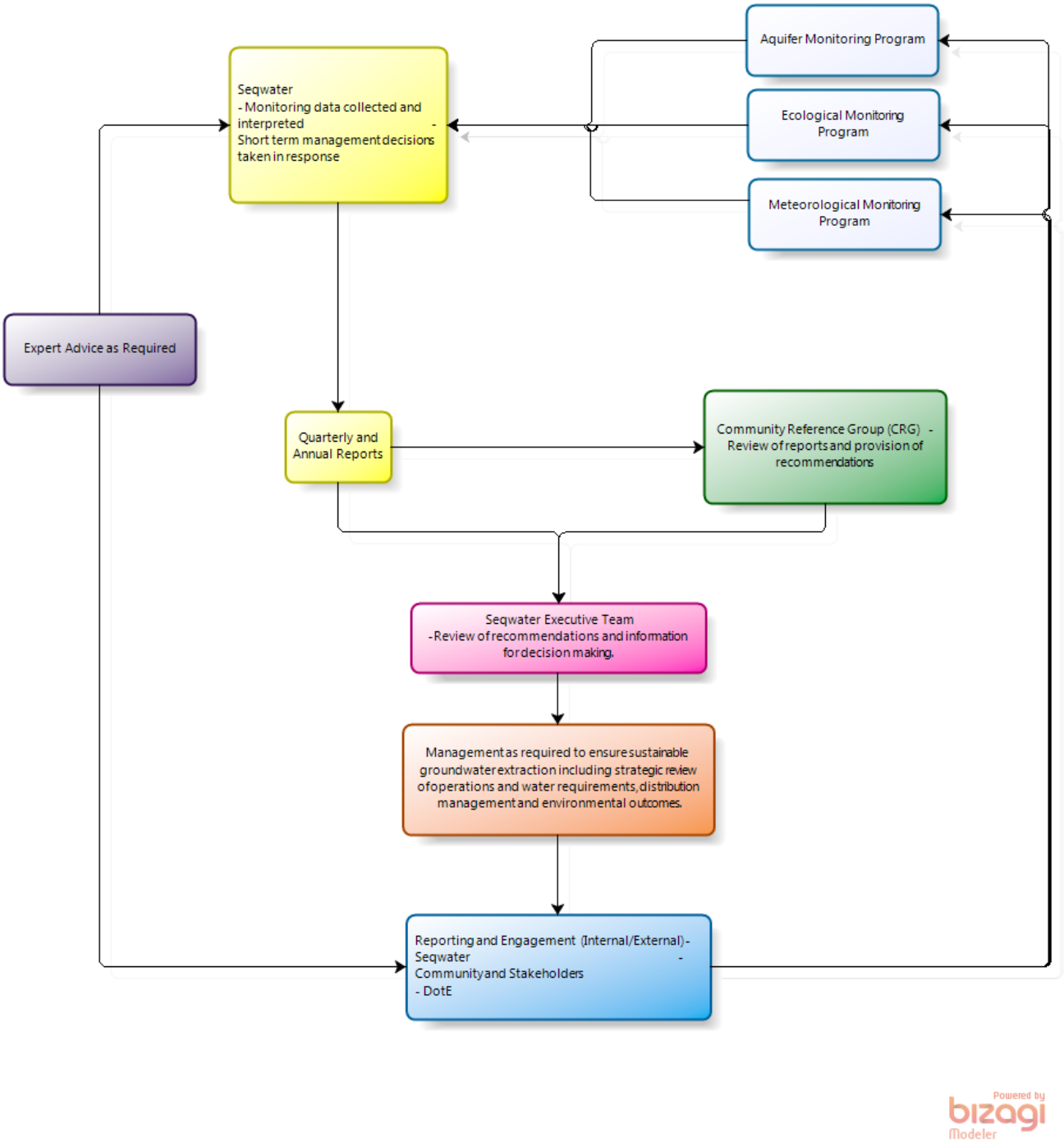

Figure 4: BEMP Decision Making Process

5. Complaint and Incident Management

5.1 Emergency Response, Incident Reporting / Non-Compliance Response

In an emergency call 000

Call the Seqwater Incident Hotline (07) 3270 4040 for all incidents and emergencies.

All incidents and emergencies will be dealt with in accordance with the processes nominated in the Bulk Authority Emergency Response Plan: Whole of supply chain response, V1.0, August 2013. The Emergency Response Plan nominates the following 6 step response framework when an incident occurs, which results in the release of contaminants or has the potential for environmental harm the following actions will be taken as soon as practicable:

1. Identify and assess event severity;
2. Notify;
3. Establish command and control;
4. Manage the emergency;
5. Manage the recovery; and
6. Improvement Actions

5.2 Emergency Contacts

All incidents and emergencies should be notified to your immediate Supervisor and the Seqwater Incident Hotline (07) 3270 4040, in the first instance.

The key personnel and emergency services to be contacted in the event of an emergency are shown in Table 4 below. The list of emergency contacts is to be provided to all personnel during induction training and is also to be placed in all site vehicles and heavy machinery.

Table 4: Seqwater Emergency Contacts *(as per Incident on-call roster)*

Position	Contact Details
Seqwater Incident Hotline	07 3270 4040
WTP North *(includes North Pine WTP)*	07 3035 5765
Duty General Manager	07 3035 5763
Duty Manager	07 3035 5760
Duty Communications Advisor	07 3247 3000
Flood Centre	07 3831 0795
WTP South	07 3035 5761
WTP Central	07 3035 5782
Supply Systems	07 3270 4082
Catchments	07 3035 5776
Drinking Water Quality	07 3035 5764
Dam Safety	07 3035 5762
Environment	07 3035 5779
Process Improvement	07 3035 5780
WHS	07 3035 5783

5.3 Complaints Procedure

Seqwater has established a *Complaints and Compliments Management Policy* (POL-00049) and a *Non-conformance, Corrective Actions and Continual Improvement Procedure* (PRO–00003, TRIM D13/14762). These documents note Seqwater's commitment to the timely, courteous, and competent resolution of issues that lead to complaints from external parties. The policy applies to all employees, contractors and consultants working for or on behalf of Seqwater, unless otherwise stated.

5.3.1 Customer and Personnel Complaints

- All internal complaints or grievances should be notified to the People & Culture Team 07 3035 5582.
- External complaints and/or compliments must be notified to an immediate Supervisor and Corporate & Stakeholder Management Team as soon as reasonably practical (within 24 hours).
- All external complaints and/ or compliments will be managed and associated records maintained by the Corporate & Stakeholder Management Team in accordance with Complaints and Compliments Management Policy (POL-00049).
- External complaints must be resolved within 30 days. Any unresolved issues will be escalated accordingly.
- Following initial notification of a complaint, the associated Supervisor must ensure regular contact is maintained with the complainant, as a minimum at fortnightly intervals.

Complaint records are available upon request through the Seqwater Corporate & Stakeholder Management Team.

6. Environmental Management

6.1 Environmental Risk Assessment

Seqwater use the Environmental Aspects and Impacts procedure to develop an environmental profile for both sites and site-based projects. These assessment tools outlined within the procedure allow significant environmental issues and management controls to be identified and considered in Management Plans.

An Environmental Risk Profile (ERP) is also utilised to provide an overview of operations outlining designated release points, environmental monitoring requirements, general and incident management contacts, as well as key environmental areas or risks for the site.

6.2 Groundwater Dependant Ecosystems (GDE)

In general terms, the known groundwater dependent ecosystems (GDEs) throughout Bribie Island include:

- Interdunal wetland systems;
- The Central Swale wetland feature and its associated surface drainage;
- Coastal fringing wetlands, namely ICOLs and other freshwater bodies behind the frontal dune that do not connect to the ocean at present but may have in the past; and
- Deeper rooted vegetation in areas where the depth to groundwater is sufficiently shallow to allow it to exploit groundwater (e.g. *Allocasuarina* sp. and *Melaleuca* sp. communities).

Marine GDEs are also likely to occur in the Pumicestone Passage and other off-shore environments but remain undescribed at this point in time.

Any adverse ecological impacts are likely to be subtle and long-term in nature, rather than phenomena reflecting acute mortality of established vegetation. All native plant communities on the island are well adapted to cycles of drought and wet periods and many such as *Banksia* sp. are fire-dependent. The use of vegetation as an indicator of change due to the drawdown of the aquifer in light of the variability of the natural system in the absence of any use of the borefield, presents some difficulties. The main difficulty is that there will be a lag response to any groundwater-induced change as the communities are well adapted to long periods of dryness (sometimes of the order of decades but more frequently of shorter duration) and it will be difficult, if not impossible in the short-term, to differentiate between natural seasonal change and the limited (i.e. mean 0.1 m and less in the Ramsar areas) shallow groundwater level drawdown response predicted by the detailed modelling. Nevertheless, a process is outlined in following section to address concerns that the use of the northern borefield may have an impact on the surface aquifer that could lead to adverse environmental outcomes for the Ramsar area.

As any indication of change will take some years to manifest as discussed above, the primary indicators of change will still be the focus of the management actions in the first instance, namely SWL and EC.

6.2.1 Initial ecological assessment and monitoring program

In line with the EPBC Approval conditions in 2008 (Annexure 1 of EPBC 2007/3396), it was specified that a series of four quadrats (3 impacted and 1 control) be established and monitored to determine if there is any seasonal variation in floristic communities, and identify any adverse impacts to these ecosystems resulting from the operation of the production borefield. The initial ecosystem monitoring program utilising these four quadrats also included a long-term monitoring program for 'acid frog' species (*Crinia tinnula, Litoria olongburensis*, and L. *freycineti*) listed as vulnerable under environmental legislation and known to inhabit the wallum wet heath ecosystems of Bribie Island. The initial

quadrats employed for flora and frog monitoring were located within the western Ramsar with a control north of the borefield. Monitoring was undertaken by an experienced, independent ecologist in September and February each year.

In addition to the ecological monitoring quadrats located in the western Ramsar, the key lagoons on the eastern coastline of Bribie Island (namely Welsby, South Welsby and Mermaid with South Lagoon as a control) were mapped as a benchmark of conditions at project start-up. Following this permanent survey benchmarks were established at each lagoon as a means of identifying water level over time for comparison with other monitoring data to determine any impacts on the GDEs in the eastern Ramsar resulting from the operation of the production borefield. Under the initial ecological monitoring program water levels were measured on a quarterly basis by a licensed surveyor, with EC and pH measurements also taken at each lagoon. Full details of the initial ecological assessment and monitoring program can be found in previous versions of the BOMP (Rex Reference D14/28828); BOMP Version 6 (31 March 2009)).

6.3 Matters of National Environmental Significance (MNES)

The Bribie Island Aquifer Project is a controlled action under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999.

- Wallum Sedge frog (Listed as Vulnerable) - *Litoria olongburensis*
- Moreton Bay Ramsar Wetlands

6.4 Protection of Water Quality Objectives and Environmental Values

The adopted water treatment process will ensure that all water produced at the WTP will comply with the Australian Drinking Water Guidelines (ADWG) and the Queensland Water Supply (Safety and Reliability) Act 2008. This is captured in the Seqwater Drinking Water Quality Management Plan (PLN-00004) and the subordinate Banksia Beach WTP HACCP Plan (PLN-00052). Potential sources of groundwater contamination, other than seawater intrusion**.** The vulnerability of an aquifer to contamination is a function of the following:

- Proximity to potential source of contamination;
- The nature of the potential source of contamination;
- The thickness and permeability of the strata between the surface and the aquifer;
- The depth to groundwater; and
- Prevailing directions of groundwater flow.

Sources of groundwater contamination are most often referred to as either point sources or diffuse sources. Point sources refer to cases where contamination is localised and associated with one or more identifiable source (e.g. surface facility or in-ground tank). Diffuse sources are broader and cannot be ascribed to a single source, and are most often associated with a wide-spread land-use practice (e.g. pesticide or fertiliser application for agriculture) or a large collection of point sources (e.g. multiple septic tanks).

The key known potential point sources of groundwater contamination in the area likely to impact on the quality of groundwater sourced from the Bribie Island aquifer include:

- Point source and diffuse contaminant release associated with urban areas along coastal fringes. Sources in urbanised areas include underground fuel storages and former landfills. These all lie to the south of the northern borefield and are not considered a threat;
- Pine plantations to the north of the WTP site where fertilisers and pesticides have historically been applied (*Note*: a groundwater quality assessment undertaken by KBR (2004) indicates no contamination of the deeper groundwater system associated with the pine plantations); and

- Pacific Harbour Golf Club – potential diffuse releases of recycled water or leachate of nutrient-rich fertilisers may contribute to elevated nutrient levels within the aquifer. The proposal to replace the current use of groundwater with recycled water at the golf club for irrigation purposes may also contribute additional nutrients to groundwater resources. This can be avoided by compliance with the irrigation management plan and regular groundwater monitoring.

Another major local potential source of groundwater contamination during operation of the WTP is the release of contaminants such as concentrated wastewater to land. Operation of the WTP in accordance with the provisions of the Environmental Management Plan, and in compliance with relevant development conditions, will ensure that any potential contamination of groundwater is avoided. All wastes from the WTP will be discharged to sewer. In addition, a system of alarms will be installed at various release points at the WTP, some of which will trigger automatic plant shut-down, where circumstances leading to imminent, uncontrolled releases of product or backwash waters may arise. There will be, therefore, no direct discharge of contaminants to land.

Should any groundwater contamination be detected throughout the groundwater monitoring program for this project, or conditions indicating adverse impacts to the environmental values of Pumicestone Passage arise, applicable internal and regulatory reporting processes will be implemented and, wherever practicable, measures taken to ensure prevention of any further groundwater contamination.

7. Monitoring

7.1 Aquifer Management Monitoring Program

Monitoring of the aquifer levels will be routinely undertaken for both production and observation bores in accordance with the program. Levels at key production bores will be continually monitored and reported through the WTPs Supervisory Control and Data Acquisition (SCADA) system whilst the WTP is operational. If and when needed, automatic groundwater level data loggers will also be located within a number of observation bores to provide valuable data about variations and trends throughout groundwater extraction and WTP operation. The data will be analysed monthly and, along with all other groundwater monitoring data, summarised in the quarterly monitoring report to be compiled by Seqwater.

Under the circumstances that the WTP is in long term shutdown (shutdown for >3 months) operational trigger levels will be inactivated as there is no risk of seawater intrusion or groundwater depletion as a result of extraction. Monthly monitoring will still occur in the observation and production bores for modelling purposes.

Under the circumstances that the WTP is in cold standby shutdown (shutdown for >12 months) SWL and EC monitoring will not be required and operational trigger levels will be inactivated as there is no risk of seawater intrusion or groundwater depletion as a result of extraction.

Aquifer level monitoring results will be analysed monthly and presented in the quarterly operational reporting and annual monitoring report. Details of the SWL and other descriptive data for of all production and monitoring bores are provided in Table 5.

Table 5: Aquifer Management Monitoring Program

Monitoring Site	Monitoring Point Location(s) / Data Source(s)	Monitoring Type	Monitoring Frequency		
			WTP Operational/Pre Start up****	Long term shutdown (>3 months)	Cold Standby (>12 months)
Production Bores	BR06, BR07, BR09 to BR14, BR16 to BR24, and BR30	SWL/EC	Daily recording of continuous readings (SCADA) EC monitored manually (Monthly)	SWL monitored manually (Monthly) EC (Not Required)*	SWL/EC (Not Required)
		Extraction Volume	Daily recording of continuous readings (SCADA)	Not Required	Not Required
		Physiochemical water quality	Monthly/Quarterly as per Banksia Beach HACCP plan and Bribie Island CWQ Monitoring Plan**	Not Required	Not Required
Observation Bores	B – L,O and T, U, V	SWL / EC	Monthly/Weekly***	Monthly	SWL/EC (Not Required)
		Physiochemical water quality	Monthly/Quarterly as per Banksia Beach HACCP plan and Bribie Island CWQ Monitoring Plan	Not Required	Not Required
WTP	WTP inlet and production outlet to reticulation network.	Metered inlet and production volumes	Daily recording of continuous readings (SCADA)	Not Required	Not Required

** EC monitoring in production bores is focused on preservation of the water quality for town water supply purposes*
*** No sampling required if WTP offline*
**** Should monitoring results indicate adverse results exceeding threshold trigger levels - Weekly thereafter until impact stabilises or issue rectified through operational change*
*****Minimum 6 months operational monitoring required for pre start up monitoring after Long term and Cold Standby shutdown.*

7.1.1 Management Trigger Levels

Although detailed modelling has been undertaken to accurately and conservatively determine sustainable extraction rates for the northern Bribie Island borefield, it is recognised that the response of complex natural systems to hydrological stress is not completely predictable. Because of this, an adaptive management approach is being implemented consisting of a systematic process of gathering climatic, hydrological and ecological data followed by comparison of the observed data with pre-determined threshold triggers.
The parameters selected as primary decision points for managing aquifer operations are:

- Bore SWL (including pumping water levels in the production bores); and
- Borewater electrical conductivity (EC) as a surrogate for salinity.

A series of thresholds have been established for these two parameters and response actions defined for each threshold. The nominated thresholds have been developed based on the modelling and with the shutdown points (i.e. Threshold C) being set at:

- For the production bores at the top of the screen to avoid the risk of the aquifer being pumped down below the screen; and
- For observation/sentinel bores at key levels tied to elevations above mean sea level to ensure that unacceptable landward migration of seawater intrusion will not occur and that the shallow groundwater system will not suffer unacceptable depletion.

When the WTP is in long term shutdown (>3 months) and cold standby shutdown (>12 months), all trigger levels will be inactivated as there is no risk of seawater intrusion or groundwater depletion as a result of extraction. Before recommencement of extraction from the borefield after long term and cold standby shutdown, there is a minimum 6 months operational monitoring required for pre start up monitoring in which all trigger levels will be reinstated as per the operational monitoring program See Table 5 - WTP Operational/Pre Start up ****Minimum 6 months operational monitoring required for pre start up monitoring after Long term and Cold Standby shutdown.

The threshold values for both SWL and EC are set out in Table 6. Management actions are specified for each threshold in Table 7 and Figure 5.

Table 6:SWL and EC Trigger Levels for Production and Observation Bores

Production Bores***

Bore		BR6-P	BR7-P	BR9-P	BR10-P	BR11-P	BR12-P	BR13-P	BR14-P	BR16-P	BR17-P	BR18-P	BR19-P	BR20-P	BR21-P	BR22-P	BR23-P	BR24-P	BR30-P
Aquifer Monitored		Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep
Measurement Method		SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA	SCADA
SWL Trigger Level (m bgl#)	*A*	14.2	16.45	17.4	17.75	20.9	19.5	19.4	17.8	27.85	19.05	18.85	18.65	19.35	18.05	16.65	18.1	17.05	36.3
	B	14.63	16.55	17.7	17.88	21.18	19.75	19.6	17.9	27.98	19.28	18.93	18.83	19.43	18.28	16.83	18.3	17.13	36.4
	C	15.05	16.65	18	18	21.45	20	19.8	18	28.1	19.5	19	19	19.5	18.5	17	18.5	17.2	36.5
EC Trigger Level (µs/cm)	*A*	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	750	750	750
	B	750	750	750	750	750	750	750	750	750	750	750	750	750	750	750	800	800	800
	C	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
Nearest Affected Observation Bore		*C*	*B, C, T*	*D*		*T*	*E, F*	*E, F*	*E, F*		*G*	*G, I*	*H, I*	*H*	*H, 86*	*H, 86*	*D*	*E, F*	

Observation Bores

Bore		B1	B2	B3	B4	C1	C2	C3	D1	D2	D3	E1	E2	E3	F1	F2	F3	G1	G2	G3	H1	H2	H3	14100086 (bore 86)	I1	I2	I3
Aquifer Monitored		Deep	Deep	Deep	Deep	Deep	Deep	Shallow	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Deep	Shallow	Deep	Deep	Shallow	Deep	Deep	Upper section of deep	Deep	Deep	Deep (within indurated layer)	Shallow
Measurement Method		Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip
SWL Trigger Level (m bgl#)	A	7.01	7.01	7.01	7.01	2.54	2.54	1.23	2.4	2.4	2.4	3.5	3.5	3.5	1.75	1.75	1.83	4.74	4.74	2.53	6.44	6.44	6.44	3.19	9.5	9.25	2.13
	B	7.11	7.11	7.11	7.11	2.64	2.64	1.33	2.5	2.5	2.5	3.65	3.65	3.65	1.9	1.9	1.93	4.94	4.94	2.63	6.64	6.64	6.64	3.29	9.25	9	2.33
	C	7.21	7.21	7.21	7.21	2.74	2.74	1.43	2.6	2.6	2.6	3.8	3.8	3.8	2.05	2.05	2.03	5.14	5.14	2.73	6.84	6.84	6.84	3.39	9	8.75	2.53
EC Trigger Level (µs/cm)	A	500	500	850	600	750	750	600	NP	NP	750	500	500	500	NP	650	1000	NP	900	400	900	900	350	900	500	500	400
	B	800	800	950	800	875	875	700	NP	NP	850	650	650	650	NP	950	1250	NP	1100	650	1100	1100	400	1100	750	750	500
	C	1000	1000	1000	1000	1000	1000	800	NP	NP	950	850	850	850	NP	1200	1500	NP	1300	750	1300	1300	500	1300	900	900	600
Nearest Affected Production Bore		*BR07-P and Golf Club Bores*	*BR07-P and Golf Club Bores*	*Local residential and Golf Club Bores*	*Local residential*	*BR06-P and BR07-P*	*BR06-P and BR07-P*	*NA*	*BR09-P BR23-P*	*BR09-P BR23-P*	*BR09-P BR23-P*	*BR24-P, BR12-P,BR13-P and BR14-P*	*BR24-P, BR12-P,BR13-P and BR14-P*	*BR24-P, BR12-P,BR13-P and BR14-P*	*BR24-P, BR12-P,BR13-P and BR14-P*	*BR24-P, BR12-P,BR13-P and BR14-P*	*NA*	*BR17-P and BR18-P*	*BR17-P and BR18-P*	*NA*	*BR22-P, BR21-P, BR20-P and BR19-P*	*BR22-P, BR21-P, BR20-P and BR19-P*	*NA*	*BR22-P and BR21-P*	*BR18-P and BR19-P*	*BR18-P and BR19-P*	*NA*

Bore		J1	J2	K	L1	L2	L3	O1	O2	T1	T2	T3	14100085	14100089	P1**	P2**	P SW	Q1**	Q2**	Q SW	R1**	R2**	R SW	S1**	S2**	S SW	U1**	V1**
Aquifer Monitored		Deep	Deep	Within indurated layer	Deep	Deep	Shallow	Deep	Shallow / partly within indurated sand	Deep	Deep	Shallow	Deep	Deep	Deep	Shallow	Shallow	Deep	Shallow	Shallow	Deep	Shallow	Shallow	Deep	Shallow	Shallow	Deep	Deep
Measurement Method		Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Manual dip	Submersible data logger	Submersible data logger	Submersible data logger	Manual dip	Manual dip	Submersible data logger	Manual dip	Manual dip	Submersible data logger	Submersible data logger	Submersible data logger	Submersible data logger	Manual dip	Manual dip
SWL Trigger Level (m bgl#)	A	NP	NP	2.45	3.8	3.8	1.57	2.25	1.3	3.5	3.56	1.6	1.68	4.9	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	B	1.24	1.24	2.5	4	4	1.77	2.4	1.5	3.58	3.65	1.7	1.88	5.1	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	C	1.3	1.3	2.55	4.2	4.2	1.97	2.55	1.7	3.67	3.75	1.8	2.08	5.3	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
EC Trigger Level (µs/cm)	A	NP	NP	550	400	400	400	500	600	650	650	NP	750	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	B	NP	NP	750	500	500	500	650	700	800	800	NP	800	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
	C	NP	NP	950	600	600	600	800	800	900	900	NP	1000	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP
Nearest Affected Production Bore		*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*Golf Club Bores, BR11-P and BR07-P*	*Golf Club Bores, BR11-P and BR07-P*	*NA*			*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*

Production Bores
Observation Bores
Trigger Level A
Trigger Level B
Trigger Level C

* NP: None proposed, although monitoring required.
** 12 months of monitoring data will be reviewed and where applicable trigger levels will be developed for SWL/EC
***Production bores are monitored online for SWL. EC is monitored manually. If any triggers are exceeded for SWL in production bores then bores are automatically controlled and ramped down (ramp down level is above Trigger A). EC exceedances will follow the process flow.
metres below ground level

Notes:
Monitoring bores A1 and A2 will be monitored for general observations, but no longer apply to management trigger levels as suggested by expert hydrologists and approved by DEWHA.
Newly established monitoring bore T3 does not have proposed EC trigger levels due to the elevation of the base of the perched system at this location being well above mean sea level, thus there cannot be seawater impacts to it. There may also be impacts to salinity of the shallow aquifer from the Pacific Harbour Golf Course operation.

NRW bore 14100086 (referred to as bore 86) has been selected to monitor the aquifer in 'the western edge of eastern Ramsar area in the nearest existing bore to Welsby Lagoon, other than bore H'. This was previously conditioned under the original EPBC approval and has been carried forward into the revised program.

Table 7: Management Actions Trigger Level Response.

Triggers	Actions
Trigger Level A	1. Notify water Treatment Plant Operations Regional Coordinator at Banksia Beach WTP as early warning. 2. Initiate investigations of affected bore(s) by taking weekly readings for 4 consecutive weeks to determine if readings are consistent / stabilising / declining / increasing and not due to extrinsic forces (e.g. power spike, barometric pressure). 3. If values return to normal, no action is required. 4. If values remain in exceedance of Trigger A (4 weeks of monitoring results assessed) and/or continue to worsen, then continue to monitor until Trigger B is reached or situation stabilises. 5. When values return to normal (i.e. below Trigger A), continue with normal monitoring schedule.
Trigger Level B *It is not desirable for Threshold C SWLs to ever be reached due to the potential risks of saline intrusion to the deep aquifer. The risks of impacts associated with Threshold C for EC for the sentinel bores may indicate the start of a significant decline in water quality resulting from saline intrusion to the deep aquifer that may be irreversible. The intent of the monitoring program is to ensure that decline never reaches Threshold C levels by implementing procedures during the time that Threshold B conditions prevail.*	1. Notify Water Treatment Plant Production Manager at Banksia Beach WTP immediately of potential problem. 2. Initiate investigations of affected bore(s) by taking weekly readings for 4 consecutive weeks to determine if readings are consistent / stabilising / declining / increasing and not due to extrinsic forces (e.g. power spike, barometric pressure). 3. If values remain in exceedance of trigger B (4 weeks of monitoring results assessed), consult with the Manager Supply (treated water) North regarding reductions in pumping rate from the extraction bore(s) nearest to the affected observation bore. Details regarding which observation bores are expected to be impacted upon by the operation of specific production bores are presented in Table 6. This information will assist in decisions regarding reduction of pumping rates in individual bores. If data shows a continuing adverse trend over the following 4 consecutive weeks (4 weeks of monitoring results assessed), further reduce pumping rate from the nearest extraction bore(s) nearest to the affected observation bore in consultation with the Manager Supply (treated water) North. 4. Continue taking weekly readings for 4 consecutive weeks (4 weeks of monitoring results assessed) to determine groundwater level response to reduced pumping rate. If values remain between trigger A and B, then resume pumping at the previously reduced production bore(s) and continue to monitor until trigger A is no longer exceeded. 5. If values remain in exceedance of trigger B but are stable over the 4 consecutive weeks (4 weeks of monitoring results assessed), continue with reduced pumping rate. 6. If values remain in exceedance of trigger B and trend towards an exceedance of trigger C (assessed weekly from weekly readings), then further reduce or STOP pumping rates from the nearest production bore(s) and surrounding production bores in consultation with the Manager Supply (treated water) North and seek advice from expert hydrogeologists to avoid trigger C levels being reached for the affected monitoring bore(s).
Trigger Level C	1. Notify Manager Supply (treated water) North at Banksia Beach WTP immediately. 2. Consult with the Manager Supply (treated water) North regarding cessation of pumping at the nearest production bore(s) to the monitoring bore and surrounding production bores where the exceedance has occurred (Table 6) in line with established protocols for bore shutdown. 3. Initiate investigations of affected bore(s) by taking weekly readings for 4 consecutive weeks to determine if readings are consistent / stabilising / declining / increasing and not due to extrinsic forces (e.g. power spike, barometric pressure). 4. If values remain in exceedance of trigger C (assessed weekly from weekly readings), consult with the Manager Supply (treated water) North to cease extraction from all production bores and the WTP. 5. Continue weekly monitoring and seek advice and review of data by expert hydrogeologist 6. Seek advice from expert hydrogeologist prior to resumption of extraction from the production bore field. Extraction can resume once an extraction strategy is approved by an expert hydrogeologist and SWL and EC values have returned to within trigger B at least. The extraction strategy will outline the approved extraction rates and acceptable EC levels supplemented with a weekly monitoring program for three months to ensure that no further deterioration occurs.

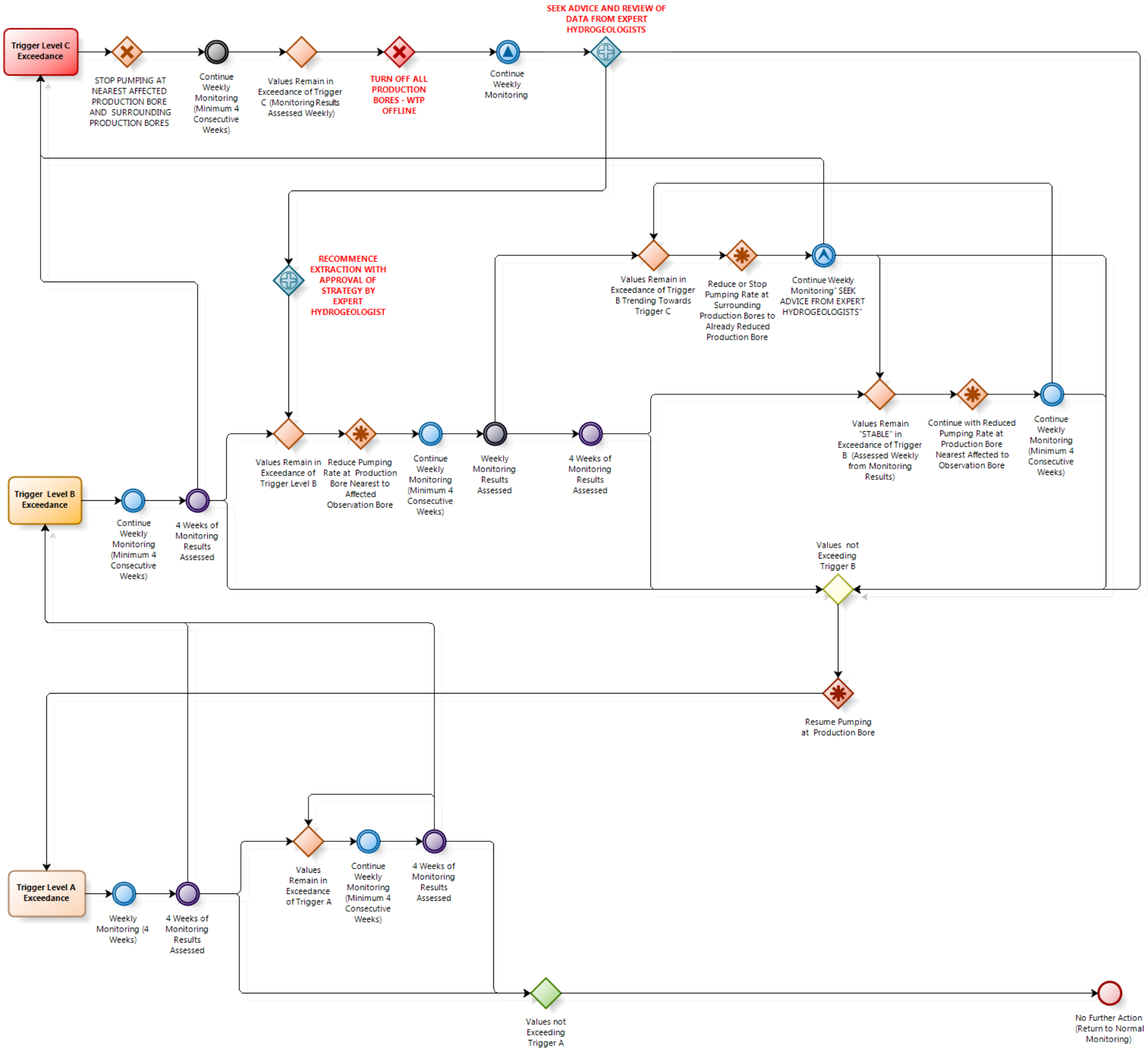

Figure 5: Management Actions Trigger Level Response Process Flow

As an example, the basis of the three threshold levels for the production bores is as follows:

Threshold A
SWL trigger levels have been set as half the distance from the operating water level (i.e. the pumping water level) in the bores as predicted from test pumping and subsequent analytical modelling of the borefield operating with each bore operating at the proposed rates and the Level C SWL triggers. EC for Threshold A for all bores has focused on preservation of the water quality for town water supply purposes and thus will provide an early indication of any adverse increase in salinity.

Threshold B
SWL trigger levels have been set as three-quarters of the distance from the operating water levels in the bores predicted from the test pumping and subsequent analytical modelling of the borefield operating at the proposed pumping rates with all bores operating and the Level C SWL triggers. EC for Threshold B for all bores has focused on preservation of the water quality for town water supply purposes and thus will provide an early indication of any adverse increase in salinity.

Threshold C
SWL trigger levels were set as groundwater levels drawn down to the top of the well screens (reduction below this level is undesirable because of cascading of water leading to iron fouling and potentially cavitation/pump failure issues). Level C is also set above the safe pumping level as a further conservative measure to ensure sustainability of the aquifer. EC for Threshold B for all bores has focused on preservation of the water quality for town water supply purposes and thus will provide an early indication of any adverse increase in salinity.

For bores tapping the deeper aquifer, EC thresholds (i.e. a measure of seawater intrusion) at each point will take precedence over the groundwater level thresholds (North 2007). For example, if in a near coastal sentinel bore EC monitoring results suggest that seawater interface has advanced landward beyond the predicted extent, but SWLs are below threshold A values, then the relevant management actions required will be those dictated for the EC threshold value. Nevertheless, a spike may occur in EC values following significant rainfall events after a prolonged dry spell due to the flushing of accumulated salts.

To avoid hasty responses in such instances, the BEMP ensures that increased monitoring occurs for a period of at least a month after the initial breach to determine whether the change is an artefact of extraneous conditions or, alternatively, a more serious indicator of saltwater intrusion (***Note***: A spike in EC at a production bore with no corresponding EC in a nearby sentinel bore is unlikely to indicate saltwater intrusion in that area. A significant spike in EC in a sentinel bore, in contrast, needs to be investigated thoroughly to avoid any irreversible change occurring).

Further details pertaining to the approach taken setting threshold levels is provided in *Draft Report - Proposed Hydrological Monitoring Network and Groundwater System Monitoring Thresholds* (TRIM D14/133896) (North 2007) developed by EHA. Trigger level values have also been provided for some additional observation bores which are either on automatic data loggers or measured as part of other monitoring programs from time to time.

The trigger levels for the thresholds were reviewed after by expert hydrogeologists following 3 years of operation and updated following confident establishment of reliable systematic relationships between SWL, EC and any ecological indicators (Barber, Barnett, Fawcett 2013). Ongoing Annual reviews will also be undertaken with the intent of assessing performance of the aquifer and recommending adjustments to the trigger levels if required in line with the adaptive management approach.

7.1.2 Assessment of Aquifer Yield

In response to the *Water Regulation 2002*, 'Water Supply Emergency (SEQ Region)' Caboolture Shire Council (CSC) engaged the services of EHA Pty Ltd. (EHA), together with Brisbane Water and sub-contracted water bore drilling and test pumping contractors, to establish new borefields on Bribie Island to maximise the production of additional

groundwater, if viable and sustainable. EHA undertook a detailed assessment of the sustainable aquifer yield as part of this task. In general terms, this assessment consisted of the following.

- Initial groundwater modelling assessment to plan locations to host production bores using an existing numerical groundwater flow model developed by DNR (now DNRM) in 1996 together with analytical models to assess potential for seawater intrusion.
- A bore program to confirm the feasibility of constructing production and observation bores at a number of locations.
- Production of a series of schematic hydrogeological cross-sections using the data obtained from the test, production and observation bore drilling, and available historical drilling data from DNRM observation bores.
- A test pumping program for established production bores, and monitoring of groundwater level recovery rates at production and observation bores following pumping.
- Collection of regular groundwater samples for laboratory quality determination throughout the course of the test pumping operations.
- Spreadsheet-based analytical modelling of borefield performance using the Theis equation to project the cumulative groundwater level drawdowns at each pumping bore, taking into account any influence of pumping from each of the other pumping bores.
- Assessment of borefield performance, utilising MODFLOW modelling and analytical models of seawater intrusion to determine optimum pumping rates for each of the production bores, impacts of groundwater pumping from the deeper system on both the regional groundwater levels in the deeper system, and the groundwater levels in the shallow, perched system.
- Production of contour plans for the drawdown in the regional aquifer potentiometric surface based on modelling outputs.
- Analytical model assessment of likely changes to the position of the seawater interface for the proposed pumping in steady state conditions.
- Identification of long-term groundwater level and drawdown impacts to the shallow aquifer system using an instructional transient-state numerical model (also MODFLOW).

7.1.3 Aquifer Yield Revision

Data from monitoring programs along with production data will be used to evaluate sustainable yields from the Bribie Island aquifer. Short-term (day-to-day) decisions relating to any increase or decrease in groundwater yields, water quality or SWL will be made by Seqwater. Such operational decisions will be based on the identification of trends and impacts in consideration of the specified trigger levels and corresponding management actions. The groundwater resource is subject to transient conditions and reductions in the shallow aquifer level may be influenced by a number of factors which must be taken into consideration, such as rainfall, seasonal variability, barometric pressure and domestic usage. The main focus will be on changes with respect to the deeper aquifer, but decisions will also take into account changes in the shallow aquifers as measured across the monitoring bore network.

A quarterly operational report will be collated and provided to the Bribie Island CRG for information and the opportunity to provide recommendations back to Seqwater.

The CRG will not be responsible for making decisions on operational grounds as that responsibility will rest with Seqwater. The reporting will involve documentation of recorded data and an assessment of management decisions relating to aquifer management in line with this BEMP. Seqwater operational staff will make daily management decisions in line with agreed trigger levels provided in this BEMP as the operational process needs to be responsive to change, which may occur over short time periods.

Seqwater Senior Management may make long-term management decisions about variations in aquifer yield, particularly when occasions arise where monitoring results indicate unsustainable groundwater extraction rates (e.g. evidence of seawater intrusion and/or other adverse environmental impacts). Decisions on extraction rates will be required in both the long and short-term. The former relate to an overall assessment of long-term sustainable extraction rates and such an assessment will only be possible after gaining actual experience with aquifer performance over a range of seasons. The latter will relate to emergent decisions on extraction rates that arise in response to one or more of the identified triggers being reached, requiring an instantaneous response.

7.1.4 Recommended WTP pumping/treatment rates

Based on the outcomes of the detailed groundwater assessment, EHA determined that a continuous extraction rate of 50 L/s collectively from the proposed production bores will not cause appreciable seawater intrusion into the deeper aquifer system, although it does result in some migration of the toe of the seawater wedge inland particularly in the vicinity of a major palaeochannel. This pumping rate results initially in an annual planned town water supply extraction for the whole of Bribie Island of 2 675ML which represents approximately 1.5 % of the total annual rainfall of more than 200,000 ML based on average rainfall. With the decommissioning of the Woorim WTP, this results in the annual planned maximum town water supply of 1580 ML for Banksia Beach or approximately 0.8% of total annual rainfall.

These values do not include extraction from domestic bores, which are neither monitored nor have their use controlled on the Island. It is noted that the majority of domestic groundwater use on the island is drawn from shallow sand spears that predominantly draw water from the shallow perched aquifer systems of the island. The groundwater modelling of the island has implicitly incorporated the impact of the domestic bores on the island insofar as that the presence of these bores would reduce the groundwater levels in some areas of the shallow aquifer system and thus reduce recharge to the underlying deeper system in such areas.

The extraction rate of 50 L/s for the proposed borefield, which is considered conservative based on the previously mentioned figures, has been adopted as the sustainable aquifer extraction and treatment rate from commencement of water treatment at the Banksia Beach WTP. This equates to a total extraction rate of approximately 4.32 ML/day average (max 5) or 1580 ML/year for Banksia Beach WTP.

Acceptance of this lower but sustainable rate of extraction was acknowledged by the Queensland Government (which had initially nominated 10 ML/day) and was formally revised on the 2nd November 2007 to 5 ML/day in the amendment of the *Water Regulation 2002.*

7.1.5 Predicted Groundwater Level Drawdown

Bore pumping alters the natural movement of groundwater. The depth from the ground level to the groundwater surface in a bore is the groundwater level. Where no pumping is being undertaken from such a bore, this water level is more strictly referred to as the static water level (SWL). When a bore is pumped, the groundwater level in the bore casing is lowered below the groundwater level outside the casing creating a differential head and groundwater then flows in from the aquifer into the bore through the well screen.

Over time, the groundwater level outside the bore is lowered as water flows into the bore. The depth from ground surface to the water level in the bore during stabilised water withdrawal is called the pumping water level. The difference between the static water level and the pumping water level is called the drawdown. The greater the extraction of water from a bore, the greater the drawdown for a given period of pumping.

The pattern of groundwater level drawdown from static in an aquifer affected by pumping approximates the shape of an inverted cone and is called the cone of depression. The cone of depression is sharper closer to the pumping bore(s) and flattens with distance from the bore(s) in a logarithmic manner.

The same area as viewed on a map of the ground surface is known as the zone of influence. The extent of a cone of depression generated by a borefield varies depending on the nature of the aquifer and rate of pumping as well as other local hydrogeological conditions.

The groundwater model developed by EHA, on which the monitoring regime was based, predicted that the mean impact on the shallow sand aquifer would be 0.09 m with a maximum predicted reduction in shallow groundwater levels of 0.44 m. Shallow groundwater level reductions in the vicinity of the western Ramsar area were predicted be in the order of 0.05 m. Drawdowns around the eastern wetlands were predicted to be less than 0.1 m around Mermaid Lagoon and Welsby Lagoon, less than 0.1 m around South Lagoon, and not discernible elsewhere. Within the deep sand aquifer a mean drawdown of 0.61 m was predicted, with a maximum drawdown of 1.26 m (excluding the production bores) (North 2007).

The revised and calibrated groundwater model developed by SKM in 2012 has been used to assess potential impacts on groundwater levels from maximum borefield abstraction during both “average” and dry weather conditions. For assessing predictive scenarios in the first iteration of the model abstraction was distributed evenly between all 17 active production bores. While this was unlikely to reflect actual production rates for individual bores, at the time this work was undertaken reliable data on the distribution of extraction between individual bore was not available (Barlow et al. 2012).

Following the model revision, Seqwater worked to resolve issues impacting reliability of the pumping data. Then in 2013 SKM were contracted to validate the model by incorporating the corrected pumping data. The original calibration model was carried out for the period 1st June 2008 to 31st December 2012 (1368) days. The extended model calibration includes pumping data for a further 10 months, from the period 1st March 2012 to 31st December 2012. The extended calibration model was able to successfully replicate the observed groundwater behaviour in the 10 months following the previous calibration, which shows the uncertainty in historic records of groundwater extraction did not adversely influence modelling results.
Potential impacts on the shallow sand aquifer have been considered in terms of drawdown to provide an estimate of the spatial distribution and magnitude of impacts to the shallow system where GDEs are the primary receptor. Potential impacts on the deep sand aquifer relate primarily to the reduction in groundwater levels relative to mean sea level and the resulting potential for the landward migration of the freshwater / saltwater interface. For this reason impacts on the deep sand aquifer are considered in terms of predicted water levels in m AHD.

Figure 6 and Figure 7 present the maximum predicted drawdown in the shallow aquifer for “average” recharge and dry weather conditions respectively. The areas of predicted impact in the immediate vicinity of the borefield are directly north of the northern end of the borefield; mid-way between the northern end of the borefield and the coast to the east; and, immediately west of the centre of the borefield. These zones correspond to areas where the underlying coffee rock is thinner. The impacts for both the average and dry weather condition are relatively limited with maximum predicted drawdowns of 0.2 m and 0.3 m respectively. Drawdown impacts of 0.1 m extend into the eastern Ramsar area towards Welsby and South Welsby lagoons which have shown a natural variability of between 1.5 m and 1.6 m respectively since water level monitoring began at the start of borefield operation. These drawdown impacts predicted by the revised model are similar to those predicted in the earlier modelling by EHA (Barlow et al. 2012 and Barber, Barnett, Fawcett 2013).

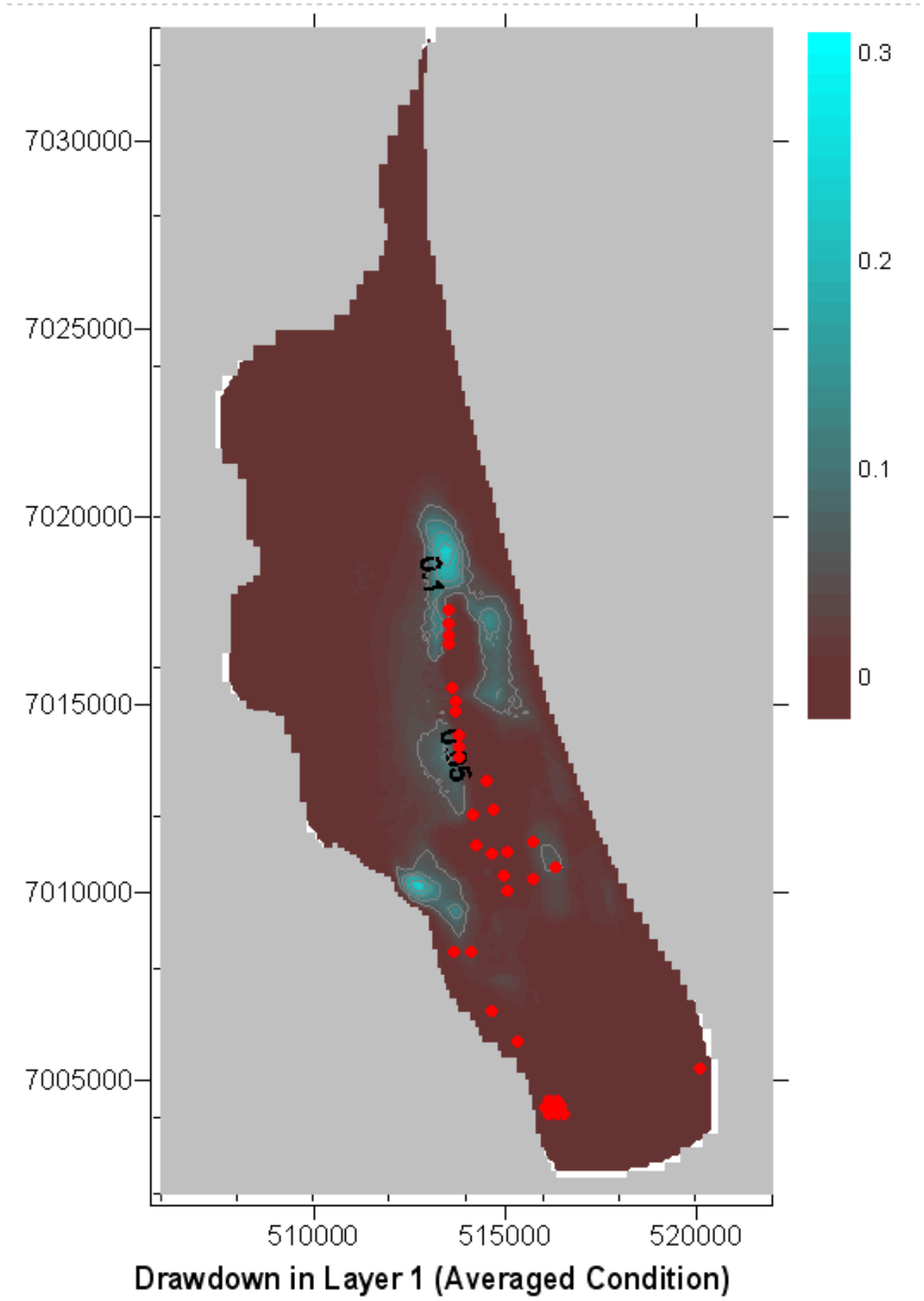

Figure 6: Shallow sand aquifer modelled predictions of maximum drawdown under 'average' recharge conditions (4.32 ML/d extraction over 7.5 years)
Source: (Barber, Barnett, Fawcett 2013)

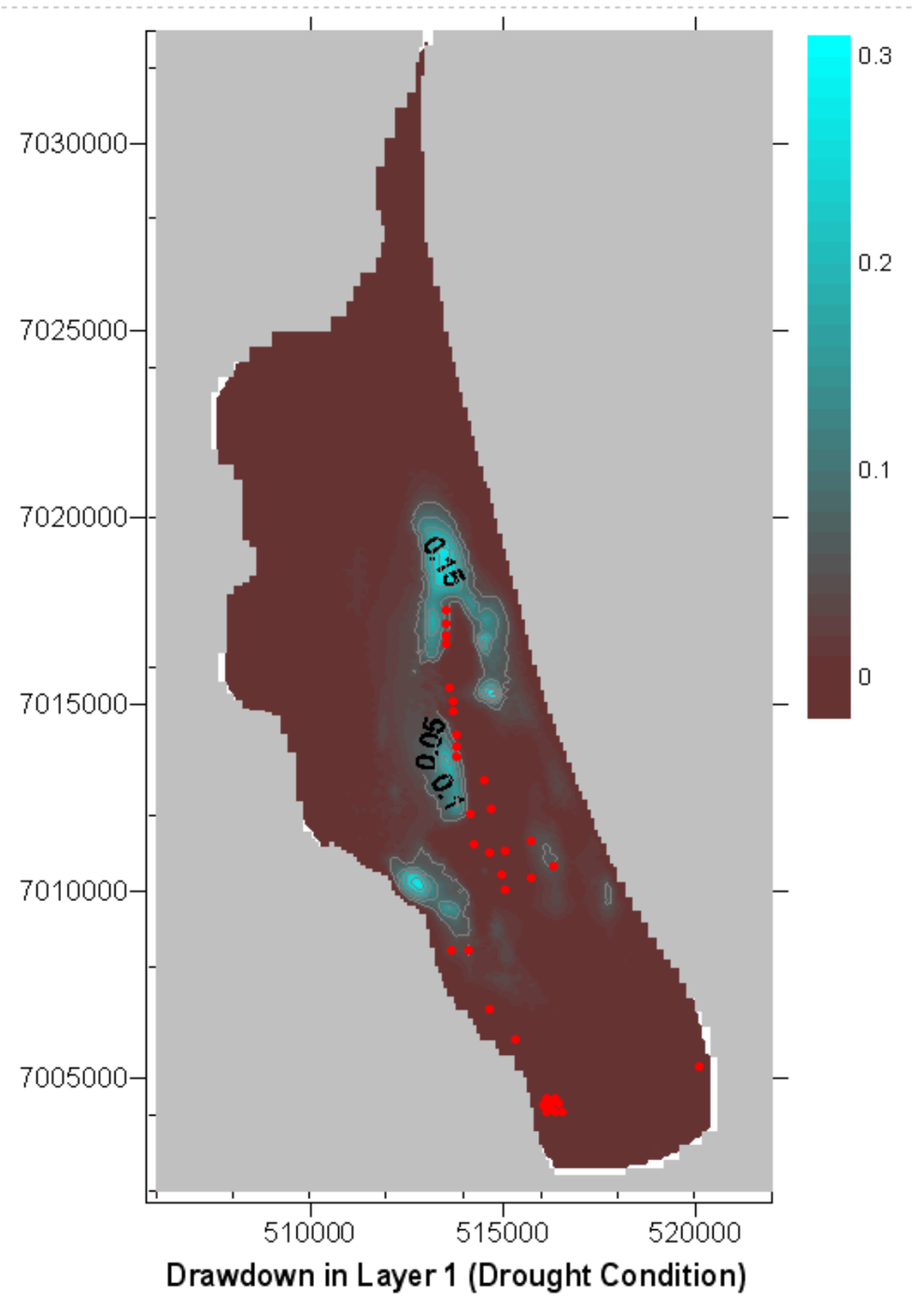

Figure 7: Shallow sand aquifer modelled predictions of minimum groundwater levels under 'drought' conditions (4.32 ML/d extraction over 7.5 years)
Source: (Barber, Barnett, Fawcett 2013)

Figure 8 and Figure 9 present the minimum predicted water levels in the deep sand aquifer for “average” recharge and dry weather conditions respectively. The distribution of drawdown around the borefield between the two scenarios is very similar with the dry weather condition resulting in a small additional drawdown compared to the average recharge condition. The simulated hydrographs for the deep sand aquifer bores indicate that borefield production at the licensed rate of 4.32 ML/d will reduce groundwater levels at the monitoring bores to the east of the site by between approximately 0.5 m at the coastline bores up to approximately 2.5 m further inland (Barber, Barnett, Fawcett 2013). At monitoring location I, closest to the production bores, drawdowns in the order of 4 m are predicted (Barber, Barnett, Fawcett 2013).

The model predicts that under these scenarios groundwater elevations between the borefield and the eastern coast will be less than 0.5 m above mean sea level. However, breaches of level C triggers are likely to result in reductions to borefield production rates before these levels are reached and therefore action will be taken prior to any effect being realised. To the north and west of the borefield the model predicts that groundwater levels in the deep sand aquifer will remain above 0.5 m AHD and for the most part will be >1 m AHD. It should be noted that these water levels represent the minimum levels 7 years into an 8 year dry weather period (based on actual data from the Beerburrum rain gauge). The groundwater model predicts that levels in the deep sand aquifer will fluctuate seasonally by between 0.25 m (coastline bores) and 0.4 m above these levels. To the south and the west of the borefield the model predicts greater seasonal variation in the simulated bore hydrographs of up to about 0.7 m

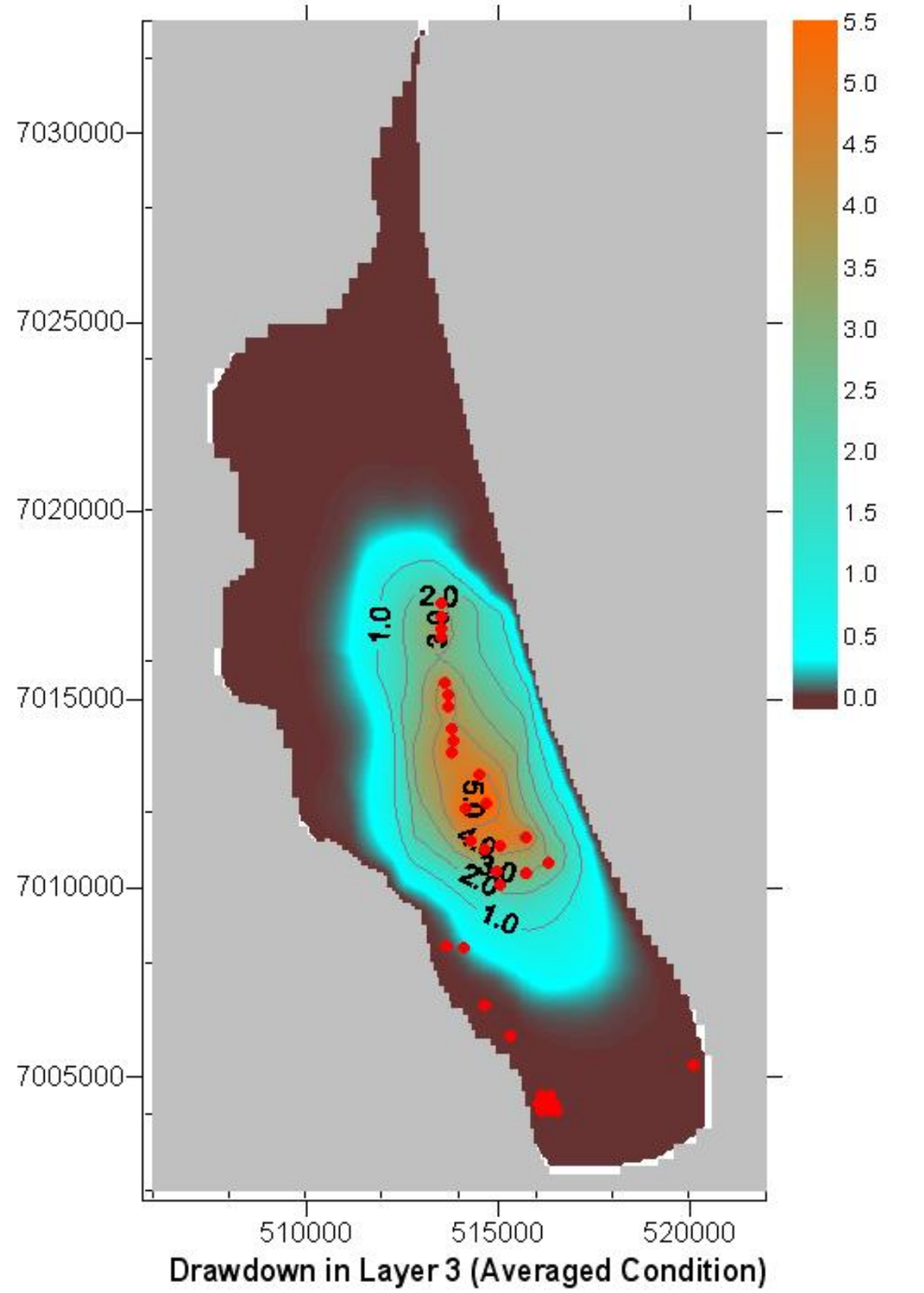

Figure 8:.Deep sand aquifer modelled predictions of minimum groundwater levels under 'average' recharge conditions (4.32 ML/d extraction over 7.5 years)
Source: (Barber, Barnett, Fawcett 2013)

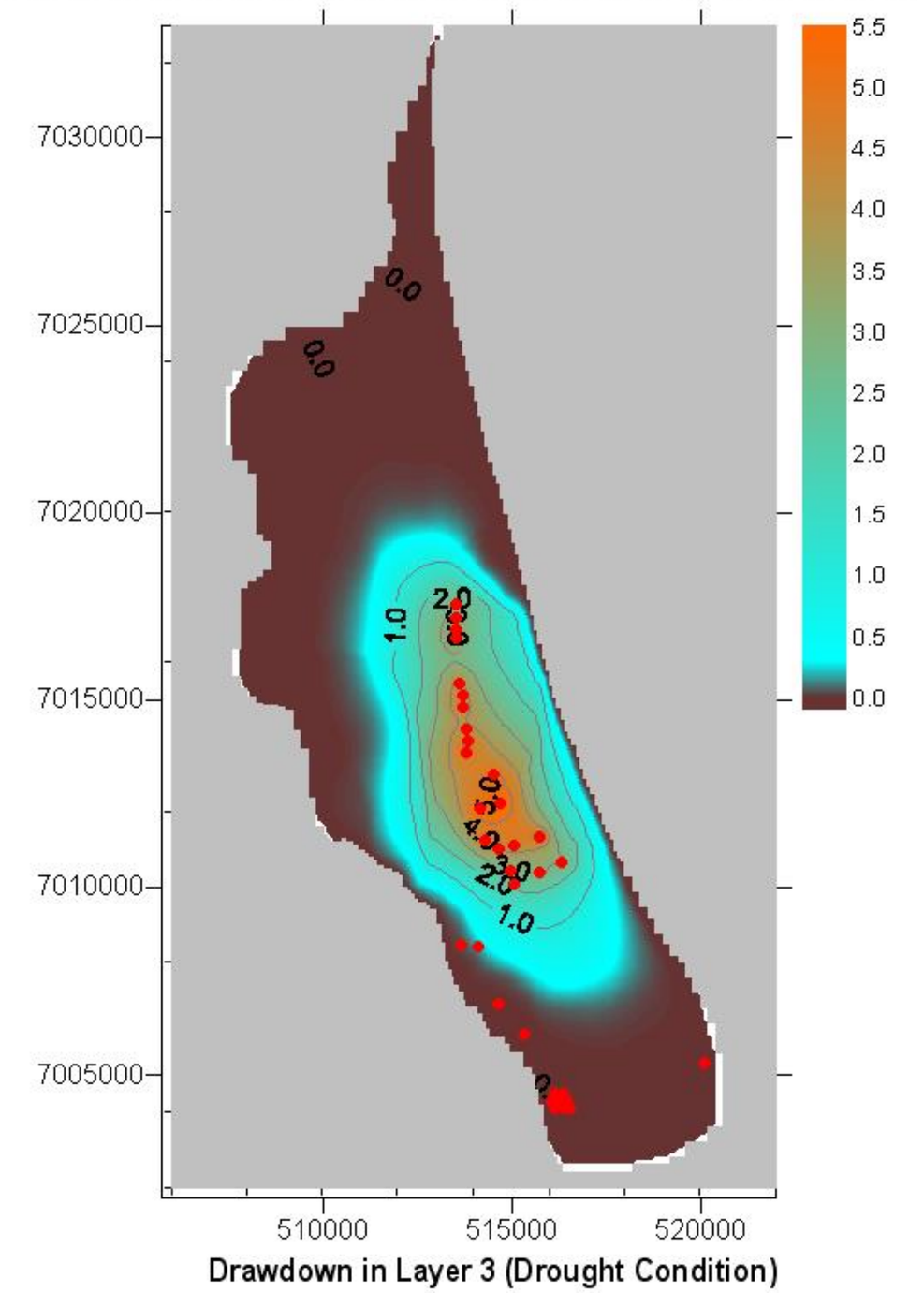

Figure 9: Deep sand aquifer modelled predictions of minimum groundwater levels under 'drought' conditions (4.32 ML/d extraction over 7.5 years)
Source: (Barber, Barnett, Fawcett 2013)

7.1.6 Aquifer Water Quality Monitoring

The monitoring program for assessing groundwater quality within the aquifer borefield, throughout the operational phase of the project is presented in Table 5: Aquifer Management Monitoring Program. The water quality monitoring program for the borefield network has been updated to closely align with the in Banksia Beach HACCP plan (PLN-00052) and the Catchment Water Quality Monitoring Program for the Bribie Island Bore Fields (TRIM D14/134030) to ensure operational relevance and source water protection. These values represent information required to manage the treatment process in the first instance but will also act as surrogate indicators of any changes in the aquifer that might have environmental implications.

Observation and sentinel bores are positioned both linearly along the production aquifer and at locations between the production aquifer and the coastline, to monitor hydraulic trends and to identify any seawater intrusion or other contamination of the water supply. Rigorous water quality monitoring is also undertaken at the Banksia Beach WTP In the combined inlet water. These are outlined in Banksia Beach HACCP plan (PLN-00052) and Banksia Beach WTP monitoring plan (PLN-00030).

All groundwater water quality monitoring will be undertaken in accordance with relevant industry standards including:

- *Monitoring and Sampling Manual 2009, Version 2 (DEHP, 2013)*

  http://www.ehp.qld.gov.au/water/pdf/monitoring-man-2009-v2.pdf
- *Groundwater Sampling and Analysis—A Field Guide (Geoscience Australia, 2009)*
  http://www.ga.gov.au/corporate_data/68901/Rec2009_027.pdf
- *AS/NZS 5667.11:1998 Water Quality—Sampling—Guidance on Sampling of Groundwaters.*

Groundwater quality data loggers installed in groundwater monitoring bores do not require routine maintenance and will be replaced if found to be deficient. The groundwater quality data loggers will be inspected routinely and cleaned ensuring it is of scope appropriate for the loggers being used (e.g. gentle removal of biofilms for submersible data loggers).

7.2 Ecological Monitoring Program

Table 8: Ecological Monitoring Program

Monitoring Site	Monitoring Point Location(s) / Data Source(s)	Monitoring Type	Monitoring Frequency		
			WTP Operational/Pre start up**	Long term shutdown (>3 months)	Cold Standby (>12 months)
Vegetation	GDE Site 5 (Potential Drawdown) & GDE Site 6 (Control)	Vegetation Transects Survey	Twice yearly – once during the wet season (~February) and once in at the end of the dry season (~September)	Twice yearly – once during the wet season (~February) and once in at the end of the dry season (~September)	Continue until baseline is established*
		Soil moisture	4 hourly readings taken using submersible data logger	4 hourly readings taken using submersible data logger	Continue until baseline is established*
		Vegetation remote sensing (NDVI)	Quarterly	Quarterly	Not Required *(discontinued 20/05/2022 as per Letter 510 Approval D22/222781)*
Welsby	Monitoring Bore (S1 & S2)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	ICOL Piezometer (S SW)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	Tidal Patterns	Daily recordings compiled for reporting via Bureau of Meteorology website	Annual	Annual	Not Required
Sth Welsby	Monitoring Bore (P1 & P2)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	ICOL Piezometer (P SW)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	Tidal Patterns	Daily recordings compiled for reporting via Bureau of Meteorology website	Annual	Annual	Not Required
Central Swale (North)	Monitoring Bore (Q1 & Q2)	SWL / EC	Monthly/Weekly	Monthly	Not Required
		Physiochemical water quality	Monthly/Quarterly as per Banksia Beach HACCP plan and Bribie Island CWQ Monitoring Plan	Not Required	Not Required
		Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	Piezometer (Q SW)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
Central Swale (South)	Monitoring Bore (R1 & R2)	SWL / EC	Monthly/Weekly	Monthly	Not Required
		Physiochemical water quality	Monthly/Quarterly as per Banksia Beach HACCP plan and Bribie Island CWQ Monitoring Plan	Not Required	Not Required
		Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required
	Piezometer (R SW)	Groundwater Flux (Data from data logger inputted to calculate GF)	4 hourly readings taken using data logger	4 hourly readings taken using data logger	Not Required

** baseline established once information from any future differential changes can be statistically assessed. Once baseline has been established then this will be presented in the Annual Compliance Report outlining the details on how baseline has been determined.*

***Minimum 6 months operational monitoring required for pre start up monitoring after Long term and Cold Standby shutdown.*

Under the revised program ecological monitoring assets are positioned to directly correspond to GDEs identified as being potentially at risk from borefield operations, with actual on-ground locations and their ecological relevance confirmed by SKM GDE experts and staff from Queensland Parks and Wildlife Service (QPWS). The selected vegetation monitoring sites were subsequently discussed with staff from the Queensland Herbarium who confirmed their suitability for the monitoring any impact arising from borefield operation. A map of the revised ecological monitoring network is shown in Figure 10.

Following the 2013 BEMP review, the ecological monitoring program consisted of:

- Two locations for vegetation monitoring transects; one within the predicted shallow aquifer drawdown zone, and a 'control' site outside the predicted shallow aquifer drawdown zone.
- Two soil moisture monitoring sites, coincident with the two vegetation monitoring sites.
- Four surface water monitoring sites; one at Welsby Lagoon, one at South Welsby Lagoon, and two in the Central Swale.
- Two GDE nested groundwater monitoring bore locations; one near Welsby Lagoon and one near South Welsby Lagoon.
- Annual assessment of vegetation condition across Bribie Island using remote sensing methods.

Details of the monitoring sites are summarised in Table 9:

Table 9: New monitoring site objectives (Source: Barlow, Lyons, Johnson 2014)

Site Name	Objective
P, Q, R **Freshwater wetlands including central swale**	• To quantify the groundwater flux into a wetland/swale • To identify any relationships between the surface water level and saturations of the wetlands and/or swale with groundwater levels.
S **Intermittent opening and closing lagoons (ICOLs) – using Welsby Lagoon as representative site**	• Measure the groundwater flux into the ICOL. • Identify relationships between the tide, opening events and groundwater levels with the rate of groundwater flux into the ICOL. • To understand the relationship between the water quality of the ICOL and groundwater flux.
GDE Site 5 (Drawdown) **Shallow rooted terrestrial vegetation (eastern Ramsar, inside predicted drawdown zone)**	• To determine the water use patterns of terrestrial vegetation • To establish the relationship between seasonal high water tables and water availability for shallow rooted vegetation
GDE Site 6 (Control) **Shallow rooted terrestrial vegetation eastern Ramsar, outside predicted drawdown zone)**	• To act as a control site and provide comparative information for site 5

Further amendment to the Ecological Monitoring Program was made in 2021, to remove the requirement for annual assessment of vegetation condition using remote sensing methods. Following monitoring of the sites over a five year period using satellite imagery and remote sensing techniques, a statistical review of the data was undertaken in comparison with field based floristic measurements (Stanton, 2021). The review found that remote sensing data were not statistically correlated to field-based floristic indices. Therefore, remote sensing as an alternative method of monitoring was not found to have practical application in the context of this BEMP, and was therefore removed as a method from the monitoring program.

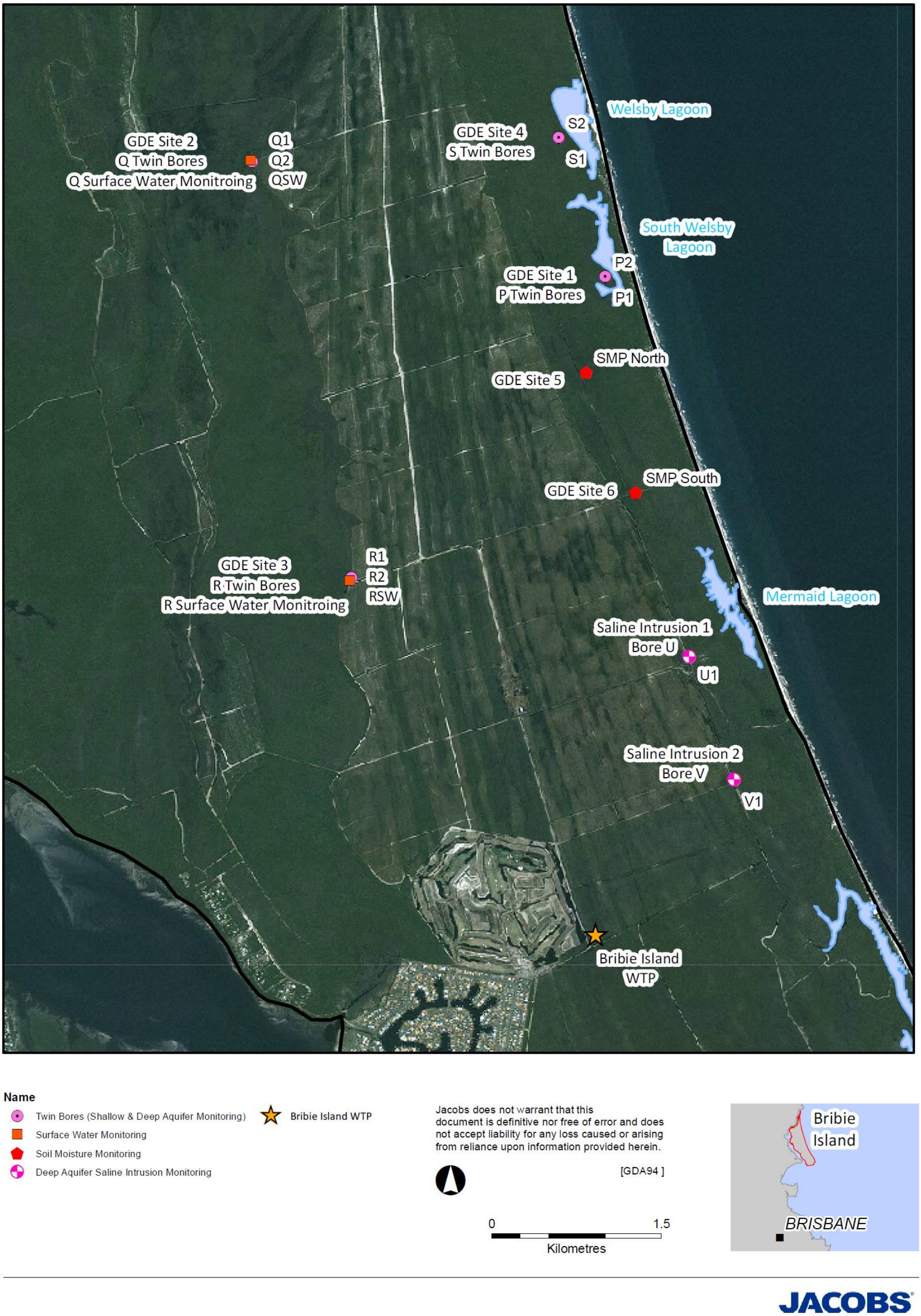

Figure 10: Ecological Monitoring Network
Source: (Barlow, Lyons, Johnson 2014)

7.3 Meteorological Monitoring Program

Table 10: Meteorological Monitoring Program

Monitoring Site	Monitoring point location(s) / Data source(s)	Monitoring Type	Monitoring frequency
Weather Stations	Banksia AWS and Northern (Nat. Park) AWS	Temperature, Relative Humidity, Rainfall, Wind Speed, Wind Direction	Data compiled monthly.
	Bureau of Meteorology (Redcliffe and Beerburrum site)	Temperature, Relative Humidity, Rainfall, Wind Speed, Wind Direction	Recordings can be compiled for reporting via Bureau of Meteorology website

Seasonal weather patterns will significantly influence groundwater recharge. Long-term climatic data were used in the modelling to determine the sustainability of the aquifer and to establish acceptable extraction rates. As no Bureau of Meteorology (BoM) approved site currently exists on the island two automatic weather stations (AWS) have been set up in the vicinity of the borefield, one at Banksia Beach WTP at the southern end of the borefield (the WTP AWS) and another 2km to the west of the northern end of the borefield (the northern AWS). Each AWS records daily measurements of rainfall, temperature and barometric pressure and also generates a calculated estimate of evapotranspiration. This data is downloaded by Seqwater staff and a database has been established to share and manage the data. Data from the two AWS can be cross checked for anomalous data and if one fails temporarily then accurate local climate data is still being recorded by the other.

This data will be assessed quarterly (except in cold standby shutdown (shutdown >12 months)) together with the SWL and EC data, and will be included in the quarterly operational report to the CRG and Seqwater senior management. BoM sites and data will be used opportunistically and where available given there is no control for Seqwater over their condition, state or activity.

Over time, this database will provide valuable local climate data for ongoing model refinement and validation including rainfall data which is required for meaningful assessment of the recorded groundwater level data.

8. Corrective Actions

8.1 Groundwater levels / Seawater intrusion

Should monitoring results indicate significant change in SWL, EC or adverse impacts on groundwater-dependent ecosystems (indicating sea water intrusion), measures as set out in Section 7.1 will be taken promptly to bring groundwater conditions back to below trigger levels.

To achieve this, any production bore(s) where applicable monitoring results (i.e. as obtained from the production bore or nearby observation bore) indicate water levels or quality outside acceptable trigger values must be shut down as soon as practicable, or extraction volumes reduced to the greatest extent necessary or practicable. Detailed management actions including pumping rate reductions in response to trigger level breaches are set out in section

7.1. Any significant variations identified at ecosystem monitoring quadrats must be investigated in consideration of groundwater monitoring data to determine the extent to which the variation correlates to the groundwater extraction activity. Any material change in wetlands that are supported by the shallow surface aquifer needs to be carefully evaluated in light of seasonal weather conditions and compared to records of SWLs in nearby bores.

A revised groundwater investigation may be required should monitoring results indicate that the recommended WTP pumping/treatment rates are not sustainable.

Amendments to the *Water Act 2000* (Water Act and Other Legislation Amendment Act 2007 – WOLA Act), passed by the Queensland Government on 13 November 2007, provide for the introduction of a broad range of demand management and water efficiency measures to address immediate water supply issues in SEQ and to provide for future long-term water security. These measures include a provision to give Water Service Provider (WSP), the power to impose water restrictions on the use of water from 'backyard' water bores, where the groundwater is being taken from the same source aquifer that supplies or supplements the town water supply. This requires approval by the Department of Natural Resources and Mines and requires that any restrictions applied to the domestic use of bore water must be equivalent to those placed on reticulated supplies.

This ultimately remains an option for additional safeguards against overuse of the shallow surface aquifer to ensure that the deep aquifer can continue to be used within the limits already imposed by the established operating thresholds in this BEMP should drought conditions extend or re-occur in future.

8.2 Groundwater contamination

Should routine monitoring results indicate groundwater contamination of the aquifer (either diffuse or point) with respect to monitored parameters, reporting procedures as outlined previously must be implemented. Where the source of contamination is identifiable and in the control of WTP operator(s) and/or Seqwater, measures must be promptly taken to cease and clean-up the contamination.

Relevant stakeholders and the DEHP will be notified promptly on evidence of any contamination of the groundwater resource.

8.3 Non-compliant product water quality

Should monitoring results obtained from routine product water monitoring indicate non-conformance with applicable product water quality targets, procedures as outlined in the Drinking Water Quality Management Plan (PLN-00004) and the subordinate Banksia Beach HACCP Plan (PLN-00052) and Monitoring Plan (PLN-00030).

9. Quality Assurance and Continual Improvement

9.1 Record keeping and site documentation

Records arising from monitoring programs specified in this BEMP will be compiled and kept by Seqwater through its identified document and record management system for a period of at least five years.

In addition Seqwater will be responsible for holding documents in relation to this activity. These include:

- a copy of the BEMP;
- development approval conditions;
- copies of relevant environment licenses and permits;

The documents shall be consistent with the obligations of the BEMP and shall be available to all staff and sub-contractors, if required.

9.2 Document and Groundwater Model Review

A review of all relevant environmental management documentation will be done on an annual basis to ensure the most effective environmental management procedures are being implemented, in accordance with industry best practice, and to provide for continual improvement in environmental management. This review will also encompass any relevant statutory approvals, such as the development approval, to ensure operation is in accordance with all applicable requirements, and to identify any areas where changes to development conditions may be warranted, due to operational changes.

In order to evaluate the hydrogeological dynamics of the aquifer in response to the extraction of groundwater are run of the groundwater model will occur in year 10 of operation.

9.3 Compliance Audits

As part of the Seqwater Management Systems, internal audits are to be undertaken on Seqwater operations on a scheduled basis, covering the three main aspects of the IMS which are the Quality Management System, Health & Safety and the Environmental Management System. The internal audits will be recorded on the form *TEM – 00021 Internal Audit Report* and undertaken in accordance with *PRO-00002 IMS Internal Audit Procedure* which describes the responsibilities, process and schedule of internal audits related to the investigation of environmental performance. An assessment of compliance with environmental management documents (including the applicable Environmental Management Plan), statutory requirements, such as development conditions associated with the EPBC approval, and relevant provisions of environmental legislation will be undertaken. The purpose of these audits is to determine if there are any areas of concern and provide for the prompt adoption of appropriate measures, where necessary, to achieve compliance and to ensure a process of continuous improvement in line with the principles of the adaptive management approach as set out in this BEMP.

9.3.1 Auditing Procedure

Auditing will take place periodically. The audit process will be undertaken by at least an Seqwater Environmental Coordinator. The audit will also require, as a minimum, one representative of the operations team to assist throughout the duration of the audit.

For each internal audit evidence will be collected and associated findings will be made under the following headings:

- **C - Complies:** Evidence supports that the requirement/ condition is being met.
- **A - Alert:** A matter that requires attention or requires monitoring to ensure that it has been completed.

- **O - Opportunity for Improvement:** A potential Operational and/or Management System improvement. An Opportunity for Improvement is provided as a valuing adding statement and should be considered.

Once evidence is collected it will be collated into a report where all findings will be communicated to the relevant personnel. The results of the audits will be recorded in an Audit Report, and will be stored and available for inspection on-site. The audit report will also summarise opportunities for improvement where operations or management systems can be improved.

Following the identification of any non-compliance, corrective actions will be actioned and, if deemed necessary, an action plan developed. The Audit Reports will be made available to the DAWE and DES on request.

Electronic copies of the internal audit reports are available within the corporate document management system Trim.

10. Management of Infrastructure Assets

10.1 Borefield Maintenance Procedures

A routine pump and bore maintenance program has been implemented for production bores to minimise the likelihood of pump breakdowns and losses in groundwater productivity.

10.2 Bore Maintenance and Trouble shooting

Production and observation bores have a carefully planned, systematic program of preventive maintenance to ensure they are kept in good operational condition. The scheduled strategic maintenance program is managed through the Seqwater Corporate Information System (CIS) and consists of:

- Records: Detailed records were taken during the construction of each bore, including the test drilling and test pumping data to assist in selection of pumps for the bores. The pump equipment and well-house specifications, amount of water pumped, power usages, and the maintenance costs are also kept on file. Other characteristics, including the SWL, pumping water level and the total water pumped will be regularly recorded.
- Quality Protection: Each bore examined regularly to ensure the top of the well is properly sealed and sources of contamination are prevented from entering the well.
- Inspection: A periodic program exists to check the pump, the drop pipe, and the motor. Typically, pumping machinery is pulled from the bore at intervals of three to six years and must always be disinfected before replacement. Bores will be inspected to check for cleaning requirements and determine the presence of any bio-films, such as iron bacteria, or heavy encrustation. Where chemical encrustation is blocking the screens it may be appropriate to establish a chemical dosing program at regular intervals, using a product such as ‘Clearbore’, which is widely used, safe and biodegradable.
- Efficiency: A periodic check of the pump efficiency and well efficiency will be undertaken to check the well condition and to determine pumping costs.

10.3 Routine Pump Maintenance

Maintenance requirements for submersible pumps, including monitoring well production and periodic pump inspection and maintenance, is also managed through CIS. Submersible pumps are prone to problems caused by sand and other solid matter, which may be indicative of well screen corrosion and result in reduced pump productivity. The following pump inspection and preventive maintenance procedures may be applicable.

- Key data that will be recorded on a regular basis include bore output (L/s) and energy consumption (e.g. fuel or electricity).
- Monitor for any abnormal noise or vibration from pumps, and any heat or odour from non-submersible pumps.
- Properly lubricate pump bearings as specified by pump manufacturer.
- Look for any soapy or foamy lubricant characteristics, which could indicate water infiltration into bearing shaft seals.
- Inspect pump priming systems to ensure that they are operational and free of leaks.
- Check automatic pump controls and operate any stand-by generators at least monthly.

11. Reporting Requirements

11.1 Internal reporting procedures

Monitoring data will be collated by Seqwater Water Quality and Environment staff, and then provided to Seqwater Operations. Any monitoring results indicating that groundwater levels and/or quality exceed specified trigger levels, and/or adverse changes in groundwater-dependent ecosystems, must be reported as per requirements set out in this BEMP, as soon as practicable following receipt of the monitoring or observation results.

Quarterly compliance reports will be distributed to the CRG, with a CRG meeting held on an annual basis timed with the annual technical report except where the Banksia Beach WTP and Borefield is in cold standby shutdown (shutdown for >12 months) the CRG will be provided with the Annual Compliance Report including applicable technical reports. Whilst in cold standby shutdown (shutdown for >12 months) no quarterly operational reports will be generated and presentation of the annual compliance report will only occur if necessary where specific issues arise.

The CRG meeting is the forum at which time recommendations may be formulated with respect to future groundwater management strategies in accordance with the BEMP provisions. These recommendations will be provided to Seqwater Senior Management Team for consideration in short and long-term decision making about the continued aquifer use.

11.2 Regulatory reporting

11.2.1 Department of Environment and Heritage Protection (DEHP)

Any environmental incidents or monitoring results indicating a contravention of any relevant development condition imposed by the DEHP for the development permit IPTP00596307, or any release of contaminants that may cause or threaten environmental harm, must be reported to the DEHP as soon as practicable following the incident or release.

The following details must be provided with notification to the DEHP as a minimum;

- location of the emergency/incident;
- name and telephone number of the designated contact person;
- time of the emergency/incident;
- time Site Supervisor/Project Manager became aware of the emergency/incident;

- suspected cause of the emergency/incident;
- the environmental harm or nuisance caused, threatened, or to be caused by the emergency/incident; and
- actions taken to prevent further emergencies/incidents and mitigate any environmental harm and/or nuisance caused by the incident/emergency.
- Within 14 days of the emergency/incident Seqwater must provide written advice pertaining to the emergency/incident to the DEHP containing the following subsequent information:
- Proposed actions to prevent a recurrence of the emergency/incident; and
- Outcomes of actions taken at the time to prevent or minimise environmental harm or environmental nuisance.

Section 320 of the EP Act requires that the DEHP must be notified of incidents that have caused, or threaten to cause, serious or material environmental harm. This may be relevant to events, acts or omissions associated with the Bribie Island Aquifer Project, which are outside the scope of the relevant development approval. In general terms, this section requires written notification of the event involving the harm with respect to its nature and the circumstances.

The DEHP should be notified directly of environmental incidents in the first instance via the pollution hotline: **1300 130 372.**

11.2.2 EPBC Matters

Approval was given for Referral EPBC 2007/3396) on 7 April 2008 for operation of the borefield under section 133 of the EPBC Act having effect for 'Wetlands of international importance – sections 16 and 17B'. The approval has effect until 30 April 2058. A copy of the Approval is provided in Appendix A.

In accordance to condition 3 of the EPBC approval, Seqwater will publish the Annual Compliance Report on its website annually on the 1st of December (within 3 months of the commencement date) addressing implementation of the BEMP.

12. References

Stephanie Barber, Brian Barnett, Jon Fawcett, 2013, Groundwater model refinement, GDE assessment and monitoring review - Bribie Island Borefield, SKM, viewed 21 September 2014.

John Barlow, Tim Ezzy, Rebecca Sheldon, Doug Weatherill, 2012, *Review of Banksia Beach Borefield Operating Management Plan*, SKM, viewed 21 September 2014.

John Barlow, Derwin Lyons, Tony Johnson, 2014, *Bribie Island Borefield Environmental Monitoring Network Upgrade*, Jacobs, viewed 21 September 2014.

North, B., 2007, Proposed Hydrological Monitoring Network and Groundwater System Monitoring Thresholds – Bribie Island North Borefield, EHA, viewed 21 September 2014.

Stanton, D., 2021, Technical Letter – RE: Analysis of NDVI data captured over 10 epochs (5 years), 3D Environmental.

13. Appendices

Appendix A: Variation to Conditions of Approval 10 April 2015

Australian Government
Department of the Environment

EPBC: 2007/3396

Contact Officer: Penny Godwin
Telephone: (02) 6275 9516
Facsimile: (02) 6274 1878
Email: post.approvals@environment.gov.au

Mr Daniel Spiller
General Manager – Asset Portfolio Development and Delivery
Seqwater
PO Box 16146
City East QLD 4002

Dear Mr Spiller

Banksia Beach Water Treatment Plant and Borefield (EPBC 2007/3396)
Variation to Conditions of Approval

I write in relation to the proposed variation to the conditions of approval for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) approval 2007/3396.

Officers of the department have considered your request, and have found that it is in accordance with the requirements of section 143(1)(c) of the EPBC Act; being that the proposed variation is necessary or convenient for the protection of a matter of national environmental significance.

As delegate of the Minister for the Environment, I have decided to approve the variation to the conditions of the approval in accordance with the provisions of the EPBC Act. The action must now be undertaken in accordance with the varied conditions specified in the enclosed variation notification.

I note that the variation of conditions requires that a Borefield Environmental Management Plan (BEMP) is submitted for approval. I am advised that a BEMP was submitted to the Department in January 2015 and that this plan will require some minor amendments to meet the requirements of the varied approval conditions.

The variation of conditions of approval does not relieve the person to whom it has been granted from an obligation to comply with any other law of the Commonwealth, State or Territory that is applicable to do the action and to have any right, title or interest that is required to access land or waters and to do the action.

If you have any enquiries in relation to this matter, please contact Penny Godwin on 02 6275 9516.

S. Gaddes

Shane Gaddes
Assistant Secretary
Compliance & Enforcement Branch
Environment Assessment and Compliance Division

10 April 2015

Australian Government
Department of the Environment

CORRECTION NOTIFICATION

VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Banksia Beach Water Treatment Plant and Borefield, Bribie Island
(EPBC 2007/3396)

The variation to conditions attached to approval signed on 10/4/2015 contained an error.

The notice incorrectly stated "insert conditions 1-7".
The notice should read "insert conditions 1-6".

Person making correction

Name and position	Shane Gaddes Assistant Secretary Compliance and Enforcement Branch
signature	S.Gaddes
date of correction	17 April 2015

Australian Government
Department of the Environment

VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Banksia Beach Water Treatment Plant and Borefield, Bribie Island (EPBC 2007/3396)

This decision to vary a condition of approval is made under section 143 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Approved action

Person to whom the approval is granted	Queensland Bulk Water Supply Authority **ABN 75 450 239 876**
Approved action	The Extraction of groundwater from Bribie Island to supply an incremental 5ML per day of drinking water to the existing Caboolture Shire Council delivery network, Queensland, (EPBC 2007/3396)

Variation

Variation of conditions of approval	The variation is: Delete conditions 1-8 and definitions and annexure 2 attached to the approval dated 7 April 2008, subsequently varied on 6 September 2011, and insert conditions 1-7 and definitions specified below
Date of effect	This variation has effect on the date the instrument is signed

Person authorised to make decision

Name and position	Shane Gaddes Assistant Secretary Compliance & Enforcement Branch
Signature	SGaddes
Date of decision	10 April 2015

Conditions attached to the approval

1. The **approval holder** must submit for approval by the **Minister** a **BEMP** designed to protect the ecological character of the Moreton Bay Ramsar wetlands. Once approved, the **BEMP** must be implemented. The approved **BEMP** must be published on the **approval holder's** website, with a location and/or metadata that enables easy discovery by relevant web searches, within one month of approval by the **Minister**. The **approval holder** must notify the **Department** within five **business days** of publishing the BEMP on its website. The BEMP must remain on the website for the period the approval has effect.

2. In accordance with the yield identified in the **BEMP**, the **approval holder** must limit groundwater extraction from the **Northern Borefield** to no greater than an annual average of 4.32ML/day, at a maximum daily rate of 5ML/day and totalling no more than 1580ML/year, subject to the requirements of conditions 1, 4 and 5.

3. The **approval holder** must maintain accurate records of all measures taken to implement the **BEMP** according to the conditions of this approval, and must make these records available to the **Department** on request. Within 3 months of every anniversary of the commencement of the action, the **approval holder** must publish a Compliance Report on its website addressing implementation of the **BEMP**. The **approval holder** must also notify any non-compliance with this approval to the **Department** in writing within 10 business days of becoming aware of the non compliance. The **approval holder** must continue to annually publish the Compliance Report until such time as agreed in writing by the **Minister**. Such records may be subject to audit by the **Department** or be used to verify compliance with the conditions of the approval.

4. If the **approval holder** wishes to carry out any activity otherwise than in accordance with the **BEMP**, the person taking the action must submit to the **Department** for the **Minister's** written approval a revised version of the BEMP. The varied activity shall not commence until the **Minister** has approved the revised plan in writing. If the **Minister** approves the revised plan, that plan must be implemented in place of the plan originally approved. All revised plans approved by the **Minister** must be published on the **approval holder's** website within one month of their approval by the **Minister**.

5. If the **Minister** believes that it is necessary or convenient for the better protection of the relevant matters of environmental significance to do so, the **Minister** may request the **approval holder** to make specific revisions to the **BEMP** and submit the revised plan for the **Minister's** written approval. Once approved, the revised plan must be implemented. Unless the **Minister** has approved the revised plan, the **approval holder** must continue to implement the originally approved **BEMP**, as specified in the conditions.

6. Upon the direction of the **Minister**, the **approval holder** must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the **Minister**. The independent auditor and audit criteria must be approved by the **Minister** prior to the commencement of the audit. The audit report must address the criteria to the satisfaction of the **Minister**.

Definitions

Approval Holder – means the person to whom the approval is granted

BEMP – means the Borefield Environmental Management Plan, as required under condition 2 and as amended in accordance with condition 4 or condition 5. The BEMP must include detailed management arrangements for ongoing ecological and groundwater monitoring, and reporting to the Department.

Department – means the Australian Government Department responsible for administration of the *Environment Protection and Biodiversity Conservation* Act 1999.

Minister – means the Minister responsible for administration of the *Environment Protection Biodiversity Conservation* Act 1999.

Northern Borefield – means the area identified as the northern borefield in the BEMP.

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Appendix B: Variation to Conditions of Approval 20 May 2022

Australian Government
Department of Agriculture, Water and the Environment

Mr Steven Cox
Senior Planning Approvals Advisor
SEQ Water
117 Brisbane St
IPSWICH QLD 4305

Dear Mr Cox

EPBC 2007/3396: Water management and use/Bribie Island /QLD/Banksia Beach Water Treatment Plant – Approval of revised Borefield Environmental Management Plan

Thank you for your email dated 28 July 2021, to the Department of the Agriculture, Water and the Environment, seeking approval of the Borefield Environmental Management Plan, in accordance with condition 4 of the above project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Officers of the Department have advised me on the revised Borefield Environmental Management Plan and the requirements of the conditions of the approval for this project. On this basis, and as a delegate of the Minister for the Environment, I have decided to approve the Banksia Beach Borefield Environmental Management Plan (BEMP) rev 13, April 2021. This plan must now be implemented.

The Department understands that the funds saved from the removal of the remote sensing component of the BEMP will be utilised to contribute to a hydrogeological study of the borefield. The aim of the hydrogeological study is to assess the risks from historical groundwater extraction of the action, in having potential delayed and continued impact on the Matters of National Environmental Significance (MNES) related to EPBC 2007/3396. The Department recommends that you address the factors outlined in Attachment A to this letter in undertaking your study, to help inform future groundwater monitoring requirements.

As you are aware, the Department has an active monitoring program which includes monitoring inspections, desk top document reviews and audits. Please ensure that you maintain accurate records of all activities associated with, or relevant to, the conditions of approval so that they can be made available to the Department on request.

Should you require any further information please contact Alice Shields on (02) 6274 2956 or postapproval@awe.gov.au.

Yours sincerely

Jennifer Pearson
Acting Assistant Secretary
Environment Assessments (Vic, Tas) and Post Approvals Branch
Environment Approvals Division
20 May 2022

Attachment A

FOR CONSIDERATION IN HYDROGEOLOGIC STUDY OF BOREFIELD

The assessment of groundwater monitoring data and other evidence will be required to assess the responsiveness of the aquifer/s, as well as consideration of climatic conditions and variables that may impact MNES in the relevant timeframe. Department considerations are listed below:

1. Current/up-to-date data to be compared against baseline data to understand any lag impacts.
2. Re-run modelling using up-to-date data.
    a. Does updated modelling and analysis show anything concerning relating to how the aquifer is responding to rainfall, lag impacts from historic extraction, impacts from recent extraction not related to the action, or any anomalies?
3. Give an indication how long lag impacts would be expected to take, and back these claims with scientific evidence (e.g. peer reviewed papers).
4. Discern the properties of the aquifer (that help it respond well to rainfall)
    a. what is the aquifer's connection to shallow aquifer/alluvium and coffee rock (aquifers discussed in the BEMP)
    b. what are the properties of the aquifers including bore extraction aquifer e.g. conductivity, geology.
5. If there is connectivity with surface water features, do these require monitoring?
6. Is there evidence of seawater intrusion?
7. Do groundwater levels and Groundwater Dependent Ecosystem indicators (e.g. vegetation health) indicate current or potential drawdown?
8. Are other developments or climactic issues likely to impact water resources, and can they be differentiated from the impacts of the borefield?
9. Is there a risk of cumulative impacts if other developments occur in the area?

Appendix B: Production, Observation and Ecological Bore Locations

	Production																	
	BR6-P	BR7-P	BR9-P	BR10-P	BR11-P	BR12-P	BR13-P	BR14-P	BR16-P	BR17-P	BR18-P	BR19-P	BR20-P	BR21-P	BR22-P	BR23-P	BR24-P	BR30-P
Easting	516304	515720	515724	515055	514268	513793	513821	513782	513719	513696	513617	513526	513509	513513	513509	514695	514524	514150
Northing	7010680	7010379	7011349	7011115	7011257	7013596	7013900	7014224	7014814	7015102	7015454	7016635	7016880	7017182	7017546	7012229	7012992	7012088

	Observation															
	B1, B2, B3, B4	C1, C2, C3	D1, D2, D3	E1, E2, E3	F1, F2, F3	G1, G2, G3	H1, H2, H3	14100086 (Bore 86)	I1, I2, I3	J1, J2	K	L1, L2, L3	O1, O2	T1, T2, T3	14100085 (Bore 85)	14100089 (Bore 89)
Easting	514795	517013	516942	515538	516085	514822	514319	514567	513671	509416	510702	512002	510976	513777	512348	515659
Northing	7009914	7010473	7012151	7014160	7014307	7015613	7017268	7017404	7015258	7014618	7011518	7012027	7015089	7010538	7016973	7012350

	Observation													
	P1	P2	P SW	Q1	Q2	Q SW	R1	R2	R SW	S1	S2	S SW	U1	V1
Easting	515472	515470	515558	512344	512343	512334	513223	513222	513209	515056	515055	515328	516212	516610
Northing	7016123	7016125	7016030	7017141	7017139	7017156	7013469	7013466	7013436	7017349	7017352	7017212	7012761	7011675

	GDE	
	GDE Site 5	GDE Site 6
Easting	515781	515306
Northing	7014197	7015227