

Belmont Desalination Plant

Construction Flood Emergency Response Sub-Plan

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Revisions and Distribution

Revisions

Draft issues of this document are identified as Revision A, B, C, etc. Upon initial issue (generally Contract Award) this will be changed to a sequential number commencing at Revision 0. Revision numbers will continue at Revision 1, 2, etc.

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Table of Contents

Revisions and Distribution	1
Terms and Abbreviations	4
Plan Profile	6
1. Introduction.....	7
1.1. Context	7
1.2. Background.....	7
1.2.1. The Project	7
1.2.2. Statutory Context	7
1.3. Scope of the Plan.....	8
1.4. Environment Management Systems Overview	8
1.4.1. FERMP Endorsement and Approval	9
1.4.2. Relationship between this Plan and other Project documents	9
1.5. Consultation for Preparation.....	9
2. Purpose and Objectives.....	10
2.1. Purpose	10
2.2. Objectives	10
2.3. Flood Risk Management	10
3. Environment Requirements	11
3.1. Relevant Legislation and Guidelines	11
3.2. Conditions of Approval – SSI-8896	11
3.3. Revised Environmental Management Measures	12
4. Existing Environment	13
4.1. History of Flooding	13
4.2. Catchment and Waterways	13
4.3. Topography.....	13
4.4. Rainfall and Climate	14
4.5. Coastal Processes and Hazards	14
4.6. Summary of Existing Flood Behaviours.....	14
5. Environmental Aspects and Impacts.....	16
5.1. Construction Activities	16
5.2. Potential Flooding Impacts	16
5.3. Stormwater Modelling for Response to Submissions.....	16
5.4. Increased Building Area Level.....	17
5.5. Cumulative impacts	17
6. Environmental Mitigation and Management Measures.....	18
6.1. Pre-flood Actions.....	18
6.2. Flood Emergency Response	18
6.3. Post-Flood Emergency Response.....	19
6.4. Mitigation Measures	20
7. Compliance Management	24
7.1. Roles and Responsibilities	24
7.2. Training.....	24
7.3. Monitoring and Inspection	24

7.4. Auditing.....	26
7.5. Reporting	26
8. Review and Improvement	28
8.1. Continuous Improvement	28
8.2. FERMP Updates and Amendments	28
Appendix A – Flood Warning, Evacuation and Response Procedure.....	29
Appendix B - Flood Preparation Management Plan Template: Belmont Desalination Plant - Site Specific Flood Preparation Plan	32
Appendix C - Site Preparation Checklist	33
Appendix D - Post Severe Weather / Flood Survey	34

Figures

Figure 4-1: Key waterways, wetlands, and surface water sites	15
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Tables

Table 3-1: Principal legislation and regulation relevant to flood management	11
Table 3-2: Conditions of Approval (CoA) relevant to this FERMP	11
Table 3-3: Environmental management measures relevant to this FERMP	12
Table 6-1: Flood Management and Mitigation Measures	21
Table 7-1: Roles and responsibilities specific to this Plan	24
Table 7-2: Monitoring, Inspection and Reporting Requirements.....	24
Table 7-3: Reporting requirements specific to flood management	27

Terms and Abbreviations

Term/Abbreviation	Definition/Expanded text
ABC	Australia Broadcasting Corporation
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
BCD	Biodiversity and Conservation Division
BoM	Bureau of Meteorology
CCS	Community Communication Strategy
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CPESC	Certified Professional in Erosion and Sediment Control
CSIRO	Commonwealth Scientific and Industrial Research Organisation
D&C	Design and Construct
DPHI	Former Department of Planning and Environment, now Department of Planning, Health and Infrastructure
EIS	Environmental Impact Statement
EMS	Environmental Management System
EPA	Environmental Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A regulation	Environmental Planning and Assessment Regulation 2021
EPBC Act	Environment Protection Biodiversity Conservation Act 1999
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
EY	Average number of exceedances per year
FERMP	Flooding Emergency Response Management Sub-Plan
HWC	Hunter Water Corporation
HW Act	Hunter Water Act 1991
IMS	Integrated Management System
JH	John Holland Group
LEMO	Local Emergency Management Officer
LEP	Local Environmental Plan
LHWSP	Lower Hunter Water Security
LMCC	Lake Macquarie City Council
mm	Millimetre
NSW SES	New South Wales State Emergency Service
OEH	Office of Environment and Heritage
PESCP	Progressive Erosion and Sediment Control Plan
PIRMP	Pollution Incident Response Management Plan
PMF	Probable maximum flood
PMP	Project Management Plan
REMM	Revised Environmental Management Measures

Term/Abbreviation	Definition/Expanded text
RL	Reduced Level
SEPP	State Environmental Planning Policy
SES	State Emergency Services
WM Act	Water Management Act 2000
Water Act	Water Act 1912
WWTW	Waste Water Treatment Works

Flooding Emergency Response Management Sub-Plan

Plan Profile

Management System	The Project will use JH's Environmental Management System (EMS) and core Project plans to support Project delivery. Additional functional plans have been developed for the Project.
Name	Flooding Emergency Response Management Sub-Plan (FERMP)
Authorisation	All personnel employed on the Project will perform their duties in accordance with the requirements of this Plan and in compliance with Project system procedures and any specific Project instructions. Once approved, this Plan is authorised by the Project Director.
Review and update	This Plan will be regularly reviewed, developed, and updated: <ul style="list-style-type: none">• For changes in design or construction sequence, staging, methodology or resourcing• To consider progress of the Project Company's Work• For changes in access to the Project Site• To consider changes directed by the Environmental Representative and Hunter Water Corporation (HWC).

1. Introduction

1.1. Context

This Flood Emergency Response Management Sub-plan (FERMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the Belmont Desalination Plant Project (the Project).

This FERMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) (CoA condition A2), the measures listed in the Environmental Impact Statement (EIS) as modified, including the Response to Submissions (HWC 2020), Amendment Report (GHD 2020), Modification Report (Jacobs 2023) and all applicable legislation.

1.2. Background

1.2.1. The Project

The Belmont Desalination Plant Project ('the Project') was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning on the 23 July 2021. The approved Project involves the construction and operation of a drought response desalination plant producing up to 30 megalitres per day (ML/d) including seawater intake infrastructure; desalination units; brine discharge via existing ocean outfall; electricity/water supply; and ancillary works.

The approved Project is being developed on land (Part Lot 1 DP 433549) at 12a Ocean Park Road, Belmont South ('the Project area') that comprises a portion of the existing Belmont Wastewater Treatment Works (WWTW) which is located to the southeast of the town of Belmont, NSW within the Lake Macquarie City Council (LMCC) local government area (LGA). Belmont Lagoon, Cold Tea Creek and the residential area of Belmont is located to the west, with the Pacific Ocean bordering the site to the east and south.

Hunter Water completed a major review of the 2014 Lower Hunter Water Plan (LHWP) in 2022, now referred to as the Lower Hunter Water Security Plan (LHWSP) in accordance with the state-wide NSW Water Strategy and in consultation with DPHI – Water, Central Coast Council, and the Lower Hunter community. Since the Project was approved the LHWP has been superseded by LHWSP (Hunter Water, 2022). The LHWSP outlines measures to ensure adequate water for the Lower Hunter region during drought including the change from a drought response Desalination Plant to a permanently available Desalination Plant at Belmont. A detailed Project description is provided in the CEMP.

1.2.2. Statutory Context

The Project was approved as State Significant Infrastructure (SSI-8896) by the then New South Wales (NSW) Minister for Planning and Public Spaces under Division 5.2 of Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) on the 23 July 2021 following submission of an EIS and Amendment Report to Department of Planning, Housing and Industry (DPHI) (formerly the Department of Planning, Infrastructure and Environment (DPIE)) in November 2019 and August 2020 respectively. The Project is identified as SSI as it satisfies Clause 4(1) of the then State Environmental Planning Policy (State and Regional Development) 2011 (SEPP SRD).

Under Section 5.25 of the EP&A Act, a proponent may request the Minister to modify the approval for State Significant Infrastructure. Such approval is required if the infrastructure as modified is not consistent with the existing approval issued under section 5.13 of the Act. After consultation with the DPHI, a Modification Report was prepared in 2023 to support a request by Hunter Water for the Minister to modify the approval to allow further changes to the approved project.

The Modification report was exhibited by the DPHI from 24 January 2024 to 20 February 2024. During the exhibition of the Modification EIS, 22 submissions were received from government agencies, stakeholders, and the community. A Submissions Report was prepared and made available in May 2024 via the Project website. The Modification received subsequent approval in August 2024.

1.3. Scope of the Plan

The scope of this FERMP is to describe how the emergency response to flooding will be managed during construction of the Project and the processes that will be followed for flood preparedness, materials management, weather monitoring, site management and flood incident management. This FERMP also contains procedures and responsibilities for flood response (preparation of site upon receipt of flood warning, evacuation of site personnel) during and recovery following a flood event.

This Plan has been prepared in alignment with the CEMP and addresses the provisions of the *Floodplain Risk Management Manual (DPHI, 2023)* (latest version of the Floodplain Risk Management Guidelines required under Condition of Approval (CoA) C16(b)). The plan also considers the existing flooding environment and construction activities. In the preparation and ongoing implementation of this Plan, SMART (Specific, Measurable, Achievable, Realistic and Timely) principles are also considered and applied.

This Plan is applicable to all activities during construction of the Project, including all areas where physical works will occur or areas that may be otherwise impacted by the construction works, and under the control of the John Holland Group (JH). All JH staff and sub-contractors are required to comply with the requirements of this Plan and related environmental management plans, over the full duration of the construction program. A copy of this FERMP will be kept on the premises for the duration of construction.

Operational flood impacts and operation measures do not fall within the scope of this FERMP and therefore are not included within the processes contained within this plan. Hunter Water Corporation (HWC) will consult with the Belmont Waste Water Treatment Works (WWTW) during the development of the Operational Management Plans to ensure procedures relating to flooding align with the operational WWTW.

1.4. Environment Management Systems Overview

The Environmental Management System (EMS) overview is described in the CEMP. The EMS also incorporates the Project-specific CEMP and sub-plans, strategies and procedures. The EMS provides overarching environmental management actions for implementation by Project personnel and contractors and will apply for the duration of construction.

The EMS consists of governance documentation, incorporating environmental management plans, policies, procedures and tools including:

- **CEMP.** Details the processes and procedures to be implemented during the Project to comply with applicable CoA, Revised Environmental Management Measures (REMMs), Environment Protection Licence (EPL), legislative obligations and contractual requirements. Compliance obligations relating to flooding are detailed in Section 3.2, with a cross reference to where they are met in this Plan.
- **Environmental Management Sub-plans.** These documents describe procedures and controls for specific environmental aspects requiring more rigorous management strategies.
- **Flood Warning and Evacuation Procedure** (Appendix A to this plan). This procedure outlines the response from notification of a flood warning, actions to be taken prior to and during a flood and then flood recovery.
- **Erosion and Sediment Control Plans (ESCPs).** A practical guide to provide progressive planning of site-specific erosion and sediment control measures including management of temporary stormwater drainage and locations of stockpiles. ESCPs will be developed by the Environmental Manager in accordance with the Erosion and Sediment Control Procedure in the CSWMP.
- **WHS Management Plan.** Details the processes and procedures to be implemented during the Project to comply with applicable work health and safety requirements.

1.4.1. FERMP Endorsement and Approval

The FERMP has been prepared by Scott Grunsell, an Environmental Consultant from Apical Environmental Services and has been reviewed by John Holland's suitably qualified and experienced Senior Hydrology and Drainage Engineer (Sarah Redfern) to satisfy NSW CoA C16 and the updated mitigation measures in relation to the management of flood events during construction of the Project.

This FERMP will be reviewed by the JH Environment Manager (or delegate), HWC Representatives and the independent Environmental Representative (ER) to confirm it is consistent with, and incorporates, all relevant elements of the CoA, prior to submission to the Planning Secretary for approval. Construction of the Project will not commence until the FERMP has been endorsed by the ER and approved by the Planning Secretary.

1.4.2. Relationship between this Plan and other Project documents

This Plan has the following interrelationships with other management plans and documents:

- Community Consultation Strategy which details procedures and processes for community notification, consultation and complaints management. It also outlines communication processes for adjacent developments to facilitate communication of cumulative impacts within the floodplain.
- The Construction Soil and Water Management Plan (CSWMP) addresses the erosion and sedimentation impacts associated with construction activities.
- Safety Management Plan, which addresses safety risk management including safety of construction workers in the event of flooding and emergency and incident management.
- Incident Response Plan is a Sub-plan to the Safety Management Plan which outlines the emergency incident response process, including in the event of a flood during construction.
- Sustainability Management Plan which sets out a framework covering energy management, workforce travel, resource use and procurement.

The CEMP provides a full list of plans, procedures and other documents that form the EMS.

1.5. Consultation for Preparation

Ongoing consultation with relevant stakeholders, including any unique local receivers (e.g. relevant councils, local businesses, and residents), may be undertaken for specific issues pertaining to the Project's response to flooding. Community feedback and complaints relating to flooding will be dealt with in accordance with the Community Communication Strategy and the Complaints Management System (see Section 7.5 of this Plan).

In accordance with A43(d), this Plan was endorsed by the Environmental Representative (ER) on 25 September 2024 prior to submission to the Planning Secretary for approval prior to the commencement of construction in accordance with CoA C12.

In accordance with CoA C11(f) and C16, this FERMP has been developed as part of the CEMP in consultation DPHI. The FERMP was provided to these stakeholders on 17 October 2024. All comments received were considered and the FERMP updated accordingly.

2. Purpose and Objectives

2.1. Purpose

The purpose of this FERMP is to describe how JH will manage potential impacts from flood related emergencies, and to describe the flood preparedness, management and response during construction of the Project. This Plan will also address procedures and responsibilities for flood response during and following a flood event.

2.2. Objectives

The key objective of the FERMP is to ensure that impacts to the local community and the built environment from flooding are minimised. To aid in achieving this objective all CoA, environmental mitigation measures and licence/permit requirements relevant to flooding are described, scheduled and assigned responsibility as outlined in:

- Environmental Assessment Documentation
- Infrastructure Approval CoA (SSI 8896)
- Sustainability Strategy
- All relevant legislation and other requirements described in Section 3.1 of this Plan.

JH will meet the performance outcomes relating to flooding from the Environmental Approval Documentation as required by NSW CoA C11(f) and C16.

2.3. Flood Risk Management

In accordance with the requirements of CoA C16(b), this FERMP has been developed in consideration of the provisions of the Floodplain Risk Management Manual (DPHI, 2023).

The Floodplain Risk Management Manual set out the provisions for the proactive management of flood related risk for relevant construction activities on work sites to ensure adequate safety considerations have been identified and implemented to minimise impacts to the project and environment.

The key principles of these guidelines include:

1. Establish sustainable governance arrangements.
2. Think and plan strategically.
3. Be consultative.
4. Make flood information available.
5. Understand flood behaviour and constraints.
6. Understand flood risk and how it may change.
7. Consider variability and uncertainty.
8. Maintain natural flood functions.
9. Manage flood risk effectively.
10. Continually improve the management of flood risk

3. Environment Requirements

In accordance with NSW CoA A21, references in the terms of this Plan to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in at the date of the Infrastructure Approval (SSI-8896).

3.1. Relevant Legislation and Guidelines

Table 3-1 lists the principal legislation, regulation, plans, policies, guidelines, and specifications that apply to flood management.

Table 3-1: Principal legislation and regulation relevant to flood management

Legislation	<ul style="list-style-type: none"> • <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) • <i>Environmental Planning and Assessment Regulation 2021</i> (EP&A regulation) • <i>Water Management Act 2000</i> (WM Act) and <i>Water Act 1912</i> (Water Act) • <i>Hunter Water Act 1991</i> (HW Act)
Plans and Policies	<ul style="list-style-type: none"> • Lower Hunter Water Security Plan (DPHI 2022) • Lake Macquarie City Flood Emergency Plan (LMCC, 2013) • NSW Aquifer Interference Policy (DPI 2012) • NSW Wetlands Policy (DECCW 2010c) • NSW Floodplain Development Manual and Flood Prone Land Policy (NSW Government 2005) • NSW Climate Change Policy Framework (OEH 2016) • Lake Macquarie Waterway Flooding and Tidal Inundation Policy version 4 (LMCC, 2020)
Guidelines and Specifications	<ul style="list-style-type: none"> • <i>Managing Urban Stormwater: Soils and Construction</i>. Landcom, (4th Edition) March 2004 (reprinted 2006) (the "Blue Book"). Volume 1 and Volume 2. • <i>Australian Groundwater Modelling Guidelines</i> (Barnett et al 2012) • <i>Guidelines for Controlled Activities on Waterfront Land</i> (NSW Department of Industry 2018) • <i>Australian Rainfall and Runoff</i> (Ball et al. 2019) • <i>Practical Consideration of Climate Change</i> (DECC 2007b) • <i>Floodplain Risk Management Guide: Incorporating Sea level rise benchmarks in flood risk assessments</i> (DECCW 2010d) • <i>NSW Water Quality and River Flow Objectives</i> (DECCW 2006) • <i>Floodplain Risk Management Manual</i> (DPHI, 2023). • <i>Lake Macquarie Coastal Management Program</i> (LMCC 2023) • <i>Environmental Management Plan Guideline: Guideline for Infrastructure Projects</i> (DPHI, April 2020).

3.2. Conditions of Approval – SSI-8896

The CoA relevant to this FERMP are listed in Table 3-2. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-2: Conditions of Approval (CoA) relevant to this FERMP

CoA No.	Condition Requirements	Document Reference
C10	<p>Management plans required under this approval must be prepared having regard to the relevant guidelines, including but not limited to the Environmental Management Plan Guideline: Guideline for Infrastructure Projects (DPHI, April 2020).</p> <p>Note:</p> <ul style="list-style-type: none"> • The Environmental Management Plan Guideline is available on the Planning Portal at: https://www.planningportal.nsw.gov.au/major-projects/assessment/post-approval 	Section 3.1
C11	<p>Prior to the commencement of construction, the Proponent must submit a Construction Environmental Management Plan (CEMP) to the to the Planning Secretary for approval. The CEMP must include, but not be limited to, the following:</p> <p>(f) Flood Emergency Response (see condition C16);</p>	This Plan

CoA No.	Condition Requirements	Document Reference
C16	The Flood Emergency Response Sub-Plan (FERMP) must address, but not be limited to, the following:	-
	a) be prepared by a suitably qualified and experienced person(s)	Section 1.4.1
	b) address the provisions of the Floodplain Risk Management Guidelines (EESG)	Section 2.3
	c) include details of:	-
	i. the flood emergency responses for both construction phases of the development;	Section 6.2 and Appendix A
	ii. predicted flood levels;	Appendix A, Section A2
	iii. flood warning time and flood notification;	Appendix A, Section A1
	iv. assembly points and evacuation routes;	Appendix A, Section A5
	v. evacuation and refuge protocols; and	Appendix A, Section A5
	vi. awareness training for employees and contractors, and users/visitors	Section 7.2
D8	The Proponent must carry out the construction of the development in accordance with the most recent version of the approved CEMP (including Sub-Plans).	This Plan
D23	Emergency Management The Proponent must prepare and implement awareness training for employees and contractors, including locations of the assembly points and evacuation routes, for the duration of construction	Section 7.2

3.3. Revised Environmental Management Measures

Relevant environmental management measures are listed in Table 3-3 below. This includes reference to required outcomes, the timing of when the commitment applies and cross reference to indicate where the requirement is addressed in this Plan or other Project management documents.

Table 3-3: Environmental management measures relevant to this FERMP

Impact	Ref	Commitment	Timing	Document Reference
Flooding	WR4	The soil and water management plan will include procedures to ensure that machinery, stockpiles, equipment, fuels and chemicals, and other facilities are not stored or left within areas subject to flooding.	Pre-Construction	Construction Soil and Water Management Plan
Flooding	WR5	An emergency response plan will be prepared to include a procedure for managing flooding due to natural events. This will include an emergency procedure for ensuring the health and safety of construction workers.	Pre-Construction	This FERMP Section 6.1

4. Existing Environment

This section summarises the existing flooding conditions within and adjacent to the Project, based on information contained in the Environmental Assessment Documentation. The key reference documents are:

- Environmental Impact Statement (EIS) - Chapter 7.2.2 - Hydrology and Flooding and associated assessments related to flooding.

4.1. History of Flooding

Lake Macquarie has experienced several flooding events during its recorded history. Significant flood events include Cooranbong 1927/1962/1977; Dora Creek 1977, 1989, 1990, 2015; Toronto/Blackalls/Edgeworth 1981; Cardiff/Barnsley/Glendale/Boolaroo 1981, 1990 and 2007 and the Lake 1949 and 2007 and 2015, as well as the entire City inclusive of the Lake waterway in 2007.

Parts of the low-lying suburbs of Swansea, Pelican, Marks Point and Belmont South are affected by flooding from Lake Macquarie waterway. Other smaller systems are also subject to minor localised flooding.

4.2. Catchment and Waterways

The Project is located within the Lake Macquarie Waterway, which is a saline tidal lake, with a permanently open entrance. The location of the Project is characterised by a coastal dune environment which, due to elevation and soil (sand) transmissivity lacks significant surface water features. Surface waterbodies and watercourses in close proximity to the Project area is shown in Figure 4.1 and consists of:

- Belmont Lagoon located 30 m to the north-west. This is a shallow coastal saltwater lagoon which connects to Lake Macquarie in Belmont Bay via Cold Tea Creek. The lagoon is adjacent to protected (Coastal SEPP) wetlands.
- The South Pacific Ocean located 80 m to the east. This area of coastline between Redhead Headland to the north and Swansea Channel to the south contains three beaches. From north to south these beaches are known as Redhead Beach, Nine Mile Beach (adjacent to the site) and Blacksmiths Beach. With the exception of the Belmont WWTW and the Belmont Golf Course to the south, Nine Mile Beach and its dune system are relatively undeveloped and therefore have minimal surface impact from human activities. Due to the transmissivity of the sandy soils, there is no significant standing water in the beach or dune environments close to the Project area.
- Belmont Bay located 1.2 km to the west. Belmont Bay forms part of Lake Macquarie which is a large (approx. 110 km²), relatively shallow (average depth approx. 8 m) coastal saltwater lake which drains to the Pacific Ocean through the Swansea Channel approximately 5 km to the south of the Project area.
- Sludge/effluent lagoons within the Belmont WWTW. A lined lagoon within the boundaries of the Belmont WWTW for the storage of sludge materials following wastewater processing. The WWTW also includes a number of aboveground concrete storage tanks such as clarifier tanks and aerobic digester tanks.
- Runoff from the west of the Belmont WWTW access road generally drains to Belmont Lagoon, while runoff from the east of the Belmont WWTW access road is directed to the lowest point at the Belmont WWTW at the base of the existing sand dunes along Nine Mile Beach where it infiltrates into the sandy soils.

4.3. Topography

Topographically the Project area is in a relatively low-lying flat area, with elevation ranging from 2 m to 5 m Australian Height Datum (AHD). The surface has been modified to form evaporation ponds which are now decommissioned, including excavation below surrounding ground level within the ponds and build-up of the pond embankments, which vary in height between approximately 1.5 m – 3.0 m above surrounding ground level. To the north, the Belmont WWTW lies on top of a low rise, ranging from 4 m to 8 m AHD, and to the east are undulating sand dunes.

4.4. Rainfall and Climate

Climate data was obtained from the Bureau of Meteorology (BoM) Newcastle Nobbys Signal Station weather station (site number 061055), located approximately 17 km north of the Project area. The annual average maximum and minimum temperatures experienced at Newcastle are 21.8 degrees and 14.3 degrees respectively. On average, January is the hottest month with an average maximum temperature of 25.6 degrees. July is the coldest month, with an average minimum temperature of 8.5 degrees. Most of the annual 1,121 mm of rainfall occurs between January and June.

4.5. Coastal Processes and Hazards

Coastal processes that influence the project location vary and relate to aspects such as coastal morphology, bathymetry, wave climate, water level fluctuation, sediment transport, changes in climatic conditions and sea level rise. The project area is subject to a moderate wave climate predominantly from the south to southeast with an average offshore wave height of around 1.6m. Wave modelling has been undertaken specific to the project area which ran three scenarios across varying water depths (i.e. 16m, 18m and 20m). These results show that:

- Under the same water level scenario, the highest wave height is observed at the deepest extraction point (at 20 m AHD).
- In some instances, the higher wave height does not always occur at higher water levels.
- Swell waves have overall higher component than wind waves. Wind waves are primarily dominant on lower return periods while swells are dominant on higher return periods.
- Wave periods generally increase with higher return periods and are not sensitive to water levels.
- The addition of sea level rise had a significant effect on the swell height.

As the project area is oriented to the southeast, this contributes to lower energy dissipation of deep-water waves as they travel to the nearshore zone contributing to potential wave run-up during a storm surge.

Potential influence of these processes fluctuates as they are driven by a number of factors including tidal variation and storm surge. Predominant conditions and climatic variations also contribute to sediment transport patterns experienced across the wider project area.

4.6. Summary of Existing Flood Behaviours

The Lake Macquarie Waterway Flood Study (WMAwater, 2012) indicates probable flood levels for Lake Macquarie of 1.23 Meters (m) AHD for a 1 in 20-year flood, and 1.5 m AHD for a 1 in 100 year flood. The Project is located outside of Council's mapped 1 in 100-year flood extent; however, portions of the site are within the Lake Macquarie LEP flood planning area (defined as 1 in 100 year flood level plus 0.5 m).



Figure 4-1: Key waterways, wetlands, and surface water sites

5. Environmental Aspects and Impacts

5.1. Construction Activities

Key aspects of the Project that could result in adverse flooding impacts include:

- Use of site compounds and stockpile areas in flood affected areas.
- Earthworks for the Project, including construction of fill embankments.
- Alterations to catchment drainage
- increase in the amount of hardstand which will affect hydraulic runoff.

Key constructability considerations that have been incorporated into the development of the detailed as follows:

- Optimisation of the cross-drainage structures and installation as early in the construction program as practical.
- Optimisation of the design aspects of the project
- Regular inspection and maintenance of drainage structures to be undertaken prior to heavy rainfall events to ensure that these structures will perform as designed during flood events.
- Follow up inspections undertaken as required after rainfall events to identify any need for maintenance.

5.2. Potential Flooding Impacts

Potential impacts from flooding depend on the nature, extent and magnitude of construction activities, the magnitude of the storm event and the existing environment (including topography, creek characteristics and level of saturation in the wider system). These impacts have the potential to affect flood resilience and may include:

- Increases in the rate of flow in the receiving drainage lines could result in scour and channel erosion.
- Partial or total blockage of transverse drainage by debris could result in floodwater surcharging onto roads or access points and /or adversely affecting private property.
- Surface water contamination if chemical storage areas are breached and hazardous chemicals migrate offsite.
- Restricted access to construction areas
- Safety risks associated with high flow velocities and/or deep water, constituting a hazard to personnel and equipment.
- Inundation and damage to construction plant and equipment
- Increased runoff and sedimentation, especially if erosion and sediment controls (ERSED) are damaged.
- Increase in flood impact of properties adjacent to the Project.
- Inundation of site access roads.

There is a potential for flooding to occur to neighbouring property during the construction phase, in particular earthworks and filling however, this will be managed via the Erosion and Sediment Control Plan (ESCP) (refer to the CSWMSP). Operational flood impacts and response will be managed in accordance with the Operational Flood Emergency Management Plan in accordance with CoA E23.

Works will be undertaken in accordance with the CSWMSP to minimise the potential for soil and erosion impacts.

Construction works such as road closures and traffic diversions may also have the potential to impact flood evacuation routes. Discussion of flood emergency response is provided in Section 6.

5.3. Stormwater Modelling for Response to Submissions

Stormwater modelling has been undertaken as part of the Response to Submissions Report to assess the potential stormwater impacts using the MUSICX model based on the Like Macquarie City Council (LMCC) parameters. Results indicate that:

- Both the northern infiltration basin and southern infiltration swale have been sufficiently designed to treat the stormwater quality to the water quality requirements used for the Approved Project.
- The Modification on-site infiltration infrastructure adequately treats the water quality requirements and meets all design criteria set by both LMCC and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

- All NSW Office of Environment and Heritage (OEH) requirements are met by utilising infiltration into the nearby sand soils and meeting LMCC water quality requirements before release from the site.
- The results indicate that the proposed larger pond and swale are expected to achieve a better stormwater pollution reduction outcome for all stormwater pollutant parameters compared to that identified for the Project from the EIS.

5.4. Increased Building Area Level

The additional infilling to raise the area underneath the building and infrastructure footprint by between 1.5 to 2.5 metres would not decrease the threat of coastal inundation from wave overtopping the foredunes in extreme coastal storm events (e.g. 1 in 100 year events) with future sea level of at least 0.4 metre (e.g. by 2050). The proposed infilling would restrict the overland flow paths for any overtopping seawater, such that slightly greater inundation depths could occur to the south of the Proposed Modification.

5.5. Cumulative impacts

The construction of the project within the vicinity of the Belmont WWTW include the potential of cumulative flooding impacts.

Should other construction projects commence in the vicinity of the Project, interface meetings will be undertaken as required with government authorities, the neighbouring Belmont WWTW operation and stakeholders as detailed in the CEMP and within the Community Communication Strategy (CCS).

6. Environmental Mitigation and Management Measures

A summary of the actions to be taken during a declared flooding event is provided in the sections below. Further details on the flood warning, evacuation and response planning and procedures to be undertaken by JH during the construction of the Project are presented in Appendix A.

6.1. Pre-flood Actions

The following actions will be undertaken as to prepare for flooding on site:

- A site-specific flood response plan (Appendix B) has been developed for all active work sites. The Site-specific flood response plan is specific to the works occurring, the surrounding environmental constraints and the flood risk. The site-specific flood response plan will include any temporary works and flood preparation and response measures specific to those works. Additional documents to assist flood planning and response is provided in Appendix C– Appendix D.
- Daily monitoring of weather forecasts and flood alerts, using the BoM (<http://www.bom.gov.au/australia/warnings/>). A “Flood Watch” is typically issued several days before rainfall events which may cause flooding at the site (Flooding Rain).
- Flood watch and flood warning notifications and water level trigger alerts shall be set-up on mobile phones of key personnel including the Construction Manager and Site Supervisor(s) using the WaterLive App. Information will be provided via this application using the real time monitoring unit within Lake Macquarie at Belmont (Station 211461 / BOM Gauge No.561070).
- Information on flood response measures and emergency response will be provided during the induction process.

Activities that may affect existing drainage systems during construction will be planned and carried out so that existing hydraulic capacity of these systems is maintained where practicable in line with the preparation checklist in Appendix C. These activities may include (but not be limited to):

- Culvert construction
- Earthworks
- Temporary stockpiles (i.e. import of aggregates and materials for construction or material excavated materials in proximity to waterways and drainage channels) will be limited in size where possible to allow the material to be moved within 48 hours to an area outside the expected flood extent when heavy rain is predicted. These areas will be defined in progressive ERSED plans.
- Prior to establishing any plant or equipment on site an assessment of its ability to be relocated prior to a flood event to be considered and where relocation is not feasible prepare appropriate mitigations (e.g. secure to prevent floating and creating a hazard, remove fuel to prevent contamination of waterways, etc)

Construction activities that may affect existing drainage systems or with a high risk of impact from flooding will be assessed through the Erosion and Sediment Control Planning process and CSWMP which will consider site specific controls and flood response measures as required. Take-off and landing to/from the Jack-up Barge (JUB) during instances of predicted or declared flooding events will be managed in consultation with the Lake Macquarie Airport due to the low flood tolerance of the airport (i.e. flooding occurs in a 5% AEP).

6.2. Flood Emergency Response

Flood response operations will begin on receipt of notification from the State Emergency Services (SES), BoM advice, or when other evidence leads to an expectation of flooding (such as rainfall forecast exceeding 100mm in 24 hours or where a cumulative total of more than 100mm of rain has fallen over a period of one week and further rainfall events are forecast). Rainfall totals of 80mm - 100mm or more is expected to generate a moderate flood level surrounding the project area and coincides with a 12% - 20% AEP rainfall event.

The key principles of emergency flood response, according to the NSW State Flood Plan (December 2021) and the Lake Macquarie Flood Risk Management Plan (LMCC, 2012) and LMCC Coastal Management Plan include the following:

- Protection and preservation of human life (including the lives of responders and the community) is the highest priority.
- Evacuation is the primary response strategy for people impacted by flooding.

In the event a flood warning is issued, it will be communicated to the workforce to stop what they are doing and follow the Project Flood Warning and Evacuation Procedure (Appendix A).

The BoM will issue Flood Warnings prior to flooding for the Lake Macquarie Waterway catchment through their website. BoM also issue Severe Thunderstorm Warnings and Severe Weather Warnings for weather which may contribute to flooding in the catchment. The SES will issue notification and information for the Lake Macquarie area once a flood is declared.

The State Emergency Services (SES) is the designated Agency for floods and is responsible for coordinating the evacuation and welfare of affected communities (SES Act 1989; EMPLAN, 2018). In response to a flood event, SES will operate 24 hours a day, 7 days a week “Operations Centre” to manage the Emergency Assistance telephone number (132 500) and co-ordinate their activities. The SES provides public information management strategies and provides information to the community relating to the potential impacts of flooding and what actions need to be undertaken. The SES issue Local Flood Bulletins, Evacuation Warnings, Evacuation Orders and All Clears for areas impacted by floods in the catchment and share these on the SES website. This website will also be monitored by JH following flood warnings.

Local radio stations and other media outlets also provide information updates and advice.

The Environmental Manager (or delegate) in conjunction with the Safety Manager, Construction Manager will regularly consult these resources to maintain awareness of any flood threats that may arise.

During a flood event, the following will be undertaken:

- Continue to monitor the BoM website / app for warnings, Australia Broadcasting Corporation (ABC) radio broadcasts, local emergency services social media pages, and local news outlets.
- Follow all advice and instructions given by emergency services and maintain open communication with the SES.
- Ensure all occupants on-site, including HWC and Belmont WWTW personnel are informed of the incident response procedures via the induction process (i.e. evacuation routes, assembly areas)
- Monitoring of water levels adjacent to Ocean Park Road (i.e. Belmont Lagoon) will also be undertaken via visual inspection as required to ensure the designated evacuation route remains safe and accessible.
- Implementation of the flood mitigation measures as detailed in Table 6-1.

6.3. Post-Flood Emergency Response

Following a flood event occurring at the Project, the initial response will be to determine whether or not it is safe to return to work. A safety walk through of the construction work area will be conducted by the Construction Manager and Supervisors (or delegates), in conjunction with the Environment Manager and Safety Manager (or delegates). The team will assess the following:

- Likelihood of flood damage to access roads and construction works.
- Determine whether flood waters have receded.
- Power boxes and electrical equipment that have been inundated or water affected. The power is to remain off until assessed by the electrician.

Once it is deemed safe to return to work, the following will be undertaken:

- Any equipment, materials or debris moved by the flood water will be returned to correct area or disposed of in accordance with the Construction Waste Management Plan (CWMP) if damaged beyond repair/use.
- Check stockpiles for erosion or losses. Restore erosion and sediment control devices as per the CSWMP.
- Temporary onsite structures or partly constructed structures should be checked for erosion or other water damage prior to entering them or continuing work.
- Determine whether any water held in excavations can be pumped to sediment basins/holding tanks for treatment prior to discharge. Undertake water testing/sampling in line with the CSWMP and Environment Protection Licence (EPL), if required.
- Make good any damage to partially constructed works or temporary works caused by the flood event. This includes clearing away of debris, sedimentation and blockage of uncompleted and temporary flood mitigation structures, as well as repairs required due to failures from overtopping of any temporary or partially constructed embankments and damage to partially constructed scour protection.
- Monitoring will also be undertaken following a flood event for erosion and scour resulting from the project to water bodies, watercourses and other areas.

Further details of flood related emergency response and planning is provided in Appendix A – Appendix C.

6.4. Mitigation Measures

Performance outcomes, commitments and management measures were identified in the EIS, Submissions Report, the CoAs, and REMMs. All specific practicable measures and requirements to avoid and/or minimise flood impacts during construction are outlined in Table 6-1.

Table 6-1: Flood Management and Mitigation Measures

ID	Mitigation Measure	When to Implement	Responsibility	Reference / Source	Evidence of Implementation
General					
FL1	An emergency response plan will be prepared to include a procedure for managing flooding due to natural events. This will include an emergency procedure for ensuring the health and safety of construction workers.	Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	REMM	FERMP
FL2	Design infrastructure and landscaping to minimise the likelihood and extent of wave overtopping. Minimise the impact on the plant should wave overtopping occur by maintaining appropriate drainage and designing the plant to withstand an overtopping event.	Detailed Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	REMM	Regular site inspections, CEMP
FL3	Appropriately design site drainage for the site	Detailed Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	REMM	Pre-Rainfall Inspection, CSWMP
FL4	The revised cut and fill areas (i.e. areas underneath the building and infrastructure footprint) would be raised to 1.5 – 2 metres to provide a finished surface level of 3.8 - 4.3 mAHD to adapt to future climate change driven sea level rise and to cater for the 1 in 100-year flood event.	Detailed Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	EIS MOD1 - Appendix A, Section A.2.1	Construction Methodology, CEMP
FL5	During construction, stormwater from hardstand areas would be directed to ERSED controls including the designed swale drain	Detailed Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	EIS MOD1 - Appendix A, Section A.1.5	Construction Methodology, CEMP
FL6	As the Project area is partially within the Lake Macquarie LEP flood planning area, Council's flood planning level (2.36 mAHD) has been adopted as the minimum floor level. As such, impacts to the Project area as a result of flooding are not anticipated	Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	EIS AR&RTS Section 2.6.9.2 – Submission 11, item 5	Construction Methodology, CEMP
FL7	All electrical installations will be designed in accordance with Australian Standard AS 3000 Australian/New Zealand Wiring Rules.	Design, Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	Response to Submissions 4.2.3	As built design drawings

ID	Mitigation Measure	When to Implement	Responsibility	Reference / Source	Evidence of Implementation
Monitoring and Pre-Flood Measures					
FL8	Locate ASS treatment area within the Project area, which is already disturbed and is outside of flood liable land	Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	REMM	Pre-Rainfall Inspection, ASSMP
FL9	Safety procedures would be in place to avoid impacts on workers and measures would be implemented to ensure (where possible) that no equipment or materials are stored or left within areas mapped as being within the flood planning area. This includes ensuring stockpiles are located in order to minimise the potential alteration of flood levels, flow paths and velocities during construction.	Prior to construction, and during construction	Construction Manager Safety Advisor / Superintendent	EIS Section 7.2.3.1	WHSMP, CEMP
FL10	<p>In the event of a flood warning, or rainfall forecast exceeding 100mm in 24hrs, take all measures necessary to protect the water quality of the waterways and prevent potential pollution incidents during flood events including:</p> <ul style="list-style-type: none"> • Prepare to / cease all work in the vicinity of flood-prone areas within the 1% AEP. • protecting disturbed ground from erosion • collect all loose materials and wastes. • relocate waste containers, chemicals and dangerous goods above flood prone areas. • Silt curtains or other in-creek environmental controls are to be secured or removed. 	Prior to construction, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor	Blue Book (Landcom, 2004)	Pre-Rainfall Inspection SAPs, CEMP
FL11	Following flooding event, conduct safe walk through to determine whether it is safe to return to work.	Prior to construction recommencement, and during construction	Construction Manager Superintendent / Foreman / Site Supervisor / Safety Advisor	Best practice	Safety Inspection
Notification and Evacuation					
FL12	A Flood Warning, Evacuation and Response Procedure (Appendix A) has been developed and will be implemented for the Project.	Prior to construction, and during construction	Construction Manager Safety	CoA C16	Project Flood Warning and

ID	Mitigation Measure	When to Implement	Responsibility	Reference / Source	Evidence of Implementation
			Advisor / Superintendent		Evacuation Procedure
Assessment of damage and remediation after flood					
FL13	Review and restore erosion and sediment control devices as per the CSWMSP.	Prior to construction recommencement, and during construction	Construction Manager / Foreman / Site Supervisor / Environmental Site Representative	Best practice	Post-Rainfall Inspection
FL14	Any equipment, materials or debris moved by the flood water will be returned to correct area, or disposed of in accordance with the CWMP if damaged beyond repair/use	Prior to construction recommencement, and during construction	Construction Manager / Foreman / Site Supervisor /	Best practice	CWMP Waste dockets
FL15	Dewater site water in accordance with the Construction Groundwater Management Plan (CGMP)	Prior to construction recommencement, and during construction	Construction Manager / Foreman / Site Supervisor / Environmental Manager	Best practice	Dewatering Records

Note: Identifying references in Table 6.1 are for the purpose of identifying the specific flood mitigation measures and are identification numbers only.

7. Compliance Management

7.1. Roles and Responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6. Table 7-1. provides a summary of key roles and responsibilities relating to this FERMP.

Table 7-1: Roles and responsibilities specific to this Plan

Role	Responsibilities
Construction Manager	Providing training to all Project personnel on flooding and emergency response procedures, as well as ensuring the implementation of flood control measures outlined in the plans.
Foreperson	Implementing flood control measures during construction, ensuring minimal obstructions in flood-prone areas, removing construction infrastructure and equipment during flood events, establishing stockpiles in suitable locations, and maintaining a register of materials stored in flood-prone areas.
WHS Manager	Communicating and reviewing the impact of works on flood evacuation routes during construction.
CPESC	Reviewing and assisting the design of drain crossings and temporary diversions in accordance with relevant standards and developing ESCPs accordingly.

7.2. Training

All Project personnel, including contractors working onsite, will undergo site induction training relating to flooding management issues. The induction training will address elements related to flooding management, including:

- Applicable and relevant legislative requirements
- The existence of this plan
- Emergency response obligations in the event of flood or other extreme weather events

Further details regarding staff induction and training are outlined in the CEMP.

7.3. Monitoring and Inspection

Monitoring, inspections, and reporting requirements are outlined in Table 7-2

Table 7-2: Monitoring, Inspection and Reporting Requirements

Type	Frequency	Standards	Location	Reporting	Responsibility
Inspections					
Construction site layout inspection	Periodic inspections during site establishment Pre and post flood event as specified in monitoring listed below	Site layout inspections for flood management controls, including: Adequacy and effectiveness of erosion and sediment control measures Presence and condition of infrastructure Inspection of drainage systems, culverts, and waterways for any signs of blockages or obstructions Assessment of the location and condition of stockpiles and materials stored in flood-prone areas	Site-wide	Pre-construction inspection report	Foreperson Environment Manager (or delegate)

Type	Frequency	Standards	Location	Reporting	Responsibility
		<p>Evaluation of the site proximity to watercourses, creeks, or other water bodies that may pose flood risks</p> <p>Inspection of temporary works, such as access tracks and hardstand areas, for their resilience to flooding</p> <p>Verification of proper storage and management of hazardous materials above designated flood levels</p> <p>Assessment of the site susceptibility to scour or erosion during flood events</p> <p>Evaluation of any changes or impacts to the existing hydraulic capacity of drainage systems.</p>			
Post rain / flood event scour inspection	<p>Post discharge event</p> <p>Post flood event</p>	<p>Inspection to regularly assess scour conditions including at watercourses and adjacent sites.</p> <p>Conduct periodic inspections after significant rainfall events or flood events to monitor any changes in scour patterns and assess the performance of riprap protection measures.</p> <p>Identification of erosion and sediment controls which require maintenance/repair in accordance with the CSWMP.</p> <p>Document and report any observed scouring and erosion and take appropriate actions to address identified issues.</p> <p>Review SES website for All Clears for flood affected areas.</p>	Project to riverbanks, watercourses, floodplain areas and other areas adjacent to ancillary sites and temporary and permanent access tracks	Post rainfall environmental inspection	Foreperson Environment Manager (or delegate)
Weekly inspections	Once a week during environmental inspections	Weekly inspections which, as part of the weekly environmental inspection further outlined in the CEMP, will include inspection of the environmental controls and mitigation measures outlined in Section 6 of this Plan. Action lists are to be produced to address any maintenance issues or additional controls required, and a register of all actions raised and detailing the close out of actions is to be maintained.	Site-wide	Weekly environmental inspection	Environment Manager (or delegate)
Monitoring					
Meteorological monitoring	Daily	<p>Daily check of:</p> <p>Daily BoM Forecast including 3-day look ahead. For Belmont BoM Latest Weather Observations for nearest weather station (Lake Macquarie - Cooranbong – Station ID 061412)</p> <p>http://www.bom.gov.au/nsw/warnings/</p>	Site Wide Lake Macquarie - Cooranbong Station	Pre-starts - Weather notifications	Environment Manager (or delegate) Foreperson
Flood Warning Services	Daily	<p>Daily check of:</p> <p>NSW SES HazardWatch - New South Wales Flood Warnings</p>	Site Wide	Pre-starts - High-risk	Foreperson

Type	Frequency	Standards	Location	Reporting	Responsibility
				weather notifications	Emergency Response Team
Water levels	During and post flood warnings	check of: BoM automated river heights telemetry systems Belmont Station 211461 NSW Water Level Data Collection Program - (https://mhl.nsw.gov.au/Data-Level)	Belmont	Pre-starts - High-risk weather notifications	Foreperson Emergency Response Team

Site inspections will be recorded (along with actions and issues observed) and actioned appropriately within agreed timeframes. These inspections will be recorded as part of the Weekly Environmental Inspection Checklist and will also be used as a record of activities and observations related to flooding. Additional requirements and responsibilities in relation to inspections are documented in the CEMP.

Weekly and other routine inspections by HWC and the ER will also occur throughout construction. Detail on the nature and frequency of these inspections are documented in the CEMP.

All environmental monitoring equipment (if required) will be maintained and calibrated according to the manufacturer's specifications, and appropriate records will be kept. Non-conformance reporting protocols are outlined in Section 7.5 of this Plan and the CEMP.

7.4. Auditing

Audits (both internal and independent) will be undertaken to assess the effectiveness of environmental controls, compliance with this Plan, CoA and other relevant approvals, licenses, and guidelines. These audits will be undertaken at planned intervals to provide information on whether the Project:

- Is meeting its compliance obligations.
- Conforms to this Plan.
- Determines if this Plan is effectively implemented and maintained.

The approach to internal and independent audits, including audit requirements and the auditing schedule, are detailed the CEMP.

7.5. Reporting

Reporting requirements relevant to the management of flooding are identified in Table 7-3. A full list of reporting requirements and responsibilities for reporting are documented in the CEMP.

Accurate records will be maintained substantiating all construction activities associated with the Project or relevant to the conditions of approval, including measures taken to implement this FERMP. Records will be made available to the relevant stakeholders upon request, within the timeframe nominated in the request.

Table 7-3: Reporting requirements specific to flood management

Item	Frequency	Standards	External Reporting	Responsibility
Incident and non-compliance reports	At each occurrence	Reporting of incidents and non-compliances in accordance with CoA, EPL 1771 (and associated PIRMP), Environmental Incident Classification and Reporting Procedure.	Appropriate authority dependant on nature of the incident (e.g. Environment Protection Authority (EPA), DPHI)	Environment Manager (or delegate)
Complaint register	Daily (ER, EPA) as received DPHI as requested	Reporting of complaints, in accordance with the CoA, EPL and OCS, through the complaints register, to the ER and EPA for any complaints received (on the day they are received). Communication, notification and complaints handling requirements regarding flooding matters will be managed through the Complaints Management System and the OCS.	ER EPA (in accordance with EPL conditions) DPHI (as requested by the Secretary)	Environment Manager (or delegate)
Weekly environmental inspection	Weekly	Inspection of the environmental controls and implementation including the measures outlined in Table 6-1.	HWC ER	Environment Manager (or delegate)
Pre-Flooding Rain inspection	At each occurrence	Record of inspection of flood prone areas in response to BoM flood warning with focus on the implementation of pre-flood measures as outlined in Table 6-1.	HWC ER	Environment Manager (or delegate)
Post-flood inspection	At each occurrence	Record of inspection of flood prone areas following flooding event with focus on the implementation of the assessment of damage and remediation after flood measures as outlined in Table 6-1.	HWC ER	Environment Manager (or delegate)

8. Review and Improvement

8.1. Continuous Improvement

Continuous improvement of this Plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives, and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

The Environment Manager (or delegate) is responsible for ensuring stage-specific environmental risks are identified and included in the Project risk register and appropriate mitigation measures implemented throughout the construction (including those contained within this FERMP), as part of the continuous improvement process. The process for ongoing risk identification and management during construction is outlined in the CEMP.

8.2. FERMP Updates and Amendments

The processes described in the CEMP may result in the need to update or revise this Plan. This will occur only as needed throughout the duration of construction.

Only the Environment Manager (or delegate) has the authority to approve changes to the requirements of this Plan. Minor amendments to the Plan may be approved by the ER in accordance with the CEMP. Amendments not considered minor by the ER need to be approved by the Planning Secretary.

A copy of the updated Plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

Appendix A – Flood Warning, Evacuation and Response Procedure

A1 - Flood Warning Strategy

Weather conditions in the vicinity of the site will be monitored with sufficient warning time of impending flood producing rain (usually 2-4 days). Weather warnings will need to be disseminated to all construction personnel on site so they can implement precautionary measures and relocate any mobile equipment stored on site outside of the waterways wherever possible.

The following flood warning approach will be implemented:

WaterNSW provide a freely downloadable app 'WaterLive' which provides access to water level data from a mobile phone. Users (i.e. Environment Manager, Construction Manager and Supervisors) can set up 'push notifications' sent straight to their home screen for updates on timely water level information. The push notifications are provided within 30 minutes of the data being recorded at the gauge and may be set up to notify the user of any specified trigger levels.

The WaterLive app is available at <https://www.waternsw.com.au/waterinsights/waterlive>.

1. The Lake Macquarie Waterway Catchment is included in the BOM Flood Watch / Flood Warning product as Flood Watch Area No. 64. This product is issued when flooding is expected in NSW. Lead time for this warning product is usually 2-4 days (or sometime longer), with less accuracy the further away from the predicted rainfall event. Early warning messages with flood predictions for the region are disseminated directly to the NSW SES, other State and Local Government Agencies and are published at <http://www.bom.gov.au/australia/warnings/>.
2. 7-Day rainfall forecasts and significant weather events are mapped by the BoM MetEye Product which can be accessed here: http://www.bom.gov.au/australia/meteye/?loc=NSW_FA001

This site will be checked on a daily basis by key construction personnel (i.e. Environment Manager, Construction Manager and Supervisors). BoM also provide a rainfall radar for the Lake Macquarie area referred to as the 'Newcastle Radar Loop'. This site provides a highly accurate imagery of the storm cloud that is developing over the Lake Macquarie catchment at any point in time.

A2 - Flood Classifications, Predicted Flood Levels and Flood Triggers

The severity of flooding may be described as minor, moderate, or major according to the effects caused in the local area or in nearby downstream areas. Terms used in Flood Warnings are based on the following definitions. Table A-1 shows the flood classifications for selected water height gauging stations. The gauge was installed under the Floodplain Management Program for Lake Macquarie, to monitor water levels in relation to flooding.

- **Moderate Flooding**: In addition to the above, the area of inundation is more substantial. Main traffic routes may be affected. Some buildings may be affected above the floor level. Evacuation of flood affected areas may be required. In rural areas removal of stock is required.
- **Major Flooding**: In addition to the above, extensive rural areas and/or urban areas are inundated. Many buildings may be affected above the floor level. Properties and towns are likely to be isolated and major rail and traffic routes closed. Evacuation of flood affected areas may be required. Utility services may be impacted.

Table A-1: Construction Phase Predicted Flood Levels and Associated Flood Triggers

STATION	STATION/ BOM GAUGE NO.	GET READY	MODERATE FLOOD*	MAJOR FLOOD**
Lake Macquarie @ Belmont	211461 / 561070	1.1mAHD	1.23mAHD	1.5 mAHD

* This classification indicates probable flood levels for Lake Macquarie for a 1 in 20-year flood (WMAwater, 2012).

**This flood classification refers to a Major Flood Level of RL. 1.5 mAHD as having a 1% AEP or, 1 in 100-year flood probability at this location.

The Project is located outside of Council's mapped 1 in 100-year flood extent; however, portions of the site are within the Lake Macquarie Local Environmental Plan (LEP) flood planning area (defined as 1 in 100-year flood level plus 0.5 m). The "Get Ready Level" was selected using available recorded water level data from the Lake Macquarie Waterway (at Belmont) gauging station (ID: 211461).

The "Get Ready Level" is below the designed cut and fill areas (i.e. the areas underneath the building and infrastructure footprint). This footprint would be raised to 1.5 – 2 metres to provide a finished surface level of 3.8 - 4.3 m AHD to adapt to future climate change driven sea level rise and to cater for a 1 in 100-year flood event.

A3 - Rainfall Monitoring and Rainfall Trigger Levels

Benchmark rainfall depths for the region have been extracted from the BOM website with reference to the approximate location of the Belmont gauging station (Latitude 33.04°S, Longitude 151.65°E).

Rainfall depths associated with critical storm durations (i.e. the storm duration that produces the worst-case flooding) are summarised in Table A-2. Information presented in Table A-2 indicates that forecast rainfall totals of 51.3 millimetres (mm) or more over a minimum of 6 hours duration is expected to generate minor localised flooding within the Lake Macquarie Waterway catchment and general project area. Moderate flooding will be expected should the project record 6-hour rainfall totals of 84.6 mm or more.

Table A-2: IFD Design Rainfall Depths (mm) for the Project Area

Flood Classification	MINOR FLOOD		MODERATE FLOOD				MAJOR FLOOD
Event ARI	1 IN 1	1 IN 2	1 IN 5	1 IN 10	1 IN 20	1 IN 50	1 IN 100
AEP	63.2%	50%	20%	10%	5%	2%	1%
STORM DURATION	TOTAL RAINFALL (MM)						
6- Hour	51.3	59.0	84.6	104	123	152	175
12-Hour	67.1	76.9	110	136	163	201	233
24-Hour (1-Day)	87.3	100	144	178	215	267	310
48-Hour (2-Day)	110	127	184	228	277	343	397
72-Hour (3-Day)	124	142	206	257	312	384	442

Source: <http://www.bom.gov.au/water/designRainfalls/>

The following two links will be accessed for accurate rainfall data and forecasts (up to seven days) to inform flood classifications.

- The latest rainfall observations for these sites are accessed from the following website: http://www.bom.gov.au/nsw/flood/rain_river.shtml
- 7-Day rainfall forecasts and significant weather events are mapped by the BoM MetEye Product which can be accessed here: http://www.bom.gov.au/australia/meteye/?loc=NSW_FA001.

A4 - Flood Warning Time

Flood warning times are evaluated as the lag time between a peak rainfall intensity and a peak flood level occurrence for gauged catchments. Flood warning times for local waterways surrounding the project area are likely to be over a period of days as the upstream catchment areas are relatively large and the catchment response is slow.

In addition, BoM Flood Watches, Flood Warnings and Severe Weather Warnings are generally issued 2-4 days in advance which would allow precautionary action to be taken on site prior to a flood event. Therefore, the emphasis should be on implementing precautionary actions based on BOMs Warnings rather than responding during the actual events. Rainfall monitoring will also occur which will inform site personnel in relation to the trigger values in Table A-3.

A5 - Project Personnel Flood Emergency Evacuation

The LMCC Local Government Area (LGA) has developed the Lake Macquarie City Flood Emergency Plan (LMCC, 2013) for the region. This plan identifies flood risks across the catchment and presents preparedness, response and recovery measures for all levels of flooding. The Plan identifies evacuation routes and evacuation shelters based on the determined flood levels. The Project Construction Team have utilised these plans to develop response measures and evacuation routes for Project personnel and will comply with the directions of the local emergency services should a regional flood event occur. The local evacuation triggers, routes and locations relevant to the Project are summarised in Table A-3.

Table A-3: Regional Flood Evacuation Information

LOCATION	FLOOD WARNING TIME	EVACUATION TRIGGER	INDICATIVE EVACUATION ROUTE (from site)	INDICATIVE EVACUATION LOCATION*
Belmont Desalination Project Area and Belmont WWTW	Several Days	Expectation of Moderate or Major Regional Flooding	Ocean Park Road	a. Belmont 16' Sailing Club, The Parade, Belmont b. Belmont Golf Club, Pacific Highway, Marks Point c. Gunyah Hotel, Pacific Highway, Belmont

Nominated warden is the Site Superintendent.

Evacuation route and timing of evacuation from the Project area is dependent on the flood event and the movement of floodwaters across the Lake Macquarie Waterway catchment area. In lieu of the above, Project personnel will adhere to the evacuation advice provided and road closures issued by the NSW SES, Local Emergency Management services, Ambulance or Police. Live Traffic NSW (Live Traffic NSW | Incident Details) website and physical road closures will inform suitable and available evacuation routes for personnel to be evacuated from site in a safe and timely manner.

Appendix B - Flood Preparation Management Plan Template: Belmont Desalination Plant - Site Specific Flood Preparation Plan

Site Name:

Area/Chainage:

Drafted by (Area Supervisor):

Date:

Approved by (Area Engineer):

Instructions: This Site-Specific Flood Preparation Plan is to be prepared prior to the mobilisation to site and triggered following a Flood Warning or Flood Watch alert issued by BOM.

Site Layout Diagram (Insert) NOTE: This Site Layout Diagram must include key site features, temporary works, access routes, onsite flood refuge (elevated) ground, drainage features, etc		
Flood Evacuation Route		
<u>Key Personnel / Response Crew (Insert)</u>	<u>Name:</u>	<u>Phone Numbers:</u>

Appendix C - Site Preparation Checklist

Task	Completed
Undertake actions in consultation with the Project Manager – environmental, safety risk assessment / WMS?	
Check perimeter of all building structures for any loose items that need to be secured.	
Isolate dams/water catchments where possible – battering/windrowing	
Secure/remove pumping station where possible – high ground designated area	
Empty and secure effluent tanks to ensure no leakages?	
Move plant/machinery or other equipment to designated 'high ground' areas and secure. Photograph for records.	
Stored fire extinguishers inside buildings?	
Empty rubbish bins and store inside storage/shipping containers?	
Secure all windows on huts on sites?	
Close all air conditioner vents and tie down condensers?	
Empty fridges of all perishable goods?	
Close all internal doors?	
Clear and tidy all office desks?	
Cover all records, drawings and documents etc. in plastic (watertight)?	
Turn off and cover (or remove from site) all computers and hardware?	
Monitor phone and fax until site evacuation?	
Close and lock all external doors?	
Turn off all electrical equipment?	
Secure or store all loose items in office areas and laydown areas?	
Secure gas cylinders, oil and fuel drums?	
Raise materials and equipment that are vulnerable to water damage from the floor?	
Isolate, secure and store all fuel dispensing equipment?	
Bundle and secure all loose debris?	
Secure or remove signs and star pickets?	
Check all ties on buildings and objects?	
Check of high ground that is considered appropriate for holding machinery/material/hazardous substances/chemicals & other equipment in the event of flooding on the worksite – identified on site prior to commencement of works (environmental risk assessment)?	
Remove temporary traffic control devices where possible e.g. traffic cones?	
Ensure clear drainage paths on sites – to accommodate heavy rainfall?	
Monitor and maintain ESC devices?	
Establish stable access/egress points – gravel/rock?	
Separation of dirty and clean water catchments where possible?	
Cover road areas with gravel & seal wherever possible?	
Tasking – team inspections to designated areas for inspection of ESC devices/batters/verges – includes photographs of same – recorded data?	
Site Specific Actions / Measures (Insert) – Incl. Temporary Works Response Measures	
1.	
2.	
3.	

Appendix D - Post Severe Weather / Flood Survey

Name: _____ Date: _____
Position: _____ Site: _____

Instruction: Please complete the following questions and return to your Supervisor, Area Manager or Project Manager. The answers (and any feedback provided) will assist in the review and improvement of the Belmont Desalination FERMP.

Note: Please indicate N/A if a question does not relate to you.

1. Had you previously read and understood the Flood Emergency Management Plan or Site-Specific Flood Preparation Plan? (Y / N)
2. Did you highlight any questions about the plan to your supervisor prior to the severe weather or flood event? (Y / N)
3. What was the outcome of your questions?

4. Were you given updates on the status of the severe weather / flood event before and during the event? (Y / N)
5. If so, by whom?

6. Were you given adequate time to carry out your duties in preparation for the severe weather / flood event?

7. How did sub-Contractors cooperate with Contractor's instructions?

8. Were you given adequate time to take care of your family and home prior to the severe weather / flood event (if applicable)?

9. How effective was the communication in relation to severe weather or flood management / evacuation management process?

10. Did procedures provide minimal disruption prior to and during the severe weather / flood event?

11. What are your suggestions on improving the Flood Emergency Management Plan, the Site-Specific Flood Preparation Plan and associated procedures?

12. What processes or innovations do you consider may be appropriate to assist in making this plan more effective and efficient?

13. Were you a member of the Response Crew established for the site?

14. Any other suggestions or comments?
