Hunter Water Corporation

Belmont Drought Response Desalination Plant Submissions and Amendment Report

August 2020

Executive summary

Introduction

Hunter Water Corporation (Hunter Water) is seeking approval to construct a drought response desalination plant (the Project), should it be required in response to a severe drought, adjacent to the Belmont Wastewater Treatment Works (WWTW) in Belmont South, a suburb of Lake Macquarie Local Government Area (LGA) of New South Wales (NSW).

Like much of NSW, the Lower Hunter region continues to experience ongoing drought conditions. In February 2020, storages reached a 40 year low of 52.5 per cent. As at June 2020, storages were around 68 per cent, well below typical levels for this time of year. In response, Hunter Water is rolling out a program of drought response measures outlined in the 2014 Lower Hunter Water Plan (LHWP), including the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives, as well as operational measures such as the operation of the Tomago Sandbeds and inter-regional transfers with the Central Coast. The 2014 LHWP identified the implementation of emergency desalination as a last resort in response to a severe drought, and would only be implemented if water storage levels reached a critical point and all other measures have been implemented. The NSW Government, through the 2014 LHWP, has committed to desalination as a climate independent emergency measure to secure water supplies for the region.

Hunter Water previously prepared an environmental impact statement (EIS) to assess the potential impacts of the Project, in accordance with the Secretary's Environmental Assessment Requirements (SEARs).

The EIS was exhibited by Department of Planning Industry and Environment (DPIE) for a period of 28 days, from 21 November to 19 December 2019. A total of 19 submissions were received for the Project.

Approval for the Project is being sought under Division 5.2 (State Significant Infrastructure) (SSI) of the *Environmental Planning and Assessment Act* 1979 (EP&A Act 1979). Hunter Water is seeking a 10 year approval term for the EIS, during which time further Project stages (including detailed design) will be instigated, if required, based on water storage levels.

Strategic context

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the Lower Hunter Water Security Plan (LHWSP). The LHWSP seeks to determine the preferred portfolio of supply and demand side options to ensure a sustainable and resilient supply for the region, over the long term as well as during drought. As with the 2014 LHWP, the major revision is a whole of government approach, and Hunter Water are working closely with the DPIE – Water, Central Coast Council, the Lower Hunter community and other stakeholders in developing the new Plan.

The LHWSP review has shown that in the event of a rare and unprecedented drought, resulting in storages approaching empty, there is a predicted shortfall between the network's existing supply capacity and the estimated severely restricted demand (defined as 125 ML/d). This shortfall is predicted to occur following the implementation of all the measures in the 2014 LHWP including the 15 ML/d Belmont Drought Response Desalination Plant as described in the EIS.

In light of the LHWSP development and in response to the ongoing drought, Hunter Water investigated a range of options to reduce the predicted shortfall in water supply, including increased access to groundwater sources (beyond current license limits), additional recycling schemes and increased desalination capacity.

This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/d would provide the best balance of meeting the community's needs should a severe drought occur, while still providing value for money. Furthermore, the proposed amendment would not compromise Hunter Water's ability to deliver a desalination scheme in the timeframe required in response to a severe drought.

In addition to the proposed increase in plant capacity, further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability. Further, direct ocean intake systems have been used at all of the seawater desalination plants constructed in Australia in the last two decades proving their suitability.

Despite the Project amendments, the objectives remains the same: provide a rainfall independent water source in the event of an extreme drought, and slow the depletion of existing water storages in the event of an extreme drought.

There is no change to the proposed approach of linking Project investment with trigger points for each stage of work to defer expenditure until as late as possible, and allow early work to be put on hold should storages recover. However, Hunter Water proposes to amend the trigger for construction to commence at 45 per cent total water storage level. The construction trigger has been revised as a result of the Project development following the EIS exhibition, with more information becoming available on lead times for key components. These triggers will continue to be reviewed in order to defer construction to as late as possible and increase the chance of storages recovering from rain, whilst ensuring adequate lead times are provided for construction.

Key features of the amended Project

The amended Project for the construction and operation of a drought response desalination plant, designed to produce a nominal capacity of up to 30 ML/d of potable water, includes the following key components:

- **Direct ocean intake** – To ensure the reliable provision of sufficient quantities of raw feed water for the water treatment process plant, a direct ocean intake is proposed as part of the amended Project, including an on-shore sea water pump station, intake pipeline and off-shore intake structure.
- **Water treatment process plant** – The water treatment process plant would not significantly change from that described in the EIS. The inclusion of permanent buildings to house equipment rather than the installation of containerised equipment is the primary change. The buildings would be placed above ground level and be located to allow incremental installation, if required. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater) would comprise a mix of buried and overhead methods.

- **Brine disposal system** – The desalination process would produce up to 56 ML/d of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to a brine pump station at the Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – Power requirements of the amended water treatment process plant would require connection to Ausgrid's 33 kV line to the north-west of the water treatment process plant site, with new private power line connecting to a substation within the plant site.
- **Ancillary facilities** – including a tank farm, equipment housing buildings, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, parking areas, and fencing, signage and lighting.

The desalination plant would be connected to Hunter Water's potable water network via a potable water pipeline proposed to be constructed to augment the existing water network. The pipeline does not form part of the Project and would be part of a separate design and approvals process.

The estimated Capital Investment Value (CIV) for the Project is approximately $201 million. A signed report from a qualified quantity surveyor has been prepared for the Project and is commercial in confidence. This report has been provided separately to DPIE.

The Independent Pricing and Regulatory Tribunal (IPART) determines Hunter Water's revenues and prices during periodic price reviews, including setting allowances for efficient capital and operating expenditure. Hunter Water's capital and operating expenditure is self-funded (financed through borrowings and retained earnings) with expenditures recovered via customer prices. The quantum of any impact to customer prices would be determined by IPART if the Project is required to proceed.

IPART recently finalised a determination taking effect from 1 July 2020. Hunter Water did not request IPART include any capital or operating cost allowance for the Project in the current regulatory period. Any capital expenditure in the period 2020 to 2024 would be added to Hunter Water's regulatory asset base from 1 July 2024.

Purpose of this Report

In accordance with the requirements for SSI under Part 5.2 and Section 5.17 of the EP&A Act 1979 and clauses 55 and 85A of the Environmental Planning and Assessment Regulation 2000, Hunter Water is required to provide a response to the issues raised in the submissions received for the Project and assess proposed changes to the Project.

The Submissions and Amendment Report considers the issues raised in the community, agency and stakeholder submissions received during the public exhibition of the EIS in late 2019, as well as Hunter Water's response to these issues. It also provides:

- An overview of the Project
- A summary of the consultation activities undertaken prior to, and during, the public exhibition period for the EIS, as well as ongoing consultation
- An overview of the issues raised in government agency, organisation and community submissions that were received during the EIS exhibition period, and, Hunter Water's response to these issues
- A description and assessment of the proposed changes made to the Project as described in the EIS

- Additional investigations and specialist studies that have been undertaken since the EIS was on exhibition
- Revised consolidated mitigation measures, incorporating those responding to the submissions received and those developed for the amendment report

Overview of submissions

Submissions from the community, community organisations and government agencies were received by DPIE. All submissions received were provided to Hunter Water for consideration. A total of 18 submissions were received, comprising nine submissions from the community, two from community organisations and seven from government agencies.

Submissions were received from the following government agencies:

- Lake Macquarie City Council
- Biodiversity and Conservation Division
- Crown Lands
- Hunter New England Population Health
- Transport for NSW
- NSW Department of Primary Industries
- NSW Environmental Protection Agency

All of the nine community and two community organisations submissions were letters from individual authors.

Community submissions covered the following issues:

- Coastal processes, including groundwater
- Soils, geology and contamination
- Alternatives to the project
- Biodiversity

Submissions have been itemised by respondent type and theme. Submissions and Hunter Water's responses are provided in Sections 2.4, 2.5 and 2.6.

Assessment updates

The proposed design amendments were assessed against each of the key issues and other issues, as set out in the SEARs issued for the Project by DPIE. The assessment process involved desktop and field investigations.

Key potential impacts identified which are additional or different to those outlined in the EIS include:

- Groundwater – The groundwater impact assessment for the EIS Project quantified changes to the groundwater level and flow from the operation of the sub-surface seawater intakes. The changed design to a direct ocean intake removes the requirement to extract seawater via a sub-surface intake during operation. Therefore, there are negligible potential impacts associated with groundwater interference and groundwater dependent ecosystems during operation of the water treatment process plant.

- Terrestrial and freshwater biodiversity – An additional 7.62 ha of land will be impacted as a result of the amended Project area, including 0.51 ha of native vegetation. Of this 0.51 ha of native vegetation, 0.12 ha of Sydney Freshwater Wetlands in the Sydney Basin Bioregion Endangered Ecological Community would be cleared. Additional impacts on threatened flora and fauna are considered unlikely as a result of the amended Project.
- Marine biodiversity – The design amendment to a direct ocean intake creates potential construction and operational impacts to the marine environment not previously relevant. The assessment identified that construction of an intake structure has the potential to harm the marine environment as a result of the following:
  - Seabed disturbance causing benthic and epi-benthic impacts.
  - Disruption of fish and marine mammal movement.
  - Increased turbidity and water quality impacts in isolated areas.
  - Light and noise pollution from vessel platforms and drilling activities.

    During operation potential impacts associated with entrapment and entrainment and brine dispersion have been identified. Potential impacts associated with construction, operation and maintenance of the desalination plant are not considered significant and as low as reasonably practicable with the implementation of the management and mitigation measures.
- Coastal processes – The amendment in design requires the construction of an intake pipeline and structure which have the potential to alter coastal processes through activities that will disturb the seabed. Minor and temporary potential impacts to coastal processes are predicted due to the temporary offshore receival infrastructure and associated excavation/stockpiling activities would result from horizontal directional drilling or pipe jacking to construct the intake pipeline.
- Visual – The design amendment requires temporary construction impacts associated with the direct ocean intake. These impacts have been assessed to have a moderate to low impact on the landscape character and the visual impact due to the nature of the beach landscape, duration, number of viewers and the distance of the works from viewers.
- Human health – Increases in the brine discharge being discharged via the WWTW outfall result from the increase to the desalination plant capacity. The degree of recirculation of the brine plume to the intake point was simulated to ensure appropriate spatial separation was considered during the concept design of the intake structure. Therefore, the operational risk of material recirculation is predicted to be very low.

Revised environmental mitigation and management measures

The EIS identified mitigation and management measures that would be implemented to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the Project. After consideration of submissions and additional environmental assessment, Hunter Water has identified new and revised mitigation measures for the Project where appropriate. These mitigation and management measures will guide the detailed design, construction and operation phases of the Project.

The key changes to the revised mitigation measures pertain to terrestrial and marine biodiversity. The amended design has resulted in potential impacts to marine ecology which require the implementation of management controls during construction. The design and Project area amendments have also resulted in the requirement for biodiversity offsetting to address potential impacts.

Conclusion

The amended Project described in this Amendment Report would not have any significant adverse environmental impacts as a result of construction or operation. Obtaining planning approval would provide significant benefit to the local and wider community, ensuring the Project can be deployed quickly in the event of extreme drought, and avoid significant financial and non-financial costs to households and businesses.

If the Project does not proceed and an extreme drought occurs, the Lower Hunter region is at risk of running out of water. Hunter Water would be forced to put in place severe and drastic limits on water use as water storages fell below 30 per cent and 15 per cent. These limitations may initially involve a ban on all outdoor potable water use; but at the very low water storage levels of around 15 per cent the limitations would become more severe. Under this situation, residential consumption may need to be limited to 45 litres per person per day.

The Project does have potential to have short-term impacts during construction works; however, these impacts would be managed through the adoption of appropriate and targeted environmental management and mitigation measures identified in this Amendment Report and summarised in Appendix E.

The Project is a robust response to a recognised need and provides a number of benefits. The EIS and Amendment Report have demonstrated that the Project is in the public interest and is consistent with the objects of the EP&A Act and the principles of ecologically sustainable development.

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1. Introduction

1.1 Project background

Hunter Water Corporation (Hunter Water) is seeking approval to construct and operate a drought response desalination plant (the 'Project'), adjacent to the Belmont Wastewater Treatment Works (WWTW) in Belmont South, a suburb of Lake Macquarie Local Government Area (LGA) of New South Wales (NSW) (the 'Project area').

Like much of NSW, the Lower Hunter region continues to experience ongoing drought conditions. In February 2020, storages reached a 40 year low of 52.5 per cent. As at June 2020, storages were around 68 per cent, well below typical levels for time of the year.

In response to the drought, Hunter Water is rolling out a program of drought response measures as outlined in the Lower Hunter Water Plan (LHWP) (NSW Department of Finance and Services, 2014). Measures include the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives as well as various operational measures such as the operation of Tomago Sandbeds and inter-regional transfers with the Central Coast. Reduction in demand has been achieved through a combination of proactive community engagement and education programs, and the progressive introduction of water restrictions as storage levels decline. Since the introduction of restrictions in September 2019, Hunter Water customers have reduced water consumption by around 20 per cent compared to what would have otherwise been expected given the time of year.

The 2014 LHWP identified the implementation of emergency desalination as a measure of last resort in response to a severe drought, and would only be implemented if water storage levels reached a critical point and all other measures have been implemented.

The Project described in the Environmental Impact Statement (EIS) included the construction and operation of a desalination plant, designed to produce up to 15 megalitres per day (ML/d) of potable water, with two sub-surface intake structures. Hunter Water is seeking a 10 year approval term for the EIS, during which time further Project stages (including detailed design) will be instigated based on water storage levels.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the Lower Hunter Water Security Plan (LHWSP). The LHWSP seeks to determine the preferred portfolio of supply and demand side options to ensure a sustainable and resilient supply for the region, over the long term as well as during drought. As with the 2014 LHWP, the major revision is a whole of government approach, and Hunter Water are working closely with the DPIE – Water, Central Coast Council, the Lower Hunter community and other stakeholders in developing the new Plan.

The LHWSP review has shown that in the event of a rare and unprecedented drought, resulting in storages approaching empty, there is a predicted shortfall between the network's existing supply capacity and the estimated demand. This shortfall is predicted to occur following the implementation of all the measures in the 2014 LHWP including the 15 ML/d Belmont Drought Response Desalination Plant as described in the EIS.

In response to the ongoing drought, at a time when storages reached the lowest level in 40 years, Hunter Water investigated a range of options to close, or partially fill the shortfall in supply, including increased access to groundwater sources (beyond current license limits), additional recycling schemes and increased desalination capacity. This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/d would provide the best balance of meeting the communities needs should a severe drought occur while still providing value for money. Furthermore, the proposed amendment would not compromise Hunter Water's ability to deliver a desalination scheme in the timeframe required in response to a severe drought.

In addition to the proposed increase in plant capacity, further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option. Further, direct ocean intake systems have been used at all of the seawater desalination plants constructed in Australia in the last two decades proving their suitability. The direct ocean intake incorporates the seawater pump station, intake pipeline and intake structure. The construction method of the intake pipeline would be determined during detailed design; however, horizontal directional drilling (HDD) and pipejacking/micro-tunnelling construction methodologies have been assessed.

1.2 Report structure

An EIS for the Belmont Drought Response Desalination Plant ('EIS Project') (SSI_8896) was placed on public exhibition between 21 November and 19 December 2019. During the exhibition period, government agencies, organisations and the community were invited to make comment via written submissions to the DPIE.

This document comprises the Response to Submissions Report and an Amendment Report that summarises proposed changes to the Project. This report has been prepared in accordance with the requirements for State significant infrastructure (SSI) under Part 5.2 and Section 5.17 of the *Environmental Planning and Assessment Act* 1979 and clauses 55 and 85A of the *Environmental Planning and Assessment Regulation* 2000.

An overview of the report structure is provided below.

- **Executive Summary:** Provides a brief overview of the Project and the proposed amendments.
- **Section 2 – Submissions Report:** Analysis of issues raised in government agency, organisation and community submissions that were received during the EIS exhibition period, and, Hunter Water's response to these issues.
- **Section 3 – Amendment Report:** Strategic context and description of the proposed amendments to the Project, additional investigations and specialist studies undertaken since the EIS exhibition, and revised consolidated mitigation measures.
- **Section 4 – Evaluation of Merits:** Sets out the justification for the Project and how it addresses the objects of the EP&A Act and the principles of ecologically sustainable development (ESD).

2. Submissions report

2.1 Analysis of submissions

Submissions in response to the EIS were accepted by DPIE during, and after, the public exhibition period (21 November to 19 December 2019). A total of 18 submissions were received, of which nine submissions were from the community, two were from organisations and seven were from government agencies (Table 2-1). All submissions were letters from an individual author.

A letter was received from DPIE requesting Hunter Water to provide a submissions report, and to respond to additional DPIE comments. Hunter Water's response has been included as Submission 19 in Section 2.4.9 in this report to demonstrate that DPIE comments have been addressed.

Each submission was examined individually to identify and understand the issues raised. The content of each submission was reviewed and categorised according to the key issues (such as traffic and transport). Each submission is itemised by respondent type and theme and is presented with Hunter Water's response in Sections 2.4, 2.5 and 2.6.

Table 2-1 Summary of submissions received

Submission number	Author name	Location	Distance from Project	Type	Support, object or comment only
1	Lake Macquarie City Council	Speers Point, NSW	5-100 km	Government	Comment only
2	Biodiversity and Conservation Division	Newcastle, NSW	5-100 km	Government	Comment only
3	Crown Lands	Newcastle, NSW	5-100 km	Government	Comment only
4	Hunter New England Population Health	Wallsend, NSW	5-100 km	Government	Comment only
5	Lake Macquarie Sustainable Neighbourhood Alliance Inc.	Warners Bay, NSW	5-100 km	Organisation	Object
6	Universal Water Recycling	Mount View, NSW	5-100 km	Organisation	Object
7	Transport for NSW	Newcastle, NSW	5-100 km	Government	Comment only
8	Department of Primary Industries	Newcastle, NSW	5-100 km	Government	Comment only
9	EPA	Newcastle West, NSW	5-100 km	Government	Support
10	Community member	Adamstown Heights, NSW	5-100 km	Individual	Comment only

Submission number	Author name	Location	Distance from Project	Type	Support, object or comment only
11	Community member	Wangi Wangi, NSW	5-100 km	Individual	Object
12	Community member	Adamstown Heights	5-100 km	Individual	Comment only
13	Community member	Eleebana	5-100 km	Individual	Comment only
14	Community member	Cardiff Heights, NSW	5-100 km	Individual	Object
15	Community member	Dungog, NSW	5-100 km	Individual	Object
16	Community member	Caves Beach, NSW	5-100 km	Individual	Object
17	Community member	Corlette, NSW	5-100 km	Individual	Support
18	Community member	Redhead, NSW	< 5 km	Individual	Support
19	Department of Planning, industry and Environment	Newcastle, NSW	5-100 km	Government	Comment only

The most common issues raised by all respondents were in relation to:

- Coastal processes, including groundwater (9)
- Soils, geology and contamination (8)
- Alternatives to the Project (7)
- Biodiversity (5)

When making a submission respondents were able to identify if their submission was an objection to the Project, support for the project or comments only. The results of this were as follows:

- Object (6)
- Support (3)
- Comments (13)

Stakeholder engagement and consultation has been ongoing throughout the Project. Engagement and consultation began prior to the exhibition of EIS and continued throughout the exhibition of the EIS and will continue post-exhibition. This has allowed government, organisation and community issues to be identified and addressed in the EIS and Response to Submissions. A summary of consultation activities and ongoing stakeholder engagement is provided in Section 2.2.

2.2 Stakeholder engagement

2.2.1 Prior to EIS exhibition

As detailed in Section 6 of the EIS, Hunter Water implemented a consultation plan between February 2018 and November 2019. This included making direct contact with key stakeholders such as government, organisations and the community. Consultation activities included face-to-face meetings, community presentations, events, door-knocking, direct letters and telephone interviews. Further details of the consultation, including copies of outgoing and incoming correspondence is provided within Section 6 of the EIS.

2.2.2 During EIS exhibition

The EIS was placed on public exhibition for a period of 28 days, from 21 November to 19 December 2019. During the display period, government agencies, key stakeholders (including interest groups and organisations), and the community were invited to make written submissions. A summary of the engagement activities and tools used to encourage community and stakeholder participation during the exhibition is provided in Table 2-2.

The EIS was exhibited at:

- Hunter Water Head Office: 36 Honeysuckle Drive, Newcastle
- Lake Macquarie City Council Administration Building: 126-138 Main Road, Speers Point
- Belmont Library: 19 Ernest Street, Belmont
- Swansea Library: 228 Pacific Highway, Swansea
- Charlestown Library: Corner Smith and Ridley Street, Charlestown
- Toronto Library: Corner Brighton Avenue and Pemell Street, Toronto

The EIS was also available on the Department of Planning, Industry and Environment's website at: https://www.planningportal.nsw.gov.au/major-projects/project/10546

Hunter Water also undertook additional consultation with key stakeholders during and after exhibition as detailed in Table 2-2.

Table 2-2 Consultation activities undertaken during EIS exhibition period

Activity	Detail
Drop in session	Held two community drop-in sessions at Belmont Library (19 Ernest Street, Belmont) on: • Saturday 30 November 2019 between 9:00 am and 12:00 pm • Tuesday 3 December 2019 between 3:00 pm and 6:00 pm
Stakeholder letters	Issued letters to agency and community stakeholders notifying them of the EIS exhibition details and offering a meeting to answer any questions about the EIS.
Stakeholder meetings	Meeting with Lake Macquarie Sustainability Neighbourhood Alliance on Thursday 5 December 2019 at LMCC Speers Point office to discuss the EIS and key findings.
Your Voice	Update to the Project page at http://yourvoice.hunterwater.com.au/desal
Social Media	Video featuring the Project team members providing detail on the EIS and how to make a submission. Shared on Hunter Water's social media channels (Facebook, LinkedIn, Twitter) https://www.linkedin.com/posts/hunter-water_the-environmental-impact-statement-eis-activity-6611138861617733632-hqVh

2.2.3 Ongoing stakeholder engagement

Hunter Water continues to provide Project updates via Your Voice website (http://www.yourvoice.hunterwater.com.au/desal) through media releases and via standard communication channels.

If the Project is approved, Hunter Water would continue to engage with the customers, the local community and all relevant stakeholders. During the construction and operation period, a complaints management protocol, inclusive of emergency contact phone number and email address would be developed and implemented.

2.3 Actions taken since exhibition

2.3.1 Review of 2014 LHWP and amending the Project

The Lower Hunter Water Plan (LHWP) was developed in 2014 to prepare the region for drought through the identification of feasible water supply measures to meet the needs of Hunter Water customers, including residential, business and industry.

The EIS notes that Hunter Water is rolling out a program of drought response measures outlined in the 2014 LHWP. This program includes the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives and continued planning for a drought response desalination plant at Belmont.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, to be known as the LHWSP. As with the 2014 LHWP, the major revision is a whole of government approach, and Hunter Water are working closely with the DPIE – Water, Central Coast Council, the Lower Hunter community and other stakeholders in developing the new Plan. Hunter Water is actively exploring a range of options to ensure that the environmental and social aspects, the technical feasibility and costs of each option are understood, as well as the reliability that each option adds to our water system. The options being considered include recycled water, stormwater harvesting, additional water conservation measures, dams, desalination, groundwater and water sharing with other regions.

The LHWSP review has shown that in the event of a rare and unprecedented drought, resulting in storages approaching empty, there is a predicted shortfall between the network's existing supply capacity and severely restricted demand. This shortfall is predicted to occur following the implementation of all the measures in the 2014 LHWP, including the 15 ML/d Belmont Drought Response Desalination Plant as described in the EIS.

In light of the LHWSP development and in response to the ongoing drought, Hunter Water investigated a range of options to close, or partially fill the predicted shortfall in water supply. This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/d would provide the best balance of meeting the community's needs should a severe drought occur, while still providing value for money. Furthermore, the proposed amendment would not compromise Hunter Water's ability to deliver a desalination scheme in the timeframe required in response to a severe drought.

In addition to the proposed increase in plant capacity, further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option.

Two direct ocean intake design options are being assessed for the most suitable intake option (see Section 3.6). This report includes an Amendment Report to assess the amended design and associated impacts (see Section 3). Section 3.3.3 describes the key features of the proposed amendments to this Project.

2.3.2 Stakeholder engagement

Following the Project EIS exhibition, Hunter Water held a number of online briefing sessions with government agencies to notify them of the proposed Project amendments, and allow agencies to discuss any of their concerns. Table 2-3 summarises the dates and stakeholders attending the online briefing sessions.

Table 2-3 List of online briefing sessions held

Stakeholder(s) attending	Date of briefing(s)
Lake Macquarie City Council (staff)	25 March 2020 4 June 2020
NSW Health Environmental Protection Authority SafeWork NSW NSW Police (Belmont Local Area Command)	29 May 2020

In addition to online briefing sessions, Hunter Water provided letters to government agency and community stakeholders to notify them of the Project amendment. The letters are provided in Appendix C.

2.3.3 Further assessment of impacts

Further assessment of the following issues has occurred in response to the submissions received during the exhibition of the EIS:

- Stormwater (see Sections 3.5.2.1 and 3.6.2.2 and see Appendix I)
- Mine subsidence (see Section 3.6.2.1 and see Appendix G)

As stated in Section 1.1 Hunter Water has identified the need to amend the Project design. As such the above studies are included in the Amended Report for the Project, alongside the required updated studies corresponding to the new Project design.

2.4 Response to government agency submissions

2.4.1 Respondents

Seven government agencies made a submission. Table 2-4 provides a list of these, the submission number and where the relevant Hunter Water response is addressed in this report.

A letter was received from DPIE requesting Hunter Water to provide a submissions report, and to respond to additional DPIE comments. The letter and Hunter Water's response has been included as Submission 19 in Section 2.4.9 in this report.

Table 2-4 List of respondents – government agencies

Submission no.	Respondent	Section number where issues are addressed
1	Lake Macquarie City Council (LMCC)	Section 2.4.2
2	Biodiversity Conservation Division (BCD)	Section 2.4.3
3	Crown Lands	Section 2.4.4
4	Hunter New England Population Health (HNEH)	Section 2.4.5
7	Transport for NSW (TfNSW)	Section 2.4.6

Submission no.	Respondent	Section number where issues are addressed
8	Department of Primary Industries (DPI)	Section 2.4.7
9	Environment Protection Authority (EPA)	Section 2.4.8
19	Department of Planning, Industry and Environment	Section 2.4.9

2.4.2 Lake Macquarie City Council

2.4.2.1 Soils, geology and contamination

Erosion and sediment control

Submission

Submission 1, Item 1: *The Environmental Impact Statement for the Hunter Water Corporation Belmont Drought Response Desalination Plant dated November 2019 has addressed earlier concerns raised by Council's Erosion and Sediment Control officer. The proposed erosion and sediment control actions are in accordance with Council's Development Control Plan (DCP) 2014.*

Hunter Water response

Submission 1, Item 1: Hunter Water notes LMCC's submission.

Earthworks (cut/fill)

Submission

Submission 1, Item 2: *The proposed development includes significant cut and fill, in the order of 20 metres of cut and approximately 2 metres of fill. This is inconsistent with the DCP controls, however: A. The filling is required to facilitate sufficient levels above storm surge and sea level rise. B. The proposed cut will only be undertaken to facilitate the salt water take-up into the plant and will be hidden after construction finishes*.

Hunter Water response

Submission 1, Item 2: The cut and fill proposed for the EIS was designed to place the desalination plant above the flood level. An updated cross section for the amended Project is provided in the amended Project design (see Appendix F) to demonstrate the extent of cut and fill required.

2.4.2.2 Water resources

Water quality, including stormwater management

Submission

Submission 1, Item 3: *A Stormwater Management Plan in line with the Lake Macquarie DCP to be provided prior to construction.*

Submission 1, Item 12: *The impacts of increased saline discharge on water quality and nearshore ecosystems should also be addressed.*

Hunter Water response

Submission 1, Item 3: As discussed in Section 7.1.3.2 of the EIS, given the permeability of the Project area's upper soil layers, minimal runoff and ponding is likely to occur and would be managed consistently with stormwater management currently utilised at Belmont WWTW.

As discussed in Appendix C (DCP Requirements) of the EIS, given the high permeability of the surrounding sandy soil, stormwater runoff would readily infiltrate the ground with no impacts expected to the surrounding hydrology. Regardless, measures for the management of runoff during construction would be detailed in the Construction Environment Management Plan (CEMP). Operational stormwater drainage has been designed to manage discharge from impervious surfaces to an on-site stormwater basin, allowing infiltration of stormwater within the Project area, without discharge.

Additional detail on the design of the stormwater basin is provided in Section 3.5.2.1, with consideration to the amended Project.

Submission 1, Item 12: As discussed in Section 7.4.3.3 of the EIS, the proposed brine-effluent discharge through the existing diffuser is predicted to have the same, or reduced impact in terms of marine toxicity, marine ecosystem and ambient salinity water quality objectives.

Additionally, as a result of the amendment to the capacity of the water treatment process plant, updated assessment of the impact of increased saline discharge was completed, as summarised in Section 3.6.2.3. The brine report (see Appendix M) assesses the plume, concentration, spread and mixing of the brine discharge. The assessment found that operation of the amended Project would have a negligible impact to marine biodiversity, including benthic in-fauna communities, and epi-benthic pipeline communities.

Groundwater

Submission

Submission 1, Item 7: *Hydrological studies should be undertaken to quantify direct and indirect impacts on wetland ecosystems. These would need to address changes in frequency, height and duration of flooding and inundation, as well as any possible changes to ground water levels. The EIS indicates a ground water drawdown of 0.5 m for 30 metres west of Ocean Park Road (P115). However, ground water drawdown is shown to be up to 1 metre and extending further west in Figure 7.6 (P101). The EIS states that the drawdown is considered unlikely to significantly impact on the persistence of the existing vegetation communities however, this statement is not substantiated with evidence. The impacts are not quantified. Drawdown for up to 2 years followed by a 1-2-year recovery could lead to significant impacts on important wetland vegetation communities particularly during drought. The relationship between ground and surface waters under drawdown conditions needs to be quantified and data on the impact of such drawdowns on the composition of wet heath and swamp mahogany communities over the long term is required.*

Hunter Water response

Submission 1, Item 7: In light of the amendments to the Project (see Section 3), this has resulted in a change to the proposed source of raw feed water (i.e. from a sub-surface saline aquifer to ocean water). Therefore, this would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater (see Section 3.6.2.2).

2.4.2.3 Terrestrial and aquatic biodiversity

Traffic and transport impacts

Submission

Submission 1, Item 5: *A Construction Management Plan should be required and fencing provided along the western side of the site providing a barrier to the neighbouring wetlands and Belmont Lagoon. The Construction Management Pan should specifically address avoiding impacts on the native vegetation to the west of Ocean Park Road. This would include avoiding impacts that might arise from use of the road to access the site or upgrading the road.*

Submission 1, Item 9: *Any roadworks required to access the site, or deterioration of the existing road surface associated with site access also has the potential to impact on the native vegetation communities, (including wetland vegetation), to the west of Ocean Park Road. Raising the road could also change surface hydrology.*

Hunter Water response

Submission 1, Item 5: As discussed in Table 7-7 of the EIS, prior to the commencement of any work adjoining areas of native vegetation, the construction area would be clearly defined. This would include marking the limits of clearing to avoid unintended clearing of adjacent native vegetation.

Furthermore, temporary fencing would be installed during the construction phase to exclude native ground fauna from adjacent native habitat entering construction areas. Fencing and any associated signage would be maintained for the duration of construction works, and designed to allow any fauna within the construction area to exit the Project area. In addition, environmental inductions during construction would also ensure approved clearing limits are clearly communicated.

Submission 1, Item 9: As discussed in Section 7.3.3.1 of the EIS, while access to the Project area would be along Ocean Park Road, no clearing of vegetation within the road reserve would be required for the Project.

While potential clearing of vegetation may be required in relation to other Hunter Water pipeline works currently proposed in the vicinity of the Project. These works are subject to a separate assessment and approvals process, which would be completed in consultation with LMCC as the relevant roads authority.

Hunter Water has identified that Ocean Park Road is currently in a very poor condition. The road is likely to further deteriorate during the construction of the Belmont Desalination Project.

To maintain the road in a way that provides safe access that is suitable for the public, Hunter Water and Hunter Water Contractors, Hunter Water would work closely with Lake Macquarie City Council to support their efforts to maintain the road in a condition that is suitable for all users.

Lake Macquarie City Council has identified potential asbestos containing material within the existing road reserve. Hunter Water would work closely with Lake Macquarie City Council as the owner of the road to further investigate this potential risk, including how the potential risk is currently being managed. Hunter Water is committed to working with Lake Macquarie City Council to ensure the safety of all road users, including project traffic, operational traffic currently working at Belmont Wastewater Treatment Works and the public.

2.4.2.4 Coastal processes

Water resources (hydrology and groundwater drawdown)

Submission

Submission 1, Item 6: *All efforts should be made to avoid impacts on the adjacent wetlands protected under the State Environmental Planning Policy (Coastal Management) 2018 (Coastal Management SEPP), including direct removal of native vegetation and changes in hydrology*.

Submission 1, Item 8: *Should any adverse impact within the Coastal Management SEPP mapped wetland area occur then the consent authority needs to have regard to Clause 10 of the policy and be satisfied that sufficient measures have been or will be undertaken to protect and where possible enhance the wetland.*

Submission 1, Item 10: *Adverse impacts on the wetland ecosystem regardless of significance would also be inconsistent with the objectives of the adjacent (E2) Environmental Conservation Zone (LMLEP 2014).*

Submission 1, Item 17: *Appendix M of the EIS makes several references indicating that the proposal will increase coastal risk due to the siting of the development, and increase in potential consequences resulting from the additional infrastructure, (whilst acknowledging that this increase is not significant); e.g. S.6.1.2 of Appendix M states: part of the subsurface infrastructure would extend into the mapped hazard areas of the coastal zone under these scenarios (Figure 5-1), including the horizontal intake wells and the pipeline connection between the temporary desalination plant and the WWTW for brine disposal (Appendix M shows construction of seawater intakes (caisson) in areas of likely coastal erosion/high coastal erosion risk). Council requests that the assessment documentation address clause 15 of State Environmental Planning Policy (Coastal Management) 2018 with regards to potential increased risk of coastal hazards on the land.*

In relation to the two following statements from Appendix M, Council requests preparing and resourcing an emergency response/contingency plan to be invoked in the event of a coastal hazard event occurring during and/or post construction.

Append M, Pg. 22: Should a storm occur during construction of the Project, coastal erosion could be exacerbated due to the exposure of the subsurface. The aspect of the Project most at risk is the intake structures and pipelines that lie closest to the coastline. The construction timeframe and method would define the extent of the impact, such as open trenching compared with directional drilling and the duration of earthworks.

Append M; Pg 34, Table 7.1 incl. following mitigation measure wrt exposure of the subsurface network by coastal processes including beach level fluctuation and storm bite. Preferentially construct subsurface structures (particularly the deep intake wells) by directional drilling (or alternative), to avoid the need for an open trench. Monitor weather forecasts when working on the horizontal intake wells and the connection pipeline and halt works when extreme coastal warnings are issued by the Bureau of Meteorology.

Submission 1, Item 18: *Council seeks clarification if any elements of the project, including elements ancillary to the project, (including temporary measures during construction), meet the definition of 'coastal protection works'. If any aspects of the proposal meet this definition, Council requests the EIS address clause 27 of the NSW Coastal Management Act 2016, and clause 19 of the Coastal Management SEPP.*

Submission 1, Item 19: *The impact of groundwater draw-down on aquatic ecosystem is requested to be addressed in greater detail. The biodiversity assessment report does not assess impacts on the aquatic environment of Belmont Lagoon, (noting that it outside the project area), yet the EIS identifies the potential for groundwater draw-down in this area, (a mapped Groundwater Dependent Ecosystem).*

Submission 1, Item 20: *It is also requested that the biodiversity assessment consider impacts on stygofauna that may occur as a result of groundwater draw-down.*

Hunter Water response

Submission 1, Item 6: As discussed in Section 7.3.3.1 and Section 7.7.3.7 of the EIS, construction would avoid direct clearing of native vegetation and threatened species habitat. Impacts to the surrounding environment, including wetlands, are not anticipated as a result of the Project.

In relation to the amended Project, potential impacts to land mapped under the Coastal Management SEPP have been reconsidered (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed in Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Furthermore, the proposed change from a sub-surface to a direct ocean intake for raw feed water would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater and aquatic biodiversity.

Submission 1, Item 8: Hunter Water acknowledges LMCC's comment. Section 7.3.3.1 of the EIS discusses that the Project avoids the Coastal Wetland mapped under the Coastal Management SEPP. In the event that unexpected adverse impacts occur within the wetlands area, the relevant clauses would be reviewed and applied accordingly.

Furthermore, potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed in Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Submission 1, Item 10: Hunter Water acknowledges LMCC's comment. As discussed in Section 5.1.4 of the EIS, in accordance with Section 5.22 of the EP&A Act environmental planning instruments do not apply to or in respect of State Significant Infrastructure (SSI) except where they apply to the declaration of infrastructure as SSI.

This notwithstanding, as discussed in Section 7.3.3.1 of the EIS, the Project avoids the Coastal Wetland mapped under the Coastal Management SEPP. Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Submission 1, Item 17: Section 7.5.2.3 of the EIS discusses that only the subsurface infrastructure, such as horizontal wells, are located in the coastal zone but are assumed deep enough so that the risk of exposure is negated.

The amended design replaces a subsurface intake structure with a direct ocean intake structure, and hence groundwater will not be sourced for processing in the desalination plant.

Hunter Water maintains a Corporate Emergency Management Plan that summarises the main protocols to be followed in identifying and managing major incidents and emergencies, including coastal hazard events. These protocols would be used to guide emergency management in the Construction Environmental Management Plan during the construction phase. During the operational phase, Hunter Water's treatment plant operations contractor would maintain an Incident and Emergency Management System to respond to warnings received from the Hunter Water system controller.

Submission 1, Item 18: Relevant provisions of the Coastal Management SEPP were considered in Section 5.1.3 of the EIS, and have been reconsidered in relation to the amendments to the Project. The Project identifies measures to mitigate any potential impacts to and from coastal processes resulting from construction and operation. As identified in the EIS, the Project is for the purpose of a desalination plant by or on behalf of a public authority (i.e. Hunter Water), not for the purpose of coastal protection works.

Submission 1, Items 19 and 20: As discussed in Section 7.3.3.3 of the EIS, predicted drop in water table levels by up to 0.5 m is considered unlikely to significantly impact on the composition or the persistence of groundwater dependent vegetation communities.

As discussed in Sections 3.5.2.3 (terrestrial and aquatic biodiversity), and 3.5.2.1 and 3.6.2.2 (water resources), groundwater dewatering during construction is not predicted to result in groundwater drawdown; therefore, impacts to aquatic flora and fauna (including stygofauna) are considered negligible.

In light of the amendments to the Project (see Section 3), this has resulted in a change to the proposed source of raw feed water (i.e. from a sub-surface saline aquifer to ocean water). Therefore, this would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater and aquatic biodiversity (see Section 3.6.2.2).

Vegetation clearing and offsetting

Submission

Submission 1, Item 11: *Any unavoidable impacts on native vegetation should be adequately offset. This includes direct and indirect impacts whether or not the proposal triggers the Biodiversity Offset Scheme (BOS). Unavoidable impacts should be offset within and around the wetland being affected and if this is not possible within a similar ecosystem in the local area.*

Submission 1, Item 13: *Additional control measures to minimise impacts should include:*

a. *Containment of all runoff from the site on the site - in order to maintain water quality for the Coastal Wetland. The site should not be permitted to drain to the west of Ocean Park Road.*

b. *A plan to deal with the spread of Chytrid fungus.*

c. *A native vegetation rehabilitation plan for Hunter Water land to the west of Ocean Park Road to remove weeds and enhance values of the state significant wetland area that could be affected by drawdown and be invaded by weeds as a result of hydrological changes.*

d. *Retention of a bund planted with native vegetation on the western side of the proposed development adjacent to Ocean Park Road. Wind fencing should be used to prevent sand blowing across the road into the adjacent wetland area.*

e. *After construction permanent post and cable fencing on the western side of Ocean Park Road to restrict access and any damage to native vegetation.*

f. *Modifications to drawdown management, so that when ground water levels reach a point where impacts to native vegetation within the wetland area are likely, pumping ceases. This will need to be informed by the information requested above, including timing of recharge, and baseline data on natural water level fluctuations, particularly seasonal variability.*

g. *Any fencing of the foredune area should not include barbed wire to minimise impacts on shorebirds that may use the rehabilitated area.*

Hunter Water response

Submission 1, Item 11: As discussed in Section 7.3.3.1 of the EIS, the Project avoids coastal wetland as classified under the Coastal Management SEPP, and no aquatic or wetland habitat would be directly impacted by the Project. Section 7.3.3 also discusses that there are no threatened ecological communities considered likely to occur within the Project area. Direct impacts are therefore considered unlikely. Section 7.3.4 discusses the mitigation measures proposed to mitigate potential impacts on terrestrial and freshwater ecology. Due to the amendment of the Project design, the Project area has now changed relative to what was presented in the EIS. The amendments would result in disturbance of an additional 0.51 ha of native vegetation and 3.94 ha of cleared land (see Table 3-4). As a result of these amendments, clearing cannot be avoided therefore offsets are now required to offset the impacts of the Project on native vegetation and potential threatened species habitats.

Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Submission 1, Item 13, Part a: As discussed in Section 7.3.3.1 of the EIS, the Project avoids the Coastal Wetland mapped under the Coastal Management SEPP.

Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Updated details in relation to stormwater management via a stormwater basin are provided in Section 3.5.2.1 and Appendix I.

Part b: Relevant controls are identified in Table 7-7 of the EIS.

Parts c, d and e: As discussed in Table 7-7 of the EIS, temporary fencing would be installed during the construction phase to exclude native ground fauna from adjacent native habitat entering construction areas The amended Project would result in disturbance of an additional 0.51 ha of native vegetation and 3.94 ha of cleared land, (see Table 3-4).

As the detailed design is yet to be determined, the clearing estimate is likely to be conservative due to the minimal area of disturbance required for installation of electricity poles. Hunter Water will commit to creating a Native Vegetation Management Plan to manage progressive rehabilitation of the disturbance footprint, maximise potential for re-establishment of native vegetation and to minimise the potential for long-term weed issues post-construction.

Part f: The amended design replaces a subsurface intake structure with a direct ocean intake structure. Therefore, groundwater would not be sourced for processing in the desalination plant; eliminating any potential ongoing impacts to groundwater and hydrology.

Part g: As discussed in Section 3.3.3 of the EIS, the Belmont WWTW dune restoration project will involve the installation of dune forming fences within the fenced area to provide for sand build up.

2.4.2.5 Traffic and transport

Submission

Submission 1, Item 4: *The proposed development has not achieved adequate facilities for service vehicles with regard to AS 2890.2 Parking Facilities – Off Street commercial vehicle facilities. It should be demonstrated where and how service vehicles are parked/unloaded on the site. It is considered the access road should not be used for this purpose*.

Submission 1, Item 14: *Council's Projects and Technical Officer Asset Management – Asset Planning has reviewed the application and provided the following comments:*

Ocean Park Road, Belmont South, has failed due to heavy vehicles gaining access to the Belmont WWTW and beach access. Council will require the road from Green Street to the main access gate to Hunter Water land, to be reconstructed post construction.

Council has undertaken a pavement investigation of the road and it was identified, that asbestos was observed. This material imposes a level of complexity into the construction, which means the road will require a granular overlay 300-400 mm thick and sealed to meet expected vehicle usage.

Submission 1, Item 16: *Ocean Park Road should be conditioned to be maintained by Hunter Water during construction, to the satisfaction of Council and any failed areas shall be repaired within a reasonable timeframe of 4 weeks, should Council be notified by other motorists, using this road to gain access to Blacksmiths Beach. The future road reconstruction will require a design to be submitted for approval as per Council's DCP requirements.*

Hunter Water response

Submission 1, Item 4: As discussed in Section 4.3.1 in the EIS, parking facilities would be made available in the main compound, which is proposed to be located within the Project area. In addition, the concept design for the amended Project (see Section 3) has been prepared with consideration to *AS 2890.2-2002 Parking facilities - Off-street commercial vehicle facilities*.

Hunter Water would ensure relevant requirements of *AS 2890.2-2002 Parking facilities - Off-street commercial vehicle facilities* are considered and documented in the detailed design for the Project.

Submission 1, Item 14 and 16: Lake Macquarie City Council has identified potential asbestos containing material within the existing road reserve. Hunter Water would work closely with Lake Macquarie City Council as the owner of the road to further investigate this potential risk, including how the potential risk is currently being managed. Hunter Water is committed to working with Lake Macquarie City Council to ensure the safety of all road users, including project traffic, operational traffic currently working at Belmont Wastewater Treatment Works and the public.

As discussed in Section 4.1.5 of the EIS, access to the desalination plant would be along the existing Ocean Park Road access road to the Belmont WWTW. A new turn off would be added to enable safe access to the facility. Hunter Water has identified that Ocean Park Road is currently in a very poor condition. The road is likely to further deteriorate during the construction of the Belmont Desalination Project.

To maintain the road in a way that provides safe access that is suitable for the public, Hunter Water and Contractors, Hunter Water would work closely with Lake Macquarie City Council to support their efforts to maintain the road in a condition that is suitable for all users.

2.4.2.6 Aboriginal heritage

Submission

Submission 1, Item 15: *As part of these works, stormwater will need to be catered for, that will require additional drainage to take a water build up from the northern side of the road and discharged into the sand dunes. Due to potential aboriginal artefacts being present, an impact study will be required for where the water discharge is likely to occur.*

Submission 1, Item 21: *Council's Planner – Heritage has noted that the subject site is affected by the Sensitive Aboriginal Cultural Landscape under Lake Macquarie LEP 2014 and as mapped in the Lake Macquarie Aboriginal Heritage Management Strategy. The subject site is within 50 m from the DP High Water mark and within 200 m of an Aboriginal Heritage Information Management System (AHIMS) site. An Aboriginal Cultural Heritage Assessment in accordance with OEH requirements has been undertaken, which included consultation with the Aboriginal Community, as per the OEH guidelines. The recommendations in the report should be included as conditions of any approval.*

Hunter Water response

Submission 1, Item 15: As a result of the amendments to the Project, a revised ACHAR was prepared to consider potential changes to impact predictions made in Appendix G of the EIS and is summarised in Section 3.5.2.6. The revised assessment identified potential impacts to Aboriginal cultural heritage as minor.

Furthermore, the stormwater basin has been designed and incorporated to the amended Project, managing discharge from impervious surfaces and allowing infiltration of stormwater within the Project area. Flows in excess of the stormwater basin capacity are directed to an overflow swale draining to the beach. The swale and stormwater basin have been designed for 1 in 100 year Average Recurrence Interval (ARI) storm events, with a 130 m^2 surface area which meets the stormwater pollution reduction targets set by LMCC (LMCC, 2013).

Construction and operation of the Project would be undertaken in accordance with Aboriginal Cultural Heritage Management Plan (ACHMP) for the amended Project.

Submission 1, Item 21: Hunter Water notes LMCC's submission.

2.4.3 Biodiversity Conservation Division

2.4.3.1 Biodiversity

Submission

Submission 2, Item 1: *1. BCD recommends monitoring of vegetation potentially impacted by groundwater drawdown:*

The Biodiversity Development Assessment Report (BDAR) (prepared by GHD, dated November 2019) states that groundwater drawdown will occur adjacent to the site below vegetation mapped as a terrestrial groundwater dependent ecosystem, corresponding to PCT 1724 Broad-leaved Paperbark - Swamp Oak - Saw Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast. This groundwater drawdown has the potential to impact on this vegetation community, which may result in impacts on threatened species habitat or endangered ecological communities.

A groundwater monitoring program and trigger, action, response plan is proposed to be developed to monitor groundwater level and quality and establish actions required if trigger levels are exceeded. Biodiversity and Conservation Division (BCD) recommends that the groundwater monitoring program incorporates monitoring of vegetation condition within the area of groundwater drawdown to ensure that any drawdown or water quality changes associated with the project are not impacting on threatened species habitat or endangered ecological communities. The trigger, action, response plan should also establish triggers and actions for any vegetation changes associated with groundwater impacts.

Recommendation 1

BCD recommends that the groundwater monitoring program includes monitoring of vegetation condition within the area of groundwater drawdown and that the trigger, action, response plan establishes triggers and actions for any vegetation changes associated with groundwater impacts.

Hunter Water response

Submission 2, Item 1: As identified in Appendix E a construction groundwater monitoring program will be developed. This plan will include groundwater level triggers and an appropriate trigger, action, response plan. However, the amendment to the Project discussed in Section 3 has resulted in a change to the proposed source of raw feed water (i.e. from a sub-surface saline aquifer to direct ocean water intake). Therefore, this would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater and freshwater biodiversity.

2.4.3.2 Coastal processes

Submission

Submission 2, Item 7: 7. *Coastal erosion and recession risks to intake structures*

The EIS identifies coastal erosion and recession risks to the proposed seawater intake structures. To ensure the risk of damage to these structures from coastal erosion and sea level rise is minimised, further investigations should be undertaken during detailed design into locating the intake caissons further landward with longer horizontal intake pipes.

Recommendation 7: Further investigations should be undertaken during detailed design into locating the intake caissons further landward with longer horizontal intake pipes.

Submission 2, Item 8: *8. Belmont Waste Water Treatment Works dune restoration project*

Section 3.3.3 of the EIS describes a proposed Belmont Waste Water Treatment Works (WWTW) Dune Restoration Project that is separate to the desalination project. It is recommended that as part of the proposed dune restoration project, consideration is given to raising the dune crest in the vicinity of the proposed desalination plant, to reduce the risk of wave overtopping at the desalination plant site.

Recommendation 8: Consideration should be given to raising the dune crest height in the vicinity of the proposed desalination plant as part of the Belmont WWTW Dune Restoration Project, to reduce the risk of wave overtopping to the project.

Hunter Water response

Submission 2, Item 7:

The amended design replaces a subsurface intake structure with a direct ocean intake structure, and hence groundwater will not be sourced for processing in the desalination plant. A coastal processes assessment has been conducted for these design changes (see Appendix N).

Submission 2, Item 8: As discussed in Section 3.3.3 of the EIS, the Belmont WWTW dune restoration project will involve the installation of dune forming fences within the fenced area to provide for sand build up.

Recommendation noted. As outlined in Section 3.3.3 of the EIS, the Belmont WWTW dune restoration project will involve possible dune reshaping and sand build up.

2.4.3.3 Aboriginal heritage

Submission

Submission 2, Item 2: *2. The ACHAR does not demonstrate that adequate consultation has been conducted.*

BCD has reviewed the Environmental Impact Statement (EIS) for the project and the Aboriginal Cultural Heritage Assessment Report, Belmont Desalination Plant (ACHAR) prepared by RPS (October 2019).

The ACHAR does not demonstrate that the consultation process undertaken for the project was conducted in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010). 'Sample' pro-forma letters presented in Appendix C of the ACHAR do not meet the requirements to demonstrate that adequate consultation with the Aboriginal community has been undertaken. The ACHAR must be updated to include all relevant supporting consultation documentation necessary to demonstrate the requirements have been satisfied by supplying copies of all key consultation documents.

Recommendation 2: The ACHAR must be revised to include all relevant supporting consultation documentation necessary to demonstrate the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010) have been satisfied.

Submission 2, Item 3: *3. An Aboriginal cultural heritage management plan must be prepared and implemented for the project.*

An Aboriginal Cultural Heritage Management PLAN (ACHMP) must be developed for the project in consultation with the Registered Aboriginal Parties (RAPs) and to the satisfaction of BCD, to manage and mitigate extant Aboriginal sites and objects located within the project area. BCD advises that an ACHMP be developed in consultation with the RAPs and to the satisfaction of BCD, prior to any ground disturbance works being undertaken.

Recommendation 3: BCD recommends that a consent condition is created that requires an ACHMP be prepared in consultation with the RAPs and BCD prior to ground disturbing works being undertaken for the project.

Submission 2, Item 4: *4. The project area must be re-surveyed after vegetation removal*

BCD has reviewed the supplied documentation with respect to Aboriginal cultural heritage for the project area, including the ACHAR prepared by RPS (October 2019). BCD notes the effective ground surface visibility was generally <10% due to thick vegetation obscuring the ground surface across parts of the project area. Identification of any additional Aboriginal objects present in the project area was hampered due to the lack of ground surface visibility. BCD is not satisfied that the ACHAR adequately identified and assesses the impacts of the proposal on potential Aboriginal cultural heritage in the project area.

Recommendation 4: BCD recommends that re-survey of the project area with the RAPs must occur following surface removal of vegetation. Any Aboriginal objects or sites identified during the re-survey will need to be managed in accordance with the protocols for newly identified sites in the ACHMP.

Submission 2, Item 5: *5. Aboriginal site AHIMS #45-7-0397 to be impacted by the proposed development must be mitigated:*

Based on the information supplied in the ACHAR, AHIMS registered Aboriginal site isolated find #45-7-0397 (RPS BEL IF01) located within the proposed project area will be subject to full impact by project construction works.

The ACHAR recommends the site be salvaged by community collection, under a mitigation procedure integrated into the Aboriginal Cultural Heritage Management Plan (ACHMP), to be developed for the project. BCD concurs with the recommendation of impact mitigation for AHIMS site #45-7-0397 (RPS BEL IF01) as outlined in the ACHAR.

Should the Aboriginal object be salvaged, then an Aboriginal Site Impact Recording (ASIR) form must be completed and submitted, for inclusion on the AHIMS database.

Recommendation 5: BCD recommends mitigation of AHIMS registered site #45-7-0397 (RPS BEL IF01) be integrated into the ACHMP, to be prepared for the project.

Submission 2, Item 6: *6. A care agreement for all salvaged Aboriginal objects must be prepared and implemented for the project.*

A temporary storage location must be determined in consultation with the RAPs in order that a temporary keeping place can be used to analyse, and catalogue Aboriginal objects recovered during the salvage program, pending any agreement reached about their long-term management.

Recommendation 6: BCD recommends that a care agreement for Aboriginal objects be prepared for the project and integrated into the ACHMP.

Hunter Water response

Submission 2, Item 2: As noted in Section 7.9.1.1, the EIS states that the ACHAR has been prepared to satisfy the requirements of Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010). In light of the amendments to the design and Project area, an updated ACHAR has been developed, see Appendix O of this report. The ACHAR has also been updated in the adequacy review to include draft review responses from Registered Aboriginal Parties (RAPs).

Submission 2, Item 3: As noted in Section 7.9.4, the EIS states that an ACHMP will be formulated following approval of the Project and prior to construction to provide management and protection process for known and unknown Aboriginal objects and places.

Submission 2, Item 4: As noted in Section 7.9.3.1, the EIS states that survey was conducted as per the Project methodology and survey strategy that was approved by the Registered Aboriginal Parties (RAPs). As part of the mitigation measure in Table 7-24 of the EIS, it is recommended to provide the opportunity to undertake additional inspection and surface collection to an archaeologist and Aboriginal party representatives following vegetation clearance.

Submission 2, Item 5: As noted in Section 7.9.4, the EIS states that Aboriginal cultural site AHIMS #45-7-0397 will be salvaged through Community Collection, prior to works proceeding.

Submission 2, Item 6: The preferred option for care of salvaged artefacts will be the subject of consultation with the registered Aboriginal parties prior to the development of the Aboriginal Cultural Heritage Management Plan. Hunter Water have requested that the Aboriginal parties identify their preferred mechanism for long-term care; being either reburial on site or with the development of a care agreement for the artefacts to be retained by a particular body or institution. Artefacts salvaged over the course of recommended activities for the Project will be temporarily stored at the Hunter Water offices.

2.4.4 Crown Lands

2.4.4.1 Land and property

Submission

Submission 3, Item 1: *The proponent must provide evidence for the authorised occupation of Crown land by the existing ocean outfall pipe that extends from the Belmont Wastewater Treatment Works (WWTW) to approximately 1.5 km offshore. Alternatively, the proponent should provide evidence of the legislative exemption that negates the required authorisation for the ocean outfall pipe under the former Crown Lands Act 1989. Possible further evidence may be required under the current Crown Land Management Act 2016. Should no approval or exemption exist then the proponent must apply to Crown Lands for the creation of an easement for the outlet pipe to occupy Crown land.*

Submission 3, Item 2: *The access road and infrastructure of the WWTW partially occupies a Crown road (refer to Attachment 1). The proponent should apply to close and purchase the Crown road within the project area as shown in Attachment 1.*

Submission 3, Item 3: *Alternatively, for the 1 above and 2 below, Hunter Water may wish to consider compulsory acquisition under relevant legislation*.

Key reasons

The Department requests that this information is included in the Environmental Impact Statement (EIS) for the following reasons:

- *The existing ocean outfall pipe occupies Crown land between the mean high water mark and a position approximately 1.5 km offshore. The PEA does not contain information relating to an existing authorisation to occupy this Crown land under the Crown Land Act 1989, or a legislative exemption, for the outfall pipe. The department has no record of an easement or other approval for the ocean outfall pipe.*
- *The Crown road adjoining the project site has been severed by the construction of access and storage bays as part of the proponent's development of Lot 1 DP 433549 (see Attachment 2). The proponent should apply for the closure and purchase of the impacted Crown road shown in Attachment 1. This will facilitate the legal management of the existing access and the infrastructure located on the Crown road.*
- *Hunter Water holds compulsory acquisition powers under relevant legislation (Hunter Water Act 1991 and Land Acquisition (Just Terms Compensation) Act 1991).*

Hunter Water response

Submission 3, Items 1, 2 and 3: The existing ocean outfall is a component of the Belmont WWTW, construction and operation of this asset does not form a component of the Project. Further discussion is provided in Section 3.1.3.

Hunter Water consulted with the neighbouring property owner, LMCC, regarding closing the Crown Road via letter on 27 February 2020. LMCC responded via letter on 11 March 2020 agreeing to the closure of the Crown Road provided the portion of Ocean Park Road providing access to LMCC property is retained. An application to close the Crown Road that runs through Hunter Water property was lodged with DPIE on 20 March 2020.

2.4.5 Hunter New England Population Health

2.4.5.1 Consultation

Submission

Submission 4, Item 1: *The EIS refers to appropriate standards and guidelines for ensuring drinking water quality. It is essential that NSW Health and DPIE Water are actively consulted throughout all stages of this project to ensure the public's health.*

Submission 4, Item 3: *We also want to strongly emphasise that due to the sensitivity within the surrounding and the broader community, that the proponent ensure meaningful ongoing community engagement and awareness.*

Hunter Water response

Submission 4, items 1 and 3: As discussed in Section 6.9 of the EIS, consultation and engagement with relevant stakeholders, including NSW Health, would be ongoing. Should the amended Project be approved, Hunter Water would continue to engage with the customers, the local community and all relevant stakeholders.

2.4.5.2 Noise and vibration

Submission

Submission 4, Item 2: *Environmental noise can have negative impacts on human health and well-being and trigger ongoing community complaints about annoyance and stress. It is noted that works associated with the power upgrades and additional traffic related to construction are predicted to increase noise levels. It is important that the applicant ensure compliance with all NSW Environment Protection Authority noise criteria and that all reasonable and feasible measures are taken to reduce the impact on the surrounding receivers.*

Hunter Water response

Submission 4, Item 2: Section 7.12.4 of the EIS discusses that all activities associated with the construction of the desalination plant are predicted to comply with the Construction Noise Management Levels (CNMLs). Proposed mitigation measures for noise are outlined in Section 7.12.5 of the EIS. The Amendment Report considers the changes to the impacts of noise and vibration and recommends mitigation measures accordingly (see Appendix Q). Upgrade to the facility would see no change to previously assessed construction or operation impacts or associated mitigation measures.

2.4.6 Transport for NSW (TfNSW)

2.4.6.1 Traffic and transport

Submission

Submission 7, Item 1: *TfNSW's primary interests are in the road network, traffic and broader transport issues. In particular, the efficiency and safety of the classified road network, the security of property assets and the integration of land use and transport.*

The Pacific Highway (A43) is a classified State road and Beach Street is a local road. Council is the roads authority for both roads and all other public roads in the area, in accordance with Section 7 of the Roads Act 1993.

Submission 7, Item 2: *TfNSW has reviewed the information provided and raises no objection to or requirements for the proposed development as it is considered there will be no significant impact on the nearby classified (State) road network*.

Hunter Water response

Submission 7, Items 1 and 2: Hunter Water notes TfNSW's comments.

2.4.7 Department of Primary Industries

2.4.7.1 General comments

Submission

Submission 8, Item 1: *The Department of Primary Industries has reviewed the proposal has no objections as the impacts are expected to be minimal*.

Hunter Water response

Submission 8, Item 1: Hunter Water notes this submission.

2.4.8 Environment Protection Authority

2.4.8.1 Soils, geology and contamination

Submission

Submission 9, Item 7: *Prior to the commencement of any surface disturbance and/or construction activities, appropriate erosion and sediment control measures must be in place in accordance with the publication "Managing Urban Stormwater: Soils and construction – Volume 1"* (Landcom, 2004) *and "Managing Urban Stormwater: Soils and construction –Volume 2A, Installation of Services"* (DECC, 2008a).

Submission 9, Item 8: *Prior to commencing any site preparation works, the Proponent must provide the EPA with a Detailed Site Investigation (DSI) report, which addresses potential acid sulphate soil and contamination issues at the site. The DSI must be prepared in accordance with the requirements and guidance in the document 'Managing Land Contamination: Planning Guidelines – SEPP 55 Remediation of Land'.*

Hunter Water response

Submission 9, Item 7: As outlined in Table 7-2 and Table 8-1 of the EIS, control measures for soils, geology and contamination are in accordance with Managing Urban Stormwater: Soils and construction – Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and construction –Volume 2A, Installation of Services (DECC, 2008a).

Submission 9, Item 8: The amended Project would increase the Project area compared with the EIS. Hunter Water has reviewed the EIS contamination assessment (GHD, 2019i) and has completed additional contamination investigation in the amended Project area (Appendix G). These investigations found that with the exception of one sample that identified asbestos, there are no widespread contamination issues.

Despite no significant contamination being detected within the amended Project area, Hunter Water commits to undertaking a DSI prior to Project determination to ensure that if construction is triggered then planned lead times are not impacted. Hunter Water will provide the DSI as a Supplementary Report as part of the response to submissions received during the exhibition of the Amendment Report. The scope of the DSI is outlined in Appendix G and has been based on existing contamination data and the low potential for significant contamination to be present within the amended Project area.

As outlined in the updated mitigation measures in Appendix E, Hunter Water will also undertake a focused investigation within the area of TP204 to further assess potential asbestos impacts

prior to construction. This assessment, and the outcomes of the DSI, will inform the management measures in the Contaminated Site Management Plan (CSMP) or if remediation is required.

2.4.8.2 Sustainability – Pollution

Submission

Submission 9, Item 1: *The EPA has reviewed the "Belmont Drought Response Plant - Environmental Impact Statement" prepared for HWC and dated November 2019 (the EIS) for the proposed activity and development. The EPA is satisfied that the EIS addresses relevant environmental pollution matters of concern for the proposal.*

The EPA is satisfied that the EIS addresses relevant environmental pollution matters of concern for the proposal.

Hunter Water response

Submission 9, Item 1: Hunter Water notes the EPA's comments provided in the submission. The Amendment Report details changes to relevant environmental pollution matters of concern for the Project (see Section 3.5.2.9).

2.4.8.3 Management and mitigation measures

Submission

Submission 9, Items 3, 4 and 5:

Operating Conditions

2) All activities must be carried out in a competent manner. This includes:

- The processing, handling, movement and storage of materials and substances used to carry out the activity
- The treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity

3) All plant and equipment installed at the premises or used in connection with the licensed activity:

- Must be maintained in a proper and efficient condition
- Must be operated in a proper and efficient manner

Incident Management

4) The Proponent must have in place adequate procedures including notification requirements to the Appropriate Regulatory Authority and other relevant authorities for incidents that cause, or have the potential to cause, material harm to the environment (Part 5.7 of the POEO Act).

All activities to carried out in a competent manner, with all plant and equipment installed at the premises or used in connection with the activity to be maintained and operated in a proper and efficient manner.

Hunter Water must have in place adequate procedures including notification requirements to the Appropriate Regulatory Authority and other relevant authorities for incidents that cause, or have the potential to cause, material harm to the environment.

Water Quality

5) The Proponent must comply with section 120 of the Protection of the Environment Operations Act 1997 which prohibits the pollution of waters, except as permitted by a condition of an Environment Protection Licence.

6) The proponent must discharge all waste-water from the plant via the Belmont Sewage Treatment Plant ocean outfall pipe.

Hunter Water response

Submission 9, Items 3, 4 and 5: Table 8-1 of the EIS outlines mitigation measures for both potential operational and construction impacts (including incidents), with an updated table provided as an appendix to this report with consideration to changes in predicted impacts as a result of amendments to the Project. Furthermore, construction and operation of the amended Project would be carried out in accordance with the conditions of consent, including identification of and management of incidents with potential to cause material harm to the environment.

As discussed in Section 5.3.1.1 of the EIS, the EIS is developed in line with the *Protection of the Environment Operations Act 1997* (POEO Act), and the Project would involve discharge of a number of wastewater streams via the existing Belmont WWTW outfall at various stages of the Project. Hunter Water currently holds an EPL (licence number 1771) for the Lake Macquarie sewerage system, which includes Belmont WWTW outfall.

Prior to construction, either a new EPL could be obtained or EPL 1771 would be modified to authorise the discharge of dewatered groundwater during construction and additional proposed saline discharges from the Project to the Belmont WWTW outfall during operation.

2.4.8.4 Post-approval requirements

Submission

Submission 9, Item 2: *Administrative Conditions*

1) Except as expressly provided in the conditions below, works and activities must be carried out in accordance with the information contained in:

- The State significant infrastructure application SSI-8896 submitted to the Department of Planning, Industry and Environment in 2017
- The Environmental Impact Statement entitled “Hunter Water Corporation - Belmont Drought Response Desalination Plant - Environmental Impact Statement” prepared by GHD Pty Ltd and dated 8 November 2019 relating to the State significant infrastructure
- All additional documents supplied in relation to the State significant infrastructure

Submission 9, Item 6: *7) Within 3 months of approval, the proponent must submit a report to the Environment Protection Authority (EPA) containing the following information:*

a) Details of any additional or alternative measures that could practically and reasonably be employed to improve dilution within the near-field mixing zone;

b) Assessment of the potential impacts of all chemicals that are to be used in the treatment processes, including anti-scalants, coagulants, membrane cleaners and disinfectants, on the environmental values of the receiving waterways with reference to relevant guideline values or benchmarks; and

c) Details of the method used to derive site-specific guideline values for the project in comparison with the method outlined in the National Water Quality Guidelines (ANZG, 2018).

Note: The information provided in the report required by condition 2 may be used by the EPA to create conditions to be added to the Environment Protection Licence held by Hunter Water Corporation for the Belmont Waste Water Treatment Plant.

Submission 9, Item 9: *10) Within 3 months of the approval, the proponent must submit an expanded groundwater monitoring program that includes trigger, action and response measures to the EPA. The program must include:*

- Shallow groundwater piezometers in the moderately disturbed dunes and marsh environment, including Belmont lagoon
- Visual inspection of vegetation health
- Additional Acid Sulfate Soil (ASS) sampling in the modelled zone of groundwater drawdown to assess the risk of oxidation of ASS from project operation

11) The proponent must report all data acquired under the groundwater monitoring program to the EPA annually.

Hunter Water response

Submission 9, Item 2: Table 8-1 of the EIS outlines mitigation measures for both potential operational and construction impacts, with an updated table provided in Appendix E to this report with consideration changes to predicted impacts as a result of amendments to the Project.

Submission 9, Item 6: Hunter Water would provide a timely report to the EPA with the details requested, following completion of the detailed design.

Submission 9, Item 9: As discussed in Table 7-3 of the EIS, a comprehensive groundwater monitoring program would be developed for construction of the Project. Existing monitoring wells GW101 – GW108 would be considered for inclusion in the program and additional monitoring sites will be identified (if necessary). The groundwater monitoring program would include continuous monitoring of groundwater levels and routine groundwater quality monitoring.

The amended design replaces the subsurface intake structures with a direct ocean intake structure, and hence groundwater will not be sourced for processing in the desalination plant during operation. Therefore, as discussed in Section 3.6.2.2, a comprehensive groundwater monitoring program will no longer be required.

2.4.8.5 Noise and vibration

Submission

Submission 9, Items 10, 11, 12: *Construction activities at the premises must only occur during the following hours:*

- 7.00 am to 6.00 pm Mondays to Fridays, inclusive
- 8.00 am to 1.00 pm Saturdays
- At no time on Sundays or Public Holidays

This notwithstanding, undertaken outside the hours specified in the following circumstances:

- For the delivery of vehicles, plant or materials where required by the NSW Police Force or other authority for safety reasons
- Where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm
- Where different construction hours are permitted in writing by the EPAWork that causes:
  - No more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (ICNG) (DECC, 2009a)

  - No more than the ‘Noise affected’ noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009a) at other sensitive land uses
  - Continuous or impulsive vibration values, measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (AVTG) (DEC, 2006)
- Intermittent vibration values measured at the most affected residence are no more than the maximum values for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006)

Highly noise intensive works exceeding 75 dB(A) $LA_{eq(15\ minute)}$ noise descriptor at a sensitive receiver must only be undertaken:

- Between 8:00 am to 6:00 pm Monday to Friday
- Between 8:00 am to 1:00 pm Saturday
- If continuously, then not exceeding three (3) hours, with a minimum respite from those activities and works of not less than one (1) hour

For the purposes of this condition, 'continuous' includes any period during which there is less than one (1) hour between ceasing and recommencing any of the work.

Submission 9, Item 13: *The Proponent must implement all reasonable and feasible noise and vibration mitigation measures to minimise construction noise and vibration impacts in accordance with the “Interim Construction Noise Guidelines” (DECC, 2009) and “Assessing Vibration: a technical guideline” (DEC, 2006).*

Submission 9, Item 14: *Operational noise generated at the premises must not exceed the project specific noise goals defined in ‘Table 4-7 – Project noise trigger levels, dBA’ of the “Belmont Drought Response Desalination Plant Noise and Vibration Assessment” prepared by GHD Pty Ltd (Revision 0 dated 11 October 2019).*

Submission 9, Item 15: *The Proponent must implement all reasonable and feasible noise mitigation measures to minimise operational noise in accordance with “Fact Sheet F: Feasible and reasonable mitigation” contained within the “Noise Policy for Industry” (EPA, 2017).*

Submission 9, Item 16: *The Proponent must engage a suitably qualified and experienced person to undertake and prepare a report in accordance with the “Noise Policy for Industry” (EPA, 2017) that must identify all annoying noise characteristics, including tonality, low frequency and impulsiveness, which may be generated by the operation of the SSI and, where necessary, investigate, identify and implement additional noise mitigation measures to achieve the relevant project specific noise goals. The report must be submitted to the EPA prior to commissioning of the project.*

Submission 9, Item 17: *Within 12 months of commencing operation of the project, the Proponent must engage a suitably qualified and experienced person to undertake and report on a representative noise compliance assessment. The noise compliance assessment report must be prepared and submitted to the EPA within 14 months of commencing operation of the project.*

Submission 9, Item 18: *The noise compliance assessment must monitor noise from the premises across all time periods and assess compliance with the noise limits set out in the approval.*

The noise compliance assessment must consider the characteristics of the noise and apply any relevant modifying factor adjustments as required under Chapter 3 of the "Noise Policy for Industry" (EPA, 2017) and where compliance is not achieved, identify all reasonable and feasible noise mitigation measures and timeframes for implementation.

The report must comply with all relevant industry guidelines and standards and include:

- Details of the activities (including production rates etc.) occurring at the premises at the time of the noise compliance assessment
- Details of the noise monitoring undertaken (personnel, equipment, methods, locations, times, duration, tabulated results, description of noise etc.)
- Details of any modifying factors required to be applied
- Assessment of compliance with existing noise limits contained within the licence
- Where any non-compliances are identified, identification of all reasonable and feasible noise mitigation measures required to achieve compliance

Hunter Water response

Submission 9, Items 10, 11, 12: Construction hours consistent with these requirements are included in Section 4.2.4 of the EIS, and are provided in the updated Project description (see Appendix A). In addition, as discussed in Section 4.1.1 of the Noise and Vibration Impact Assessment (NVIA) (Appendix P of the EIS), construction noise criteria were developed in accordance with the ICNG (DECC, 2009a) for each noise catchment area. Dewatering activities have been assessed in accordance with these guidelines.

Hours for highly noise intensive works would be undertaken in accordance with the EPA's requirements detailed above.

Submission 9, Item 13: As discussed in Section 7.12.3.1 of the EIS, construction noise criteria were developed in accordance with the ICNG and AVTG. Mitigation measures for construction activities are based off of this guideline, and outlined in Table 7-44 of the EIS. Relevant mitigation measures have been updated, as relevant, to reflect the amended Project (see Section 3).

Submission 9, Item 14: An updated noise and vibration impact assessment was completed for the amended Project. As identified in the updated Noise and Vibration Report (see Appendix Q), no exceedances of the operational noise criteria is predicted to occur as a result of the amended Project. Mitigation measures for operational activities were outlined in Table 7-44 of the EIS, with relevant mitigation measures having been updated, as relevant, to reflect the amended Project (see Section 3).

Submission 9, Item 15: Hunter Water notes the EPA's comments provided in the submission.

Submission 9, Item 16: As discussed in Section 6.2.1 of the Noise and Vibration Impact Assessment (Appendix P of the EIS) any annoying characteristics (such as tonality, low frequency, impulsiveness, etc.) generated by the Project would need to have corrections factors applied, as per the Noise Policy for Industry (NPI).

This would need to be assessed by the construction contractor during the detailed design stage, following selection of specific operational equipment.

Submission 9, Items 17 and 18: As outlined in the updated mitigation measures in Appendix E, Hunter Water will commit to undertaking the required Noise and Vibration specifications in the conditions of approval.

2.4.8.6 Waste management and chemical storage

Submission

Submission 9, Item 19: *The Proponent must, as far as possible, follow the waste hierarchy principles contained in the Waste Avoidance and Resource Recovery Act 2001 when dealing with any waste generated at the premises.*

Submission 9, Item 20: *The Proponent must assess and classify any waste generated at the premises in accordance with the "Waste Classification Guidelines – Part 1: Classifying waste" (EPA, 2014) and manage this waste in a lawful manner*.

Submission 9, Item 21: *The Proponent must not cause, permit or allow any waste to be received at the premises, except that waste which complies with a Resource Recovery Order and Exemption issued under the Protection of the Environment Operations (Waste) Regulation 2014 and is used for the purpose(s) stipulated by each Resource Recovery Order and Exemption.*

Submission 9, Item 22: *Waste generated by all activities associated with works and operation of the project must only be:*

- Exported to a licensed facility for the storage, treatment, processing, reprocessing or disposal, or to any other place that can lawfully accept such waste, or
- Reused in accordance with a Resource Recovery Exemption and Order

Submission 9, Item 23: *The Proponent must maintain a waste register that tracks any waste received at or transported from the premises that clearly identifies each entity and vehicle involved in the waste transaction and the premises from which or to which the waste originated or was transported to.*

The Proponent must retain all waste related records in a legible form, or in a form that can readily be reduced to a legible form, for at least 4 years after the record was made.

Submission 9, Item 24: *All above ground tanks and containers containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place. Bunds must:*

- Have walls and floors constructed of impervious materials
- Be of sufficient capacity to contain 110 per cent of the volume of the tank (or 110 per cent volume of the largest tank where a group of tanks are installed)
- Have floors graded to a collection sump
- Not have a drain valve incorporated in the bund structure
- Or be constructed and operated in a manner that achieves the same environmental outcome

Hunter Water Response

Submission 9, Items 19, 20 and 22: As discussed in Table 7-46 of the EIS, waste management measures specify to manage all waste material in accordance with the POEO Act and Waste Classification Guidelines (EPA 2014) and the Waste Avoidance Resource Recovery Strategy for NSW (NSW EPA).

Submission 9, Item 21: As discussed in Table 7-46 of the EIS, waste management measures specify to not accept waste from outside of the project site.

Submission 9, Item 23: As discussed in Table 7-46 of the EIS, waste management measures specify to manage and track waste in accordance with Hunter Water specifications, including recording of the total waste generated per month and the percentage recycled.

As presented in Table 3-3, the AR has updated mitigation measures to include tracking vehicles, origin and destination of the waste, and records to be kept for a minimum of four years.

Submission 9, Item 24: As noted in Section 7.1.3.2 of the EIS all chemical storage and delivery areas would be within bunds designed to meet the specific storage requirements of those chemical types and volumes. Additionally, chemicals would be stored in accordance with the Australian Dangerous Goods (ADG) Code and relevant Australian Standards, hence potential contamination impacts due to inappropriate storage or chemical spills is considered unlikely.

And as stated in Section 4.1.5 of the EIS the storage area would likely be placed on the western side of the desalination plant site and would have a concrete bunded unloading area draining to a sump emptied by a licensed contractor, as required.

2.4.9 Department of Planning, Industry and Environment

2.4.9.1 EIS requirements

Submission

Submission 19, Item 1: *The exhibition of the development application including the Environmental Impact Statement (EIS) for the above proposal ended on Thursday 19 December 2019. All submissions received by the Department during the exhibition of the proposal are available on the Department's website at https://www.planningportal.nsw.gov.au/major-projects/project/10546.*

The Department requires that you provide a response to the issues raised in those submissions, in accordance with clause 85A(2) of the Environment Planning and Assessment Regulations 2000. Please provide a response to the issues raised in these submissions within three months/by Friday 20 March 2020.

You are also requested to provide a response to the issues included at Attachment 1.

Note that under clause 113(7) of the Environmental Planning and Assessment Regulation 2000, the days occurring between the date of this letter and the date on which your response to submissions is received by the Secretary are not included in the deemed refusal period.

Attachment 1: Key Issues

If any changes to the design of the Belmont Drought Response Desalination Plant are proposed, the Department requests the Applicant consult with the Department prior to lodgement of any further documentation.

The Department requests additional information and/or clarification on the following:

Hunter Water Response

Submission 19, Item 1: Section 2 of this report is dedicated to itemising and responding to all submissions made to the Department during the EIS exhibition period for the Project.

Response to the issues raised in Attachment 1 are included in Section 2.4.9 of this report.

2.4.9.2 Detailed design

Submission

Submission 19, Item 2: *Provide a detailed drawing/plan set that accurately depicts the proposal.*

Confirmation as to whether the proposed desalination plant infrastructure will be built on hardstand or whether infrastructure will on the existing surface of the disused evaporation ponds.

Hunter Water Response

Submission 19, Item 2: As discussed in Section 3.2.2 of the EIS, the desalination plant would be located entirely within the boundary of Hunter Water owned land (Lot 1 of DP 433549), to the south of the existing WWTW in an area that was previously used for evaporation ponds. Suitable spoil from within the site would be re used to fill the existing evaporation ponds. As stated in Section 4.1.5 of the EIS, the desalination plant would generally comprise an unsealed surface (gravel, crushed concrete or similar) with some areas of concrete bunding, and concrete pads for placement of treatment components.

2.4.9.3 Subsidence

Submission

Submission 19, Item 3: *Consideration of subsidence areas to be impacted by water intake infrastructure and how any impacts will be mitigated and managed.*

Hunter Water Response

Submission 19, Item 3: As stated in Table 5-9 of the EIS, Review of the Subsidence Advisory NSW mapping indicates that the Project, including water intake infrastructure, is outside mapped mine subsidence areas. Therefore, approval of Subsidence Advisory NSW is not required for the Project. However, as investigations have shown that the Project area was undermined, as discussed in Section 7.1.2.6 of the EIS, further assessment of anticipated risks posed by underground mine workings to the Project and provide a recommendation for mitigation measures based on the desktop review. An updated mine subsidence assessment was completed for the amended Project (refer Appendix G).

2.4.9.4 Surface water, stormwater and drainage

Submission

Submission 19, Item 4: *Based on Concept Design drawings provided, a significant proportion of the disused evaporation pond area will be utilised for the purposes of the desalination plant, as such additional detail is required in relation to stormwater and drainage flows around the proposed infrastructure.*

Consideration of Guidelines for development adjoining land and water management by DECCW (OEH, 2013).

Hunter Water Response

Submission 19, Item 4:

As discussed in Section 7.1.3.2 of the EIS, given the permeability of the Project area's upper soil layers, minimal runoff and ponding is likely to occur and would be managed consistently with stormwater management currently utilised at Belmont WWTW.

As discussed in Appendix C (DCP Requirements) of the EIS, given the high permeability of the surrounding sandy soil, stormwater runoff would readily infiltrate the ground with no impacts expected to the surrounding hydrology. Regardless, measures for the management of runoff during construction would be detail in the Construction Environment Management Plan (CEMP). Operational stormwater drainage has been designed to manage discharge from impervious surfaces to an on-site stormwater basin, allowing infiltration of stormwater within the Project area, without discharge.

Additional detail on the design of the stormwater basin is provided in Section 3.5.2.1 and Appendix I, with consideration to the amended Project.

2.4.9.5 Groundwater

Submission

Submission 19, Item 5: *Section 7.2.3.2 contradicts some information presented within the EIS. Confirmation is required on the intake volumes via the seawater intakes and the anticipated drinking water yield.*

Hunter Water Response

Submission 19, Item 5: Section 9.3 of the EIS discusses that the Project would have the capacity to produce up to about 15 ML/d of potable water for supply to the local Hunter Water network. As stated in Section 4.1 the amended Project would have the capacity to produce up to approximately 30 ML/d of potable water for supply to the local Hunter Water network.

2.4.9.6 Consultation

Submission

Submission 19, Item 6: *Provide detail of the feedback received during consultation (both prior to lodgement of the EIS and following exhibition of the EIS) (as detailed in Section 6.5) and elaborate how this feedback was used to refine the design of the proposal.*

Hunter Water Response

Submission 19, Item 6: Table 6-2 of the EIS presents a summary of issues and questions raised by key stakeholders during consultation. The table provides a response from Hunter Water and/or indicates where in the EIS the issue/concern is addressed. Likewise, Table 6-4 presents a summary of feedback received from NSW Government departments and agencies and the corresponding Hunter Water response to each. Service providers were also invited to provide comment on the Project. This feedback is summarised in Table 6-5 of the EIS, and indicates where in the EIS the comments are addressed and/or considered. Consideration for future developments

Submission

Submission 19, Item 7: *Demonstrate consideration of any cumulative impacts associated with the proposal.*

Consider any upcoming (or planned) large-scale projects within the immediate vicinity that may be impacted by the proposed development, particularly during construction.

Hunter Water Response

Submission 19, Item 7: Section 7.18 of the EIS discuss potential cumulative impacts have been considered in the EIS and the management and mitigation measures to address potential cumulative impacts.

As discussed in Section 1.1 of the EIS, Hunter Water is seeking a 10 year approval term for this EIS, during which time further Project stages (including detailed design) would be instigated based on the key trigger levels for implementing the Project, which is outlined in Section 2.1 of the EIS. This results in some level of uncertainty as to when construction and operation of the Project is likely to occur; therefore, making assessment of cumulative impacts with other projects occurring concurrently a difficult exercise. Therefore, cumulative impacts would be considered as part of consistency reviews for the Project against the EIS, approval conditions and latest available project information at the LMCC and DPIE websites.

2.4.9.7 Crown ownership

Submission

Submission 19, Item 8: *Provide detail of ownership of the parcels of land affected by the proposal and any management measures proposed, specifically in relation to Crown Lands*.

Hunter Water Response

Submission 19, Item 8: Hunter Water contacted Crown Lands in January 2020 and is preparing documentation to acquire an easement over the existing Belmont WWTW ocean outfall pipeline, and to close the Crown road that runs through Hunter Water property at Ocean Park Road, Belmont South.

2.4.9.8 Decommissioning

Submission

Submission 19, Item 9: *As the proposal is considered to be a temporary response, provide details of the deconstruction process and how this would be managed. Additionally, what would trigger the need for deconstruction?*

Hunter Water Response

Submission 19, Item 9: As stated in 4.6 of the EIS, the desalination plant would be run until storage levels reach a set trigger point, which is currently set at 35 per cent.

At that time, the desalination plant would be stood down and mothballed. It could then be turned back on at short notice if the operational trigger is reached once again. Decommissioning would occur when water storage levels reach around 50 per cent or greater. A plan for decommissioning and deconstruction for the desalination plant would be further developed in the detailed design phase.

2.5 Response to organisation submissions

2.5.1 Respondents

Two organisations made a submission. Table 2-5 provides a list of these, the submission number and where the relevant Hunter Water response is addressed in this report.

Table 2-5 List of respondents – organisation

Submission no.	Respondent	Section number where issues are addressed
5	Lake Macquarie Sustainable Neighbourhood Alliance Inc.	Section 2.5.2
6	Universal Water Recycling	Section 2.5.3

2.5.2 Lake Macquarie Sustainable Neighbourhood Alliance Inc.

2.5.2.1 Project opposition

Submission

Submission 5, Item 1: *With anticipated population growth and with current water-use demands, we would encourage Hunter Water to consider both the supply and demand side of the water balance equation.*

The Alliance appreciates the need for Hunter Water to begin the approval process for a temporary desalination plant, should, it be required if water storage levels drop to critically low levels. However, we have concerns about the current proposal and urge Hunter Water and other entities to make every effort to encourage lower water use by both residents, and industry. We would rather that a desalination plant not be built at all.

Hunter Water Response

Submission 5, Item 1: Hunter Water acknowledges the comments provided in this submission. The Introduction section of the EIS states that Hunter Water is rolling out a program of drought response measures outlined in the 2014 LHWP, including the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives and continued planning for a drought response desalination plant in Belmont South.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the LHWSP. The LHWSP review has shown that in the event of a rare and unprecedented drought, resulting in storages approaching empty, there is a predicted shortfall between the network's existing supply capacity and the estimated severely restricted demand. This shortfall is predicted to occur following the implementation of all the measures in the 2014 LHWP including the 15 ML/d Belmont Drought Response Desalination Plant as described in the EIS.

In light of the LHWSP development and in response to the ongoing drought, Hunter Water investigated a range of options to reduce the predicted shortfall in water supply, including increased access to groundwater sources (beyond current license limits), additional recycling schemes and increased desalination capacity.

This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/d would provide the best balance of meeting the community's needs should a severe drought occur, while still providing value for money. Furthermore, the proposed amendment would not compromise Hunter Water's ability to deliver a desalination scheme in the timeframe required in response to a severe drought. The upscale in design is included in this report in Section 3.

2.5.2.2 Biodiversity

Submission

Submission 5, Item 2: *the close proximity of the proposed plant to the Coastal Wetlands and a number of Endangered Ecological Communities.*

Hunter Water response

Submission 5, Item 2: As discussed in Section 7.3.3.1 of the EIS, the Project avoids coastal wetland as classified under the Coastal Management SEPP, and no aquatic or wetland habitat would be directly impacted by the Project. Section 7.3.3 also discusses that there are no threatened ecological communities considered likely to occur within the Project area. Direct impacts are therefore considered unlikely. Section 7.3.4 discusses the mitigation measures proposed to mitigate potential impacts on terrestrial and freshwater ecology.

Due to the amendment of the Project design, the Project area has now changed relative to what was presented in the EIS. The amendments would result in disturbance of an additional 0.51 ha of native vegetation and 3.94 ha of cleared land (see Table 3-4). As a result of these amendments, clearing cannot be avoided therefore offsets are now required to offset the impacts of the Project on native vegetation and potential threatened species habitats.

Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

2.5.2.3 Marine impacts

Submission

Submission 5, Item 3: *the accumulative effect of the constant adding of brine back into the ocean, together with the effects of other desalination plants across the world, including Australia.*

Hunter Water response

Submission 5, Item 3: In Section 7.4.3.3 of the EIS it discusses that the proposed brine-effluent discharge through the existing diffuser is predicted to have the same or smaller areas of impact (or effect) in terms of marine toxicity, marine ecosystem and ambient salinity water quality objectives. As discussed in Section 3.6.2.3 and Appendix M, the impact of the drought response desalination plant will be insignificant compared with natural fluctuations in salinity.

2.5.2.4 Groundwater

Submission

Submission 5, Item 4: *The effects of dewatering 10 ML of ground water during the period of construction.*

Submission 5, Item 5: The lack of statement regarding the total of this dewatering activity, across construction and/or operation.

Submission 5, Item 6: *The lack of statement regarding where this 10 ML of ground water will ultimately go.*

Hunter Water response

Submission 5, Item 4: As discussed in Section 7.2.3.1 of the EIS, the extent and duration of dewatering required during construction is expected to be less than the dewatering and drawdown during operation.

Section 7.2.3.2 of the EIS outlines the anticipated impacts on groundwater during operation including water table, water pressure and water quality. When assessed against the NSW Aquifer Interference Policy, the impacts to groundwater during operation are considered to be acceptable.

Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability.

A direct ocean intake is proposed as part of the amended Project (see Section 3). Therefore, this would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater (see Section 3.6.2.2).

Submission 5, Item 5: As noted in Section 7.13.2.1 of the EIS, construction of the intake structures are predicted to generate approximately 10 ML of groundwater from dewatering activities.

As outlined in the updated mitigation measures in Appendix E, the EIS will be updated to include a description of dewatering activities during operation.

Submission 5, Item 6: As discussed in Section 7.13.2.1 of the EIS, the 10 ML of groundwater from dewatering activities may be disposed of via the Belmont WWTW outfall following appropriate treatment to ensure that water quality limits are met.

2.5.2.5 Greenhouse gas emissions

Submission

Submission 5, Item 7: *Increased CO_2 emissions resulting from operational aspects and the current low green energy sourcing target contemplated.*

Submission 5, Item 12: *The Alliance would also request that the proposed plant includes an increase to the percentage of 'green power' to be used as an energy source.*

Hunter Water response

Submission 5, Items 7 and 12: As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

2.5.2.6 Contamination

Submission

Submission 5, Item 13: *Investigate the potential for sand contamination at the intake point, as there have been reports, for example, of asbestos dumping on beaches, including Belmont wetlands, as well as the high potential for micro plastics to be taken in with seawater intake.*

Hunter Water response

Submission 5, Item 13: As discussed in Section 7.1.2.5 of the EIS, one potential asbestos containing material fragment was noted on the surface within the Project site. No asbestos was detected in soil samples analysed. The risk to workers is considered to be low and can be managed through an unexpected finds protocol in a contaminated soil management plan.

Micro plastics are of relevance to subsurface intake, however the Amendment Report (see Section 3) describes a design change to the seawater intake structure that includes a treatment process that will filter out any potential micro plastics, asbestos and other foreign material that could contaminate the potable water produced by the Project. Ongoing water testing would be undertaken to ensure potable water produced by the Project meets the requirements of the Australian Drinking Water Guidelines.

2.5.2.7 Sea level rise

Submission

Submission 5, Item 8: *Consideration of the potential for impacts of sea level rise on the facility: this will be a big investment to have to protect from a rising ocean.*

Hunter Water response

Submission 5, Item 8: Section 7.5.3.2 of the EIS discusses that mapping for the Lake Macquarie Coastal Zone Management Plan 2015-2023 (Umwelt, 2015) indicates all infrastructure within the Project would be landward of the designated risk areas and not deemed to be at risk of coastal inundation.

2.5.2.8 Erosion and sediment control

Submission

Submission 5, Item 9: *The potential for dune erosion and disturbance of coastal sand biome at the intake point.*

Hunter Water response

Submission 5, Item 9: Section 7.5.2.3 of EIS discusses that mapping from the Lake Macquarie Coastal Zone Management Plan 2015-2023 (Umwelt, 2015) indicates that the proposed plant area is subject to high erosion risk in 2100 and a portion of the intake structures subject to extreme erosion risk in 2100. However, the design life of the Project is not likely to exceed 50 years and as such the 2100 scenario is not likely to be of relevance to the Project.

2.5.2.9 Alternatives to the Project

Submission

Submission 5, Item 10: *We would also ask why consideration of water storage in disused mines is not a serious consideration for Hunter Water. This method of conserving water would not affect salt levels in our oceans and would provide a low or non-evaporative method of storage in appropriate 'containers'.*

Hunter Water response

Submission 5, Item 10: In response to the current drought, Hunter Water has introduced the staged implementation of restrictions and substantially increased water conservation and water loss programs to slow the rate of depletion of the existing system. Extraction of water from Tomago Sandbeds and regional transfers from the Central Coast have also been used to supplement existing supplies.

Hunter Water has investigated a number of additional measures to improve water storage as part of the response to the current drought, including recycled water schemes, importing water from other regions' via Newcastle Harbour and additional desalination at alternative sites.

Water discharged from Newstan mine was considered as a potential drought response supply option in the 2014 LHWP. The Newstan mine had a number of risks, including integration with the existing water distribution network and land ownership. In addition, the water within the mine is sourced from rainfall and modelling has shown the mine would only provide water for approximately four months during a drought. Therefore this option was not progressed as a drought response for the current drought.

Hunter Water has commenced a major review of the LHWP, in partnership with the NSW DPIE and other stakeholders, to ensure a sustainable and resilient water supply for the region, for the long term as well as during drought. The review is considering all options, including the potential to use water from abandoned or operating mines for non-drinking end uses such as irrigation or industrial use.

2.5.2.10 Reducing water demand

Submission

Submission 5, Item 10: *LMSNA would like to see a more dedicated approach to the further decrease of water demand:*

- The use of greywater, including an educational campaign, with examples of grey water use, disseminated to the wider community.
- Rainwater harvesting and actions to make this more widespread.
- Stormwater harvesting methods.
- Water recycling.
- An increased media campaign to change water use behaviour among residents (e.g. shorter showers, more efficient shower heads, reduced garden watering) is critical and Hunter Water's own modelling clearly shows the positive effect of this on maintaining water storages. Along with this we request Hunter Water offers assistance to lower income customers to repair leaks etc.

Hunter Water response

Submission 5, Item 10: The introduction section of the EIS states that Hunter Water is rolling out a program of drought response measures outlined in the 2014 LHWP, including the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives and continued planning for a drought response desalination plant in Belmont South.

As discussed in Section 2.3.1 Hunter Water is currently undertaking a review of the Lower Hunter Water Plan to ensure our region has a resilient water system now and in the future. We're actively exploring a range of options including recycled water, stormwater harvesting, additional water conservation measures, dams, desalination, groundwater and water sharing with other regions. We encourage the community to take part in developing the new Lower Hunter Water Plan - to learn more visit https://yourvoice.hunterwater.com.au/water-future.

2.5.3 Universal Water Recycling

2.5.3.1 Submission summary

Submission 6, Item 1: *I would like to make a submission for a water proposal for the Lower Hunter Water Plan. The proposed projects title is "The Hunter Bayswater Recycling Water Scheme." (THBRWS) It is available to view on my website www.uwr.com.au then go to a Scheme 1. I would also like to make some comments on the proposed Emergency 15 ML/d desalination Plant at a Belmont, plus put both projects side by side to compare.*

Submission 6, Item 2: *First of all, the AGL [Macquarie] Power Stations uses around 70 Gigalitres of water per annum, we also have the Mining Sector, both of these industries use water from the Hunter River, which is released from Glenbawn Dam, with little treatment this water is of a potable grade, more than 50 Power Stations in the USA use treated recycled water to help supplement their supply where water is scarce, in Queensland we have 3 Power Stations in the Western Corridor Water Recycling Water Scheme with over 200 km of large diameter pipelines using treated recycled water, (see page 6 Scheme 1.) Here in the Hunter Valley, no plans have been provided to the public for a long term solution for a potable water source for our growing population. We need to follow Israel's system, they recycle 90% of their waste water, Sydney recycles less than 10%, the Hunter has some recycling water projects but unfortunately the Burwood Treatment Plan discharges around 5 million buckets of water every day or almost one Chichester Dam per annum of water that has had Secondary Treatment. (see Pages 10 and 50, in Scheme1) (THBRWS) is a Water exchange system, it supplies 50 ML/d of Secondary treated water from the Burwood Treatment Plant to the Power Station or the Mining Sector in exchange for 50 ML of their Glenbawn Dams water supply, which with little treatment is of a potable grade. My Comments on the Proposed Emergency 15 ML/d Desalination Plant at Belmont. A) It is a puny plan. B) CapEx, Capital Expenditure, excessive costs can't be justified. C) OpEx, Operating Expenditure, a financial burden for Hunter water uses both Domestic and Industrial. D) A Desalination Plant is totally unnecessary.*

Submission 6, Item 3: *Desalination Option. A) The volumes of water, 15 ML/d is only a bandaid solution, if the drought continues dam levels will continue to keep dropping. One Olympic swimming pool = 2.5 ML, 15 ML = just 6 Olympic swimming pools per day.*

Submission 6, Item 4: *B) Capital Expenditure A $87 million dollars Desalination Plant would provide infrastructure to produce water to fill 6 Olympic size swimming pools per day, divided by 6 = $14.5 million per Olympic Swimming Pool, or just 2.5 ML of water produced per day, this would have to be the highest cost of any water infrastructure project on the planet and for such little return, this is money down the drain! , $14 Million can build an 80 ML Concrete Tank (Ellenbrook Tank Western Australia), this is a wise investment.*

Submission 6, Item 5: *C) Operating Expenditure Desalination Sea Water costs varies from $1 to $4 per kL, 1 ML = 1000 x 1000 cubes. A ML at $1 per kL = $1000, a ML at $4 per kL = $4000 15 ML per day cost ranges from $15,000 to $60,000 per day. Costs at $1 kL per year, $15,000 x 365 = $5,475,000 million per annum. Costs at $4 kL per year, $60,000 x 365 = $ 21,900,000 million per annum.*

Submission 6, Item 6: *D) A Desalination Plant is totally unnecessary, By following Israel's system of 90% water recycled, and by utilizing the 50 ML/d of the Burwood Treatment Plants secondary treated water in (THBRWS) that is equivalent to having almost an extra Chichester Dam per annum, and if this water was incorporated with Scheme 2, (see pages 93 to 107 Scheme 2.) it would result in a potable water source much larger for the entire Hunter Valley and drought proof the Vineyards and the Mining Sector for the next 50 to 100 years.*

Submission 6, Item 7: *The Hunter Bayswater Recycling Water Scheme, (THBRWS) Option.*

Some of the associated costs, Quote to supply 100 km of 1 meter in diameter pipeline that can transfer 50 ML/d = $70 million (see pages 44 and 45 in Scheme 1) Quote for energy costs to transfer 45 ML/d from the Burwood Treatment Plant to the AGL Power Station by James McKell, Origin Energy ($ 2,027,182 million per annum.) see pages 14 and 15 in Scheme 1. W3 plus consulting energy requirements, pumping station costs, (pages 24 to 29.) Quote for a preliminary Cost analysts from Makai Ocean Engineering for a survey for a Freshwater Transmission Subsea Pipeline. (USD $38,000) see Pages 30 to 36 in Scheme 1. I put in a submission for the Lower Hunter Water Plan of transferring water from North Head to Newcastle to Cathy Cole, Project Manager of the Metropolitan Water Directorate with Mr. Alan Cibilic on the 24 – 3 – 2013, at that meeting I was told that the project would supply too much water and the costs would be too expensive, I then put forward another submission of a smaller scale water project on the 11-11 -2013 Titled "The Hunter Bayswater Recycling Water Scheme."

Question: Why has THBRWS water proposal not been explored? For some reason or another some peoples mindset is focused on Desalination Plants, they may even believe that the best long term solution to provide water security for the Lower Hunter is to expand the proposed Desalination Plant to a larger scale, well they would need to rethink this and do their math's, (THBRWS) proposal which is 50 ML/d, let's compare some of the costs if they were the same size. A 15 ML/d Desalination Plant = $87 Million, divided by 15 = 5.8 per ML Therefore a 50 ML Desalination Plant would be approximately $290 million. Operating costs to provide 50 ML/d from a Desalination Plant. Costs at $1 per kL per year, $50,000 x 365 = $18,250,000 per annum. Costs at $4 per kL per year, $200,000x 365 = $ 73,000,000 per annum.

Submission 6, Item 8: *(THBRWS) Water Exchange Option. Operating costs to transfer 50 ML from the Burwood Treatment Plant to the Power Station or Mining sector = just over $2 million dollars per annum. See pages 14 and 15 in Scheme 1. Costs to treat this water to be suitable for the Power or Mining Sector. This water has already had Secondary Treatment, costs would be minable, water would not need to be of a potable grade to service both of these industries. It will also operate every day resulting in water banking (see page 10 Scheme 1). All Desalination Plants around Australia are mothballed when Dam levels are high, simply because they are far too expensive to run. The above costs of between $18,250,000 to $73,000,000 per annum to operate Desalination compared to the (THBRWS) just over $ 2million per annum for this water exchange system. Think of the money NSW and the Hunter will save by not proceeding with a totally unnecessary Emergency 15 ML/d Desalination Plant at Belmont. On page 96 in Scheme 2 titled " Project Measured in Dam Numbers," this is combining North Head and the Burwood Treatments Plant, to 450 ML/d, both having Secondary treatment, look at the figures, 1 year, 10 years and 50 years. This water proposal and these projected figures is of National Importance, to attract attention for this much needed water source, I will be sending both projects along with this letter to our State and Federal Water Ministers, other relevant politicians on all sides, the Mining Sector and the media.*

2.5.3.2 Hunter Water response

Submission 6, Items 1 through 8:

The EIS notes that Hunter Water is rolling out a program of drought response measures outlined in the 2014 Lower Hunter Water Plan (2014 LHWP). This program includes the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives and continued planning for a drought response desalination plant in Belmont South.

Hunter Water is currently working with the NSW Government, key stakeholders and the community to review the LHWP to ensure our region has a resilient water system now and in the future. Hunter Water is actively exploring a range of options to ensure that the environmental and social aspects, the technical feasibility and costs of each option are understood, as well as the reliability that each option adds to our water system. The options we are considering include recycled water, stormwater harvesting, additional water conservation measures, dams, desalination, groundwater and water sharing with other regions.

The NSW DPIE are responsible for the long term strategy planning for the Greater Hunter region. In 2018, DPIE published the Greater Hunter Regional Water Strategy (GHRWS) to improve the water security of the Greater Hunter region. The GHRWS considered a number of options, including transferring recycled water to the Upper Hunter from regional wastewater treatment plants. The report is available on line at https://www.industry.nsw.gov.au/water/plans-programs/water-mgmt-strategies/greater-hunter-region.

Hunter Water is working closely with the Lower Hunter community to develop a sustainable and resilient water plan for the Lower Hunter region. To learn more visit https://yourvoice.hunterwater.com.au/water-future.

2.6 Response to community submissions

2.6.1 Respondents

Nine community submissions were received. Table 2-6 provides a list of these, submission number, issues raised and where the Hunter Water response is provided in this report.

Table 2-6 List of respondents – community

Submission no.	Respondent	Issue	Section number where issues are addressed
10	Individual	Alternatives to the proposal	Section 2.6.4
		Biodiversity	Section 2.6.6
		Water	Section 2.6.7
		Sustainability	Section 2.6.8
		Coastal processes	Section 2.6.9
11	Individual	General opposition to the Project	Section 2.6.3
		Alternatives to the proposal	Section 2.6.4
		Sustainability	Section 2.6.8
		Coastal processes	Section 2.6.9
		Design and operation	Section 2.6.10
12	Individual	Design and operation	Section 2.6.10
13	Individual	Alternatives to the proposal	Section 2.6.4
		Project objective	Section 2.6.5
		Design and operation	Section 2.6.10
14	Individual	General opposition to the Project	Section 2.6.3
		Alternatives to the proposal	Section 2.6.4
		Biodiversity	Section 2.6.6
15	Individual	General opposition to the Project	Section 2.6.3
		Alternatives to the proposal	Section 2.6.4
		Design and operation	Section 2.6.10
16	Individual	Alternatives to the proposal	Section 2.6.4
17	Individual	General support for the Project	Section 2.6.2
18	Individual	General support for the Project	Section 2.6.2
		Alternatives to the proposal	Section 2.6.4

2.6.2 General support for the Project

2.6.2.1 Submission

Submission 17, Item 1: *Do it!!!! Future proof our water supply. Stop putting bandaids on our problems, fix it once and for all.*

Submission 18, Item 1: *I support the abovementioned proposal because of the necessity to ensure a supply of water in times of crisis.*

2.6.2.2 Hunter Water response

Submission 17, Item 1: Hunter Water notes the comments provided.

Submission 18, Item 1: Hunter Water notes the comments provided.

2.6.3 General opposition for the Project

2.6.3.1 Submission

Submission 11, Item 1: *Objections on the following grounds: That the project is not the most economical option and will add to Australia's greenhouse gas emissions unnecessary through high energy use from the grid and is not the most efficient option for non-rain fresh water harvesting nor the least impact on the environment. I also have to question the proposed location.*

Submission 14, Item 1: *I object to this project on the grounds that it is inappropriate to situate a desalination plant in this sensitive area. Local people fought for many years to preserve these wetlands, and the community needs to be satisfied that this project is absolutely necessary before this is even considered. Even if the desalination plant was demonstrated to be essential, it should not be built on these wetlands.*

Submission 14, Items 2 and 3: *I further object to this project on the grounds that the time allowed for submissions is totally inadequate for us to consider the rationale presented for this project. I would suggest that a minimum of one year would be required for proper community consultation and debate in regard to this project. I should also point out that we have never been on level 3 water restrictions, and I believe that other water conservation methods should be employed before a desalination plant is considered.*

Submission 15, Item 1: *I am opposed to the Belmont Drought Response Desalination Plant because it will not provide enough potable water for the whole region. I think that the enormous expense to get a temporary plant going and maintained for the benefit of few is not the best solution for the Hunter. The Lower Hunter needs a new bulk water supply and I think it should be at Tillegra, near Dungog. This would service the whole region and provide water security for at least 50 years. Chichester Dam is almost 100 years old and quite small in comparison. It is passed its use by date with maintenance issues and ongoing problems. We also have PFAS contamination at Tomago Sandbeds which has been spreading. There has been exponential residential growth with new subdivisions and towns in the region. Our population needs new infrastructure that can service the whole region. Tillegra could also have a hydro plant that could potentially supply power to 500 homes. Enormous financial benefits in the way of tourism to surrounding towns would flow on.*

Submission 16, Item 1: *You obviously don't want to hear from the public. If you did it would not be so difficult to create an account on your site. Go back to the Tillegra dam proposal. I fail to see any logic in any proposal to slug ratepayers with a bill for millions of dollars to maintain a plant which may operate for 5 or 10% of the time.*

2.6.3.2 Hunter Water response

Submission 11, Item 1: As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

Submission 14, Item 1: The Project will not be constructed on any part of the wetlands. As discussed in Section 7.3.3.1 of the EIS, the construction of the Project will avoid direct clearing of native vegetation and threatened species habitat. It is noted that the Project avoids the Coastal Wetland as classified under the Coastal Management SEPP.

Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

Submission 14, Items 2 and 3: As discussed in Section 6 of the EIS, since February 2018, Hunter Water has implemented a pro-active consultation plan including making direct contact with key stakeholders, face-to-face meetings, community presentations, events, door-knocking and direct letters. Hunter Water have also provided up-to-date project information on their *Your Voice* website, since February 2018. It is noted the required 28 day public exhibition period was satisfied as per the EP&A Act.

Submission 15, Item 1: As discussed in Sections 1.1 and 1.4.1 of the EIS, the key objective of the Project is to 'slow the depletion of existing water storages in the event of an extreme drought', with the Project provide around 10 to 15 per cent of the regions' restricted demand for water during an extreme drought.

However, an amendment to the capacity of the water treatment process plant from 15 ML/d to 30 ML/d is detailed and assessed in Section 3.

Submission 16, Item 1: Since February 2018, Hunter Water has implemented a pro-active consultation plan including making direct contact with key stakeholders, face-to-face meetings, community presentations, events, door-knocking and direct letters. Hunter Water has also made up-to-date project information on the Hunter Water *Your Voice* website since February 2018. In addition, Section 9.3 of the EIS discusses that the Project would be implemented as a last resort if water storage levels reach a critical point to ensure water security and would have the capacity to produce up to about 15 ML/d of potable water for supply to the local Hunter Water network. The amendment design has includes a capacity upgrade from 15 ML/d to 30 ML/d.

2.6.4 Alternatives to the proposal

2.6.4.1 Submission

Submission 15, Item 1: *The Lower Hunter needs a new bulk water supply and I think it should be at Tillegra, near Dungog. This would service the whole region and provide water security for at least 50 years. Chichester Dam is almost 100 years old and quite small in comparison. It is passed its use by date with maintenance issues and ongoing problems. There has been exponential residential growth with new subdivisions and towns in the region. Our population needs new infrastructure that can service the whole region. Tillegra could also have a hydro plant that could potentially supply power to 500 homes. Enormous financial benefits in the way of tourism to surrounding towns would flow on.*

Submission 10, Item 1: *I appreciate the need for Hunter Water Corporation (HWC) to begin the approval process for a temporary desalination plant, should, it be required if water storage levels drop to critically low levels. With anticipated population growth in the Lower Hunter and current water-use demands, I encourage HWC to consider both the supply and demand side of the water balance equation. I have concerns about the current proposal and urge HWC and other stakeholders including NSW State Government to make every effort to encourage lower water use by both residents, and industry.*

Submission 10, Item 11: *I feel it is imperative to take a wider reaching approach to decrease water demand. This would require HWC to work more closely with residents, Councils, businesses, industry and mining operations to ensure greater uptake to protect our water supply including: The use of greywater, including an educational campaign, with examples of grey water use, disseminated to the wider community; rainwater harvesting and actions to make this more widespread; stormwater harvesting methods; water recycling; an increased media campaign to change water use behaviour among residents to maximise our remaining water storages and assistance to low income customers to repair leaks etc.*

Submission 13, Item 4: *It is noted that the wind turbine power generation was not considered as an option to supply the up to 5 MW capacity required. Consider the following: * The Hunter Water population base is approximately 600,000 which is 7.5% of the NSW population of nearly 4M * NSW current coal and gas power generating capacity is between 10,000 and 12,000 MW * On a per head of population basis, the Hunter Water serviced area accounts for 900 MW of the NSW coal/gas sourced capacity (i.e. 7.5% x 12,000 MW) * The power required for the proposed desalination plant is 5 MW or between 0.5% and 1% of the total Hunter Valley requirement. This is not an insignificant draw on a declining base source of non-renewable energy supply. Furthermore, new energy consuming infrastructure should be looking towards renewable energy sources, or at least be non-renewable energy neutral. This aligns with the imperative to transition from renewables to non-renewable energy together with the broader community expectation of private and public sector entities meeting their societal environmental responsibilities. Construction of two (or possibly three if the desalination plant capacity is increased to 22.5 ML) 2 MW wind turbines at a suitable off-site location at a cost of say $3M each would only add $6-9M to the estimated cost of the project. This cost could be offset by selling the power generated back into the market when the desalination plant is not required.*

Submission 11, Item 4: *Despite the perception that the public does not favour alternatives that are cheaper, produces fewer greenhouse gasses by being less energy intensive and have a lessor impact in the environment there are better alternatives. The current proposed site is located in close proximity to Hunter Water sewage treatment works. In a world of increased recycling and re-use it is imperative that Hunter Water and all its customers endeavour to capture as much storm water on site or into localised dams for reuse as possible. Household water tanks are inexpensive. All waste water is captured at the existing treatment works before it is disposed of into the ocean. This waste water is a potential resource that needs to be captured, treated and re-used just as is storm water which is potable water virtually going down the drain. The cost of filtration and treatment would be very little with a guaranteed supply with reuse in comparison to the current proposal. The current location near wetlands could also act as a natural filter and would not impact the environment. In fact filtered nutrients would enhance the ecology of the wetlands and would also provide important habitat for migratory birds in times of drought.*

Submission 16, Item 2: *I actually can't help thinking you are playing us for suckers once again. Some of this plant couldn't be easily converted to a water recycling plant could it?*

Submission 18, Item 2: *In creating this infrastructure I urge you to incorporate into the facility's design and operation:*

(1) An indoor public education centre of minimum 50 seat capacity (e.g. a full coach of passengers)

(2) A model of the desalination plant showing its operation unless tours of the actual facility are planned

(3) Water saving and awareness displays for home owners with practical guidelines on rainwater harvesting e.g. water tanks; redundant swimming pool conversions; careful grey-water·usage etc.

(4) Practical guidance for gardeners on using less water, improving soil structure for the retention of water for use on plants, selecting drought tolerant plants etc.

(5) Expert input be sought from The CSIRO on items {1) to {4)

(6) Other partners to include in this water conservation and education project to include the Lake Macquarie City Council's nearby Belmont Library and Trees In Newcastle who operate a native plant propagating nursery close by within the Belmont Wetlands State Park

(7) Volunteers be trained and engaged to assist Hunter Water Corporation staff in this water conservation program at the desalination plant

Please give serious consideration to creating the above mentioned centre of excellence in the conservation of water education.

2.6.4.2 Hunter Water response

Submission 15, Item 1; Submission 10, Item 10 and 11; Submission 13, Item 4; Submission 11, Item 4 and; Submission 16, Item 2: The EIS (Section 1) states that Hunter Water is rolling out a program of drought response measures outlined in the 2014 LHWP, including the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives and continued planning for a drought response desalination plant in Belmont. In addition, Section 9.3 of the EIS states that the Project would be implemented as a last resort if water storage levels reach a critical point to ensure water security and would have the capacity to produce up to approximately 15 ML/d of potable water for supply to the local Hunter Water network.

A change to the design to upgrade the capacity of the plant from 15 ML/d to 30 ML/d is underway. Also, as discussed in Section 1.1 of the EIS, 15 ML/d capacity will provide around 10 to 15 per cent of the regions' restricted demand for water during an extreme drought. As discussed in Section 1.4.1 of the EIS the objectives of the Project are to 'slow the depletion of existing water storages in the event of an extreme drought', and not to provide a bulk supply of water.

As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

As discussed in Section 2.3.1 Hunter Water is currently undertaking a review of the Lower Hunter Water Plan to ensure our region has a resilient water system now and in the future. We're actively exploring a range of options including recycled water, stormwater harvesting, additional water conservation measures, dams, desalination, groundwater and water sharing with other regions. It would be more appropriate for Hunter Water to include an education facility within the design of a new water source that may be identified in the revised LHWP. We encourage the community to take part in developing the new Lower Hunter Water Plan - to learn more visit https://yourvoice.hunterwater.com.au/water-future.

Submission 18, Item 2: Hunter Water appreciates the suggestion to create an education centre alongside the proposed Belmont Drought Response Desalination Plant. Hunter Water is committed to help educate our community about the many aspects of water supply, treatment, conservation and the health benefits of drinking water. Such a facility would certainly enhance Hunter Water's ability to educate the community on how we can all 'love water'.

An example of this type of facility that already exists in our region is the purpose-built Centre for Education at the Mayfield West Advanced Water Treatment Plant, which provides a unique, locally focused learning experience provided by Hunter Water experts. At the Centre for Education, students are engaged in an interactive presentation, science experiments and other hands-on activities. The Centre for Education also offers guided tours of a working water recycling plant.

At this stage Hunter Water considers that the inclusion of an education centre within the design of the Belmont Drought Response Desalination Plant is not ideal, as the plant is intended as a measure of last resort to prolong water supply in the event of an extreme drought in the Lower Hunter. If the plant construction was triggered due to falling water storage levels, construction activities would need to proceed at a rapid pace to ensure the facility was ready to produce water as early as possible. The additional complexity of designing and constructing an education facility at the site would potentially compromise the construction program, leading to delays.

As discussed in Section 2.3.1 Hunter Water is currently undertaking a review of the Lower Hunter Water Plan to ensure our region has a resilient water system now and in the future. We're actively exploring a range of options including recycled water, stormwater harvesting, additional water conservation measures, dams, desalination, groundwater and water sharing with other regions. It would be more appropriate for Hunter Water to include an education facility within the design of a new water source that may be identified in the revised LHWP. We encourage the community to take part in developing the new Lower Hunter Water Plan - to learn more visit https://yourvoice.hunterwater.com.au/water-future.

2.6.5 Project objective

2.6.5.1 Submission

Submission 13, Item 1: *One of the two stated project objectives is to "slow the depletion of existing water storages in the event of an extreme drought". This is considered too general, almost aspirational. Inclusion of some metrics either as part of the objective, or directly linked to key performance indicators, would make the objective more meaningful, definitive, and outcome focused in measuring operational project success.*

2.6.5.2 Hunter Water response

Submission 13, Item 1: Hunter Water notes the comments and suggestions provided in the submission. The use of desalination to 'slow the depletion of existing water storages in the event of extreme drought' was developed as a result of climate/rainfall modelling and, future usage water projections which identified the need for drought contingencies which are independent of rainfall. This quantitative approach underpinned the recommendation included in the LHWP.

2.6.6 Biodiversity

2.6.6.1 Submission

Submission 14, Item 1*: I object to this project on the grounds that it is inappropriate to situate a desalination plant in this sensitive area. Local people fought for many years to preserve these wetlands, and the community needs to be satisfied that this project is absolutely necessary before this is even considered. Even if the desalination plant was demonstrated to be essential, it should not be built on these wetlands.*

Submission 10, Item 2: *the close proximity of the proposed plant to the Belmont Coastal Wetlands and a number of Endangered Ecological Communities.*

2.6.6.2 Hunter Water response

Submission 14, Item 1 and Submission 10, Item 2: The Project will not be constructed on any part of the wetland. It is noted in Section 7.3.3.1 of the EIS that the Project avoids the Coastal Wetland as classified under the Coastal Management SEPP, and will avoid direct clearing of native vegetation and threatened species habitat. Section 7.3.4 of the EIS discusses the mitigation measures are proposed to mitigate potential impacts on terrestrial and freshwater ecology.

Due to the amendment of the Project design, the Project area has now changed, and would require the clearing and disturbance of a very small area of native vegetation. The amendments would result in disturbance of an additional 0.51 ha of native vegetation and 3.94 ha of cleared land (see Table 3-4). As a result of these amendments, offsets are now required to offset the impacts of the Project on native vegetation and potential threatened species habitats.

Potential impacts to land mapped under the Coastal Management SEPP have been reconsidered in relation to the amended Project (see Section 3.4.1.1). Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

2.6.7 Water

2.6.7.1 Brine-effluent discharge

Submission

Submission 10, Item 3: *Concern for the accumulative effect of the constant adding of brine back into the ocean, together with by-products of other desalination plants across Australia and further afield.*

Hunter Water response

Submission 10, Item 3: In Section 7.4.3.3 of the EIS it discusses that the proposed brine-effluent discharge through the existing diffuser is predicted to have the same or smaller areas of impact (or effect) in terms of marine toxicity, marine ecosystem and ambient salinity water quality objectives. As discussed in Section 3.6.2.3 and Appendix M the impact of the drought response desalination plant will be insignificant compared with natural fluctuations in salinity.

2.6.7.2 Groundwater

Submission

Submission 10, Item 4: *Concern for the effects of onsite dewatering during construction.*

Submission 10, Item 5: *Concern for the lack of statement regarding the impacts of dewatering activity, across construction and/or operation.*

Submission 10, Item 6: *Concern for the lack of statement regarding where this 10 ML of ground water will ultimately go.*

Hunter Water response

Submission 10, Item 4: As discussed in Section 7.2.3.1 of the EIS, the extent and duration of dewatering during construction is expected to be less than the dewatering and drawdown during operation.

Section 7.2.3.2 of the EIS outlines the anticipated impacts on groundwater during operation including water table, water pressure and water quality. When assessed against the NSW Aquifer Interference Policy, the impacts to groundwater during operation are considered to be acceptable.

Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability.

A direct ocean intake is proposed as part of the amended Project (see Section 3).Therefore, this would remove the potential for groundwater drawdown as a result of the Project and would eliminate potential ongoing impacts to groundwater (see Section 3.6.2.2).

Submission 10, Item 5: As noted in Section 7.13.2.1 of the EIS, construction of the intake structures are predicted to generate approximately 10 ML of groundwater from dewatering activities.

As outlined in the updated mitigation measures in Appendix E, the EIS will be updated to include a description of dewatering activities during operation.

Submission 10, Item 6: As discussed in Section 7.13.2.1 of the EIS, the 10 ML of groundwater from dewatering activities may be disposed of via the Belmont WWTW outfall following appropriate treatment to ensure that water quality limits are met.

2.6.7.3 Contamination

Submission

Submission 10, Item 10*: I would like to see more research available on the potential for sand contamination at the intake point: the surrounding area has a mixed past with asbestos, and other hazardous waste dumped and buried over time.*

I would like to see more research available on the potential for micro plastics to be transported through the seawater intake.

Hunter Water response

Submission 10, Item 10: As discussed in Section 7.1.2.5 of the EIS, one potential asbestos containing material fragment was noted on the surface within the Project site. No asbestos was detected in soil samples analysed. The risk to workers is considered to be low and can be managed through an unexpected finds protocol in a contaminated soil management plan.

The Amendment Report (see Section 3) describes a design change to the seawater intake structure that includes a treatment process that will filter out any potential micro plastics, asbestos and other foreign material that could contaminate the potable water produced by the Project. Ongoing water testing would be undertaken to ensure potable water produced by the Project meets the requirements of the Australian Drinking Water Guidelines.

The pre-screening process and testing for compliance with the Australian Drinking Water Guidelines would also ensure that asbestos is prevented from entering the potable water stream.

2.6.8 Sustainability

2.6.8.1 Submission

Submission 10, Item 7: *Concerns regarding increased carbon emissions resulting from operational aspects and the current low green energy sourcing target contemplated.*

Submission 10, Item 12: *if the proposed plant does proceed, I strongly encourage Hunter Water Corporation increase the percentage of green power to a minimum of 10%.*

Submission 11, Item 3: *The EIS does not adequately demonstrate comparisons with other cheaper and more energy efficient options but briefly mentions 6 planning portfolios that were assessed with the current proposal deemed the cheapest without any detailed comparisons to prove this. The reasoning given for dismissing alternatives are inadequate. For instance the reasoning for not considering solar energy and instead opting to power the plant from AUSGRID main power. The reasoning for not considering more efficient alternatives as well as having less environmental (particular greenhouse gas emissions) is also completely inadequate in the absence of these alternatives as well as lack of cost comparisons.*

2.6.8.2 Hunter Water response

Submission 10, Items 7 and 12: As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

Submission 11, Item 3: Section 2.3 of the EIS discusses that at the start of planning for the 2014 LHWP, over 70 water supply and demand options were identified that could potentially contribute to securing the regions water supply. The list was screened using information from technical investigations and expert knowledge. To identify a mix of measures that had the best chances for delivering a cost-effective solution, a number of potential portfolios with different supply and demand measures were developed. The criteria used to assess theses portfolios included: risk, consistency with community values, controllability, impact on the nature environment and flexibility to change. Through this process, desalination was supported, as it provides an acceptable level of drought security when considered against the assessment criteria.

As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

2.6.9 Coastal processes

2.6.9.1 Submission

Submission 10, Item 8: *Concerns regarding consideration of the potential for impacts of sea level rise on the facility: the proposed plant is a considerable investment to protect from rising sea levels.*

Submission 10, *Item* **9:** *Concerns regarding the potential for dune erosion and disturbance of coastal sand biome at the intake point is a concern.*

Submission 11, Item 5: *The current site has been chosen due to its proximity to the ocean because of its nature being a desalination plant and for the obvious reason Hunter Water already owns the land. The cost of such a plant is prohibitive with this location being in a flood zone. The cost is also likely to exceed initial estimates as is with many public infrastructure proposals. Flooding due to sea level rise is likely to become more prevalent and more severe with the global warming and climate change. Storms are also predicted to become more prevalent and severe including storm surges and higher king tides that have already been noted in the adjacent largest coastal lake of Lake Macquarie that connects directly to the existing water holding area and wetland in the immediate facility of the proposed desalination plant. Such a severe storm was already responsible to severe damage to the Sydney desalination plant that caused delays in operation and also added to costs.*

2.6.9.2 Hunter Water response

Submission 10, Item 8: Section 7.5.3.2 of the EIS discusses that mapping for the Lake Macquarie Coastal Zone Management Plan 2015-2023 (Umwelt, 2015) indicates all infrastructure within the Project would be landward of the designated risk areas and not deemed to be at risk of coastal inundation.

Submission 10, Item 9: Section 7.5.2.3 of EIS discusses that mapping from the Lake Macquarie Coastal Zone Management Plan 2015-2023 (Umwelt, 2015) indicates that the proposed plant area is subject to high erosion risk in 2100 and a portion of the intake structures subject to extreme erosion risk in 2100. However, the Project is for the intermittent operation of a desalination plant and the 2100 scenario is not likely to be of relevance to the Project.

Submission 11, Item 5: Section 7.2 of the EIS outlines that 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). 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.

Section 7.5 of the EIS identified potential impacts as coastal erosion and coast inundation. Mapping for the Lake Macquarie Coastal Zone Management Plan 2015-2023 (Umwelt, 2015) indicates all infrastructure within the Project area would be landward of the designated risk areas and not deemed to be at risk of coastal inundation. This mapping also indicates that the proposed plant area is subject to high erosion risk in 2100 and a portion of the intake structure is subject to extreme erosion risk in 2100. However, the Project is for the intermittent operation of a desalination plant and the 2100 scenario is not likely to be of relevance to the Project.

2.6.10 Design and operation

2.6.10.1 General

Submission

Submission 11, Item 2: *There is no direct comparisons of options in regard to initial construction costs and ongoing maintenance and energy costs. These will be additional costs on top of existing costs that will ultimately be imposed and a burden to local ratepayers. -Initial projected costs are 90 million plus annual maintenance costs even when not operational and only triggered when dam levels are at 15% guesstimated to occur by the end of construction, and at which there would be additional unnecessary high energy cost to operate the plant without guarantee of green power purchase or provision of additional green energy construction to power this plant. Energy use is estimated at 35000 kWh/pA to produce potable water from sea water at 15 ML pd using approximately 100 MWh. These figures do not accurately indicate the volume of potable water that would be produced for the amount of energy necessary to be expended nor does the EIS reflect the additional cost or final cost to ratepayers per year and number of years when and if the plant is switched on. Decommissioning of the plant at >50% dam capacity is an ineffective use of a water facility. The cost of the current proposal far out ways the benefits. You only have to make a comparison with the Sydney desalination plant. For this reason other lesser costly alternatives should be implemented.*

Submission 12, Item 1: *No details have been given in the report of the area intended to be serviced by the desalination plant. It has been stated that this information is to be covered in a separate report on the delivery system at some point in the future. Reference is made in Section 3.3.1 to the construction future potable pipework from the plant but no details are provided other than a statement that "the pipelines can provide an additional level of redundancy for the existing trunk water main network and can be utilised independent of the desalination plant". Two potable pipelines, a northern and a southern pipeline, are shown on the concept design drawings leaving the plant. It is not clear what the destination or function of the northern pipeline is intended to be. However, without this information it is difficult to understand how the projected output of the plant is to be utilised. The report states that the proposed output from the plant will be 15 MLD and it is assumed that the plant will deliver this output at a constant rate over 24 hours. The Belmont Desal plant, unlike a plant located at, say Stockton, is remote from the major trunk feeds from the Grahamstown, Tomago and Chichester sources and therefore its output cannot be directly added to these trunk feeds. Because the Belmont plant is located near the outer limits of the Hunter Water supply system it poses the question as to how the full output from the plant can be successfully utilised across the wider supply system if this was the intention (the report seems to imply this). As demand varies significantly throughout the day,*

with morning and evening peaks and minimal overnight usage, use will need to be made of storage to control the rate of flow into the reticulation system. Flow from the treatment plant cannot simply be directly fed into the existing reticulation system. The storage at the plant itself is limited to a 1.8 ML tank with less than 3 hours storage with an inflow rate of 15 MLD. It would therefore seem necessary to make use of the existing larger local Hunter Water storage reservoirs for flow averaging. The Belmont No 1 Reservoir, located in Violet Town Road (storage 4.6 ML, TWL 88.45) would seem the obvious destination for the output from the plant as it is the main reservoir controlling supply south for the Belmont – Swansea region. Because of the higher hydraulic head on the supply side of this reservoir (as a result of gravity and pumped flows) it would not appear practical to gravitate flows in a northerly direction. Based on the above assumptions, a trunk main, approximately 6 km in length, would need to be constructed from the Desal Plant to the reservoir with appropriate inlet controls installed to permit inflow from either the Desal Plant or the existing sources of supply. Based on 2016 census figures the population of the suburbs of Belmont, Belmont North, Jewells, Floraville, Belmont South, Marks Point, Pelican, Swansea, Caves beach, Murrays Beach and Nords Wharf was 33,868. This could have increased to, say 36,000, in 2019. This would give an approximate estimate of the population serviced by the Belmont No 1 Reservoir. Recent published consumption figures for Tamworth (population 62,000), which is currently on Level 5 restrictions, were 16.1 MLD (Ref: The Northern Daily Leader, 2 October 2019). No outdoors water usage is permitted under Level 5 restrictions. This consumption amount represents residential and non-residential usage. The local council claims to have reduced daily per capita consumption to 150 litres per day. This would be comparable to what would apply with Hunter Water supplies if falling storage levels required Level 4 or 5 restrictions to be introduced (at 25% and 20% storage levels respectively). If these assumptions are correct and the Belmont Desalination plant output is regulated to meet only Level 4 or 5 usage (which could apply by the time the Desal Plant is finally operational) rather than Level 3 usage as stated in the report, then on a pro-rata basis the required output from the Belmont Desal Plant could be scaled back to, say, 9 to 10 MLD, which could result in a worthwhile saving in costs. As water restrictions are meant to apply uniformly across Hunter Water's supply system it would be unacceptable to offer some areas a more abundant supply than the rest of the system. It has been noted in Section 2.4.1.4 - Capacity of the desalination plant – that the modelling undertaken during the development of the LHWP was based on the supply of 9 ML/d of desalinated water. As long as provision is made in the design for scaling up the capacity of the plant to 15 ML/d, it could be worthwhile from an economic point of view to initially only install two 5 ML/d desal modules, deferring the installation of a third 5 ML/d module to a future date.

Submission 12, Item 2: *It is agreed with the conclusions of the report that the preferred intake option for the Belmont Desal Plant should be the use of horizontal sub-surface seawater intake wells.*

Submission 12, Item 3: *The use of collection wells with horizontal filters is well established in the United States, Europe and parts of Asia where they are used for both seawater and river aquifer extraction. The original Ranney design method for inserting the horizontal filters has evolved to include other designs such as Nebolsine, Fehlmann and Preussag gravel cover. The method of inserting the horizontal filters involves the use of specialised jacking systems (not microtunnelling equipment referred to in the report). The usual diameters of the collecting well caissons also fall in the range 4 to 6 meters, not the larger diameters (9 to 10 metres) mentioned in the report. Lineshaft vertical turbine pumps, as opposed to submersible pumps, seem to be the preferred method of pumping in overseas installations. However, as the motors of these pumps are surface mounted, they will require a suitable above ground pump house to be installed. There does not appear to be any comparable examples of horizontal collection wells being constructed in Australia or any evidence of local expertise in this area. The caissons could certainly be constructed by local contractors but the expertise and equipment needed for*

the construction of the horizontal filters would need to come from overseas. If the horizontal filters are not correctly installed to suit local conditions there is a real risk of the filters clogging and being unable to sustain the required rate of delivery. As the output capacity of the Desal Plant is dependent on the ability of the collection well to deliver the required input it would be prudent to give the highest priority to the construction and testing of the collection well system. If the collection well fails to deliver as expected, the success of the Desal Plant will be put in jeopardy and the whole exercise could be a costly and embarrassing failure, especially as it will occur at a critical time when water supplies are at their lowest. Serious consideration should therefore be given to an immediate start of the detailed investigations required to allow an early start on the collection well system. This will necessitate the involvement of overseas firms who have the expertise required to undertake the work. To allow testing of the collection system it will also be necessary to bring forward the construction of the brine disposal pipeline and the provision of power for the collection well pumps. It is suspected that the construction timetables put forward in the report could be overly optimistic and have not given sufficient regard to the amount of work that will be involved in preliminary investigations and contract preparation. As stated in the report, if the current drought persists, water storages could fall rapidly, dropping from 35% to 15% in the space of 10 months. Consideration should therefore be given to starting on the detailed investigation and planning for the collection well system well before the trigger point of 35% storage to allow adequate lead times for construction.

Hunter Water response

Submission 11, Item 2: Section 2.3 of the EIS discusses that at the start of planning for the 2014 LHWP, over 70 water supply and demand options were identified that could potentially contribute to securing the regions water supply. The list was screened using information from technical investigations and expert knowledge. To identify a mix of measures that had the best chances for delivering a cost-effective solution, a number of potential portfolios with different supply and demand measures were developed. The criteria used to assess theses portfolios included: risk, consistency with community values, controllability, impact on the nature environment and flexibility to change. Through this process, desalination was supported, as it provides an acceptable level of drought security when considered against the assessment criteria.

As discussed in Section 7.7.3.3 of the EIS, energy use and greenhouse gas emissions have been modelled for both construction and operation phases of the Project. If the Project goes ahead Hunter Water will consider available options at the time to reduce the energy impacts from operating the plant. Options to be considered may include:

- Commencing a Corporate Power Purchase Agreement for the operation of the Belmont Plant
- Purchasing green power via Renewable Energy Certificates
- On-site renewable options to partially offset consumption

Opportunities for the use of an on-site solar photovoltaic system to provide a portion of the Project's operational energy requirements have been identified in Section 2.7 of the EIS, however has not been selected as a preferred power supply option due to economic and space considerations.

Overall, Hunter Water is committed to reducing energy consumption and reducing greenhouse gas emissions. Hunter Water has an aspirational goal of being carbon neutral by 2030. As a part of this, Hunter Water has developed an energy efficiency initiative across its water supply and water treatment networks. The program focusses on energy management and greenhouse gas reduction. Measures include energy efficiency upgrades at pump stations and treatment sites, together with developing a solar program through the network.

As discussed in Section 1 of the EIS, triggers for the design and construction of a drought response desalination plant were identified in the LHWP to ensure a plant would be operational prior to total water storage levels reaching no less than 15 per cent. The LHWP identified detailed design for the drought response desalination plant to commence at around 65 per cent total water storage level to allow adequate time to construct and commission the plant. While the 2015 LHWP included trigger levels for commencing construction at around 35 per cent total water storage Hunter Water proposes to amend the trigger for construction to commence at 45 per cent total water storage level. The construction trigger has been revised as a result of the Project development following the EIS exhibition, with more information becoming available on lead times for key components. . These triggers will continue to be reviewed in order to defer construction to as late as possible and increase the chance of storages recovering from rain, whilst ensuring adequate lead times are provided for construction.

As discussed in Section 3.2, following the completion of the EIS, further design development undertaken by Hunter Water identified the sub-surface intake system would require substantial additional infrastructure to reliably operate the plant at the 15 ML/d capacity.

An assessment to examine viability of a sub-surface horizontal intake system for the 30 ML/d plant capacity found that a direct ocean intake performed considerably better than the sub-surface options across all assessment criteria. The direct ocean intake option was identified as the most suitable to deliver the 90 ML/d of seawater required to produce the 30 ML/d of potable water from the Project. Furthermore, direct ocean intake systems have been used at all other seawater desalination plants constructed throughout Australia in the last two decades and have been demonstrated as an effective and reliable intake option.

2.6.10.2 Intake structure

Submission 12, Item 1: As part of the Belmont Drought Response Desalination Plant Project, Hunter Water identified the need to construct two potable water pipelines connecting the desalination plant to the potable water network. As stated in the EIS section 3.3.1, during design development for the desalination plant, detailed hydraulic modelling identified that the pipelines could provide an additional level of redundancy for the existing potable water network, and can be utilised independent of the desalination plant. Details of these pipelines were not included in the desalination plant EIS, as the pipelines development is being assessed as a separate Review of Environmental Factors under Division 5.1 of the EP&A Act. However, the following paragraph provides an overview of water distribution from the desalination plant to the potable water network.

Water would distributed from the desalination plant via two potable water pipelines – a 6.2 km long, 500 mm diameter ‘northern’ water pipeline, and 1.2 km long, 375 mm diameter ‘southern’ water pipeline, as shown in Figure 2-1. The northern pipeline would connect to existing pipelines along Murray Street, Jewells. The southern pipeline would connect to an existing pipeline near Beach and Hudson Streets, Belmont South. When the desalination plant is online, the majority of water would be distributed through the northern pipeline, as the receiving pipelines at the connection point are larger pipelines that are directly connected to two existing water storage reservoirs (tanks). This allows the desalination plant to supply water to customers beyond the Belmont area, with minimal impact to the existing water network operation.

Paper Size ISO A4

0 180 360 540 720

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Hunter Water Corporation
Belmont Potable Water Pipeline
Response to Submissions

Proposed potable pipeline connections

Project No. **22-19573**
Revision No. **0**
Date **29/06/2020**

Figure 2-1

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Print date: 29 Jun 2020 - 10:20

Data source: LPI: DTDB / DCDB, 2017; public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay

Submission 12, Item 2: Hunter Water notes this comment. It is further noted that there is an amended design underway, which will assess two direct ocean intake method options for the intake structure.

Submission 12, Item 3:

As discussed in Section 1 of the EIS, triggers for the design and construction of a drought response desalination plant were identified in the LHWP to ensure a plant would be operational prior to total water storage levels reaching no less than 15 per cent. The LHWP identified detailed design for the drought response desalination plant to commence at around 65 per cent total water storage level to allow adequate time to construct and commission the plant. Triggers to commence construction of the plant were identified to be around 35 per cent in the LHWP. These triggers will continue to be reviewed in order to defer construction to as late as possible and increase the chance of storages recovering from rain, whilst ensuring adequate lead times are provided for construction.

As discussed in Section 1.1, following the completion of the EIS, further design development undertaken by Hunter Water identified reliability and construction risks with the proposed horizontal sub-surface intake system.

An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option. Furthermore, direct ocean intake systems have been used at all other seawater desalination plants constructed throughout Australia in the last two decades and have been demonstrated as an effective and reliable intake option.

Intake structure

Submission

Submission 13, Item 3: *The EIS recommends seawater intake from a sub-surface saline aquifer. The modelling for the preferred horizontal intake arms alternative provides a predicted large range of intake rates for both single "three arm" and "five arm" intake structures. No modelling was carried out for multiple three and five arm intake structures with the predicted outcomes somehow being extrapolated from the single structures' data. As the proposed design is based on two "three arm" structures, the degree of uncertainty in achieving the required intake is further compounded. From the analysis presented there appears to be significant risk in ensuring that the 15 ML intake will be achieved. Adoption of the "open seawater intake" option would remove the intake risk and uncertainty associated with the subsurface seawater intake options, and also negate the need to rely on the recharging of the aquifer following the cessation of the desalination plant operation to be ready for future re-commissioning.*

Hunter Water response

Submission 13, Item 3: In light of the amendments to the Project (see Section 3), this has resulted in a change to the proposed source of raw feed water, from a sub-surface intake to a direct ocean intake (i.e. from a sub-surface saline aquifer to ocean water).

2.6.10.3 Capacity of the Desalination Plant

Submission

Submission 15, Item 2: *The EIS states that the 15 ML capacity plant will contribute 10% to 15% of the total supply under Level 3 water restrictions. The 15 ML produced is only 11% of the stated Level 3 estimated daily consumption of 138,000 ML. This is not a significant contribution especially when comparing to other desalination plants in Australia. While a 30 ML capacity plant (i.e. 100% capacity increase on the proposed 15 ML) would be desirable, a 50% capacity increase to 22.5 ML would at least achieve a 15% to 22.5% contribution to the estimated daily consumption. This assumes that the outlet diffusers can accommodate an outflow of 65-70 ML (combines brine and waste water), and that the dry weather existing waste water arriving at the Belmont plant is 22.5 ML or greater to ensure that the treated combined effluent (brine plus waste water) has the same saline content as the seawater. Increasing the capacity to 22.5 ML would increase the estimated project cost in the order of 35-40% to a total value of about $125M which is not unreasonable. A desalination project which delivers 10% or less of the total water supply needs to be questioned as to whether the benefit can be economically, socially, environmentally, and resource allocation justified.*

Hunter Water Response

Submission 15, Item 2: As stated in section 1.1 of the EIS the operating capacity of the Project in the EIS would produce up to 15 ML/d of potable water to Hunter Water's network. This is approximately 10-15 per cent of Hunter Water's water demand when water demand is reduced as far as possible with all water restriction levels in place. Since the EIS, as discussed in Section 3.2, additional information relating to network storage capacity, water delivery options, supply constraints, and plant components (i.e. lead-times for key components, in conjunction with construction costs and limitations) indicates a predicted shortfall between the existing supply capacity and the estimated demand.

These considerations have determined a water treatment process plant capacity of 30 ML/d would more effectively contribute to bridging the predicted shortfall between the existing supply capacity and the estimated demand. To service the proposed increase in the plant's operating capacity, an amended design has been developed. The amended design is discussed in Section 3.

2.6.11 Additional mitigation measures and commitments

In response to the submissions, Table 2-7 below and Appendix E include additional mitigation measures to be implemented for the Project.

In addition, the below is a summary of commitments from Hunter Water in response to the submissions:

- The construction of the plant will only proceed if critical water storage levels are reached as a result of a severe drought. Hunter Water will consider available options to reduce the energy impacts from operating the plant (see Sections 2.6.4.2, 2.5.2.5 and 2.6.8.2) in the unlikely event these triggers are reached and construction of the plant proceeds.
- The language used in the EIS to describe the predicted groundwater drawdown will be revised and updated in the Amendment Report for consistency (See Section 2.4.2.2).
- The EIS will be updated to include a description of dewatering activities during operation (see Sections 2.5.2.4 and 2.6.7.2).

Table 2-7 Summary of additional mitigation measures

Aspect	Phase	Summary of mitigation measure	Relevant section
Coastal processes	Design	The Construction Environmental Management Plan (CEMP) will be updated to include a natural event response plan to mitigate risks associated with coastal hazards.	2.4.2.4
Biodiversity	Post-construction	Hunter Water will commit to creating a Native Vegetation Management Plan to mitigate potential impacts from any disturbance to native vegetation.	2.4.2.4
Water resources	Design	Prior to construction, either a new EPL would be obtained or EPL 1771 would be modified to authorise the discharge of dewatered groundwater during construction and additional proposed discharges from the Project to the Belmont WWTW outfall during operation.	2.4.8.3
Noise and vibration	Construction	Hours for highly noise intensive works would be undertaken in accordance with the EPA's requirements detailed in their submission.	2.4.8.5
	Design	Hunter Water will commit to undertaking the required Noise and Vibration specifications in the conditions of approval.	2.4.8.5
Waste management	Construction	Waste management measures will be updated in the EIS to also include tracking vehicles, origin and destination of the waste, and records to be kept for a minimum of four years.	2.4.8.6
Aboriginal Cultural Heritage	Pre-construction	Hunter Water will develop a care agreement in consultation with Aboriginal parties for the long-term care of Aboriginal objects. This will be integrated into the ACHMP.	2.4.3.3
Traffic and access	Construction	Hunter Water will ensure relevant requirements of *AS 2890.2-2002 Parking facilities - Off-street commercial vehicle facilities* are considered and documented in the CEMP for the Project.	2.4.2.5
Soil, geology and contamination	Pre-construction	Hunter Water commits to undertaking a DSI prior to Project determination. The scope of the DSI will include analysis for heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs and asbestos and has been based on existing contamination data and the low potential for significant contamination to be present on Project area. Hunter Water will also undertake a focused investigation within the area of TP204 to further assess potential asbestos impacts prior to construction. This assessment, and the outcomes of the DSI will inform the management measures in the Contaminated Site Management Plan (CSMP) and if remediation is required.	2.4.8.1

3. Amendment report

3.1 Overview of the EIS

3.1.1 Background

The Lower Hunter Water Plan (LHWP) was developed by the NSW Department of Finance and Services in 2014 to identify sources of water for homes, business and industry in the lower Hunter, and to prepare the region for drought. A desalination plant was identified in the 2014 LHWP as beneficial because it is the only source of water that is independent of rainfall.

Triggers for the design and construction of a drought response desalination plant were identified in the 2014 LHWP. The triggers were developed to ensure that a plant could be operational prior to total water storage levels reaching no less than 15 per cent. The 2014 LHWP identified the detailed design trigger at 65 per cent total water storage level. This would allow adequate time to construct and commission the plant before storage levels reached 15 per cent.

The Project EIS was submitted to DPIE in October 2019. The EIS described a plant at Belmont (see Figure 3-1) with a capacity to produce up to 15 megalitres per day (ML/d) of potable water for supply. This volume would provide around 10 to 15 per cent of the regions' restricted demand for water during an extreme drought. Restricted demand in this scenario is defined as the total supply of potable water to Hunter Water's customers during Level 3 water restrictions and is estimated to average 138 ML/d, but will vary based on season and climate conditions.

The Project is located within the southern portion of the existing WWTW off Ocean Park Road in Belmont South within the Lake Macquarie LGA of NSW (the Project area) (see Figure 3-1).

3.1.2 Objectives of the Project

The key objectives of the Project are:

- Provide a rainfall independent water source in the event of an extreme drought
- Slow the depletion of existing water storages in the event of an extreme drought

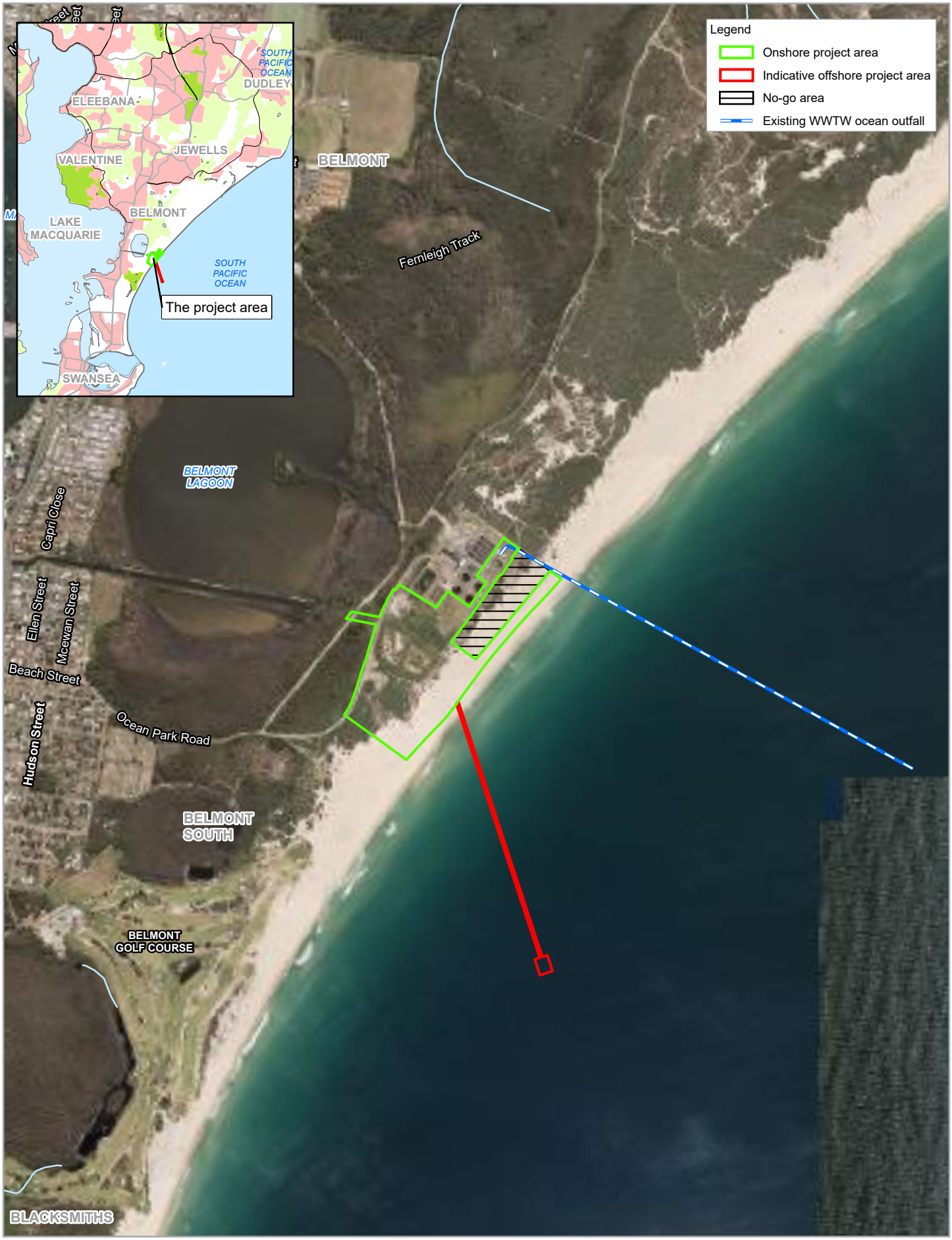
The Project, would address these objectives while considering the environmental, social and economic impacts, with the options assessment process considering these factors.

3.1.3 Key features of the Project in the EIS

The Project described in the EIS is for the construction and operation of a drought response desalination plant, designed to produce up to 15 ML/d of potable water, with key components including:

- **Seawater intakes** – Two intake structures proposed to extract raw feed water (seawater) from a sub-surface saline aquifer. The central intake structures would comprise:
  - Concrete structure (referred to as a caisson) of approximately nine to 11 m diameter and installed to a depth up to 20 m below existing surface levels.
  - Intake pipes located approximately eight to 15 m below ground level radiating out from the central structure.
  - Pipelines and pumps are required to transfer the seawater to the desalination plant.

- **Water treatment process plant** – The water treatment process plant would comprise a range of equipment potentially in containerised form. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater)) would comprise a mix of buried and overhead methods. The general components of the water treatment process would comprise:
  - *Pre-treatment:* a pre-treatment system is required to remove micro-organisms, sediment, and organic material from the seawater.
  - *Desalination:* a reverse osmosis (RO) desalination system made up of pressurising pumps and membranes. These would be comprised of modular components. In addition, a number of tanks and internal pipework would be required.
  - *Post treatment:* desalinated water would be treated to drinking water standards and stored prior to pumping to the potable water supply network.
- **Brine disposal system** – The desalination process would produce wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to the existing nearby Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – A minor upgrade to the existing power supply network in the vicinity of Hudson and Marriot Streets. A power line extension from the existing line along Ocean Park Road into a new substation within the proposed drought response desalination plant would also be required.
- **Ancillary facilities** – Including a tank farm, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, and fencing, signage and lighting.



Paper Size ISO A4

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Metres

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Hunter Water Corporation
Belmont Drought Response Desalination Plant
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Project Location

Figure 3-1

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3.2 Strategic context

Like much of NSW, the Lower Hunter region continues to experience ongoing drought conditions. In February 2020, storages reached a 40 year low of 52.5 per cent. As at June 2020, storages were around 68 per cent, well below typical levels for time of the year.

In response to the ongoing drought, Hunter Water is rolling out a program of drought response measures as outlined in the LHWP. Reduction in demand has been achieved through a combination of proactive community engagement and education programs, and the progressive introduction of water restrictions as storage levels decline. Since the introduction of restrictions in September 2019, Hunter Water customers have reduced water consumption by around 20 per cent compared to what would have otherwise been expected given the time of year.

In addition to these measures, Hunter Water commenced design and environmental assessments for the Project to ensure the desalination plant would be operational in the unlikely event overall storages reach 15 per cent. Investment at key stages would be deferred for as long as possible (increasing the likelihood of storage recovery due to rainfall), without compromising the ability to deliver the desalination plant in time should storages reach critical levels. While the chance of such an extreme drought is extremely low, the consequences to the region of running out of water are catastrophic.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the LHWSP. The LHWSP seeks to determine the preferred portfolio of supply and demand side options to ensure a sustainable and resilient supply for the region, over the long term as well as during drought. As with the 2014 LHWP, the major revision is a whole of government approach, and Hunter Water are working closely with the DPIE – Water, Central Coast Council, the Lower Hunter community and other stakeholders in developing the new Plan.

The LHWSP review has shown that in the event of a rare and unprecedented drought, resulting in storages approaching empty, there is a predicted shortfall between the network's existing supply capacity and the estimated severely restricted demand. This shortfall is predicted to occur following the implementation of all the measures in the 2014 LHWP including the 15 ML/d Belmont Drought Response Desalination Plant as described in the EIS.

3.2.1 Water treatment process plant

The EIS (GHD, 2019a) for the Belmont Drought Response Desalination Plant was based on an operating capacity of up to 15 ML/d of potable water being delivered to Hunter Water's network.

In response to the ongoing drought, at a time when storages reached the lowest level in 40 years, Hunter Water investigated a range of options to close, or partially fill the shortfall in supply, including increased access to groundwater sources (beyond current license limits), additional recycling schemes and increased desalination capacity.

As the design process for the Belmont Desalination Plant has developed, more information has become available on costs associated with plant components, lead-times for key components, together with construction limitations and costs. This information in conjunction with further modelling of the system storage capacity, water delivery options and supply constraints has been used to determine that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/d would provide the best balance of meeting the communities needs should a severe drought occur while still providing value for money.

Concurrent with this reassessment, the LHWSP review has investigated alternative sites that could provide larger desalination production capacities. It found that these alternative sites could not be delivered during the current drought in the timeframes required to prevent storage depletion under worst-case drought conditions. Importantly, the increased capacity at Belmont Desalination Plant could be delivered in these timeframes.

3.2.2 Intake structure

Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system.

An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options including a direct ocean intake, vertical sub-surface wells and inclined sub-surface wells. Options were evaluated against relevant criteria including environmental impact, constructability, maintenance and durability, water quality, program and cost.

This assessment found that a direct ocean intake would perform considerably better than a sub-surface option. Further, direct ocean intake systems have been used at all of the seawater desalination plants constructed in Australia in the last two decades proving their suitability. The direct ocean intake would be suitable to deliver the 91.2 ML/d of seawater required to produce the 30 ML/d of potable water at the Belmont Desalination Plant.

The direct ocean intake incorporates the seawater pump station, intake pipeline and intake structure. The construction method of the intake pipeline would be determined during detailed design; however, the following construction methodologies have been included in the assessment.

- Construction method 1 (CM1) horizontal directional drilling (HDD).
- Construction method 2 (CM2) pipejacking/micro-tunnelling.

3.3 Description of the amendments

3.3.1 Overview

This section provides an overview of the amendments to the EIS Project for key Project elements as provided in Table 3-1 while Section 3.3.3 provides a description of the key features of the Amended Project.

A detailed updated Project description is provided in Appendix D.

Table 3-1 Overview of amendments to the Project

Project element	EIS Project	Amended Project
Project area	Approximately 7.64 hectares, including: • An area of approximately 7.60 hectares associated with the seawater intake, water treatment process plant, brine disposal system, and ancillary facilities. • A small area of approximately 0.04 hectares associated with the power supply works.	Approximately 17.39 hectares, including: • 2.21 hectares associated with the direct ocean intake. • 15.18 hectares associated with the water treatment process plant, brine disposal system, ancillary facilities and power supply works (No-Go area is excluded). • See Appendix D for further discussion.

Project element	EIS Project	Amended Project
Structure design	Water treatment process equipment in buildings and potentially containerised form. Indicative maximum structure height is 5 m. Indicative total footprints for structures associated with each Project feature: • Sub-surface intakes = 57 m^2 • Water treatment process plant = 1500 m^2 • Brine disposal system = 210 m^2 • Power supply = 50 m^2 • Ancillary facilities = 1170 m^2	Buildings to house all equipment. Indicative maximum structure height is 14 m. Indicative total footprints for structures associated with each amended Project feature: • Direct ocean intake = 800 m^2 • Water treatment process plant = 2,880 m^2 • Brine disposal system = 480 m^2 • Power supply = 830 m^2 • Ancillary facilities = 2,500 m^2
Work methodology	Construction methodology for the water treatment process incorporates construction of hardstand and installation of process equipment (containerised). Construction methodology for the intake incorporates two key aspects: • Caisson installation • Installation of the horizontal seawater intake pipes from within the caisson structure Work methodology for the EIS Project was provided in Section 4.2.2 of the EIS.	Construction methodology for the water treatment process incorporates construction of hardstand and associated buildings for operational equipment housing. Construction methodology for the direct ocean intake incorporates three key aspects: • Sea Water pump station • Intake pipeline • Intake structure (off shore) The intake pipeline construction method has been assessed for two potential methodologies including: • Horizontal Directional Drilling (HDD) (Construction Methodology CM1) • Microtunnelling or pipe jacking (CM2) An updated work methodology for the amended Project is provided in Appendix D.
Staging and workforce	Construction program would include, in order of staging: • Site establishment • Intake Structure • Water treatment process plant • Power upgrades • Commissioning	
	Construction workforce of up to 25 full time equivalent (FTE) personnel, including: • Intakes = 10 • Water treatment process plant = 10 • Power upgrades = five (5) Operation a workforce of up to five (5) FTE personnel to manage onsite operations.	Construction workforce of 60 full time equivalent (FTE) personnel, including: • Direct ocean intake = 20 • Water treatment process plant = 30 • Power upgrades = 10 Operation a workforce of up to five (5) FTE personnel to manage onsite operations.
Project hours and duration	Standard construction hours, with out of hours work for dewatering during construction of the intake structures would be required.	
	Construction duration: • Intakes = 6 months • Water treatment plant = 2 months • Power upgrades = 2 weeks	Construction duration is provided in Appendix D. • Direct ocean intake = 8 months • Water treatment plant = 4 months • Power upgrades = 4 weeks

Project element	EIS Project	Amended Project
Plant and equipment	Relevant plant and equipment for the EIS Project was provided in Section 4.2.5 of the EIS. Plant and equipment required for the Intake included: • Concrete saw • Welding equipment • Compressor • Concrete truck • 30 t crane • 15 t excavator • Microtunnel/drilling rig • Generator • Dewatering equipment • Pumps • Heavy vehicles • Portable pipelines/couplings	Relevant plant and equipment for the amended Project, including all methods of construction for the intake pipeline, is provided in Appendix D. Plant and equipment required for the direct ocean intake include: • General plant and equipment - Generators - 15 t excavators - Heavy vehicles • Sea Water pump station - Pumps - Welding equipment - 30 t crane - Concrete saws • Intake structure - 30 t crane - Ocean barges - Concrete batching - Clamshell excavator • Intake pipeline • CM1 - Sump pumps - Drill rig truck - HDD equipment • CM2 - Auger drill rig - Boring jack power unit - Drill rig truck - 30 t crane - Sump pumps
Traffic management and access	Relevant total construction traffic movements for the EIS Project were provided in Section 4.2.5 of the EIS and included: • Heavy vehicles movements: - Intakes = 668 - Water treatment process plant = 25 - Power upgrades = 5 • Light vehicles per week: - Intakes = 120 - Water treatment process plant = 120 - Power upgrades = 60	Relevant total construction traffic movements for the amended Project and include: • Heavy vehicles movements: - Direct ocean intake = 752 - Water treatment process plant = 25 - Power upgrades = 5 • Light vehicles per week: - Intakes = 240 - Water treatment process plant = 360 - Power upgrades = 120 Further detail is provided in Appendix D and Section 3.6.2.6.
Land use and ownership	Land use and ownership for the EIS Project were provided in Section 3.2 of the EIS, including: • Project area located entirely on Hunter Water owned land zoned SP2 – Infrastructure and E2 – Environmental Conservation	The on-shore Project area would be located entirely on Hunter Water owned land zoned SP2 – Infrastructure and E2 – Environmental Conservation. The off-shore Project area would be located on Crown land zoned E2 – Environmental Conservation.

3.3.2 Definitions

For the purpose of this Amendment Report (AR), the following definitions apply:

- The 'Project' is the development that is the subject of this AR, being the proposed construction and operation of a drought response desalination plant.
- The 'Project area' is the land in respect of which the SSI approval is made and within which the Project is proposed to be carried out, comprising both an on-shore Project area and an off-shore Project area (refer to Figure 3-2). The off-shore Project area includes the intake pipeline and intake structure, while the on-shore Project area includes the water treatment process plant, brine disposal system, power supply, ancillary facilities and sea water pump station.
- The 'Study area' is the land in which the biodiversity and heritage surveys and investigations have been undertaken, including both the on-shore and off-shore surveys and investigations.
- The 'No/Go area' is the area to the east of the Belmont WWTW in which no construction activities or ground disturbance would be undertaken (refer to Figure 3-2).
- The 'locality' encompasses the suburbs in the immediate area surrounding the Project area.
- The 'Project outfall area' is the existing Belmont WWTW outfall and the area of influence considered for the Marine Assessment (GHD, 2020c) summarised in Section 3.5.2.3.

3.3.3 Key features of the amended Project

The amended Project for the construction and operation of a drought response desalination plant, designed to produce up to 30 ML/d of potable water, includes the following key components (as shown in Figure 3-2):

- **Direct ocean intake** – To ensure provision of sufficient quantities of raw feed water for the water treatment process plant, a direct ocean intake is proposed as part of the amended Project, as follows:
  - *Sea Water Pump Station (On-shore), including a central well, screening and pump housing*, proposed to be a concrete structure (referred to as a wet well) of approximately nine to 11 m diameter, installed to a depth up to 20 m below existing surface levels.
  - *Intake pipeline,* the indicative pipeline alignment is approximately 1000 m in length, extending outwards from the central housing to the off-shore intake structure. Construction of the intake pipeline would be determined during detailed design; however, the following construction methodologies/ considered and assessed included Construction Method 1 (CM1) Horizontal directional drilling (HDD) and (CM2) Pipejacking/micro-tunnelling.
  - *Intake structure (Off-shore)*, the intake structure would be in the form of a horizontal intake with a velocity cap structure and low through-screen velocity to minimise impacts on marine species and habitat. The intake structure would be 5 m in diameter, have a minimum of 5 m clearance from the seabed and a depth of approximately 18 m of water.

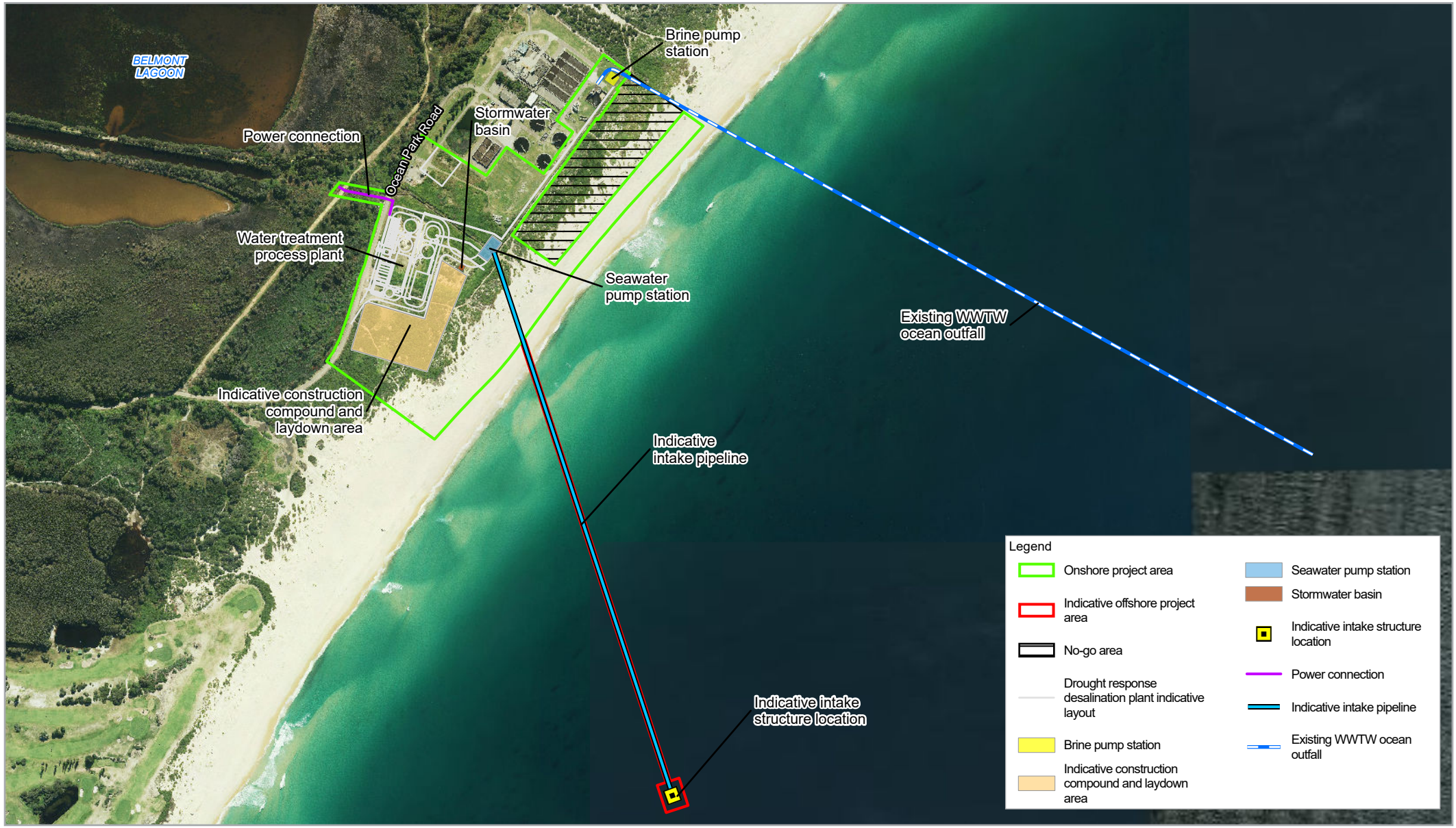
- **Water treatment process plant** – The water treatment process plant would not significantly change from that described in the EIS. The inclusion of buildings to house equipment rather than the installation of containerised equipment is the primary change. The buildings would be placed above ground level and located to allow incremental installation, if required. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater)) would comprise a mix of buried and overhead methods. The general components of the water treatment process would comprise:
  - *Pre-treatment:* a pre-treatment system is required to remove micro-organisms, sediment, and organic material from the raw feed water.
  - *Desalination:* a reverse osmosis (RO) desalination system made up of pressurising pumps and membranes. These would be comprised of modular components. In addition, a number of tanks and internal pipework would be required.
  - *Post treatment:* desalinated water would be treated to drinking water standards and stored prior to pumping to the potable water supply network.
- **Brine disposal system** – The desalination process would produce up to 56 ML/d of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to a brine pump station at the Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – Power requirements of the amended water treatment process plant would require connection to Ausgrid's 33 kV line to the north-west of the water treatment process plant site, with new private power line connecting to a substation within the plant site.
- **Ancillary facilities** – including a tank farm, equipment housing buildings, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, parking areas, and fencing, signage and lighting.

Each of these elements are described further in Appendix D. A comparison of the EIS Project with the amended Project is shown on Figure 3-3.

The desalination plant would be connected to Hunter Water's potable water network via a potable water pipeline proposed to be constructed to augment the existing water network. The pipeline does not form part of the Project and would be part of a separate design and approvals process.

Despite the Project amendments, the objectives remain the same: to provide a rainfall independent water source in the event of an extreme drought, and slow the depletion of existing water storages in the event of an extreme drought.

There is no change to the proposed approach of linking Project investment with trigger points for each stage of work to defer expenditure until as late as possible, and allow early work to be put on hold should storages recover. However, Hunter Water proposes to amend the trigger for construction to commence at 45 per cent total water storage level. The construction trigger has been revised as a result of the Project development following the EIS exhibition, with more information becoming available on lead times for key components. These triggers will continue to be reviewed in order to defer construction to as late as possible and increase the chance of storages recovering from rain, whilst ensuring adequate lead times are provided for construction.



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Grid: GDA 1994 MGA Zone 56

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The Amended Project

Figure 3-2

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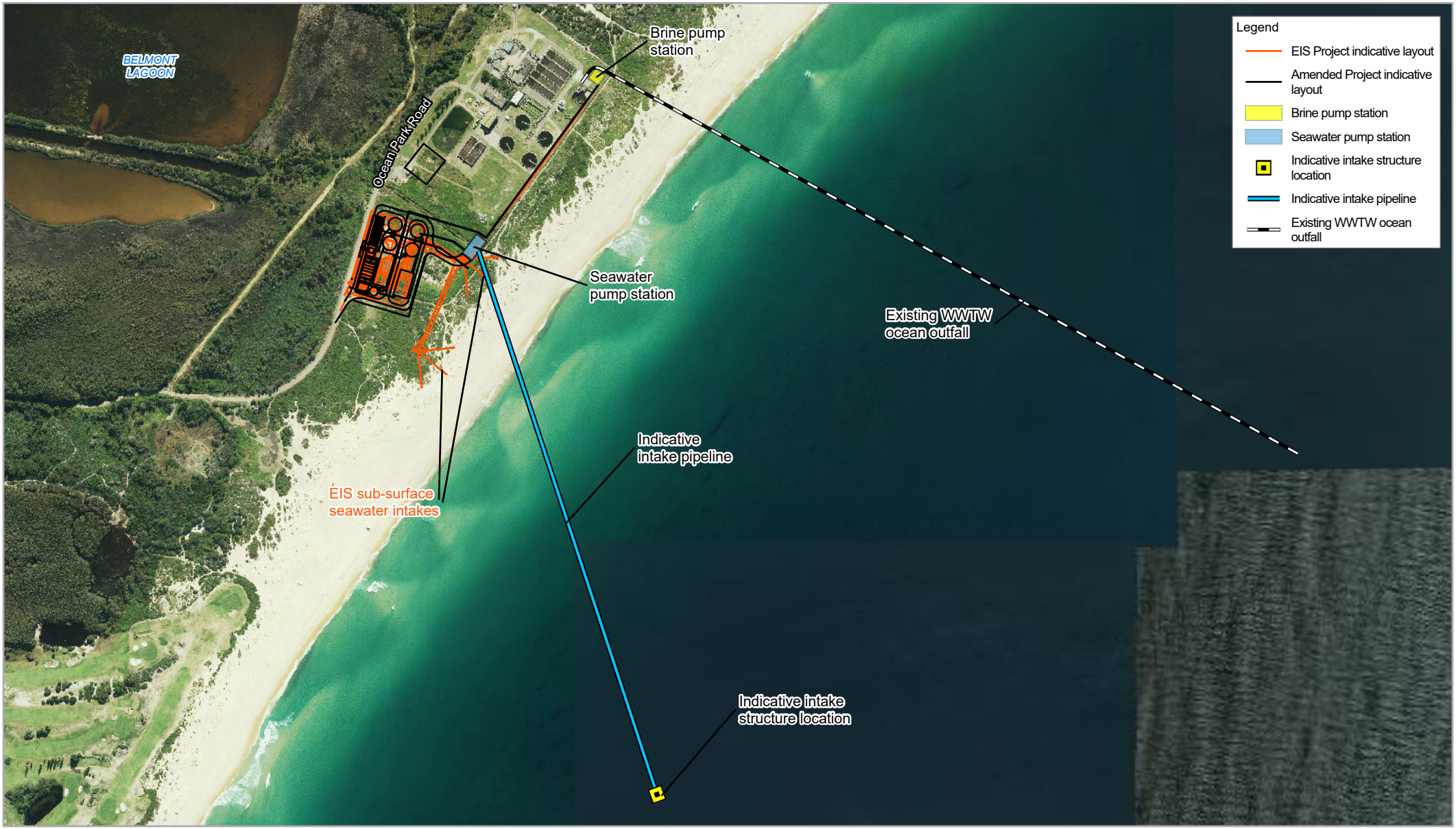
Data source: HWC: Aerial Imagery, Existing outfall: 2019; LPI: DTDB / DCDB, 2017; public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay



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Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Comparison of the Amended Project with the EIS Project

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Figure 3-3

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Data source: HWC: Aerial Imagery, Existing outfall: 2019; LPI: DTDB / DCDB, 2017; public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay

3.4 Statutory context

The statutory context for the Project is generally consistent with the exhibited EIS. The Project satisfies Clause 4(1) of the *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD), being development for the purpose of desalination plants by or on behalf of a public authority that has a capital investment value of more than $10 million. The Project is therefore State Significant Infrastructure (SSI) (see Section 5.1.3 of the EIS).

As SSI, the Project is subject to assessment and approval under Division 5.2 of Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP& Act).

Relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice were considered in Section 5 of the EIS. The amended Project results in disturbance of new areas and therefore requires the consideration of any changes to legislative requirements identified in the EIS. Environmental planning instruments and other legislation relevant to the amended Project are discussed in Section 3.4.1 and 3.4.2 respectively.

3.4.1 Environmental planning instruments

3.4.1.1 State Environmental Planning Policy – Coastal Management 2018

The Coastal Management SEPP does not apply to the Project as it is classified as SSI (see Section 5.1.1 of the EIS). However, the assessment of the amended project has considered the Coastal Management SEPP in order to fully assess the potential impacts.

Coastal Management SEPP aims to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*. The objectives of the Coastal Management SEPP are to manage development in the coastal zone and establish a framework for land use planning and decision making in the coastal zone.

The amended Project, is partially located within land mapped as coastal wetlands and proximity area for coastal wetlands. The Coastal Management SEPP (Clause 10(4)) requires that development within coastal wetlands or littoral rainforests must include sufficient measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland. Potential impacts to the biophysical, hydrological and ecological integrity of the coastal wetland are discussed Sections 3.5.2.1 and 3.5.2.3. Mitigation measures to protect the biophysical, hydrological and ecological integrity of the coastal wetland are provided in Section 3.8 and Appendix E.

The Project is located within the ‘coastal use’ and ‘coastal environment’ coastal management areas mapped under the policy (refer to Figure 4-1 of Appendix M of the EIS). The Coastal Management SEPP requires that development in a coastal environment area or a coastal use area address the requirements of Clause 13 and Clause 14, respectively. These are addressed in Table 3-2. A detailed assessment of the potential impacts of the Project is provided in Sections 3.5 and 3.6.

Table 3-2 Impacts to be considered under the Coastal Management SEPP

Clause 13 and 14 requirement	Comment
Clause 13(1)	
(a) The integrity and resilience of the biophysical hydrological and ecological environment	No change from the EIS. The Project would not significantly degrade biological diversity or ecosystem integrity, or disrupt ecological, biophysical, geological or geomorphological coastal processes.
(b) Coastal environmental values and natural coastal processes	Degradation of or disruption to the beach and foreshore amenity is generally avoided due to siting of the plant close to existing infrastructure and within previously disturbed areas behind the beach and dunes. During construction there is the potential for short term impacts to coastal processes as assessed in Appendix N. With mitigation measures employed, increased erosion of the beach or adjacent land is not anticipated.
(c) The water quality of the marine estate, in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1	The Project area, including proposed amendments, is not listed in Schedule 1 of the Coastal Management SEPP.
(d) Marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms	The Project has considered potential impacts on biodiversity (terrestrial and marine), with the technical reports (Appendix E and Appendix K of the EIS, and Appendix K and Appendix L of this report) concluding no State or Commonwealth listed threatened biota, or their habitats, would be significantly impacted as a result of the Project, as amended.
(e) Existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,	During operation, relevant infrastructure would be located behind the sand dunes and outside the area accessible by the public once on the beach. During construction there may be periods of time when access is restricted or stopped dependant of the construction method. Potential access impacts would be minimised through implementation of the safeguards and management measures outlined in Section 7.6.4 of the EIS and reproduced in Appendix E.
(f) Aboriginal cultural heritage, practices and places	Impacts to Aboriginal cultural heritage would be minor and managed in accordance with an ACHMP for the amended Project (see Appendix O).
(g) The use of the surf zone	With mitigation measures employed impacts to use of the surf zone are not anticipated. Mitigation measures would include appropriate exclusion barriers, signage and site supervision. This would ensure that the Project area is controlled and that unauthorised vessels and swimmers are excluded from the works area. The Project would have negligible impacts during operation.
Clause 14(1)	
(a)(i) Existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	With mitigation measures employed the Project would not affect the amenity of use of the beach or foreshore. Mitigation measures will include the use of appropriate exclusion barriers, signage and site supervision. This would ensure that the Project area is controlled and that unauthorised vehicles and pedestrians are excluded from the works area.

Clause 13 and 14 requirement	Comment
(a)(ii) Overshadowing, wind funnelling and the loss of views from public places to foreshores	During construction, positioning of plant and equipment within view of nearby sensitive receivers and existing road users would result in minor, temporary visual impacts. During operation the potential loss of views from public places including the Golf Course and the beach are considered negligible. The existing WWTW is also clearly visible at relevant viewpoints. The construction of the Project would not create overshadowing or wind funnelling. The Project would require removal of some vegetation within the boundaries of the Project area (see Appendix E of the EIS, and Appendix K of this report). Some of this vegetation contributes to the amenity and character of the local area, and/or screens views from key viewpoints (refer to Sections 3.5.2.8 and 3.6.2.8). The removal of this vegetation would have the potential to reduce some screening between sensitive receivers and the Project area. This would lead to temporary visual impacts during construction until the works are complete and disturbed areas rehabilitated. Potential visual impacts during construction and operation would be minimised through implementation of the safeguards and management measures outlined in Appendix E. Operational visual impacts are minor and have been considered in Sections 3.5.2.8 and 3.6.1, and Appendix R.
(a)(iii) The visual amenity and scenic qualities of the coast, including coastal headlands	
(a)(iv) Aboriginal cultural heritage, practices and places	Impacts to Aboriginal cultural heritage would be minor and managed in accordance with an ACHMP for the Project.
(a)(v) Cultural and built environment heritage	Construction of the proposal would not impact on non-Aboriginal heritage items. There is potential for the works to impact unidentified heritage items; however, given the highly disturbed nature of the proposal site, it is considered unlikely.

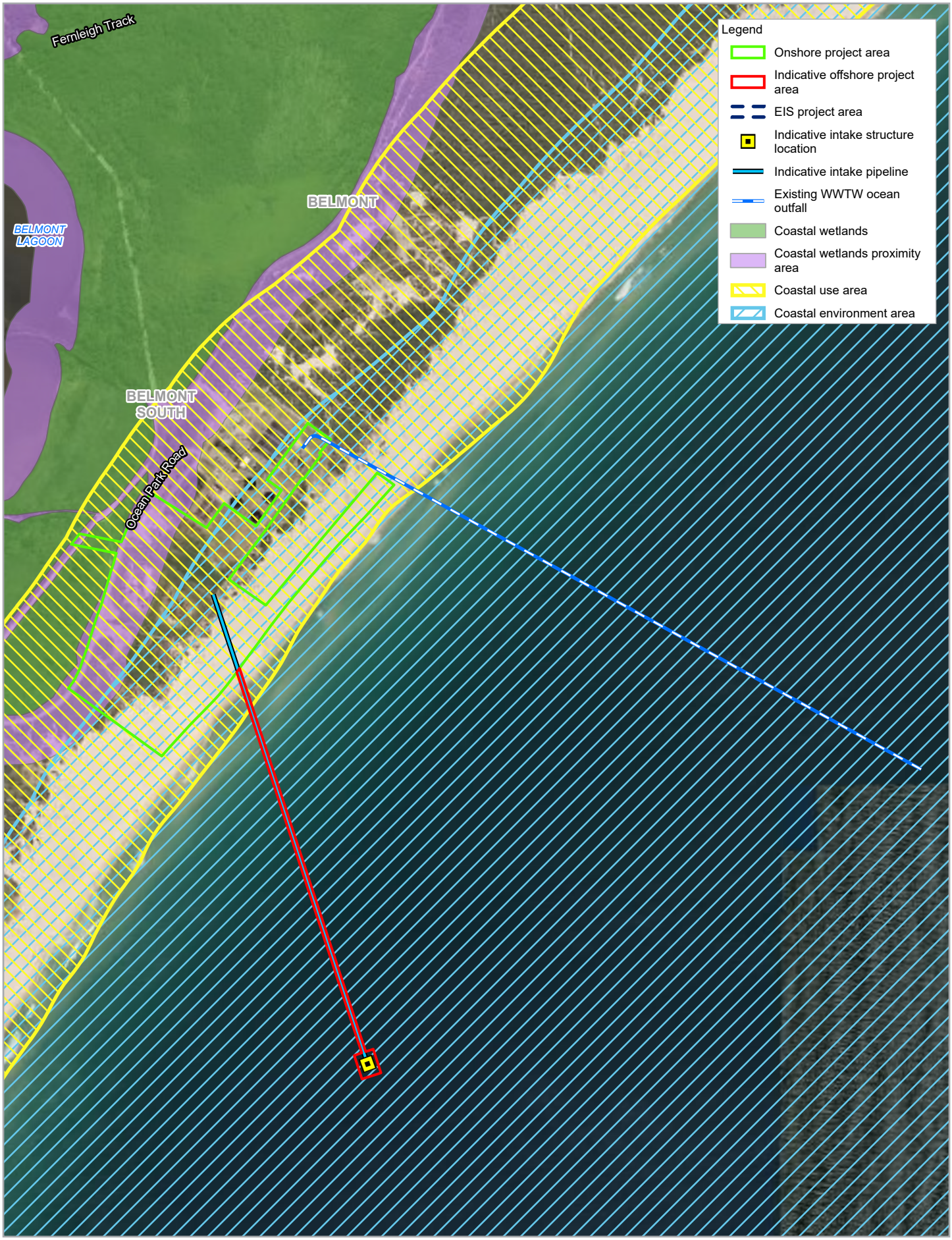
Development consent must not be granted in a coastal use or coastal environment management area unless the responsible authority is satisfied that:

- The development is designed, sited and will be managed to avoid an adverse impact, or
- If that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
- If that impact cannot be minimised—the development will be managed to mitigate that impact.

For development within the coastal use area, the responsible authority has the additional requirement of taking into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development.

The results of the detailed coastal process assessment, considering amendments to the Project, are outlined in Section 3.6.2.4 and Appendix N.

The objectives of the Coastal Management SEPP have been taken into account as described above. However, as the Coastal Management SEPP does not apply to the Project as it is classified as SSI (see Section 5.1.1 of the EIS) the amended Project does not require approval under the Coastal Management SEPP.



Paper Size ISO A4

0 70 140 210 280

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Hunter Water Corporation
Belmont Temporary Desalination Plant
Amendment Report

Project No. **22-19573**
Revision No. **0**
Date **29/06/2020**

Coastal Management Areas

Figure 3-4

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Print date: 29 Jun 2020 - 06:58

Data source: LPI: DTDB / DCDB, 2017; DPE: Coastal Wetlands SEPP, 2018public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay

3.4.2 Approvals

3.4.2.1 Approvals that cannot be refused for approved SSI

The proposed amendment to the Project would not result in the need for any additional approvals from those outlined in Table 5-7 of the exhibited EIS.

3.4.2.2 Approvals that are not required

Under Section 5.23 of the EP&A Act, if a SSI application is approved under Division 5.2 of Part 5 of the EP&A Act, a number of authorisations (as identified in Section 5.3.3 of the EIS), which may otherwise have applied, would not be required to carry out the Project. Authorisations and other legislative considerations that are required as a result of the amended Project, and are still required despite the Project being SSI, are discussed in Section 3.4.2.3.

3.4.2.3 Other legislation

The following section provides a summary of State environmental and planning legislation relevant to the amended Project as a result of the changes to construction and operational activities.

Water Act 1912

The exhibited EIS identified the need for approvals/licensing under the *Water Act 1912* and *Water Management Act 2000* (WM Act).

The proposed amendments to the Project would not result in a change to approvals under the *Water Act 1912*. Part 5 of the Water Act applies to water supply work or aquifer interference approvals within the meaning of the Act.

Groundwater dewatering would be required during construction of the amended Project. A licence from DPIE – Natural Resources Access Regulator for groundwater dewatering during construction would therefore still be required.

Water Management Act 2000

The unassigned (available) water within the Hawkesbury to Hunter Coastal Sands Groundwater Source of the North Coast Coastal Sands Water Sharing Plan is 12,740 ML/year (at commencement of the plan in 2016). This is significantly in excess of the predicted groundwater take for all scenarios of the amended Project. Therefore, it is considered there is sufficient groundwater available within the water source to enable Hunter Water to obtain a WAL for construction of the direct ocean intake.

The exhibited EIS identified that Hunter Water would need to obtain a WAL for the Project during operation. However, due to the change in the intake design (i.e. source water in the exhibited EIS being groundwater, and source water for the direct ocean intake being ocean water), a WAL is no longer required for operation of the Project.

Crown Land Management Act 2016

The *Crown Land Management Act 2016* provides for the ownership, use and management of Crown land in New South Wales. The *Crown Land Management Act 2016* requires environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land, and provides for fair and transparent management of Crown land for the benefit of the people of NSW.

Crown Roads are part of NSW's public road network, administered under the *Roads Act* 1993. Crown Roads often exist as 'paper roads', where they have not yet been constructed. Paper roads which are not required for public use or access may be sold and then subsequently closed.

The Project area partially occupies a 'paper' Crown Road. This Crown Road (Lot 2064 DP 823738) travels roughly south-west to north-east, and crosses through Ocean Park Road. Hunter Water consulted with the neighbouring property owner, LMCC, regarding closing the Crown Road via letter on 27 February 2020. LMCC responded via letter on 11 March 2020 agreeing to the closure of the Crown Road provided the portion of Ocean Park Road providing access to LMCC property is retained. An application to close the Crown road that runs through Hunter Water property was lodged with DPIE on 20 March 2020.

Hunter Water contacted Crown Lands in January 2020 and is preparing a Proposed Acquisition Notice to acquire an easement over the existing Belmont WWTW ocean outfall pipeline.

Hunter Water would also be required to obtain an easement across the sea floor for the intake structure.

Fisheries Management Act 1994

As above, approvals under Section 201, 205 and/or 219 of the FM Act are not required in accordance with Section 5.23 of the EP&A Act.

A Species Impact Statement is required if there is likely to be a significant impact on a threatened species, population or ecological community or its habitat. A significant impact on a threatened species, population or ecological community as listed under the FM act is not predicted. Therefore, the FM Act is not triggered and is not considered further.

As the Project does include dredging and reclamation work on water land, as defined in Section 198A of the FM Act, a notification to DPI – Fisheries under Section 199 of the FM Act would be required for the Project. Hunter Water must consider any matters raised by DPI – Fisheries within 21 days of giving notice.

Marine Pollution Act 2012

The *Marine Pollution Act 2012* includes provisions to protect the sea and waters from pollution by oil and other noxious or harmful substances discharged from vessels. The use of marine vessels in the construction of the amended Project would comply with the requirements of the *Marine Pollution Act 2012* and the *Marine Pollution Regulation 2014* to prevent marine pollution. This would include consultation with TfNSW during development of the CEMP, prior to commencement of construction of the amended Project.

Marine Safety Act 1998

The *Marine Safety Act 1998*, along with the Marine Safety Regulation 2016, aims to ensure the safe operation of vessels in ports and other waterways in NSW. The amended Project meets the definition of 'aquatic activity' under Section 18(1)(b):

(1) In this section:

***aquatic activity** means:*

(b) any other activity (whether or not involving vessels or equipment) that is conducted in or on any navigable waters and that restricts the availability of those waters for normal use by the public.

Aquatic licences are required under the *Marine Safety Act 1998* for any activity on navigable waters that TfNSW (formerly Roads and Maritime Services) determines may affect the navigation of any trading vessel or restrict normal use of those waters by members of the public on board vessels or cause any risk of danger to vessel operators.

The need for an aquatic licence and any other requirements would be determined in consultation with TfNSW prior to construction. At a minimum an Access Management Plan would be prepared in consultation with TfNSW prior to the commencement of construction of the amended Project.

3.4.3 Commonwealth legislation

Environmental Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, actions that have, or are likely to have a significant impact on a matter of national environmental significance (MNES) or the environment of Commonwealth land require approval from the Minister of the Department of Agriculture, Water and the Environment (DAWE) (formerly the Department of the Environment and Energy (DotEE)). The Minister determines if assessment and approval is required under the EPBC Act.

As identified in Section 3.5.2.3 and Appendix K the terrestrial biodiversity and freshwater assessment concluded that the amended Project is unlikely to have a significant impact on MNES and therefore a Referral of the Project under the EPBC Act is not required.

Navigation Act 2012

The *Navigation Act 2012* is legislation which covers international ship and seafarer safety, protect the marine environment where it relates to shipping and the actions of seafarers in Australian waters. The Department of Infrastructure, Transport, Regional Development and Communications is the relevant administrative authority under the Commonwealth Administrative Arrangements Order.

It is necessary for all vessels in Australian waters to comply with the navigation safety requirements prescribed within the *Navigation Act 2012* and the subordinate Marine Orders concerning workplace safety equipment (e.g. lighting) and navigation. For the vessels, this requires equipment and procedures to comply with AMSA Marine Order - Part 30: Prevention of Collisions, and Marine Order - Part 21: Safety of Navigation and Emergency Procedures.

Barges used during construction of the amended Project will be required to comply with the above requirements under the *Navigation Act 2012.*

Navigable Waters Access Management Plan

In accordance with the *Marine Safety Regulation 2016* and *Navigation Act 2012*, the Access Management Plan would be prepared in consultation with relevant stakeholders and include:

- A stakeholder consultation plan that identifies affected stakeholders, likely impacts to their activities as a result of the proposal and consultation undertaken in the preparation of the plan and proposed during construction
- Roles and responsibilities
- Emergency contacts
- A schedule of works to be updated on a regular basis identifying any planned closures or key milestones that would affect movement of recreational water users

3.5 Assessment of Impacts – Water Treatment Process Plant

The proposed increase to the water treatment process plant's capacity from 15 ML/d to 30 ML/d has the potential to change the impacts from those assessed in the EIS (GHD, 2019a). A preliminary environmental impact screening process was undertaken to confirm the extent of changes to the impacts assessed in the EIS. The results are summarised in Section 3.5.1. The assessment of changes related to the direct ocean intake are detailed in Section 3.6. The preliminary environmental impact screening process was completed by evaluating the amended Project description (as per Section 3.3) in light of:

- The amended water treatment process plant, including additional areas of disturbance, power supply upgrades (see Section 3.3.2 and Appendix D) and increases to brine discharge as a result of increased plant capacity
- The SEARs for relevant key issues (see Appendix A of the EIS)
- Relevant background information for each key issue, as identified in the EIS, including:
  - Initial assessment methodology
  - Existing environment information for the Project area and surrounds
  - Potential impacts and associated mitigation measures

Where this process identified the potential changes to the environmental assessment completed for the EIS, additional assessments were completed. This is described in Section 3.5.2.

3.5.1 Environmental impact screening

The results of the preliminary environmental impact screening for the proposed amendment to the water treatment process plant are presented in Table 3-3. Where required further detailed assessment for specific environmental issues, are provided in Section 3.5.2.

Table 3-3 Preliminary environmental assessment for design changes to water treatment process plant

Aspect	Phase	Comment	Further assessment required?
Soils, geology and contamination	Construction Operation	The amended Project would result in an increase to the disturbance area. The preliminary environmental impact screening indicates no substantial changes to existing environment considerations provided in Section 7.1.2 of the EIS. The proposed amendment to the water treatment process plant would have negligible impact on potential impacts to soils and geology during construction and operation, as assessed in Section 7.1.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.2.4 of the EIS and reproduced in Appendix E. The amended Project would result in an increased Project area compared with the EIS. Therefore, review of the EIS contamination assessment (GHD, 2019i) and the amended Project area including additional contamination investigation has been completed (Appendix G). A summary of the review and amended impacts are considered in Section 3.5.2.1. The review identified that the amended Project would not change potential contamination considerations provided in Section 7.2.4 of the EIS and reproduced in Appendix E. Further investigation of the potential mine subsidence impacts was identified during the exhibition period. Potential subsidence impacts to the amended water treatment process plant and direct ocean intake were assessed concurrently (refer to Section 3.6.2.1 and Appendix H). The proposed amendment to the water treatment process plant has been assessed to have a very low likelihood of residual subsidence occurring.	Yes. See Section 3.6.2.1 and Appendix H See Section 3.5.2.1 and Appendix G

Aspect	Phase	Comment	Further assessment required?
Water resources	Construction	The proposed amendment to the water treatment process plant would result in negligible change to potential impacts to water resources, as assessed in Section 7.2.3 of the EIS.	No
	Operation	In response to submissions received during the EIS exhibition process, a Stormwater Assessment (GHD, 2020a) (Appendix I) was prepared to provide additional details relating to consideration of stormwater drainage during operation of the water treatment process plant, as amended. This would include construction of a stormwater basin managing discharge from impervious surfaces and allowing infiltration of stormwater within the Project area. The amended Project would involve sourcing seawater via a direct ocean intake. This would remove potential for operational groundwater impacts associated with the previous sub-surface intake. The amended Project would include additional pre-treatment to account for differences in water quality as a result of sourcing water via a direct ocean intake.	Yes. See Section 3.5.2.2 and Appendix I See Section 3.6.2.2 and Appendix J
Terrestrial and freshwater biodiversity	Construction	The proposed amendment to the water treatment process plant would change impacts on biodiversity from those assessed in the EIS due to an increase in Project area associated with a larger water treatment process plant footprint and power supply upgrades. Therefore, an updated assessment has been completed a summary of amended impacts are considered in Section 3.5.2.3 and Appendix K.	Yes. See Section 3.5.2.3 and Appendix K
	Operation	The proposed amendment to the water treatment process plant would have negligible affect on impacts to terrestrial and freshwater biodiversity during operation, consistent with those assessed in the EIS and would be managed in accordance with the measures outlined in Section 7.3.5 of the EIS and reproduced in Appendix E.	No
Marine biodiversity	Construction	The proposed amendment to the water treatment process plant would have negligible affect on impacts to marine biodiversity during construction, as assessed in Section 7.4.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.4.4 of the EIS and reproduced in Appendix E.	No
	Operation	The proposed amendment to the water treatment process plant would result in an increase in brine discharge volumes from those assessed in the EIS. Therefore, updated brine discharge modelling (GHD, 2020d) and marine assessment (GHD, 2020g) has been completed. A summary of amended impacts during operation are considered in Section 3.5.2.4, Appendix L and Appendix M.	Yes. See Section 3.5.2.4 and Appendix L
Coastal processes	Construction Operation	The proposed amendment to the water treatment process plant would result in a minor increase to the disturbance area. The preliminary environmental impact screening indicates no changes to existing environment considerations provided in Section 7.5.2 of the EIS. Therefore, the Project would have negligible affect on impacts to coastal processes during construction and operation, as assessed in Section 7.5.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.5.4 of the EIS and reproduced in Appendix N.	No.

Aspect	Phase	Comment	Further assessment required?
Social	Construction Operation	The social impact assessment for the proposed amendment to the water treatment process plant considered the results of the following studies: noise and vibration; traffic and transport and; visual amenity. Assessment of the changes to social impacts considered the results of these studies, and were assessed using the impact criteria established in the original social impact assessment (Table 3-4 of the SIA in the EIS) (GHD, 2019d). With the use of this criteria, it was concluded that any identified changes from the aforementioned studies would not affect the overall assessment of potential social impacts or mitigation measures for the construction of the Project. During operation, the proposed amendment to the water treatment process plant would enhance the positive social impacts through a long-term water supply. No other impacts were identified to have changed as per the criteria established in the SIA (GHD, 2019d). This assessment is summarised in Section 3.5.2.5.	Yes. See Section 3.5.2.5
Sustainability	Construction Operation	The potential sustainability impacts of the EIS Project (refer to Section 7.7.3 of the EIS) were identified with reference to the outcomes of the various specialist studies undertaken in the EIS using the IS Rating scheme, NSW Government Resource Efficiency Policy (GREP) and Hunter Water policies. A number of specialist studies have been updated to account for the proposed amendment to the water treatment process plant and used to assess any changes to the assessment of sustainability categories in Table 7-13 of the EIS. Due to the nature of the assessment methodology scheme, which is a category based assessment, the amended Project would not affect the overall assessment of potential sustainability impacts or the proposed sustainability mitigation measures. Potential sustainability impacts outlined Section 7.7.3 of the EIS would not be affected by the proposed amendment and therefore conclusions of the EIS Sustainability section are still applicable. The proposed amendment to the water treatment process plant and associated construction methodology would not result in a change to the conclusions of the sustainability assessment and associated management and mitigation measures included in Section 7.7 of the EIS and reproduced in Appendix E.	No

Aspect	Phase	Comment	Further assessment required?
Hazards and risk	Construction Operation	A Level 1 preliminary hazard analysis (PHA) was completed in Section 7.8 of the EIS. While the proposed amendment to the water treatment process plant would result in a minor change to the quantities of chemicals stored onsite, this would not result in: • Any significant change to dangerous goods and chemical storage • Any exceedance of transport screening thresholds Therefore, no change to hazard risks considerations from those assessed in Section 7.8 of the EIS are expected in relation to the proposed amendment to the water treatment process plant. No change to mitigation measures included in Section 7.8.2 of the EIS and reproduced in Appendix E.	No
Aboriginal heritage	Construction	The proposed amendment to the water treatment process plant would change impacts on Aboriginal heritage from those assessed in the EIS due to an increase in Project area associated with a larger water treatment process plant footprint and power supply upgrades. Therefore, an updated assessment has been completed and a summary of amended impacts are considered in Section 3.5.2.6 and Appendix O.	Yes. See Section 3.5.2.6 and Appendix O
	Operation	The proposed amendment to the water treatment process plant would have negligible impact on potential impacts to Aboriginal heritage during operation, consistent with those assessed in the EIS and would be managed in accordance with the measures outlined in Section 7.9.4 of the EIS and reproduced in Appendix E.	No
Non-Aboriginal heritage	Construction Operation	While the amended Project would result in an increase to the disturbance area, review of background information indicates no changes to existing environment considerations provided in Section 7.10.2 of the EIS. The proposed amendment to the water treatment process plant would have negligible affect on impacts to non-Aboriginal heritage during construction and operation, as assessed in Section 7.10.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.10.4 of the EIS and reproduced in Appendix E.	No

Aspect	Phase	Comment	Further assessment required?
Traffic and transport	Construction Operation	The proposed amendment to the water treatment process plant and the direct ocean intake would result in an increase in vehicle movements during construction and the duration of construction. The Traffic Assessment uses a conservative overall peak hour traffic volume assumption which considers both vehicle movements and duration. The traffic impacts associated with the overall amended Project are therefore assessed concurrently. A summary of the Traffic Assessment is provided Section 3.6.2.6 and in full in Appendix P. There is expected to be very little operational or maintenance vehicle movements for the water treatment process plant for either the EIS Project or the amended Project. Therefore the traffic impacts associated with the operation of the amended Project are not expected to change from those identified in Section 7.11.3.2 of the EIS.	Yes. See Section 3.6.2.6 and Appendix P
Noise and vibration	Construction Operation	The proposed amendments to the water treatment process plant have the potential to result in a change to noise and vibration impact predictions provided in Section 7.12.4 of the EIS during both construction and operation (as a result of increased capacity of plant and equipment such as pumps). Therefore, an updated assessment has been completed. A summary of amended impacts are considered in Section 3.5.2.7 and Appendix Q.	Yes. See Section 3.5.2.7 and Appendix Q
Waste management	Construction	The proposed amendments to the water treatment process plant are not expected to result in any significant increase in waste generation. During construction of the Project, the following major wastes would be produced: • *Excess spoil*: Minor cutting and filling would be required to prepare foundation areas, as identified in Appendix D. While volumes and site layout would vary slightly from the EIS Project, this would not result in a significant change to the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS. • *Wastewater from groundwater dewatering during excavation*: Dewatering would not be required during the construction of the water treatment process plant. Therefore, there is no change compared with the EIS Project and no changes to the associated management and mitigation measures provided in Section 7.13 of the EIS. • *General construction waste*: While exact quantities of general construction waste may vary from the EIS Project, this would not result in a significant change from the qualitative assessment and associated management and mitigation measures provided in Section 7.13 of the EIS.	No

Aspect	Phase	Comment	Further assessment required?
	Commissioning	As discussed in Section 7.13 of the EIS, commissioning of the desalination plant would comprise commissioning of the pre-treatment process and then the RO units. During this process, four waste streams would be generated as described in Table 7-45 of the EIS. The 'screened groundwater' waste stream is no longer relevant to the amended Project, as raw feed water for the amended Project is via a direct ocean intake, rather than reliant on the sub-surface aquifer. This waste stream would be the same as the wastewater from commissioning of the intake (see Table 3-19), but of lower volume and with some screening which would improve the quality. As such, an impact from disposal of this waste stream via the existing WWTW ocean outfall is not anticipated. Additionally, "potable water (permeate post-dosing with chlorine and fluoride)" waste stream would be dechlorinated using vitamin C or other method, in the clear water tank before being pumped and disposed via the WWTW outfall. Chlorine levels consistent with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) would be achieved prior to disposal. The proposed amendment to the water treatment process plant would result in a negligible change to waste management during operation.	No
	Operation	While the volumes of operational waste production have changed, associated management measures detailed in the EIS would be sufficient to ensure appropriate waste management, as reproduced in Appendix E. Changes to operational waste production are as follows: • The desalination process in the EIS Project would produce up to 28.2 ML/d of wastewater, comprising 25.5 ML/d of brine, 2.0 ML/d of RO membrane cleaning and pre-treatment waste and 0.75 ML/d of other losses and utilities. • The desalination process in the amended Project would produce up to 56.0 ML/d of wastewater, comprising 51.1 ML/d of brine, 6.0 ML/d of RO membrane cleaning and pre-treatment waste and 1.3 ML/d of other losses and utilities.	No
Visual amenity	Construction	The proposed amendment to the water treatment process plant would have negligible affect on impacts to visual amenity during construction, as assessed in Section 7.14.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.14.3 of the EIS and reproduced in Appendix E.	No
	Operation	The proposed amendment to the water treatment process plant would result in a change to potential impact to visual amenity from those assessed in Section 7.1.4.3 of the EIS. Therefore, an updated assessment has been completed a summary of amended impacts during operation are considered in Section 3.5.2.8 and Appendix R.	Yes. See Section 3.5.2.8 and Appendix R
Air quality	Construction Operation	The proposed amendment to the water treatment process plant would result in a negligible change to air quality impacts, as assessed in the EIS, during both construction and operation of the Project.	No

Aspect	Phase	Comment	Further assessment required?
Greenhouse gas	Construction	The construction emissions would increase due to an increase in construction equipment usage, heavy vehicle deliveries and additional land clearing. Therefore, an updated assessment has been completed as summarised in Section 3.5.2.9.	Yes. See Section 3.5.2.9
	Operation	The proposed amendment to the water treatment plant capacity would increase emissions substantially. Therefore, an updated assessment has been completed as summarised in Section 3.5.2.9.	Yes. See Section 3.5.2.9
Human heath	Construction Operation	The proposed amendment to the water treatment process plant would result in a negligible change to human impacts, as assessed in the EIS, during both construction and operation of the Project. The spatial area to meet the human health water quality objective (WQO) dilution factor is predicted to decrease because of pre-dilution by the increased brine discharge. Exceedances of the human health WQO are greater than ~1 km from the nearest beach, and thereby do not pose a material risk to swimmers (refer to Appendix M).	No
Cumulative impacts	Construction Operation	The proposed amendment to the water treatment process plant would result in a negligible change to cumulative impacts, as assessed in Section 7.18 of the EIS.	No

3.5.2 Further detailed impact assessment

3.5.2.1 Contamination

The information presented in this section is summarised from the Contamination Assessment (GHD, 2020k) (Appendix G) which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Contamination Assessment Report* (GHD, 2019i).

Methodology

GHD completed a review of the amended Project area to assess if any additional contamination assessments were required. The review included:

- Review of the EIS and EIS contamination assessment report (GHD, 2019i) in relation to the amended Project area
- Completion of a site inspection of the amended Project area on 15 January 2020
- Review of historical aerial photographs for the amended Project area
- Review of additional contamination assessments undertaken as part of the desalination plant detailed design

Findings

A review of the Contamination Assessment Report (GHD, 2019) noted that the EIS contamination study area overlaps both the EIS Project Area and amended Project Area. As a result it is considered that the contamination desktop review is applicable to the amended Project Area. In addition, the intrusive investigations completed as part of the EIS contamination assessment also covered the majority of the amended Project area.

A site inspection was completed by a senior environmental engineer in 15 January 2020 to confirm site conditions. The inspection was completed within the southern portion of the amended Project area. At the time of the inspection the site consisted mainly of undulating sand dunes covered with Bitou Bush. A number of 4WD tracks were noted in the dunes leading to Nine Mile Beach. Small amounts of concrete were noted in some areas of the Bitou Bush. Overall the site area appeared to be similar to that of the EIS Project area.

A review of available aerial photographs showed that the majority of the southern portion of the amended Project area has remained undeveloped sand dunes with varying degree of vegetation since 1965.

A review was completed of the Supplementary Geotechnical and Contamination report prepared by GHD (2020) within the proposed seawater pump station and the 30 ML/d amended design footprint area to inform the detailed design. Works included hand auger and test pit excavation at eight locations (HA201, TP202 to TP208) and cone penetrometer testing at three locations. Two locations TP203 and TP204 were located within the southern portion of the amended Project area, with the remaining locations located within the EIS Project area.

No visual or olfactory signs of contamination were noted during the investigation. No potential asbestos containing materials (ACM) were noted. Each contamination sample was screened for volatile organic compounds (VOCs) using a photo-ionisation detector (PID). All results were below 2 ppm.

Samples were compared to the NEPM 1999 HIL/HSL and EIL/ESL for commercial/industrial land use. All soil samples reported concentrations below the adopted health assessment criterial. Chrysotile asbestos was detected in the form of a loose fibre bundle in one soil sample analysed from TP204 0-0.1. Three samples (TP202 0-0.1, TP203 0-0.1, TP204 0-0.1) reported copper concentrations above the EILs, while zinc was reported above the EILs for TP202 0-0.1 and TP204 0-0.1.

Based on the results, soils were generally classified as general solid waste with the exception of soils at TP202 0-0.1 which would be classified as restricted solid waste (based on lead concentrations) and TP204 0-0.1 which would be classified as restricted solid waste with asbestos (based on lead and asbestos).

Summary

The amended Project area was found to be similar to that assessed as part of the EIS Project area in terms of site contamination. The key potential sources and contaminants of concern are considered to be the same as those outlined in the EIS.

With the exception of one sample, which identified asbestos, contamination investigations within the amended Project area have not identified any widespread contamination issues. The amended Project area is not considered to be contaminated. A detailed site investigation (DSI) will, however be undertaken in response to EPA's submission made in response to the EIS, requiring a DSI. The DSI will analyse samples for heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs and asbestos (refer to Appendix G for detail).

A focused investigation will also be undertaken within the area of TP204 to further assess potential asbestos impacts prior to construction. This assessment, and the outcomes of the DSI will inform the management measures to be included in the Contaminated Site Management Plan (CSMP), and if remediation is required.

Following this review it is considered that the potential risks from disturbance and exposure of potential contamination within the amended Project area could be managed through the development and implementation of a CSMP. The mitigation measures outlined the EIS are still therefore relevant to the amended project and these are reproduced in Appendix E of the AR report.

3.5.2.2 Water resources

In response to submissions received during the EIS exhibition process and with consideration to the amended Project, a Stormwater Assessment (GHD, 2020a) (Appendix I) was prepared. The Stormwater Assessment provides additional details relating to stormwater drainage during operation of the water treatment process plant, as amended.

Methodology

The Stormwater Assessment was prepared with consideration to:

- Guidelines for developments adjoining land managed by the Office of Environment and Heritage (OEH, 2013) (as specified by DPIE. Refer to Section 2.4.9.4)
- Lake Macquarie City Council Water Cycle Management Guideline (LMCC, 2013)
- Design changes (i.e. 10 per cent increase in the impervious area in the amended water treatment process plant)

In addition, a Model for Urban Stormwater Improvement Conceptualisation (MUSIC) model (Version 6.3.0) was completed using the MUSIC-link feature, incorporating LMCC model parameters and requirements.

Stormwater management

The OEH guidelines require developments adjacent to OEH managed land to incorporate stormwater detention and water quality systems (with appropriately managed buffer areas) within the development area. The MUSIC modelling was used to assess the potential impact on stormwater quality from the construction of the on-site stormwater basin (refer to concept design drawings in Appendix F).

A stormwater basin has been designed and incorporated to the amended Project, managing discharge from impervious surfaces and allowing infiltration of stormwater within the Project area. Discharge from impervious surfaces would be via a swale on the southern and eastern sides of the water treatment process plant, generally draining to the stormwater basin in the north-east. Flows in excess of the stormwater basin capacity would be directed to an overflow swale generally draining to the east and infiltrating into the sand. The existing landform (i.e. dunes) would prevent off-site discharges into the ocean.

Summary

The swale and stormwater basin have been designed for 1 in 100 year Average Recurrence Interval (ARI) storm. The stormwater basin has a surface area of 130 m^2. This would meet the stormwater pollution reduction targets set by LMCC (LMCC, 2013). This amendment to the design would assist to manage discharge from impervious surfaces and allow stormwater infiltration within the Project area.

The addition of the swale and stormwater basin would not result in changes to operational impacts. Management and mitigation measures provided in the EIS would be suitable to manage potential impacts. These have been reproduced in Appendix E.

3.5.2.3 Terrestrial and freshwater biodiversity

The Biodiversity Development Assessment Report (BDAR) for the Project that was appended to the Project EIS has been updated. The BDAR was required to be updated to assess the whole of the amended Project area in accordance with the Biodiversity Assessment Method (BAM). This report includes information regarding additional biodiversity assessments and impacts associated with the amendments to the Project area. These updates are summarised below.

This assessment takes into account additional terrestrial impacts for both the water treatment process plant and direct ocean intake as the two project components have overlapping impacts on terrestrial biodiversity that cannot be easily separated. Furthermore the majority of terrestrial impacts associated with the amended Project design of the direct ocean intake, including the on-shore pump station, intake pipeline and off-shore intake structure have been assessed and remain consistent with the Project EIS. The terrestrial biodiversity impacts associated with the construction of the off-shore intake structure are limited to the clearing and disturbance of a very small area of native vegetation (PCT 1204 Spinifex beach strand grassland). These impacts are difficult to differentiate from the water treatment process plant and as such this section of the amendment report covers impacts associated with both the amended Project design and direct ocean intake structure.

Methodology

A combination of desktop assessments and field assessments was used to assess the potential changes in impacts on biodiversity. Details regarding these assessments are provided below.

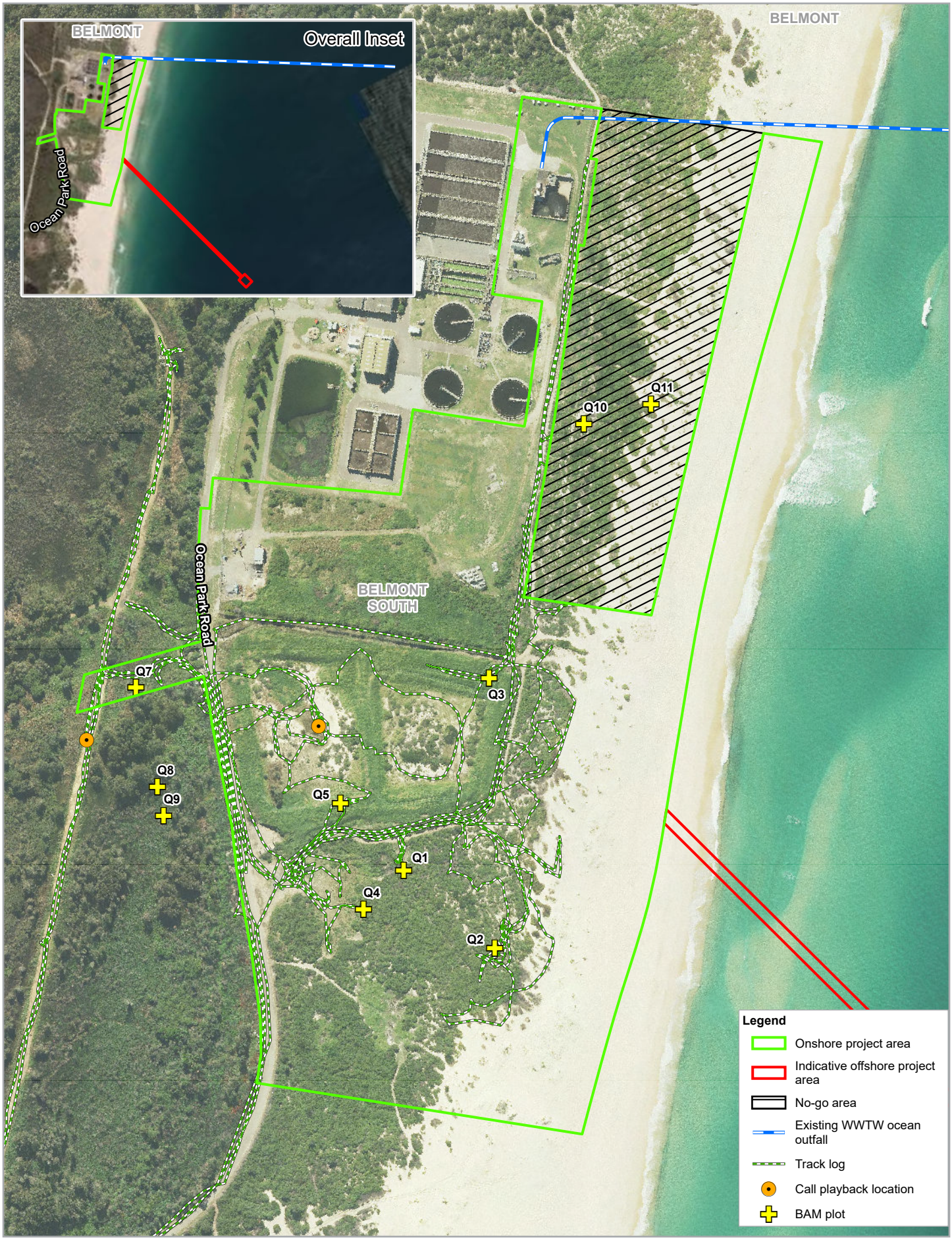
Desktop assessment

A desktop database review was undertaken to identify additional threatened flora and fauna species, populations and ecological communities (threatened biota) listed under the BC Act, FM Act, and EPBC Act that could be expected to occur in the amended Project area.

Field surveys

Additional field surveys to assess the amended Project area were conducted by GHD ecologists in January and February 2020 (Figure 3-3). Additional field surveys included:

- Site stratification and vegetation mapping - Vegetation was assessed with reference to the BAM (OEH, 2017a). The Lake Macquarie Local Government Area vegetation mapping (Bell, 2016) was ground-truthed in the field to verify community type and boundaries, floristic and structural homogeneity within patches and to update mapping as required.
- Collection of additional BAM integrity plots - Following the stratification of the amended Project area into vegetation communities, plot surveys were conducted in accordance with the BAM (OEH, 2017a). The location of survey plots is shown on Figure 3-3.
- Fauna habitat assessment - Fauna habitat assessments were undertaken throughout the amended Project area, including searches for potential shelter, basking, roosting, nesting and/or foraging sites. Specific habitat features and resources such as water bodies, food trees, density of understorey vegetation, composition of ground cover, soil type, presence of hollow-bearing trees, leaf litter and ground debris were noted.
- Targeted frog surveys – Targeted surveys for threatened frogs including Wallum Froglet (*Crinia tinnula*), Green and Golden Bell Frog (*Litoria aurea*) and Mahoney's Toadlet (*Uperoleia mahonyi*) were completed within the amended Project area from the 12-14 February 2020. Surveys were conducted in accordance to the 'Threatened species survey and assessment guidelines: field survey methods for fauna- Amphibians' (DECC, 2009b) and included spotlighting and call playback by two GHD ecologists over a two hour period each night over three consecutive nights (Figure 3-5).
- Targeted flora surveys – Targeted surveys were completed in areas of suitable habitat for additional threatened flora species that were predicted by the BAM calculator as having potential to occur within the amended Project area.
- Opportunistic fauna and flora observations – Opportunistic and incidental observations of fauna and flora species were recorded during field surveys.



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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Survey locations

Figure 3-5

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Data source: HWC: Aerial Imagery, 2018 public_NSW_Imagery: © Department of Customer Service 2020 LPI: DTDB / DCDB, 2017; public_NSW_Imagery: © Department of Customer Service 2020. Created by: fmackay

Existing environment

Vegetation communities

The amended Project area contains an additional 7.62 ha of land. This area includes four native vegetation types that were not recorded within the EIS Project area, totalling 0.51 ha. In addition to this the amended Project area includes an additional 3.19 ha of non-native vegetation (consisting of 1.46 ha of Bitou Bush scrub and 1.73 ha of exotic grassland) as well as 3.92 ha of cleared land. The additional PCT's recorded within the amended Project area and updated areas of impact are summarised in Table 3-4 and shown in Figure 3-6. A description of additional PCTs is provided in the updated BDAR.

In addition to the vegetation described above, a large patch (2.08 ha) of PCT 772- Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (Moderate-good) is also present to the east of the existing Belmont WWTW which was not in the EIS Project area. However, most of this area would be a designated no-go area, as shown in Figure 3-5 and would be fenced off during construction to prevent any unintended impacts to this vegetation.

Table 3-4 Vegetation types within the Project area

Vegetation type	Previously recorded	BC Act status	EPBC Act status	Extent within the Project area (ha)		Change in area (ha)
				EIS Project	Amended Project	
Bitou Bush Scrub*	Yes	Not listed	Not listed	3.2	4.66	1.46
PCT 772- Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (Moderate-good)	No	Not listed	Not listed	0	0.08)	0.08
PCT 783- Coastal Freshwater Swamps of the Sydney Basin Bioregion	No	EEC – Sydney Freshwater Wetlands in the Sydney Basin Bioregion	Not listed	0	0.02	0.02
PCT 1204- Spinifex beach strand grassland, Sydney Basin Bioregion and South East Corner Bioregion	No	Not listed	Not listed	0	0.29	0.29
PCT 1071- Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline	No	EEC – Sydney Freshwater Wetlands in the Sydney Basin Bioregion EEC	Not listed	0	0.12	0.12
Exotic grassland	Yes	-	-	3.0	4.73	1.73
Cleared	Yes	-	-	1.36	5.28	3.92
Total area (ha)	**-**	**-**	**-**	**7.56**	**15.18**	**7.62**

*Due to the requirement to assess fauna values within the previous EIS Project area, this vegetation community was assigned as PCT 772- Coast Banksia – Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (Low Bitou). The amended Project area now includes this PCT, therefore PCT 772- Low Bitou has been reassigned to Bitou Bush scrub reflecting its non-native condition. Fauna values required for the BDAR have been assessed according to the native vegetation communities within the Project area.

Flora and fauna

An additional 51 flora species and seven fauna species were recorded within the amended Project area, none of these species are listed as threatened under the BC Act or EPBC Act.

Conservation significance

None of the vegetation identified in the EIS Project area has conservation significance under the BC Act or EPBC Acts. Within the amended Project area one of the PCTs, Common Reed on the margins of estuaries and brackish lagoons along the New South Wales coastline (PCT 1071) is commensurate with the EEC listed under the BC Act as Sydney Freshwater Wetlands in the Sydney Basin Bioregion EEC.

Based on the additional PCTs identified in the amended Project area, the BAM credit calculator (BAM-C) identified an additional 29 species listed as threatened under the BC Act that have the potential to occur within the amended Project area. An assessment of habitat suitability within the amended Project area determined that there is suitable habitat for 16 of these species. The remaining 13 species are considered unlikely to utilise the site due to the absence of key habitat features and/or degraded habitat.

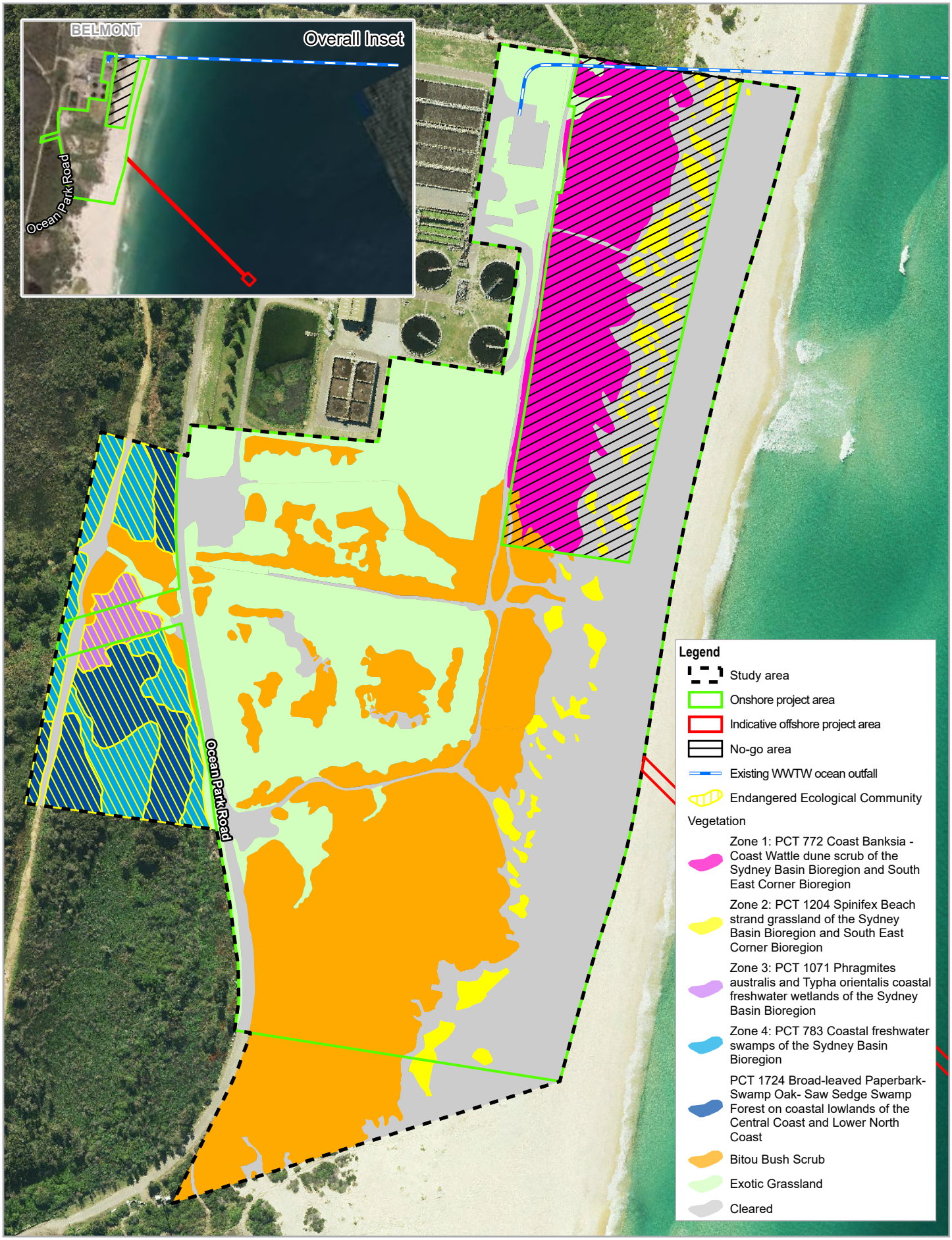
Of the additional 16 threatened species identified as having potential habitat within the site, nine species are predicted ecosystem credit species which do not require survey and the remaining seven are species credit species that require targeted surveys (refer to Table 3-5).

None of the species credit species predicted to occur within the amended Project area were recorded during targeted surveys.

Table 3-5 Additional threatened species with potential to utilise the site

Species Name	Common Name	BC Act Status	EPBC Act Status	Species or ecosystem credit
Botaurus poiciloptilus	Australasian Bittern	Endangered	Endangered	Ecosystem
Rostratula australis	Australian Painted Snipe	Endangered	Endangered	Ecosystem
Ixobrychus flavicollis	Black Bittern	Vulnerable	-	Ecosystem
Melithreptus gularis	Black-chinned Honeyeater (eastern subspecies)	Vulnerable	-	Ecosystem
Ephippiorhynchus asiaticus	Black-necked Stork	Endangered	-	Ecosystem
Oxyura australis	Blue-billed Duck	Vulnerable	-	Ecosystem
Stictonetta naevosa	Freckled Duck	Vulnerable	-	Ecosystem
Sternula albifrons	Little Tern	Endangered	Migratory	Ecosystem
Anseranas semipalmata	Magpie Goose	Vulnerable	-	Ecosystem
Maundia triglochinoides	Maundia triglochinoides	Vulnerable	-	Species

Species Name	Common Name	BC Act Status	EPBC Act Status	Species or ecosystem credit
Melaleuca biconvexa	Biconvex Paperbark	Vulnerable	Vulnerable	Species
Senecio spathulatus	Coast Groundsel	Endangered		Species
Persicaria elatior	Tall Knotweed	Vulnerable	Vulnerable	Species
Crinia tinnula	Wallum Froglet	Vulnerable	-	Species
Litoria aurea	Green and Golden Bell frog	Endangered	Vulnerable	Species
Uperoleia mahonyi	Mahony's Toadlet	Endangered	-	Species



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Vegetation zones in the Project area

Figure 3-6

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Data source: HWC: Aerial Imagery, 2018 public_NSW_Imagery: © Department of Customer Service 2020 sixmaps/LPI_Imagery_Best: © Department of Finance, Services & Innovation 2017. Created by: fmackay

Impacts

Construction impacts

Construction impacts associated with the amended Project are discussed in Table 3-6 below.

Table 3-6 Construction impacts

Aspect	Type of impact	Discussion
Vegetation communities	Direct	The amended Project would result in disturbance of an additional 0.51 ha of native vegetation and 3.92 ha of cleared land, (see Table 3-4). While it is considered unlikely that the whole Project area would be cleared during construction, the clearing estimate has assumed that all vegetation would be cleared within the onshore Project area to provide a conservative estimate.
Impacts to threatened biota listed under the BC Act	Direct	No EECs were recorded within the EIS Project area. However, amendments to the Project design would result in clearing of 0.12 hectares of Sydney Freshwater Wetlands in the Sydney Basin Bioregion EEC. This has resulted from the change in power supply connection. This clearing estimate is likely to be conservative however as the disturbance required for installation of electricity poles would not result in the total clearing of vegetation within the vicinity of these works. No additional flora or fauna listed as threatened under the BC Act were observed or are likely to occur within the amended Project area. Therefore, additional impacts on threatened flora and fauna are considered unlikely as a result of the amended Project. While the White-throated Needletail (*Hirundapus caudacutus*) and Little Bent-winged Bat (*Miniopterus australis*) were recorded within the vicinity of the Project area, the Project (as amended) is considered unlikely to result in any additional impact these species beyond what were discussed in the exhibited EIS as no habitat trees occur within the Project area and minimal foraging habitat would be impacted.
Impacts to threatened biota listed under the EPBC Act	Direct	No threatened ecological communities listed under the EPBC Act occur within or adjacent to the Project area. No additional flora or fauna listed under the EPBC Act were observed or are likely to occur within the Project area. Therefore, additional impacts on threatened flora and fauna are considered unlikely as a result of the amended Project. While the White-throated Needletail (*Hirundapus caudacutus*) was recorded within the vicinity of the Project area, the Project (as amended) would not result in any additional impacts to this species. A detailed discussion of impacts to this species is provided in the updated BDAR (GHD, 2020b).
Impacts on adjacent native swamp and wetland vegetation during the construction	Indirect	The amended Project has potential to have indirect impacts on adjacent native swamp and wetland vegetation during construction including: • Introduction of the Chytrid fungus (*Batrachochytrium dendrobatidis*) • Smothering of native vegetation due to increased movement through wetland • Increased sedimentation due to potential disturbance and increased movement through the wetland for installation of the electricity poles As these impacts would be restricted to construction, no permanent impacts are likely to occur to threatened ecological communities or biota within the Project area. These potential indirect impacts have been addressed in the Project EIS.

Operational impacts

No additional operational impacts on biodiversity are anticipated as a result of the amended design.

Offsets

No offsets were required under the BAM for impacts associated with the EIS Project as described in the exhibited EIS.

There are 0.51 hectares of native vegetation and threatened species habitat in the amended Project area that would require offsetting.

Ecosystem credits that would be required to offset the impacts of the amended Project are shown in Table 3-7.

No species credits would be required to offset impacts of the Project.

Table 3-7 Ecosystem credits required to offset impacts of the Project

Plant community type	Area (ha)	Vegetation integrity loss	BC Act status	Ecosystem credits required
Coast Banksia- Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion (772_moderate)	0.08	19.1	Not listed as a TEC	1
Spinifex Beach strand grassland of the Sydney Basin Bioregion and South East Corner Bioregion (1204_moderate)	0.29	2.4	Not listed as a TEC	0
Phragmites australis and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion (1071_moderate)	0.12	65.3	Not listed as a TEC	4
Coastal Freshwater Swamps of the Sydney Basin Bioregion (783_moderate)	0.02	47.7	Sydney Freshwater Wetlands in the Sydney Basin Bioregion	1
Total	**0.51**			**6**

Summary

The amended Project would impact on an additional 0.51 ha of native vegetation. This includes three PCTs that were not identified in the Project EIS, one of which is commensurate with the EEC listed under the BC Act as Sydney Freshwater Wetlands in the Sydney Basin Bioregion.

As a result of amendments to the Project area offsets are now required to offset the impacts of the Project on native vegetation and potential threatened species habitats.

Ecosystem credits that would be required to offset the impacts of the amended Project include:

- One ecosystem credit for impacts to 0.08 ha of Coast Banksia - Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion
- Four ecosystem credits for impacts to 0.12 ha of *Phragmites australis* and *Typha orientalis* coastal freshwater wetlands of the Sydney Basin Bioregion
- One ecosystem credit for impacts to 0.02 ha of Coastal Freshwater Swamps of the Sydney Basin Bioregion
- The Project would not impact on any species credit species and therefore no species credits are required for the Project

The overall direct and potential indirect impacts of the project are largely consistent with those described in the Project EIS. No additional mitigation measures beyond those described in the Project EIS are considered necessary.

3.5.2.4 Marine biodiversity

The information presented in this section is summarised from the *Belmont Drought Response Desalination Plant – Marine Environment Assessment Amendment Report* (GHD, 2020c) (Appendix L). This section should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a), *Belmont Drought Response Desalination Plant – Marine Assessment Report* (GHD, 2019c) and *Belmont Drought Response Desalination Plant – Amendment Report Brine Discharge Modelling* (GHD, 2020d).

Methodology

Brine discharge modelling (GHD, 2020d) has been undertaken to assess potential impacts to water quality as a result of the amended Project. The brine discharge modelling has been reviewed to identify potential impacts from the discharge of increased brine volumes into the marine environment.

Additionally, recent literature from the Sydney Desalination Plant has highlighted some interesting research outcomes on species abundance and diversity associated with the operations of that plant. This has been included below as relevant to both the EIS Project and the amended Project.

Construction

The proposed amendment to the water treatment process plant would have negligible impact on potential impacts to marine biodiversity during construction, as assessed in Section 7.4.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.4.4 of the EIS and reproduced in Appendix E.

Operation

Species abundance and diversity

Long-term marine monitoring at existing large-scale desalination plants, such as the Sydney Desalination Plant (Kelaher, Clark, Johnston, & Coleman, 2020) and Gold Coast Desalination Plant (Viskovich, Gordon, & Walker, 2014), indicate that potential impacts to species abundance and diversity may be dependent on the local assemblages and benthic characteristics at each outfall pipe.

The capacity of the WWTW outfall is expected to be an order of magnitude smaller than the Sydney and Gold Coast Plants with average daily brine discharges of 342 ML/day and 133 ML/day, respectively (Kelaher, Clark, Johnston, & Coleman, 2020). It is likely that any potential adverse impacts, such as changes to benthic community structures in the vicinity of the outfall, would be contained to the immediate area of the outfall. Additionally, unlike the Sydney and Gold Coast Plants, brine discharge would be pre-mixed with the existing wastewater effluent outflow and discharged via the Belmont WWTW. This would have the effect of diluting the salinity of the brine, resulting in a discharge salinity of 47.9 psu compared to 65 psu at the Sydney outfall site (GHD, 2020d; Sydney Water, 2005). Furthermore, salinity is expected to rapidly decrease as the near-seabed flow of brine away from the outfall becomes diluted through natural entrainment of seawater.

The increase in discharge volume at the existing WWTW outfall is expected to increase the turbulence and mixing within the area. The presence of such turbulence within the water column may attract various marine species, resulting in an increase in abundance of marine species in the vicinity of the outfall, as observed at the Sydney Desalination Plant. It is not expected that there would be a notable difference in species abundance and diversity between the EIS Project (15 ML/d) and amended Project (30 ML/d).

The benthic environment in the immediate vicinity of the outfall is also well-represented throughout the region therefore, significant impacts to benthic communities due to brine discharge are unlikely to occur.

Water quality – chemical assessment

Desalination of seawater requires the addition of a number of chemicals during the pre-treatment, desalination process and cleaning process in order to combat marine growth, remove suspended solids, maintain pH levels and preserve the reverse osmosis (RO) membranes. These chemicals may have the potential to contaminate the marine environment if present in discharge water and their impacts must therefore be assessed. Increasing the capacity of the plant from 15 ML/d to 30 ML/d will require a proportionally larger amount of chemicals for the efficient operation of the plant. Ultimately, more chemicals may be expected within the comingled brine effluent discharge.

An assessment of the chemicals that are typically used in the reverse osmosis treatment process is provided in Table 3-8. These chemicals are anticipated to have minimum impacts on marine water quality for both the EIS Project and the amended Project due to the nature of the chemicals, dilutions to be achieved and decomposition of the chemicals in seawater. This is largely due to the neutralisation, removal or dilution of these chemicals before release.

Table 3-8 Typical chemicals required for reverse osmosis treatment process. Adapted from Sydney Water (2005)

Additive	Use	Fate
Ferric chloride	Pre-treatment of intake water as coagulant to aid removal of suspended solids.	Binds to solid matter and is removed during the pre-treatment process.
Polyelectrolyte polymer	Pre-treatment of intake water to enhance coagulation and removal of particles.	Binds to solid matter and is removed during the pre-treatment process.
Sulphuric acid	Added to prevent scaling of RO membranes.	Neutralised during RO cleaning process and discharged to marine environment.
Anti-scalants	Anti-scalants are typically sodium salts of poly carboxylic acid dosed continuously to RO feedwater to prevent scaling of RO membranes.	Discharged to marine environment.
Sodium hypochlorite	Intermittent dosing of seawater intake to control marine growth.	Removed by sodium bisulphite during pre-treatment process.
Lime	Used for pH and alkalinity adjustment and corrosion control. Lime sludge is produced in lime water separators.	Discharged to marine environment during potabilisation process.
Acidic detergent	Added intermittently to clean membranes. Chemical used is dependent on membrane operating requirements.	Neutralised during RO cleaning process and discharged to marine environment.
Sodium bisulphate	Added to preserve RO membranes during membrane shutdowns. Neutralises residual chlorine in feed water.	Discharged to marine environment.
Biocide	May be added intermittently to the RO system to aid control of marine growth.	Discharged to marine environment.

The findings of the long-term marine monitoring program conducted at the Sydney Desalination plant confirmed there was no impact from these chemicals at outfall due to very low concentrations and dilution proportional to that of the brine (Clark, et al., 2018). The Sydney Desalination Plant has a productive capacity of 500 ML/d, which is considerably greater than the design capacity of the amened Project (productive capacity of 30 ML/d), with the impact from the amended Project likely to be substantially smaller than the Sydney Desalination Plant. As such, it is considered unlikely that the chemicals within discharge from the Belmont WWTW outfall would result in measureable impacts to the marine environment.

If chlorine is used as an anti-foulant during the reverse osmosis process then all discharges will need to comply with appropriate marine guidelines for chlorine and chlorine produced oxidants. Recent work by Batley and Simpson (2020) proposed a short term guideline of 7.2µg/L for chlorine produced oxidants in marine waters.

Water quality – brine discharge

Operation of the desalination plant would release brine discharge comingled with the WWTW effluent via the Belmont WWTW outfall. Overall, the key finding from the brine discharge modelling assessment is that, in comparison with the EIS Project, the amended Project brine-effluent discharge through the existing Belmont WWTW outfall is predicted to have similar areas of impact in terms of marine toxicity, marine ecosystem and ambient salinity Water Quality Objectives (WQOs) (GHD, 2020d).

During dry periods with minimal rainfall inputs, the salinity and water quality in proximity to the diffuser will improve for both the EIS Project and amended Project. This is because the comingled effluent-brine discharge has a salinity and water quality closer to the ambient marine waters than that of the existing effluent. During wet periods with substantial rainfall inputs in the WWTW effluent discharge, a relatively modest salinity increase and water quality improvement is predicted for the comingled effluent-brine versus the existing effluent salinity. The co-mingled effluent-brine discharge of the EIS Project (10^{th} and 90^{th} percentiles of ~20 and ~38 psu, respectively) and amended Project (10^{th} and 90^{th} percentiles of ~26 and ~43 psu, respectively) result from the combination of relatively low WWTW effluent discharge (median salinity of ~4.3 psu) and high brine discharge (~58 psu). Under both of these cases, the salinity can be either above or below ambient marine waters (~35 psu), so both negatively buoyant plumes that fall to the seabed and positive buoyant plumes that rise through the water column can occur. Under the existing condition, WWTW effluent discharge has low salinity which results in positively buoyant plumes that rise in the water column. Similar rising positively buoyant plumes are predicted to occur during wet weather conditions for both the EIS and amended designs. The primary difference of the EIS and amended design relative to the existing case is for the occurrence of negatively buoyant (falling) plumes that encroach on the seabed with elevated salinity events on the benthos in proximity to the diffuser. However, these impacts are considered low to negligible as the near-seabed salinity WQO of the amended design capacity of 30 ML/day is predicted to be met within 5 m of the diffuser (i.e. minimal impacts on benthic and epi-benthic communities) (refer to Appendix M).The Sydney Desalination Plant outfall resulted in an increase in local salinity of 1 psμ within 30 m of the outlet with no detectable influence on temperature (Clark, et al., 2018). This change in salinity was found to have no effect on the abundance or diversity of fish assemblages. Pelagic species with sensitivities to changes in salinity would be able to disperse, avoiding the area around the diffuser. Epi-benthic and benthic species may need to adjust to the higher salinities in the dry weather; however resilience of these species is evident by their encrusting abilities and habitat creation in areas which were otherwise lacking in these species.

Mitigation measures

The mitigation and management measures outlined in Section 7.4.4 of the EIS will assist in avoiding and/or managing any potential impacts to the marine environment.

To manage the potential impacts of increased brine discharge on marine communities and to reduce or eliminate the risk of reduced water quality, the following additional mitigation measures will be implemented:

- Integration of pipeline ecology and fish assemblage monitoring into the Ocean Outfall Benthic Monitoring Program for better understanding of potential changes in the species abundance and diversity.
- Water quality monitoring program will be developed and implemented to identify long-term impacts from the discharge of brine concentrate on water quality or the marine environment.

Summary

Brine discharge modelling undertaken for both the EIS Project and amended Project indicates that the Water Quality Objectives would have a similar or smaller impact area (exceedance of WQOs) for the amended 30 ML/day design capacity relative to the EIS 15 ML/day design capacity. This is due to the size of the predicted mixing zones and dilution factors.

Examples from operation of much larger capacity plants indicate that increases in salinity are unlikely to have significant effect on the benthic communities and the existing fish assemblages. The same is expected for the amended Project.

Ongoing monitoring of outfall benthic communities in accordance with EPL 1771 and integration of pipeline ecology and fish assemblage into that monitoring would allow for better understanding of existing communities. Active management of any impacts to species abundance and diversity that may occur through operation is also required. As such, the risk of impact to species abundance and diversity at the outfall is considered to be as low as reasonably practicable.

3.5.2.5 Social

The information presented in this section considers potential changes to social impacts as a result of the proposed amendment to the water treatment process plant. This section should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Social Impact Assessment* (GHD, 2019d).

Impact assessment

Construction

The social impact assessment for the proposed amendment considered the results of the following studies: noise and vibration; traffic and transport and; visual amenity. These results were assessed using the impact criteria established in the original social impact assessment (Table 3-4 of the SIA) (GHD, 2019d). With the use of this criteria, it was concluded that any identified changes from the aforementioned studies would not affect the overall assessment of potential social impacts or mitigation measures for the construction of the Project.

Therefore, the proposed amendment is not expected to result in any change to the EIS construction social impact assessment.

Operation

The Project amendment would increase the capacity of the facility from 15 ML/d to 30 ML/d during operation. This would deliver increased benefits for Hunter Region residents by providing improved water security.

The social impact assessment for the proposed amendment considered the results of the following studies: noise and vibration; traffic and transport and; visual amenity. These results were assessed using the impact criteria established in the original social impact assessment (Table 3-4 of the SIA) (GHD, 2019d). With the use of this criteria, it was considered that an increase in capacity from 15 ML/d to 30 ML/d would deliver increased benefits for Hunter Region residents by providing improved water security. No other impacts to the social environment were identified as a result of the amended Project operation.

Therefore, the proposed amendment would enhance the positive social impacts identified in the EIS.

Mitigation measures

Any potential impacts to the social environment would be managed in accordance with the measures outlined in Section 7.6.4 of the EIS and reproduced in Appendix E.

Summary

The amended Project would not change the previously assessed social construction or operation impacts (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.

3.5.2.6 Aboriginal Cultural Heritage

An addendum to the ACHAR prepared for the EIS was required to assess the increased Project area associated with the proposed amendments.

The information presented in this section is summarised from the *Addendum to Aboriginal Cultural Heritage Assessment Report – Drought Response Desalination Plant, Belmont, NSW* (addendum to the ACHAR) (RPS, 2020) (Appendix O), which should be read in conjunction with reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Aboriginal Cultural Heritage Assessment.* (RPS, 2019).

Methodology

Consultation

The letter of notification was sent out to the Registered Aboriginal Parties (RAPs) for the Project, 8 January 2020, informing them of the amendment to the Project area. The notification also gave the RAPs the opportunity to express or comment on cultural heritage values and considerations, including the opportunity to inspect the additional areas.

No comments were received from the letters of notification.

Four RAPs undertook the inspection of the amended Project area as described below.

The draft addendum to the ACHAR was provided to the RAPs for comments and review. One response was received stating that acceptance of the ACHAR and no further changes were required.

Database searches

Searches of the Aboriginal Heritage Information Management System (AHIMS) undertaken for the EIS Project (refer to Section 7.9.1 of the EIS) remain relevant to the amended Project. No additional database searches were undertaken.

Site inspection

A site inspection of the amended Project area was conducted on 5 February 2020, by RPS archaeologists, with the involvement of John Wegener (Lower Hunter Aboriginal Incorporated), Jackson Walker (Guringai Tribal Link Aboriginal Corporation), Peter Leven (Awabakal Descendants Traditional Owners Aboriginal Corporation) and Kentan Proctor (Bahtabah Local Aboriginal Land Council).

Existing environment

Survey results

The majority of the Project area has been disturbed through previous vegetation clearance to facilitate access and construction of the existing evaporation ponds and Belmont WWTW. The surrounding vegetation comprises intermittent low shrubs and clumps of short coastal grasses.

Redistribution of A horizon soil profiles was observed at the evaporation ponds and associated bunds.

One newly identified Aboriginal cultural site was identified during the survey. The site has been registered as an isolated find (AHIMS #45-7-0402). The artefact comprised a small, backed tuff flake approximately two centimetres in length**.** Disturbances appeared to be from recreational vehicles and vegetation clearing**.** Considering the disturbances and nearby vehicle tracks the flake has likely been transported to its current position and is not in situ. The newly identified site is located approximately 200 m south west of the artefact previously identified in the EIS (AHIMS #45-7-0397).

No other cultural raw materials were observed during the site inspection.

Based on the presence of the isolated artefact and the presence of A horizon soils in a disturbed context, soils may contain archaeological deposits, albeit at relatively low densities and highly disturbed. There is a section of vegetated dune in the south west portion of the Project area where the potential for intact A horizon soils and associated archaeological deposits may remain in a less disturbed context.

All the RAPs present during the site inspection expressed the cultural sensitivity of the broader area. For example, song lines are associated with Belmont Lagoon, immediately the west of the Project area.

Archaeological significance assessment

The cultural significance of the Project area was assessed in accordance with the Burra Charter (Australian ICOMOS, 2013) and in consultation with the RAPs.

The newly identified Aboriginal cultural site (AHIMS #45-7-0402) was found to be of low archaeological significance. The site area has been disturbed. The artefact is not assessed to be rare in the context of Belmont/Lake Macquarie archaeology. The type of artefact is consistent with residue of stone tool production and the artefact does not possess any educational potential.

The above mentioned withstanding, all the RAPs present during the site inspection expressed the significance of the intangible heritage associated with area, specifically the cultural sensitivity of the area in the form of songlines that are associated with the adjacent Belmont Wetlands and Lagoon. While it is acknowledged that the Project area is culturally significant as part of the wider Aboriginal cultural landscape, when viewed in isolation, no specific cultural values or associations have been identified by the RAPs for the Project area.

Impact assessment

The proposed works within the Project area will involve excavation, installation of pipes, lay down of equipment and vehicular movements which will impact the surface and subsurface.

That there has been cultural material identified atop the ground surface within the Project Area and the broader region indicates some potential for further material to be observed. The level of disturbance in the topsoil profiles across the Project Area has direct influence on the level of potential for insitu cultural material in that it reduces the likelihood of intact deposits which are generally always located within topsoils. Where topsoils are present but disturbed, cultural materials may still be present but in a reduced number, and in a disturbed context.

Areas comprising of existing disturbance where no A horizon soils were observed, such as previous ground surface disturbance associated with the existing WWTW or access tracks, are considered to have a low potential for sub-surface Aboriginal objects and or places.

Areas identified as having intact A horizon soils or the potential for A horizon soils in a disturbed context, may contain the potential for either insitu or non-insitu Aboriginal cultural materials.

The surface artefact previously identified in the EIS (AHIMS #45-7-0397) and the newly identified Aboriginal cultural site (AHIMS #45-7-0402), would be impacted during the construction of the amended Project and therefore surface collection prior to works would be required through Community Collection.

Due to the significant disturbances of the Project Area, the potential for sub-surface artefacts to be identified has been assessed as low.

Mitigation measures

Revised and additional mitigation measures for the amended Project are provided in Table 3-9.

Table 3-9 Aboriginal heritage mitigation measures

Impact	Mitigation measure
Unexpected Finds Procedure	An unexpected finds procedure will be prepared to provide a method to manage potential heritage constraints and unexpected finds during construction. If suspected Aboriginal objects are identified during construction, work should stop immediately and Bahtabah Local Aboriginal Land Council, DPIE and an archaeologist contacted to identify and record the objects. This procedure will be made accessible to all relevant employees and contractors working within the Project area via toolbox talks and display in break out rooms/sites offices.
Aboriginal Cultural Heritage Management Plan (ACHMP)	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be formulated following approval of the Project to provide management and protection process for known and unknown Aboriginal objects and places.
ACHMP Provisions	The ACHMP will include provision for the completion of the following activities. Additional inspection described within this Recommendation is referring to either further site inspection of A horizon soils after vegetation clearance or the monitoring of ground disturbance works during the works: • Surface collection of AHIMS #45-7-0397 (RPS BEL IF01) and AHIMS #45-7-0402 (RPS_IF2). • Additional inspection and surface collection of any artefacts exposed in the area mapped in Figure 5 of Appendix O as containing A horizon soils in a disturbed context. The opportunity to undertake the additional inspection and surface collection should be provided to an archaeologist and Aboriginal party representatives following vegetation clearance and respreading of A horizon soils currently within the bunds and adjoining area. • Additional inspection of the areas with the potential for intact A horizon soils mapped in Figure 5 of Appendix O, with the opportunity to undertake the additional inspection to be provided to an archaeologist and Aboriginal party representative following vegetation clearance and during earthworks (where the earthworks will occur within A horizon soils). Methodologies should be included for collection of surface artefacts.
Site induction	All Hunter Water personnel and subcontractors involved in the proposed works will be advised of the requirements of the NPWS Act 1974 that it is an offence for any person to knowingly destroy, deface, damage or permit destruction, or defacement to an Aboriginal object or place without a relevant approval.
Human Remains Protocol	In the event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, DPIE must be contacted on Enviroline 131 555. A DPIE officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.

Summary

An addendum to the ACHAR prepared for the EIS was required to assess the increased Project area associated with the proposed amendments to the Project.

One newly identified Aboriginal cultural site was identified within the Project area (AHIMS #45-7-0402) and would be impacted during the construction of the amended Project. Surface collection of the newly identified Aboriginal cultural site would be required prior to construction.

Due to the significant disturbances of the Project Area, the potential for sub-surface artefacts to be identified has been assessed as low. However, areas identified as having intact A horizon soils or the potential for A horizon soils in a disturbed context, may contain the potential for either insitu or non-insitu Aboriginal cultural materials.

The mitigation measures identified in Table 3-9 and reproduced in Appendix E to minimise potential impacts to Aboriginal Heritage.

3.5.2.7 Noise and Vibration

The information presented in this section is summarised from the Noise and Vibration Amendment Report (GHD, 2020e) (Appendix Q), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment* (GHD, 2019b).

Impact assessment

Construction

Construction works noise - Power connection

To service the amended water treatment process plant, a change in the power supply connection is proposed. The new power connection works is located north-west of the water treatment process plant, further details provided in Section 3.3.2 and Appendix D. The new connection location means that there will no longer be a requirement for works at the Marriott Street and Hudson Street intersection.

Table 3-10 shows the indicative equipment that will be used for the power supply works. The construction activity will be located north west of the water treatment process plant site.

Table 3-10 Power connection construction equipment

Activity	Equipment	Qty	Sound Power Level (dB(A))[1]	Equivalent Sound Power Level (dB(A))
Power connection	Pole Installer (Crane with Auger)	1	107	110
	Excavator	1	99	
	Hand Tools	1	102[2]	
	Cherry Picker	1	105	

[1] *Sound Power Level and spectrum sourced from BS5228 (2009) - Code of practice for noise and vibration control on construction and open sites.*
[2] *Overall Sound Power Level sourced from AS2436 (2010) – Guide to noise and vibration control on construction, demolition and maintenance sites.*

The predicted noise impact level due to the works associated to the power connection is shown in Table 3-11.

Table 3-11 Power connection noise impacts

Receiver address	Construction Noise Management Level (CNML) dB(A)	EIS predicted contribution noise level, dB(A)[1]	Amended design predicted contribution noise level, dB(A)
Nine Mile Beach	65	37	45
33 Williams Street, Belmont	48	59	32

[1] Comparison level based on Power Upgrade works assessed in *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment* (GHD, 2019b) report.

The amended power supply works are predicted to have an increased noise impact on the nearby Active Recreational receiver (Nine Mile Beach) as predicted in the EIS. The works are predicted to have a decreased noise impact on the nearest residential receiver (33 Williams Street). This is due to the location of the works being closer to the Active Recreational receiver than the residential receiver. The activity is expected to remain under the established Construction Noise Management Levels (CNMLs).

Construction works noise - Other

The construction methodology and equipment for construction of the remaining aspects of the water treatment process plant are consistent with the description provided in Section 7.12 of the EIS (see updated Project description in Appendix D).

The construction timeframe for the amended water treatment process plant will increase, due to additional buildings and plant sizing. However, this would not increase the previously predicted noise impacts as assessed according to the Interim Construction Noise Guideline (ICNG) (DECC, 2009a).

Site compound noise

There are no changes to the location of the compound or the operations at the compound. No changes in noise impact from the compound is expected.

Construction traffic noise

The same vehicle access paths of the construction works would be used for the amended water treatment process plant as assessed in the EIS. The heavy vehicle movements assessed in the EIS are considered conservative and still applicable for the construction of the amended design. The light vehicles volumes are expected to increase due to the increase in the workers required. The peak hour light vehicle movements are expected to increase from 10 to 30 for the amended design. This increase in light vehicle volumes is predicted to have minimal effect on the noise levels predicted in the EIS due to the heavy vehicle volumes on the road as part of the EIS construction methodology.

Construction works vibration - Power connection

The power connection works are being undertaken at a different location and using a different methodology than that identified in the EIS. Based on the increased distance from the works to the nearest building and the indicative construction methodology/equipment, it is expected that the vibration impact will be less than that from the EIS construction methodology. The nearest existing buildings to the works are the buildings associated with the WWTW.

Construction works vibration - Other

Similar construction equipment will be used for the water treatment process plant amended design as those indicated for the construction of the EIS design. Vibration impacts are not expected based on the indicative equipment and distances to receivers.

No changes to the vibration impacts assessed in the EIS are expected.

Operation

The EIS design change to the amended Project design involves increased sizing and additional plant/equipment and a minor shift in the plant location. These factors have the potential to have an impact on the operational noise contribution.

The amended Project is not predicted to result in exceedance of the Project noise trigger levels at the nearest residential receiver; however, it is predicted to result in an exceedance of 1 dB at the nearest active recreational receiver (Nine Mile Beach) (see Table 3-12).

The results present in Table 3-12 are conservative in nature, and has not considered any shielding of noise sources. In reality, it is expected that pumps and other noisy equipment will be housed in buildings, which would reduce the noise levels. The mitigation measures identified in Section 7.12.5 of the EIS and reproduced in Appendix E, can help reduce operational noise impacts and should be considered in detailed design phase.

Table 3-12 Operational noise impacts

Receiver address	Project noise trigger level, $L_{Aeq(15min)}$ dB(A)	15 ML/day plant predicted contribution noise level, $L_{Aeq(15min)}$ dB(A)[1]	30 ML/day plant predicted contribution noise level, $L_{Aeq(15min)}$ dB(A)
Nine Mile Beach	53	53	54
33 Williams Street, Belmont	38	33	35

Note 1: Comparison level based on predicted results detailed in *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment (GHD, November 2019)* report.

In addition, the Project amendments are not predicted to result in any change to EIS operational noise impact predictions, including:

- Sleep disturbance
- Operational traffic noise
- Operational vibration

Mitigation measures

Any potential noise and vibration impacts would be managed in accordance with the measures outlined in Section 7.12.5 of the EIS and reproduced in Appendix E.

Summary

Construction noise

The construction of the amended Project compared to the EIS design is predicted to have different impacts on nearby sensitive receivers. The amended Project noise and vibration impacts remain under the ICNG criteria/management levels. The previously recommended mitigation and management measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E, are still appropriate. No additional measures are proposed in relation to construction of the water treatment process plant.

Operational noise

The operation of the amended Project is predicted to result in compliance at residential receivers and an exceedance of 1 dB at the nearest active recreational receiver (Nine Mile Beach) during operation. The mitigation measures provided in Section 7.12.5 of the EIS remain appropriate to manage this potential impact.

The amended Project would result in no other change to previously assessed operational impacts or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.

3.5.2.8 Visual amenity

The information presented in this section is summarised from the *Belmont Drought Response Desalination Plant – Landscape Character and Visual Impact Assessment Amendment Report* (GHD, 2020f)(Appendix R), which should be read in conjunction with GHD reports titled:

- Belmont Drought Response Desalination Plant – Environmental Impact Statement (GHD, 2019a)
- Belmont Drought Response Desalination Plant – Landscape Character and Visual Impact Assessment (GHD, 2019e)

Landscape character zones (LCZs) and viewpoints

Section 7.14.2 of the EIS identified key LCZs and viewpoints relative to the EIS Project area and surrounds. These key LCZs and viewpoints have been revised to account for the amended Project design. Whilst the water treatment process plant has increased in size, this does not incur additional impacted viewpoints. LCZ 2 – Belmont South Residential from the EIS Project is no longer included as the amended Project no longer includes the power connection works within the residential area of Belmont South. One additional LCZ and one additional viewpoint has been considered in the revised assessment provided in Appendix R, including:

- **LCZ 3 – Ocean/sea scape:** Sensitivity is negligible. The existing character is an extensive body of water that can range in conditions from extremely calm waters to rough seas with large waves.
- **Viewpoints 2 – Nine Mile Beach – offshore construction zone:** This viewpoint is not relevant to the amendment to the water treatment process plant.

Potential impacts

As identified in Table 3-13 and Table 3-14, no change is expected to impact predictions for pre-existing LCZs and viewpoints, as detailed in Section 7.14.3 of the EIS.

Therefore, commentary is focussed on the additional LCZ and viewpoints, for which negligible impact is predicted (see Appendix R for more detail).

Table 3-13 Landscape character zone assessment

LCZ	Sensitivity	Magnitude	Predicted level of impact – Amended Project	Comment
1 – Coastal Dunes and Beach Scape	Moderate	Low	Moderate-Low	No change from EIS predictions.
3 – Ocean/ sea scape	Negligible	Negligible	Negligible	The existing character of the ocean is an extensive body of water that can range in conditions from extremely calm waters to rough seas with large waves. The impact of the Project on the character of this landscape has been identified as negligible.

Table 3-14 Visual impact assessment

Viewpoint	Sensitivity	Magnitude	Overall level of impact	Comment
1 – Nine Mile Beach (adjacent to Project area)	Low	Moderate	Moderate-Low	No change to EIS predictions.
2 – Nine Mile Beach (off-shore construction zone)	Low	NA	NA	This viewpoint is not relevant to the amendment to the water treatment process plant.
3 – Belmont Golf Course	Low	Negligible	Negligible	No change from EIS predictions.
4 – Anderson Point (elevated residential)	Moderate	Negligible	Negligible	No change from EIS predictions.
5 – Belmont North (elevated residential)	Moderate	Negligible	Negligible	No change from EIS predictions.
6 – Belmont Wetlands State Park (Kalaroo Fire Trail)	Low	Negligible	Negligible	No change from EIS predictions.

Summary

- No change to previously assessed impacts for pre-existing LCZs and viewpoints, or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019e)), which have been reproduced in Appendix E.
- Additional LCZs and viewpoints considered for the amendment to the water treatment process plant identified potential for negligible impacts, with no change to mitigation measures required.

3.5.2.9 Greenhouse Gas

The information presented in this section considers updated assumptions to the greenhouse gas (GHG) assessment provided in Section 7.16 of the EIS (GHD, 2019a), relating to the construction and operation phases of the water treatment process plant.

Assumptions

Assumptions used in estimating GHG emissions for the construction and operation of the Project are listed in Table 3-15. The assessment was based on emission factors available at the time of the assessment and future changes in emission factors are not considered.

Activity data used for the GHG assessment was provided by Hunter Water or other studies conducted as part of this EIS. All Emission Factors (EF) used were as per the National Greenhouse and Energy Reporting (NGER) (Measurement) Determination. The assumptions did not change significantly however a few key items increased the amount of emissions considerably, including additional equipment used during construction, increased fuel use for transport and increased vegetation area cleared during construction.

The electricity from the grid during the operation phase was updated based on the *Updated Power Requirements for 30 ML/ d plant* document. The total power requirements were 5.75 MW with the minor pumping stations requiring 0.92 MW. The vegetation removal was assumed to increase by 9.8 ha. The assumptions are outlined in more detail in Table 3-15.

Table 3-15 Greenhouse gas assessment amended Project assumptions by source

Parameter	Assumptions
Construction	
Construction timing and duration	Changes to construction duration provided in Table 7-56 of the EIS from approximately 8.5 months to 13 months for the Amended Project as provided in Table 3-1.
Diesel - Construction stationary energy	No change in the assumptions made for the 15 ML/d. However, additional equipment added due to more construction occurring in the large plant. After the additional equipment added, it was estimated that 802 kL of diesel fuel would be used during construction.
Diesel - construction transport (materials)	Updated to 89 kL of diesel fuel for the transportation of materials Assumptions that changed were: • 190 truck movements for concrete pouring instead of 136 • 40 truck movements for delivery of materials instead of 10
Diesel - commuting	Change to predictions provided in Table 7-56 of the EIS from 10 FTE to 20 FTE Project as provided in Table 3-1.
Grid electricity use - construction	No change to predictions provided in Table 7-56 of the EIS.
Vegetation Removal	The total Project area is 15 ha. 5.3 ha of that has already been cleared. Vegetation classifications from the BDAR were mapped against the limited vegetation types in the Transport Authorities Greenhouse Group (TAGG) Carbon Gauge calculator. It is estimated that 4.5 ha of the vegetation classified as bitou bush scrub and 4.9 ha of exotic grassland is being removed. The remaining removal of 0.4 ha of land is classified as grasslands.

Parameter	Assumptions
Operations	
Project operation	This assumption has not been changed.
Grid electricity use - operations	The electricity usage for the RO plant has been updated to be with energy recovery. The electricity usage would be around 50,370 MWh per year for the RO plant. The usage for the rest of the operations would be 8,059 MWh per year. This is based on the maximum electricity usage: operating 24 hours day, with electricity demand of 5.75 MW for the RO plant and 0.92 MW for the rest of the operations.
Diesel - operations	This assumption has not changed.

Impact assessment

Construction

A summary of estimated scope 1 GHG emissions occurring as a result of construction activities for the Project as exhibited and as amended is presented in Table 3-16.

This represents emissions across the entire construction period. There are no Scope 2 emissions anticipated. The emissions for the construction phase would increase due to additional:

- Vegetation removal
- Heavy vehicle movements
- Additional construction equipment used

Table 3-16 Construction emissions comparison

Activity	15 ML/day Scope 1 Emissions (t CO_2-e)	30 ML/day Scope 1 Emissions (t CO_2-e)
Diesel combustion (stationary)	851	2,172
Diesel – construction transport (materials)	181	241
Diesel – Commuting	28	46
Vegetation Removal	716	1,117
Total	**1,776**	**3,577**

Operational

A summary of estimated annual greenhouse gas emissions from operation of the amended Project is given in Table 3-17 below.

Table 3-17 Annual operational emissions comparison

Activity	15 ML/day Scope 2 Emissions (t CO_2-e)	Percentage of emissions	30 ML/day Scope 2 Emissions (t CO_2-e)	Percentage of emissions
Electricity use – inlet works, pre-treatment, potable water delivery*	15,910	57%	6,528	14%
Electricity use – RO plant	11,997	43%	40,800	86%
Total	**27,907**		**47,328**	

**Note: In the initial 15 ML/d assessment emissions were calculated with no energy recovery. For the 30 ML/d assessment, emissions were calculated including energy recovery.*

Summary and conclusion

- The amended Project design would increase emissions due to the larger capacity and additional construction requirements. However, the total operational emissions are still negligible compared to NSW and Australian annual emissions (0.04 per cent NSW annual emissions and 0.009 per cent Australian annual emissions).
- The overall increase in emissions for the construction and operational phases is approximately 70 per cent, with construction increasing from 1,776 to 3,577 tCO_2-e total and operation increasing from 27,907 tCO_2-e/year to 47,328 tCO_2-e/year.

The overall increase in emissions for the construction and operational phases are summarised in Table 3-18.

Table 3-18 Construction and operational emissions

Project capacity	Construction emissions (tCO_2-e total)	Operational emissions (tCO_2-e/year)
EIS design (15 ML/d desalination plant)	1,776	27,907
Amended design (30 ML/d desalination plant)	3,577	47,328
Increase	x 2.0	x 1.7

3.6 Assessment of impacts - Direct Ocean Intake

The proposed amendment of the Project from a sub-surface intake to a direct ocean intake (DOI) has the potential to result in changes to impact predictions identified in the EIS (GHD, 2019a). Therefore, a preliminary environmental impact screening process was undertaken, as summarised in Section 3.6.1. The preliminary environmental impact screening process was completed with consideration to:

- The amended Project description for the direct ocean intake, including the sea water pump station, indicative intake pipeline and off-shore intake structure as discussed in Section 3.3.2 and Appendix D, including additional areas of disturbance (see Table 3-1).
- The SEARs for relevant key issues (see Appendix A of the EIS).
- Relevant background information for each key issue, as identified in the EIS, including:
  - Initial assessment methodology
  - Existing environment information for the Project area and surrounds
  - Potential impacts and associated mitigation measures

Where this process identified the need for additional assessment as a result of the amendment to direct ocean intake, this was completed as summarised in Section 3.6.2.

3.6.1 Environmental impact screening

Table 3-19 Preliminary environmental assessment for design changes to the intake structure

Aspect	Phase	Comment	Further assessment required?
Soils, geology and contamination	Construction Operation	The amended Project would result in an increase to the disturbance area in association with the intake pipeline, The preliminary environmental screening indicates there would be no changes to existing environment considerations provided in Section 7.1.2 of the EIS. The proposed amendment to direct ocean intake would have negligible affect on impacts to soils and geology during construction and operation, as assessed in Section 7.1.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.2.4 of the EIS and reproduced in Appendix E. The amended Project would result in an increased Project area compared with the EIS. Therefore, review of the EIS contamination assessment (GHD, 2019i) and the amended Project area including additional contamination investigation has been completed (Appendix G). A summary of the review and amended impacts are considered in Section 3.5.2.1. The review identified that the amended Project would not change potential contamination considerations provided in Section 7.2.4 of the EIS and reproduced in Appendix E. Management of excess material excavated during construction of the sea water pump station or CM 1 (HDD) or CM 2 (Pipe jacking) would be consistent with mitigation measures in Table 7-2 of the EIS. Further investigation of the potential mine subsidence impacts was identified during the exhibition period. The proposed amendment to direct ocean intake has been assessed to have a very low likelihood of residual subsidence occurring.	Yes. See Section 3.6.2.1 and Appendix H See Section 3.5.2.1 and Appendix G
Water resources	Construction	While the amended Project would result in a minor increase to the disturbance area, The preliminary environmental screening indicates there would be no changes to existing environment considerations provided in Section 7.2.2 of the EIS. The proposed amendment to direct ocean intake would result in negligible change to potential impacts to water resources, as assessed in Section 7.2.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.2.4 of the EIS and reproduced in Appendix E.	Yes. See Section 3.6.2.2 and Appendix J
	Operation	The amended Project would involve sourcing seawater via direct ocean intake. This would remove potential operational groundwater impacts associated with the previous sub-surface intake. Impacts on groundwater from the amended design would be restricted to the construction phase only.	No

Aspect	Phase	Comment	Further assessment required?
Terrestrial and freshwater biodiversity	Construction	The proposed amendment to direct ocean intake would result in a change to impacts on biodiversity from those assessed in the EIS. Therefore, an updated assessment has been completed a summary of amended impacts are considered in Section 3.5.2.3 and Appendix K.	Yes. See Section 3.5.2.3 and Appendix K
	Operation	The proposed amendment to the direct ocean intake would have negligible impacts to terrestrial and freshwater biodiversity during operation, as assessed in Section 7.3.3 the EIS and would be managed in accordance with the measures outlined in Section 7.3.4 of the EIS and reproduced in Appendix E.	No
Marine biodiversity	Construction	The proposed amendment to direct ocean intake would result in a change to impacts on marine biodiversity from those assessed in the EIS. Therefore, an updated assessment has been completed a summary of amended impacts during construction are considered in Section 3.6.2.3 and Appendix L.	Yes. See Section 3.6.2.3 and Appendix L
	Operation	The proposed amendment to direct ocean intake would result in a change to potential impacts to marine biodiversity during operation. Therefore, an updated assessment has been completed, a summary of amended impacts during construction are considered in Section 3.6.2.3 and Appendix L.	
Coastal processes	Construction	Construction of the intake pipeline and structure has the potential to alter coastal processes through activities that would disturb the seabed. Therefore, an updated assessment has been completed, a summary of amended impacts during construction are considered in Section 3.6.2.4 and Appendix N.	Yes. See Section 3.6.2.4
	Operation	The proposed amendment to direct ocean intake has the potential to result in changes to potential impacts to coastal processes, as assessed in the EIS. Therefore, an updated assessment has been completed, a summary of amended impacts during construction are considered in Section 3.6.2.4 and Appendix N.	
Social	Construction	The proposed amendment to direct ocean intake has the potential to result in changes to social impacts during construction. Therefore, an updated assessment has been completed as summarised in Section 3.6.2.5.	Yes. See Section 3.6.2.5
	Operation	The proposed amendment to direct ocean intake would have negligible effect on social impacts during operation, as assessed in Section 7.6.3 the EIS and would be managed in accordance with the measures outlined in Section 7.6.4 of the EIS and reproduced in Appendix E.	No
Sustainability	Construction	Due to the nature of the sustainability assessment methodology of the EIS Project, which uses a category based assessment, the proposed amendment to the direct ocean intake and associated construction methodology would not result in a change to the conclusions of the sustainability assessment and associated management and mitigation measures included in Section 7.7 of the EIS and reproduced in Appendix E.	No
	Operation		

Aspect	Phase	Comment	Further assessment required?
Hazards and risk	Construction Operation	A Level 1 preliminary hazard analysis (PHA) was completed in Section 7.8 of the EIS. The proposed amendment to direct intake would not result in: • A change to dangerous goods and chemical storage • Any exceedance of transport screening thresholds Therefore, no change to hazard risks considerations from those assessed in Section 7.8 of the EIS are expected. No change to mitigation measures are proposed, with measures reproduced in Appendix E.	No
Aboriginal heritage	Construction	The proposed amendment to direct ocean intake would result in a change to impacts on Aboriginal heritage from those assessed in the EIS. Therefore, an updated assessment has been completed a summary of amended impacts are considered in Section 3.5.2.6 and Appendix O.	Yes. See Section 3.5.2.6 and Appendix O
	Operation	The proposed amendment to the direct ocean intake would have negligible impacts to Aboriginal heritage during operation, as assessed in Section 7.9.3 the EIS and would be managed in accordance with the measures outlined in Section 3.5.2.6 and reproduced in Appendix E.	No
Non-Aboriginal heritage	Construction Operation	While the amended Project would result in a minor increase to the disturbance area, review of background information indicates no changes to existing environment considerations provided in Section 7.10.2 of the EIS. During field survey for the Addendum to the ACHAR conducted on 5 February 2020, remnant tank traps were identified within the Project area on the beachfront to the east of the dunes. The tank traps are remnants of a former military defence barrier which extended from Belmont Lagoon to the shoreline. There is potential for the tank traps to be impacted during construction of the direct ocean intake and through ancillary construction activities, including access and laydown areas. The exact location of the tank traps would be identified during detailed design to ensure potential impacts during construction are appropriately mitigated including provision of buffer zones. Potential impacts to non-Aboriginal heritage from the proposed amendment to direct ocean intake would be managed in accordance with the measures outlined in Section 7.10.4 of the EIS and additional mitigation measures proved in Section 3.8. These are reproduced in Appendix E.	No
Traffic and transport	Construction	The proposed amendment to direct ocean intake has the potential to result in a change to traffic and transport movements during construction of the Proposal. Therefore, an updated assessment has been completed providing a summary of amended impacts (see Section 3.6.2.6, Appendix P and Appendix L).	Yes. See Section 3.6.2.6, Appendix P and Appendix L.
	Operation	The proposed amendment to direct ocean intake would result in a change to potential maritime traffic and transport impacts compared with the EIS Project. Therefore, an updated assessment has been completed providing a summary of amended impacts (see Section 3.6.2.6 and Appendix L).	

Aspect	Phase	Comment	Further assessment required?
Noise and vibration	Construction Operation	The proposed amendment to direct ocean intake has the potential to result in a change to noise and vibration impact predictions provided in Section 7.12.4 of the EIS during both construction and operation. Therefore, an updated assessment has been completed a summary of amended impacts are considered in Section 3.6.2.7 and Appendix Q.	Yes. See Section 3.6.2.7 and Appendix Q.
Waste management	Construction	The proposed amendment to direct ocean intake is not expected to result in any significant increase in waste generation. No significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS.	No
	Commissioning	The proposed amendment to direct ocean intake would result in negligible change to waste seawater generated during commissioning of the intake. No significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS.	No
	Operation	The proposed amendment to direct ocean intake is not expected to generate waste during operation and as such would result in a negligible change to waste management during operation.	No
Visual amenity	Construction	The proposed amendment to direct ocean intake would result in a change to potential visual impacts during construction, as assessed in Section 7.14.3 of the EIS. Therefore, an updated assessment has been completed a summary of amended impacts during operation are considered in Section 3.6.2.8 and Appendix R.	Yes. Section 3.6.2.8 and Appendix R
	Operation	The proposed amendment to direct ocean intake would have negligible affect on impacts to visual amenity during operation, as assessed in Section 7.14.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.14.3 of the EIS and reproduced in Appendix E.	No
Air quality	Construction Operation	The proposed amendment to direct ocean intake would result in a negligible change to air quality impacts, as assessed in the EIS, during both construction and operation of the Project. Construction activity is predominantly situated in coastal waters of some distance from populated areas, air emissions would experience rapid dissipation into the surrounding environment and are unlikely to extend to onshore communities.	No

Aspect	Phase	Comment	Further assessment required?
Greenhouse gas	Construction	The estimated additional emissions associated with construction of the seawater intake structure have incorporated construction method CM 2 Micro-tunnelling/pipe jacking, which is expected to use the most GHG-intensive equipment. A comparison of the estimated emissions for the EIS design and the amended design resulted in an approximate increase of construction emissions of approximately 28% (990 tCO_2-e). Since both the EIS design construction emissions and the direct ocean intake construction emissions are minor, and the estimated difference is within the accuracy of the calculations, no further assessment is required.	No
	Operation	The proposed amendment to direct ocean intake would not change to GHG emissions, as assessed in the EIS, during operation of the Project.	
Human health	Construction Operation	The proposed amendment to direct ocean intake would result in a negligible change to human health impacts, as assessed in the EIS, during construction of the Project. The proposed amendment to direct ocean intake introduces the potential for recirculation of the co-mingled discharge from the WWTW diffuser to the seawater intake structure. The degree of recirculation was simulated to ensure appropriate spatial separation. A 1% threshold for the proportion of co-mingled discharge provides a preliminary indicator of the risk of treated effluent recirculation into the seawater intake. The simulation found that 99.9% of the time seawater would have less than 1% concentration of co-mingled discharge 500 m from the intake structure. The simulation found that the proportion of treated effluent at the intake ranged from 0% to 0.3%, with enterococci concentrations less than 7.5 MPN/100 ml 99 % of the time. Based on the concept design the operational risk of material recirculation was predicted to be very low.	Yes. Appendix M
Cumulative impacts	Construction	The proposed amendment to direct ocean intake would result in a negligible change to cumulative impacts, as assessed in Section 7.18 of the EIS.	No

3.6.2 Further detail impact assessment

3.6.2.1 Mine Subsidence

The information presented in this section is summarised from the mine subsidence assessment report (GHD, 2020g) (Appendix H).

A desktop assessment completed for the desalination plant, wet well and direct ocean intake identified abandoned coal mine workings from the John Darling Colliery in the Victoria Tunnel and Boreholes seams at 210 m and 280 m below the surface, respectively (GHD, 2020g). This review utilised record tracings from the John Darling Colliery (RT270 and RT270A) as well as a PhD thesis of subsidence relating to pillar extraction and longwall mining (Kapp, 1984).

Based on the desktop review, the likelihood that further collapse of underground mine working would occur is assessed as very low. Additionally, the magnitude of any residual subsidence is unlikely to be sufficient to adversely impact the proposed development. Detailed design could consider options to provide a less rigid connection (given that this is understood to be common practice for the use of flexible pipe connections in such designs). If required, the magnitude of potential subsidence to accommodate in the design could be estimated from the subsidence data provided in Kapp (1984).

Summary

The likelihood that residual subsidence would occur and impact the Project is assessed as very low. Combined with the very low likelihood that if such subsidence would occur it would be of a magnitude to adversely impact the Project.

3.6.2.2 Water resources

The information presented in this section is summarised from the groundwater assessment report (GHD, 2020h) (Appendix J), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Groundwater Assessment* (GHD, 2019f).

The groundwater impact assessment for the EIS Project quantified changes to the groundwater level and flow from the operation of the sub-surface seawater intakes. Groundwater impacts from the construction of the sub-surface seawater intakes were not assessed in detail in the EIS since they were expected to be substantially lower than the impacts from the operation of the sub-surface seawater intakes.

The amended Project adopts a DOI in place of the sub-surface seawater intakes. Therefore, it is expected that the operation of the amended Project would result in considerably reduced groundwater impacts compared with the EIS Project.

There is potential, however, for groundwater impacts from the construction of the DOI in the amended Project. Therefore, the potential groundwater impacts and mitigation measures associated with construction of the DOI have been assessed.

Updated dewatering volumes

Calculated groundwater inflows for each excavation associated with the amended Project are presented in Table 3-20 for both ‘high flow’ and ‘low flow’ rates. These calculations are based on the following parameters:

- Groundwater depth below ground level: 0.3 m (high flow) and 1.2 (low flow)
- Sand hydraulic conductivity: 20 m/day (high flow) and 10 m/day (low flow)

- Sheet pile depth below base of excavation: 1 m (high flow) and 4 m (low flow)
- Depth of sand aquifer: 30 m (high flow) and 25 m (low flow)

Both 'high flow' and 'low flow' rates have been calculated, based on these.

Table 3-20 Calculated groundwater inflows (L/s)

Construction item	Inflow (high)	Inflow (low)
2 x caissons (EIS)	117.2	8.2
1 x wet well (DOI on-shore pump station)	58.6	4.1
Pipe jacking entry shaft (CM2)	137.3	2.6

Total volumes of groundwater to be dewatered for each method of construction for the intake pipeline, with consideration to EIS predictions, are presented in Table 3-21. Volumes have been calculated for the 'high flow' (i.e. worst-case) and assumed a construction timeframe of six months (180 days).

Table 3-21 Total dewatering requirement

Scenario	Total groundwater inflow rate (high), L/s	Total groundwater volume, ML
EIS design (construction)	117.2	1,823
HDD* (CM1)	58.6	911
Pipe jacking**(CM2)	195.9	3,047

* Sea water pump station only

** Entry shaft and sea water pump station

Impact assessment - construction

Dewatering and drawdown

The total groundwater volume to be dewatered during the construction of the EIS design has been calculated to be approximately 1,823 ML. This is likely to be higher than the volume to be dewatered for proposed CM1 (HDD) of the DOI, since two caissons were to be installed for the EIS design compared to one for the DOI. A higher dewatering volume is predicted for the proposed CM2 (pipe jacking), since the entry shaft is assumed to be deeper than the other excavations. It is noted that a portion of the water that is extracted from each excavation during construction would be seawater rather than fresh groundwater. Overall, the groundwater take resulting from the amended Project is less than the take predicted for the EIS design (up to 19.5 ML/d) due to the extraction of groundwater via the sub-surface seawater intakes.

Potential impacts would be mitigated through the implementation of measures outlined in Table 7-3 of the EIS, including development of a comprehensive groundwater monitoring program during construction.

Licensing and dewatered groundwater disposal

All construction methods will require a Water Access Licence to cover the take of groundwater from excavations. The unassigned (available) water within the Hawkesbury to Hunter Coastal Sands Groundwater Source of the North Coast Coastal Sands Water Sharing Plan is 12,740 ML/year (at commencement of the plan in 2016). This is significantly in excess of the predicted groundwater take for all scenarios of the amended Project. Therefore, it is considered there is sufficient groundwater available within the water source to enable Hunter Water to obtain a Water Access Licence for construction of the direct ocean intake.

Fresh groundwater extracted from the excavations during construction may be disposed by infiltration back to groundwater at a distance from the construction area. Based on a sand infiltration rate of 0.02 m/hr, an infiltration area of approximately 3.5 hectares would be required to manage the highest inflow rate of 196 L/s (CM2). It should be noted, however, that the maximum inflow would only be reached once the excavation is at maximum depth, at which time the water extracted would be seawater. As reported in the *Belmont Drought Response Desalination Plant – Groundwater Assessment* (GHD, 2019f), electrical conductivity (EC) profiling in monitoring wells identified fresher groundwater (0 – 10,000 µS/cm) generally up to a depth of 10 m below ground level with this depth become less towards the east. This suggests that seawater would be extracted in excavations beyond 10 m depth and require alternative disposal method to infiltration. The saline groundwater (seawater) may be discharged to the ocean via the existing WWTW ocean outfall following appropriate treatment. This would only be undertaken where a new EPL is obtained or EPL 1771 has been modified to authorise the discharge of dewatered groundwater during construction.

Potential acid sulfate soils considerations

The on-shore pump station and intake pipeline are located within areas identified as the 'low risk above 4 m'. With excavations extending to a depth of up to 20 m there is potential to encounter ASS. However, in accordance with Table 7-2 of the EIS, ASS testing within the Project area would be completed to confirm the presence of ASS and an Acid Sulphate Soil Management Plan (ASSMP) prepared as part of the CEMP, as required.

With the implementation of additional measures below, and reproduced in Appendix E, the amended Project is considered unlikely to impact the beneficial use of groundwater.

Impact assessment – operation

The amended Project adopts a DOI rather than the sub-surface seawater intake of the EIS Project. Therefore, during operation the amended Project would not result in the predicted groundwater drawdown and associated potential impacts identified in Section 7.2.3 of the EIS.

It is not expected that the operation of the amended Project, including a DOI in place of the sub-surface seawater intakes, would result in groundwater impact, or, if any impacts were to occur, these would be considerably reduced compared to the EIS Project. The operational phase mitigation measures for groundwater identified in the EIS therefore no longer required.

Additional mitigation measures

Additional mitigation measures for the amended Project are provided in Table 3-22.

Table 3-22 Additional water resources mitigation measures

Impact	Mitigation measure
Groundwater take	Metering of fresh groundwater removed from excavations for all construction methods. Use of sheet piling, or similar, to support excavations and reduce groundwater inflow for all construction methods will be investigated during detailed design. This applies to all construction methods. The infiltration area will be set up with bund walls, or similar, around the entire perimeter to ensure no discharge of groundwater outside the area. Only fresh groundwater (EC less than 1,500 µS/cm) to be sent to the infiltration area.
Groundwater drawdown	Use of sheet piling, or similar, to support excavation and reduce groundwater inflow for all construction methods will be investigated during detailed design.

Impact	Mitigation measure
Groundwater quality	Biodegradable drilling fluids will be used during drilling works for CM 1 (HDD). Undertake an ASS investigation in the vicinity of each excavation as part of the detailed design phase to determine the risk of exposure of PASS and prepare and implement an ASSMP if necessary.
Groundwater monitoring	Groundwater monitoring at sites GW105 and GW108. The monitoring program will include continuous monitoring of groundwater levels and routine sampling for groundwater quality in particular the change in EC associated with the fresh/ saline groundwater interface. Groundwater level and quality triggers will be established based on baseline monitoring data.

Summary

The amended Project adopts a DOI in place of the sub-surface seawater intakes. Therefore, it is considered that the operation of the amended Project would result in considerably reduced groundwater impacts compared with the EIS Project.

For each proposed DOI construction method it is considered that the risk of impact to groundwater receptors is low when mitigation measures are implemented throughout construction. Overall, the potential for groundwater impact associated with the construction and operation of the amended Project is considered to be less than that for the construction and operation of the EIS design.

3.6.2.3 Marine biodiversity

The information presented in this section is summarised from the *Belmont Drought Response Desalination Plant – Marine Environment Assessment Amendment Report* (GHD, 2020c) (Appendix L), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a), *Belmont Drought Response Desalination Plant – Marine Assessment Report* (GHD, 2019c) and *Belmont Drought Response Desalination Plant – Amendment Report Brine Discharge Modelling* (GHD, 2020d).

Methodology

Desktop assessment

A desktop assessment has been undertaken to confirm the existing legislative framework and environmental conditions relevant to marine ecology associated with the amended Project, specifically the direct ocean intake (DOI) pipe and intake structure. Relevant legislation, databases, searches, historical studies and more recent project related modelling and surveys were reviewed in support of this assessment. A likelihood of occurrence assessment was conducted to determine the likelihood of relevant species identified by the desktop searches (or their important habitat) as occurring within the Project area. Potential for impact from the proposed intake pipe was then reviewed for those species that are considered likely to occur in the Project area.

Detailed methodology and sources are provided in Appendix L.

Belmont WWTW ocean outfall targeted fish and benthic surveys

Advisian undertook targeted fish and benthic surveys along the Belmont WWTW ocean outfall in February 2020 (Advisian, 2020). Results of the surveys were reviewed to define the existing environment along and around the WWTW ocean outfall.

Intake pipeline benthic survey

A survey of the proposed DOI was undertaken on 12 and 13 December 2019 to further understanding of local site conditions. The purpose of the survey was to identify benthic habitat features and species present within the survey area. This was achieved by deployment of an underwater remotely operated vehicle (ROV) to record video footage of the benthic environment at a number of grid-mapped survey points.

Existing environment

Benthic environment - The benthic environment throughout the proposed DOI area is comprised of open homogenous sand substrate interspersed by small sand ripples associated with nearshore wave-action. Observations of survey footage obtained in December 2019 indicate that sand substrate consisted primarily of coarse grained sand, interspersed with patches of shell grit/shell fragments. There was little evidence of burrowing or mound-building activity associated with infauna.

Species assessment within the DOI area

A number of species were observed both prior to and during the surveys. Schools of unidentified fish were observed at the surface during transit to the survey area. Several marine species were observed during the survey as listed below:

- A small (approximately 1 m length) unidentified shark species was observed on the surface however was not able to be identified or photographed
- Numerous jellyfish (*Carybdea sp*.) throughout the survey area
- Octocorals (*Cavernularia sp.*) were occasionally observed on the benthos during the surveys
- Four Southern Eagle Rays (*Myliobatus tenucaudatus*)
- Flathead (*Platycephalus* sp.)
- School of fish, possible perch (*Lutajnus* sp.)

Species assessment within the Belmont WWTW ocean outfall

Advisian undertook a targeted fish survey along the Belmont WWTW ocean outfall (Advisian, 2020). The following provides a summary of findings from the fish survey:

- The fish assemblages on the Belmont outfall was similar to fish assemblages observed in the area and they were consistent across the 2019 and 2020 surveys.
- The most abundant fish were the yellowtail mackerel (*Trachurus novaezelandiae*) which were present in the lower half of the water column above the pipeline.
- Mado (*Atypichthys latus*) were the most abundant fish at the pipe.
- Two species of wrasse were observed during both surveys; crimson banded wrasse (*Notolabrus gymnogenis*) and southern Maori wrasse (*Ophthalmolepis lineolate*). Old wife (*Enoplosus armatus*) were also observed in both years.
- The red scorpionfish (*Scorpaena spp.*) and half-banded seaperch (*Hypoplectrodes maccullochi*) were common on the pipe's surface.

- A green moray (*Gymnothorax prasinus*) was observed in February 2020.
- Several shark and ray species were observed in the vicinity of the pipe: crested hornshark, (*Heterodontus galeatus*), spotted wobbegong (*Orectolobus maculatus*), stingaree (*Trygonoptera sp.*), fiddler ray (*Trygonorrhina fasciata*), small hammerhead sharks (potentially *Sphyrna zygaena*).

A targeted benthic ecology survey was also undertaken along the outfall in February 2020, results of which are summarised below (Advisian, 2020):

- Sponges (Clathrinid sp, Chondropsis sp, Holopsamma laminaefavosa and Darwinella sp.)
- Corals (soft coral and sun coral), anemone (*Phlyctenanthus australis*), sea pen (*Sarcoptilus grandis*)
- Marine worm (fan worm, Sabellastarte australiensis)
- Molluscs (squid, Sepioteuthis australis)
- Echinoderms (feather stars, Ptilometra australis and Cenolia trichopteran; brittle star, Ophiotix sp)
- Ascidians (Polycitor giganteus, Pyura spinifera, Herdmania grandis and Didemnid sp.)

Protected matters and threatened species

To identify Matters of National Environmental Significance (MNES), as listed under the EPBC Act, that may occur within the Project area a Protected Matters Search Tool (PMST) search was completed using a 10 km buffer from the Project area. This process has identified 53 listed threatened species, and a further 51 listed migratory species of relevance to the Project area. As the focus of this assessment is the marine environment, exclusively terrestrial species have been omitted from further consideration.

The Office of Environment and Heritage (OEH) BioNet Atlas for records of threatened species, populations and endangered ecological communities listed under the BC Act and FM Act was interrogated to identify records relevant to the Project area. In addition to those species identified as MNES, An additional two seals, two dolphins, one whale and 45 bird species listed solely under State legislation were identified as relevant to the Project area.

A likelihood of occurrence assessment was conducted to determine the likelihood of relevant species identified by the desktop searches (or their important habitat) as occurring within the Project area. Overall, eleven groups of species listed under either EPBC Act or BC Act and considered likely to occur within the Project area, these are:

- One shark (Great White Shark)
- Three reptiles (Loggerhead Turtle, Green Turtle, Hawksbill Turtle)
- Five mammals (Southern Right Whale, Dugong, Humpback Whale, New Zealand Fur Seal and Bottlenose Dolphin)
- Protected marine shorebirds
- Syngnathids

Additionally, migratory shorebirds are also likely to occur in the Project area.

The full likelihood of occurrence assessment is provided in Appendix L.

Direct Ocean Intake larval study

Larvae, eggs, juvenile fish and small species, such as syngnathids, have the potential to be at risk to impacts from the proposed DOI, due to their small size and low mobility. As such, a desktop study was conducted to determine if any species of relevance to the assessment had the potential to be impacted by the intake pipe during various life stages. The desktop study reviewed larval stages of threatened species likely to occur in the area, commercial species fished in the area and species known to occur on the existing WWTW outfall pipe.

Protected species

No Commonwealth or State listed threatened species that are considered likely to occur in the Project area undergo larval life stages. Black rock cod (*Epinephelus daemelii*) is considered unlikely to occur however, this species does have a larval stage which, if present in the area during intake operation, may be impacted.

Under the EPBC Act, syngnathids are not listed as threatened, however are listed as Marine species; these species are also protected under the NSW Fisheries Management Act 1994 (FM Act). Suitable hard substrate habitat for many syngnathid species is present at the existing Belmont WWTW outfall pipe, approximately 1400 m north of the indicated intake pipe location. Once constructed the intake pipe might also provide suitable hard substrate habitat for syngnathids, similar to the existing WWTW outfall pipe.

Commercial fishery species

Targeted species from the commercial fisheries in NSW waters known to have a larval life stage were identified. A likelihood of occurrence assessment carried out to determine the likelihood of the larvae of each species to occur in the vicinity of the Project area. The larvae of 32 NSW commercial fisheries catch species were identified as likely to occur within the vicinity of the Project area. The full likelihood of occurrence assessment is provided in Appendix L.

Epi-benthic species and associated fish assemblages

Since the installation of the existing WWTW outfall pipe, a variety of filter feeding organisms have recruited to the pipe, such that there is now a locally dense and diverse community established. It is anticipated that the proposed intake structure would attract a similar assemblage as the nearby WWTW outfall pipe, due to recruitment of sessile organisms on the newly available hard substrate. Larvae of sponges, acidians, sea pens, crinoids, octocoral, jellyfish and fish species are also likely to occur within the vicinity of the Project area.

A full list of species with a larval lifecycle stage and observed in previous studies or during the benthic survey is provided in Appendix L.

Impact assessment - Construction

Construction of the intake pipeline and intake structure has the potential to harm the marine environment through activities that would disturb the seabed such as drilling and installation of the intake structure and supporting infrastructure. Vessels would be required to support the construction activities. The risks to the environment from these activities are:

- Seabed disturbance and associated turbidity and water quality impacts
- Light and noise pollution from vessel platforms and drilling activities
- Release of potential wastes, contaminants or pollutants (including hydrocarbon spills) from construction activities

Other unplanned events may also arise during construction activities. The risks to the environment from these are:

- Pest introduction and proliferation
- Accidental release of solid waste
- Impacts to the seabed from dropped objects
- Marine fauna collisions
- Hydrocarbon, chemicals and other liquid waste
- Damaged fuel tank associated with vessel collision

Each of these potential impacts have been assessed in detail in the Marine Assessment Report (GHD, 2020c) provided in Appendix L and summarised below.

Seabed disturbance

The two construction methods proposed for installation of the DOI (CM 1 horizontal directional drilling (HDD) and CM 2 micro-tunnelling (or pipe-jacking)) would have varying degrees of disturbance to the seabed. An area of disturbance has been estimated for each of the proposed methods in Table 3-23. This estimate also takes into consideration the area of disturbance for the intake structure which is common for all construction methods.

Table 3-23 Estimated seabed disturbance areas for each construction method

Pipeline construction method	Area of impact	Estimated area* of seabed disturbance	Dominant sediment type
CM 1 Horizontal Directional Drilling	Pipeline pop out point at seabed and construction of intake head.	104 m^2	Sandy sediment
CM 2 Pipe jacking/micro tunnelling with reception pit	Reception pit (20 m x 10 m) with buffer for spoil deposition (600 m^3)^.	2,200 m^2	Sandy sediment

*The estimated area considers a DN1200 pipe

^ *An average dredge depth of 3 m has been assumed in calculation of spoil volumes*

The activities associated with the construction of the intake structure would disturb an estimated area of 104 m^2 or 2,200 m^2 of seabed and benthic habitats for the CM 1 HDD and CM 2 micro-tunnelling construction options, respectively.

The pipe laying activities would occur in/over benthic habitats that are widely represented at a regional scale. Once the pipe has been installed, further disturbance or damage to soft sediment habitats and benthic communities is not anticipated.

The environmental risks would be limited to the immediate surrounds of the pipe, and are expected to be short term in nature, with low risk on existing species. Additionally, disturbance and impacts to habitats from the construction phase are not likely to be detrimental to the overall quality of the region as the habitat is considered to be well represented locally and regionally. As such, risks associated with planned seabed disturbance are considered to be acceptable and as low as reasonably practicable. A detailed assessment of the impacts relating to seabed disturbance is provided in Appendix K.

Artificial light emissions

Artificial light emissions are likely to occur during the use of safety lighting on vessels and support barges. Minimum lighting is required for safety purposes on board the vessels, and for navigational purposes. It is necessary for all vessels in Australian waters to comply with the navigation safety requirements prescribed within the *Navigation Act 2012* and the subordinate Marine Orders concerning workplace safety equipment (e.g. lighting) and navigation. While light spill would be reduced wherever possible, the elimination of deck lighting on vessels would result in:

- Increased probability for vessel collisions and accidents
- Presenting new safety risks to crew members
- Non-compliance with marine codes and regulations

Artificial light from vessels may attract and disorientate fauna such as birds, marine turtles, fish, and other pelagic species in the locality, particularly during peak breeding and migratory periods. Turtles and shorebirds are identified as being the most sensitive to artificial light sources. Beaches in the vicinity of the intake pipe are not known to host turtle nesting. It is, therefore, unlikely that artificial light generated by the construction activities would interfere with species breeding success and population longevity. Indirect impacts on these and other marine species could include changes in migration patterns; nonetheless, such impacts would be temporary and mobile across the intake pipe route and are not considered to pose a significant risk.

Artificial noise emissions

Above ground and underwater noise generated by the installation of the intake structure within the Project area may result in localised influences on fauna.

Noise emissions generated by the vessels (with exception of drilling) would be similar to that of other marine vessels which cross through the region (e.g. commercial shipping vessels) and would be unbroken rather than pulsed noise emissions. The vessels are required in the field for the intake structure installation activities, therefore, vessel elimination is not considered to be a practicable alternative on this basis.

Underwater background noise levels, inclusive of biological, wind, wave and shipping movements, differ across locations. As an example, background noise levels ranging between 100-138 dB and 100-120 dB have been reported in Gladstone and South Australia, respectively (SLR, 2019 and DPTI, 2012). As such, noise levels associated with construction of the intake pipe and intake structure are expected to be consistent with background conditions and not surpass the acoustic noise limits identified for marine fauna protection. It is expected that noise emissions associated with construction of the intake structure are unlikely to result in significant impacts.

The timing of construction is dependent on Hunter Water's total water storage levels. As such, there is the potential for migratory species, such as whales, to be present within the area during installation works. Whales generally head north to warm waters to breed and give birth from late April to August and return south from September to November (NSW Government, 2020). Due to the transitory nature of the marine fauna found in the wider area, marine fauna are able to move away from noise sources without disruption to feeding and breeding ranges and therefore, it is not anticipated that construction noise would have a significant impact on marine fauna. Behavioural impacts (e.g. avoidance patterns and swimming movements away from the area) are the most probable form of impact to marine fauna as a result of anthropogenic noise generated by this activity, particularly for sensitive species such as cetaceans. Vessel noise is anticipated to only induce temporary and localised behavioural impact if species are encountered, with afflicted marine species expected to adopt normal behavioural patterns within a short time frame in the open waters surrounding the intake structure.

Due to the short-term nature of the activity, exposure of sensitive marine receptors to noise would not occur over extended periods of time. The mobility of marine fauna also supports their ability to behaviourally avoid unfavourable habitats; this also reduces the probability of inflicting any impact to marine fauna as a result of anthropogenic noise sources.

Air emissions

Atmospheric emissions Greenhouse gases (GHG) (carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)) and non-GHG (sulphur oxides (SO_X) and nitrous oxides (NO_X)) are emitted via burning fuel to power vessel engines, generators and plant and equipment. Humans and seabirds in the immediate region would be affected by the localised decline in air quality accompanying the emission of non-GHG and GHG.

Vessel gaseous emissions resulting from the combustion of hydrocarbons and waste incineration is permitted on Australian waters under the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*. This Act meets the requirements and obligations outlined in the MARPOL Annex VI. Since the activity is situated in coastal waters of distance from populated areas, air emissions would rapidly dissipate and unlikely to extend to onshore communities.

Pest introduction and proliferation

Vessels carrying invasive marine pests (IMP) may unintentionally but successfully introduce these species to the region where the activity is occurring.

Organisms from the natural environment collect on vessels and submersible equipment as biofouling. Vessels also require ballast water for safe operational purposes. As such, these occurrences and risks are difficult or impractical to eliminate.

To mitigate the possibility of introducing IMPs, the planned activities would be conducted with equipment and vessels, which would ideally have been operational and active within New South Wales State waters, or Commonwealth waters since their last dry-dock inspection or cleaning session. Where possible, equipment should not be obtained from higher risk areas in Southeast Asia susceptible to IMPs.

Successful marine pest establishment is known to be more prevalent in regions of disturbance and new hard substrate, which provide more opportunities for effective translocation by these species. Burial of the pipe via the HDD (CM 1) and micro-tunnelling (CM 2) construction methods greatly minimises the availability of hard substrate and minimises the zone of disturbance to the small area in the vicinity of the intake structure, thereby reducing the risk of translocation. Additionally, with the adherence of construction vessels to biofouling regulations, the chance of a successful translocation for IMPs is considered unlikely.

Accidental release of solid waste

A variety of hazardous (i.e. petroleum based products, solvents, batteries, heavy metals) and non-hazardous (i.e. general municipal wastes) solid waste may be released unintentionally into the environment from overfull and/or uncovered bins or if blown off the deck of a vessel. Accidental spillage of waste from vessels, and incorrectly disposed items, may also cause the unintentional release of solid waste into the surrounding environment.

Small amounts of solid non-biodegradable and hazardous wastes would be generated during the pipe-laying activities. Storage of these wastes on board in fully enclosed containers is considered good (and common) practice within this industry. During the activities, removal of these wastes from the activity area to appropriate regulated waste facilities onshore should be implemented on a regular basis.

During the activities, given the adoption of the industry standard management controls listed above, it is considered that all practicable measures have been implemented and the likelihood of solid wastes being discharged to the environment has been reduced to as low as reasonably practicable.

Dropped objects

Damage to benthic habitats can occur due to an object being dropped overboard (e.g. equipment falling from vessel deck). Any marine organisms associated with the affected benthic habitat within the dropped object's footprint may also be harmed.

Procedures have been implemented for each specific lifting/handling requirement and would be performed should any equipment lifting be needed. The equipment used for lifting operations is to be maintained as specified in the planned maintenance system.

The chance of a dropped object affecting the environment is deemed to be reduced to levels as low as reasonably possible with the adoption of these industry accepted controls and procedures.

Marine fauna collisions and entanglement

There is potential for collision to occur between marine fauna and vessels associated with the proposed activities. This risk is particularly pronounced concerning possible collision between large slowly moving cetaceans like whales and a vessel or deployed equipment.

The consequences to fauna of this risk ranges from changes to fauna behavioural patterns to injury or death of the animal as a result of a direct collision with construction vessels or of being entangled in equipment during construction.

As these activities require the presence of vessels, it is not possible to eliminate the presence of vessel from the area. Vessel are typically stationary during construction. In order to reduce the chance of vessel interaction with marine fauna, the identified management and legislative control measures would be implemented. This includes, but is not limited to, Part 8 of the *EPBC Regulations (Interacting with Cetaceans and Whale Watching)*, DoEE (2016) National Strategy for Mitigating Vessel Strike of Marine Mega Fauna, NSW *Marine Safety Regulation* 2016, and NSW *Biodiversity Conservation Regulation* 2017. Vessels would be largely stationary or very slow moving during construction so collision risk would, therefore be limited. On this basis the potential risks associated with collision and interference with marine animals from vessel activities is considered to be as low are reasonably practical.

Hydrocarbon, chemicals and other liquid waste

Vessels, plant and other construction equipment require a wide variety of liquids, chemicals and hydrocarbon compounds to operate and to be maintained. Various scenarios may result in the accidental release of liquid wastes into the surrounding marine environment. Tank pipework failure or inadequate bunding are two examples. However, the quantity of hydrocarbons that can be accidentally discharged during operations is relatively small and restricted by the quantity available stored on the deck of the vessel.

If refuelling is required during the pipe-laying activity, then refuelling events have the potential to cause environmental impacts through reduction in water quality and/or contamination of marine flora and fauna.

Removal of the use of chemicals or hydrocarbons on-board vessels is not an option for the operation of the vessel and associated intake pipe construction activities. Similarly, since open deck drainage is an essential safety feature of any marine vessel, the risk of discharge from deck drainage cannot be eliminated. However, it is anticipated that any impacts to water quality resulting from a hydrocarbon or chemical spillage would be temporary and constrained to the immediate vicinity, if such an incident did occur.

In such cases, spillage of hydrocarbons or environmentally hazardous chemicals may be attributed to machinery, engines and tanks leaking these liquids into the marine environment. Due to these limited impacts and the management controls implemented to reduce the risk of contaminants reaching the surrounding environment to levels as low as reasonably possible, the risks of a small hydrocarbon spill are considered to be environmentally acceptable.

Damaged fuel tank associated with vessel collision

During the activities, there is a possibility that vessels could collide. The rupture of a vessel's fuel tank is the predominant risk resulting from a potential vessel collision. The significance of the risk is attributed to the release of marine diesel into the aquatic environment from the damaged fuel tank. Collision between vessels and other obstacles is unlikely, with no additional sub-surface hazards found in the vicinity. Such obstacles would typically be infrastructure or regions of shallow seabeds; none of which overlap with the Project area.

In order to combat the possibility of a spill from collision risk, measures have been implemented to respond to spills and minimise their effects. Marine user notifications (as governed by NSW *Marine Safety Regulations 2016*) and stakeholder consultation for affected parties within the activity zone might help reduce the risk of vessel collision which could result in ruptured fuel tanks and oil slicks. At a national level, oil spill response is managed by Australian Maritime Safety Authority (AMSA) who administer the National Plan to Combat Pollution of the Sea by Oil and other Noxious and Hazardous Substances. These standards and controls are considered to reduce the likelihood of a vessel collision. With all controls in place risk of vessel collision is considered managed to as low as reasonably possible.

Impact assessment – operation

Impingement and entrainment

As large volumes of seawater would be sucked into the intake pipe, there is potential for marine biota to be impacted via impingement or entrainment. Entrainment occurs when organisms that are small enough to pass through the intake screens, are caught within the current and drawn into the intake system. Impingement occurs when organisms of sufficient size to avoid passing through intake screens become trapped against the screen by the force of water flowing through and are unable to escape.

Larvae from a wide range of species are likely to be present within the water column in the vicinity of the proposed intake structure (refer to earlier section on DOI desktop larval study). As such, the intake of seawater during operation has the potential to entrain larvae of species that are known to spawn larvae in the vicinity, including larvae of protected species such as the black rock cod and syngnathids, larvae of commercial fishery species and larvae of species confirmed to be present in the Project area.

Specific impingement and entrainment literature for small desalination plants of similar intake volumes and velocities to the amended Project were not available. However, desktop review of literature at other larger direct ocean intakes (Sydney Water, 2005; WRA, 2011) revealed that impacts of impingement and entrainment from larger seawater desalination plants with open ocean intakes than the amended Project is not significant. These were due to a combination of intake structure design with screen apertures of 100-300 mm allowing fish to swim freely (Sydney Water, 2005) and low flow velocities 0.15-0.3 m/s reducing entrainment of eggs and larvae (Missimer *et al*, 2015).

As such impacts from impingement and entrainment associated with the amended Project are unlikely to be significant.

Maintenance activities

Throughout operation, the intake structure would attract encrusting communities and may develop into a localised ecosystem similar to that established on the WWTW outfall. Regular maintenance activities would be required within the pipes and at the intake structure for cleaning and removal of the biofouling to maintain optimal flow velocities. This may involve replacement of screens, mechanical scraping and high pressure water jetting of surfaces to remove encrusting biota.

Any intake maintenance would be performed by a specialist group who have established targeted procedures to manage identified risks. Localised, short-term disturbances to sediments and/or epibenthos living on the intake structure/within the disturbance footprint are expected to occur as a result of planned maintenance activities. Noise impacts are expected to be negligible when compared to noise generated from construction activities and are therefore not expected to present any acoustic risk to established benthic habitat and associated communities.

Design considerations such as wider inlet pipe diameter would allow for encrusting of marine life within the pipe whilst maintaining optimum flow conditions and reducing need for regular maintenance. Chlorine dosing within the intake pipe would control growth within the intake pipe and reduce need for regular maintenance (WSP, 2020).The likelihood of maintenance adversely impacting marine habitats in and around the pipe and associated structures is considered to be reduced to as low as reasonably practicable.

Habitat creation

Construction of the intake structure would create artificial hard substrate habitat for marine encrusting and biofouling communities on the intake structure itself.

Habitat creation may be considered as a positive outcome in comparison to risks associated with seabed disturbance. Habitat creation following the installation of the existing WWTW outfall shows an abundance of marine life and rich habitat. It is expected that the provision of hard substrate from the intake structure would create habitat opportunities that would not otherwise be available.

Impact assessment – decommissioning

At the end of the Project design and operational life, there are two options for decommissioning of the direct ocean intake: retaining the intake pipe and intake structure in place or partially removing the intake structure from the seabed.

If the intake pipe and intake structure is kept in place, there is no further disturbance impact predicted on the environment as it would already have been present in the environment for a nominated period of time. Rather, the intake structure would continue to provide hard substrate for recruitment of sessile organisms, forming biogenic habitat likely to support an array of invertebrate and fish species, similar to the ecology on and around the Belmont WWTW outfall (Advisian, 2020).

If the intake structure is to be removed, the impacts to the environment would be considered similar to the impacts of installation. This would include resuspension of sediments, disturbance of established benthic habitats and organisms, collision risk of marine fauna and other potential risks associated with vessel operations previously discussed may be realised.

It is considered likely that the activities associated with removal of the intake structure would disturb the seabed and benthic habitats. The area of disturbance would be dependent on methods to be applied for retrieval of the intake structure at the time of decommissioning. The intake structure removal activities would occur in/over benthic habitats that are currently widely represented at a regional scale. Localised, short term disturbances to sediments would therefore be predicted to occur. More permanent impacts would potentially occur to the established sessile organisms living on the intake structure as a result of habitat removal.

Any future decommissioning review would take into account potential risks at the time of the proposed action adopting leading industry practices and identify measures/strategies for any proposed action that have the lowest practical environmental impact risk.

Mitigation measures

Additional mitigation measures for the amended Project are provided in Table 3-24.

Table 3-24 Additional marine biodiversity mitigation measures

Impact	Mitigation measure
Seabed disturbance	• Construction method will consider option with least disturbance to seabed area and break out of drilling fluids. • Speed of drilling will be reduced prior to breakthrough to surface to minimise the volume of drilling fluids released into the marine environment. • Visual observations during drilling for signs of increased turbidity and sedimentation. • Emergency Management Plan in place to support drilling activities.
Artificial light emissions	• Employ Best Practice Lighting Design for infrastructure such as vessels and barges that require to be lit at night in accordance with DoEE (2020) National Light Pollution Guidelines. Measures could include modification of light wavelengths, prevention of upward light spill and limiting light intensity for seabirds and maintaining a dark zone between any turtle nesting beach and infrastructure, avoiding direct lighting onto nesting beach or screen barriers for marine turtles (DoEE, 2020). • Light spill from the nearshore vessel operations will be minimised where possible using directional lighting. Light shields could be considered to avoid spill if sensitive receptors i.e. shorebirds, turtles) are determined during activities to be negatively affected. • Lighting on vessel decks will be managed to reduce direct light spill onto marine waters, unless such actions do not comply with navigation and vessel safety standards (AMSA Marine Orders Part 30: Prevention of Collisions; AMSA Marine Orders Part 21: Safety and Emergency Arrangements).

Impact	Mitigation measure
Artificial noise emissions	• Where activities that generate underwater noise cannot be timed to occur outside of peak migration months the following mitigation measures and controls may be implemented. Where this is not possible, the need for Marine Fauna Observers will be determined on the basis of construction timeframes. • Acoustic harassment/deterrent devices could be sounded prior to commencement of any underwater activity to provide opportunity for sensitive marine fauna to relocate temporarily. • Vessel machinery will be maintained in accordance with the manufacturer specifications to reduce noise emissions. • The interaction of all vessels with cetaceans and whale sharks will be compliant with Part 8 of the *Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000)*. The Australian Guidelines for Whale and Dolphin Watching (Commonwealth of Australia, 2017)) for sea-faring activities will be implemented across the entire Project.
Atmospheric emissions	Compliance with MARPOL Annex VI (as implemented in Commonwealth waters by the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (PSPPS Act); and Marine Order 97: Marine pollution prevention - air pollution).
Pest introduction and proliferation	• Vessels will be sourced locally wherever possible. • All vessels working on the Project, whether internationally or locally sourced, will adhere to Australian quarantine requirements. • The management of ballast water prior to entry to Australian waters must follow AQIS guidelines and compliance requirements in relation to marine pest introduction risk management for any internationally sourced vessel.
Accidental release of solid wastes	• Appropriate waste containment facilities will be included on the vessel as well as onshore and managed to avoid overflow or accidental release to the environment. • No waste materials will be disposed of overboard; all non-biodegradable and hazardous wastes will be collected, stored, processed and disposed of in accordance with Regulation 9 of MARPOL Annex V. • Hazardous wastes will be separated, labelled and retained in storage onboard within secondary containment (e.g. bin located in a bund). • All recyclable and general wastes to be collected in labelled, covered bins (and compacted where possible) for appropriate disposal at regulated waste facility. • Solid non-biodegradable and hazardous wastes will be collected and disposed of onshore at a suitable waste facility or to a carrier licensed to receive the waste if required by legislation. • Intake pipe design is such that in the unlikely event of contact damage, the pipe does not break apart into segments or fragments, instead remaining intact to support recovery and repair of the affected segment.
Dropped objects	• All equipment and gear on the vessels will be securely fastened during mobilisation/demobilisation. • Lifting is to be carried out by competent personnel using equipment that is suitable, certified and maintained. • Waste management controls are to remain effective to reduce risk of release of wastes that could be ingested or cause entanglement. • During the activities, detailed records of equipment lost overboard or dropped will be maintained and reviews will be undertaken to reflect on methods to mitigate repetition of the incident.

Impact	Mitigation measure
Marine fauna collision and entanglement	• Operations of vessels will be commensurate with Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching), DoEE (2016) National Strategy for Mitigating Vessel Strike of Marine Mega Fauna, NSW (2016) Marine Safety Regulation, and NSW (2017) Biodiversity Conservation Regulation. • A member of the vessel crew will act as a marine fauna observer (MFO) at all times during daylight works and will maintain vigilant watch in support of Part 8 of the EPBC Regulations to manage risk of vessel collision with any other vessels or marine fauna. The MFOs will be trained and experienced in whale identification and behaviour, distance estimation, and be capable of making accurate identifications and observations of whales in Australian waters. The MFO will provide advice on appropriate actions to be taken to mitigate risks should whales be encountered. • The Australian Guidelines for Whale and Dolphin Watching (Commonwealth of Australia, 2017) for sea-faring activities will be implemented across the entire Project.
Hydrocarbon, chemicals and other liquid waste	• Chemicals and hydrocarbons will be packaged, marked, labelled and stowed in accordance with MARPOL Annex I, II and III regulations. These include provisions for all chemicals (environmentally hazardous) and hydrocarbons will be stored in closed, secure and appropriately bunded areas. • A Material Safety Data Sheet (MSDS) will be available for all chemicals and hydrocarbons in locations nearby to where the chemicals/wastes are stored. • Vessel operators will have an up to date Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP). All shipboard chemical and hydrocarbon spills will be managed in accordance with these plans by trained and competent crew. • On board oily water disposal will be managed in accordance with the Marine Pollution Regulation 2006. The vessel operator will record the quantity, time and onshore location of the oily water disposal in the vessel Oil Record Book. • If vessels are equipped with an oily water filter system, they may discharge oily water after treatment to 15 ppm in an oily water filter system (providing they have a current calibration certificate for the bilge alarm) as required by MARPOL Annex I Regulations (for the prevention of pollution by oil). To discharge, the vessels will require a current IOPP certificate for oily water filtering equipment, and a current calibration certificate for the bilge alarm.
Damaged fuel tank associated with vessel collision	• Visual observations will be maintained by watch keepers on all vessels. • Regular notification to the following Australian Government agencies before and during operations: - The AMSA RCC of proposed activity, location and commencement date to enable an AusCoast warning to be issued. - The Australian Hydrographic Office of proposed activity, location and commencement date to enable a ‘Notice to Mariners’ to be issued. - In the event of a spill resulting in notification to AMSA, other sea users (e.g. fishing industry) will be informed of the incident via Marine Notices to prevent vessels entering an area where hydrocarbons have been released. • Vessel will operate in compliance with all marine navigation and vessel safety requirements in the International Convention of the SOLAS 1974 and the *Navigation Act 2012*. • Marine diesel oil compliant with sulphur content of maximum 0.5% m/m) is the only engine fuel to be used by the vessels, compliant with MARPOL Annex VI. • Oil spill responses will be executed in accordance with the vessel’s SOPEP, as required under MARPOL.

Impact	Mitigation measure
Maintenance activities	• Design considerations such as burial of pipeline, sizing of the pipe and dosing of the intake structure are to be considered to reduce the need for maintenance activities. • The pipe and intake structure will be inspected prior to undertaking any maintenance activities particularly for those slow moving species such as syngnathids. • In the event that syngnathids are confirmed, syngnathids and the substrate they are attached to will need to be safely relocated away from the maintenance area prior to activities commencing.
Species abundance and diversity	• Continuation of the Ocean Outfall Benthic Monitoring Program (as part of EPL 1771) throughout operation of the Project. • Integration of pipeline ecology and fish assemblage monitoring into the Ocean Outfall Benthic Monitoring Program for better understanding of potential changes in the species abundance and diversity.
Water quality	• Water quality monitoring program will be developed and implemented to identify long-term impacts from the discharge of brine concentrate on water quality or the marine environment. • Volume of chemicals in the aggregate, concentrations and discharge regimes (frequency) (inclusive of chlorine) that will be used during the desalination process will need to be adjusted and dosed in a manner so as to achieve desalination objectives and minimise harm to the marine environment to as low as reasonably practicable and/or as required by regulators.

Summary

Construction of the intake pipe and structure has the potential to harm the marine environment through activities that would disturb the seabed such as drilling. Vessels would be required to support the construction activities. The risks to the environment from these activities are listed below:

- Seabed disturbance and associated turbidity and water quality impacts
- Light and noise pollution from vessel platforms and drilling activities
- Release of potential wastes, contaminants or pollutants (including hydrocarbon spills)
- Atmospheric emissions
- Interference with other users of the area affected
- Other unplanned events may also arise during construction activities. The risks to the environment from these unplanned activities are listed below:
  - Pest introduction and proliferation
  - Accidental release of solid waste
  - Impacts to the seabed from dropped objects
  - Marine fauna collisions
  - Release of hydrocarbon, chemicals and other liquid waste
  - Damaged fuel tank associated with vessel collision

Operation of the intake pipe and intake structure will result in the following potential impacts:

- Entrainment of eggs, larvae and small species and entrapment of larger species on the intake screen
- Maintenance activities at the intake structure have potential to harm the marine environment
- Habitat creation at the intake structure and parts of the pipe that are above the seabed

The management and mitigation measures detailed in Section 7.4.4 of the EIS are still appropriate and will be implemented. Additional mitigation measures will also be implemented to manage these potential impacts. Risks associated with construction, operation and maintenance of the desalination plant are considered to be acceptable and as low as reasonably practicable with the implementation of the management and mitigation measures.

3.6.2.4 Coastal processes

The information presented in this section is summarised from the *Coastal Processes Amendment Report* (GHD, 2020i) (Appendix N), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Coastal Processes Assessment* (GHD, 2019g).

Impact assessment

The proposed amendment to the direct ocean intake would result in a minor increase to the disturbance area. The preliminary environmental impact screening indicates no changes to existing environment considerations provided in Section 7.5.2 of the EIS. An assessment of potential impacts of the amended Project was undertaken via a qualitative assessment against previously endorsed plans including the Coastal Zone Hazard and Risk Assessment and Coastal Hazard Study report, both commissioned by Lake Macquarie City Council as part of the Lake Macquarie CZMP (BMT WBM, 2015a, b).

The impact assessment builds upon available information and incorporates:

- Potential impacts during the construction of the amended Project components including undertaking construction activities on sandy soils and sand dunes.
- Potential impacts during the operation of the amended Project components, including potential impacts to infrastructure from storm surges and erosion events.
- An assessment of the potential impacts of coastal hazards on the amended Project components factoring in the potential amplification of impacts as a result of sea level rise associated with climate change.

Construction

The potential impacts of the amended Project on coastal erosion during the construction phase are related the direct ocean intake as described in Table 3-25.

Table 3-25 Potential impacts of the ocean intake on coastal processes

Impact	Infrastructure	Existing conditions	Process
Temporary offshore structures, excavated offshore receival pit and underwater stockpile may modify nearshore wave transformation behaviours, potentially leading to localised focusing or dissipation of wave energy	HDD and microtunnelling (CM1 and CM2)	The benthic environment throughout the proposed ocean intake area is comprised of open homogenous sand substrate interspersed by small scale sand ripples.	Drilling and boring machines require offshore receival infrastructure. A tunnel boring machine would also require excavation of a receival pit and stockpiling of sediments on the seafloor. Waves approaching the shoreline may “feel” the modified seabed contours which would result in modified nearshore wave transformation behaviours, potentially leading to localised focusing or dissipation of wave energy.

Comparison of the potential impacts associated with the amended direct ocean intake and associated pipeline against those described in the EIS indicates that the amended Project could be expected to create a minor increase in potential impacts to coastal processes due to the temporary offshore receival infrastructure and associated excavation / stockpiling activities.

There are no perceivable impacts on coastal inundation that could be caused by the Project. This is because the footprint and methodology for construction would have no significant influence on the processes that effect coastal inundation.

Operation

The potential changes to impacts on coastal erosion during the operation phase of the amended Project related the direct ocean intake are described in Table 3-26.

Table 3-26 Potential impacts of the ocean intake on coastal erosion

Impact	Infrastructure	Existing conditions	Process
Localised scour and modified nearshore wave transformation behaviour due to seabed infrastructure	Intake structure	The benthic environment throughout the proposed ocean intake area is comprised of open homogenous sand substrate interspersed by small scale sand ripples.	The proposed intake structure would measure 5 m in diameter and would rise from the seabed at approximately -17 m AHD to a height of 5 m above the existing seabed (to a level of approximately -12 m AHD). Given the relative size of the intake structure, no significant impacts to nearshore wave transformation are expected. Nevertheless, localised eddies and currents around the structure may lead to scour of the seabed in the immediate vicinity of the intake. These scour impacts are not expected to result in a significant impact to broader coastal processes.

Comparison of the potential impacts associated with the intake structure with the subsurface intake described in the EIS indicates that there would be impacts to longshore transport that would not have been associated with the sub-surface intake structure.

The amended Project proposal could be expected to create a minor increase in potential impacts to coastal processes due to the presence of the intake structure.

There are no perceivable impacts on coastal inundation that could be caused by the Project. This is because the footprint and methodology for operation would have zero influence on the processes that effect coastal inundation.

Decommissioning

At the end of the Project design and operational life, there are two options for decommissioning of the direct ocean intake: retaining the intake pipe and intake structure in place or partially removing the intake structure from the seabed.

If the intake pipe and intake structure is kept in place, there is no further disturbance impact expected on coastal processes as it would already have been present in the environment for a period of time.

If the intake structure is to be removed, the impacts to coastal processes would be considered similar to the impacts of installation. This would relate to the presence of temporary offshore structures, excavation of sediments and underwater stockpiling which may modify nearshore wave transformation behaviours, potentially leading to localised focusing or dissipation of wave energy.

Any future decommissioning review would take into account potential risks at the time of the proposed action adopting leading industry practices and identify measures/strategies for any proposed action that have the lowest practical environmental impact risk.

Potential impacts to coastal processes due to the decommissioning of intake and pipeline infrastructure are in addition to those considered in the EIS since an ocean intake was not proposed at the time of the EIS.

Potential impacts associated with the decommissioning of the water treatment process plant would be as per those assessed as part of the EIS.

Mitigation measures

Revised and additional mitigation measures for the amended Project are provided in Table 3-27.

Table 3-27 Coastal processes mitigation measures

Impact	Mitigation measure
Disruption to dune vegetation systems, aeolian processes and associated dune stability leading to a potential increased rate of erosion	Implement a coordinated erosion monitoring and mitigation program in conjunction with the existing strategies and dune restoration project implemented for the adjacent WWTW, including: • Site profiling and revegetation following completion of civil works in accordance with the final design which is to comply with the Lake Macquarie Coastal Zone Management Plan (CZMP) (2015) and DLWC (2001). • Monitoring of recession and implementation of mitigation measures below as needed: - Beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms if necessary. - Stabilisation of the frontal dune system by removing invasive species and replacing with locally indigenous dune vegetation. - Installation of sediment fences to minimise the movement of sands during construction. - Control offroad vehicle access and surface runoff. - Potential positive cumulative impact to align these works with Hunter Water's proposed dune protection and restoration project between the Belmont Golf Course and WWTW. • Ensure the public are prevented from entering works areas and potential areas of impact.
Consolidating or 'locking up' of coastal dunes by built infrastructure, removing the buffer for coastal erosion and increasing the risk of inland erosion	The amended design situates the desalination plant behind the foredunes. Avoid locating the water treatment process plant and intake structures more seaward than is currently proposed in the concept design and minimise hardstand areas or structures that would consolidate the coastal dunes.

Impact	Mitigation measure
Exposure of subsurface transfer pipeline by coastal processes including beach level fluctuation and storm bite	Ensure that infrastructure installed within the active portion of the beach profile is of sufficient depth such that it is below the limit of scour. Alternatively, modify the infrastructure design such that it can be exposed to wave action during extreme events, or ensure plant is decommissioned prior to risk levels increasing under future scenarios.
	Monitor weather forecasts when working on the intake infrastructure and halt works when extreme coastal warnings are issued by the Bureau of Meteorology. Prepare and implement a Natural Event Response Plan as part of the Construction Environment Management Plan (CEMP).
Risk of coastal erosion impacting the plant and associated pipelines under long term future or rare events	Ensure that infrastructure does not extend into areas of present day erosion and recession risk without appropriate design measures and that the future risk level applied allows for the most conservative operational and decommissioning timeframes.
	Conduct consistency reviews at major design milestones against the EIS, AR, approval conditions and latest available literature including the Lake Macquarie CZMP (2015). It is understood that the EIS will have a 10 year validity period if approved, and as such it is likely that updated sea level rise guidance and coastal risk maps will be available in the interval between concept design and Project implementation. The review is required to ensure that the Project area remains acceptable from a coastal erosion risk perspective.
Aeolian sand ingress into the plant leading to operational maintenance issues	Implement a coordinated erosion monitoring and mitigation program and update if required.
Wave overtopping impacting the desalination plant	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.
Localised scour and modified nearshore wave transformation behaviour due to seabed infrastructure	Adopt pipeline and intake designs which minimise impacts to wave reflection and transformation, generation of localised eddy currents and obstructions to longshore transport.

Summary

Comparison of the potential impacts associated with the amended direct ocean intake and associated intake pipe against those described in the EIS indicates that the amended Project proposal could be expected to create a minor and temporary increase in potential impacts to coastal processes due to the temporary offshore receival infrastructure and associated excavation/stockpiling activities.

Comparison of the amended design incorporating the intake structure with the subsurface intake described in the EIS indicates that there would be impacts to longshore transport that would not have been associated with the sub-surface intake structure.

As the intake structure and intake pipe would be kept in place, there is no additional impact expected to coastal processes compared to the operations phase.

3.6.2.5 Social

The information presented in this section considers potential changes to social impacts as a result of the proposed amendment to the water treatment process plant. This section should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Social Impact Assessment* (GHD, 2019d).

The social impact assessment for the proposed amendment considered the results of the following studies: noise and vibration; traffic and transport and; visual amenity. Assessment of the changes to social impacts considered the results of these studies, and were assessed using the impact criteria established in the original social impact assessment (Table 3-4 of the SIA) (GHD, 2019d). With the use of this criteria, it was concluded that no additional social impacts are expected to occur during operation of the direct ocean intake and are therefore not assessed.

Impact assessment

Construction

Sea water pump station

No changes to the social environment during construction of the on-shore pump station.

Intake pipeline

The proposed amendments outlined for construction of the intake pipeline would not result in any additional changes to the social environment during construction.

Intake structure

The construction method for both options would result in changed offshore access due to the presence of an offshore vessel during construction. The vessel would be located approximately 710 m out to sea for a period of 3-4 months. This may impact the navigation of these waters for some recreational users. However it is expected that most users would be able to safely navigate around the vessel which would be clearly visible. This would be a temporary minor impact to waterway users.

Mitigation methods

The mitigation and management measures outlined in Section 7.6.4 of the EIS will assist in avoiding and/or managing any potential social impacts.

In addition, this Social Impact Assessment (SIA) recommends the additional mitigation and management measures specifically to address social impacts, discussed in Table 3-28 below.

Table 3-28 Social impact mitigation measures

Category	Mitigation or management
Access and connectivity	**Intake structure** – As a minimum to consider public safety, an Access Management Plan for navigable waters would be prepared to address access to the waterway for construction and recreational use, in consultation with Roads and Maritime, as outlined in Section 3.4.2.3.

Summary

- Amendment to direct ocean intake would result in minor change to construction impacts, including access and connectivity for users of navigable waterways.
- *Access and connectivity mitigation measures:* General access would be addressed in the Traffic Management Plan (TMP) consistent with mitigation measures in the EIS (see Appendix E), while the Amended Project requires an Access Management Plan in accordance with NSW Maritime requirements to address consideration of other users of the waterway (see Appendix E).

3.6.2.6 Traffic and Transport

The information presented in this section is summarised from the Updated Traffic Assessment (GHD, 2020j) (Appendix P), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Traffic Impact Assessment* (GHD, 2019h). Additionally, potential impacts to maritime traffic have been summarised from the *Belmont Drought Response Desalination Plant – Marine Environment Assessment Amendment Report* (GHD, 2020c) (Appendix L).

Impact assessment

Construction

Road Traffic

The construction of the DOI and water treatment plant is associated with the most intensive period of traffic generation for the Project.

Traffic impacts consider both total vehicle movements and the duration of construction. A total of 752 trucks are expected to access the construction site across an eight month timeframe for construction of the intake as a worst case scenario.

This would comprise of the following:

- 522 truck movements for the import of fill (based on a truck capacity of six cubic metres)
- 190 truck movements for the delivery of concrete (based on a truck capacity of seven cubic metres)
- 40 trucks movements associated with the delivery of intake pipes

This results in an average of approximately 94 trucks accessing the Project area per month (a decrease of 16 trucks per month from that described in the EIS[1]), being approximately four trucks per day (a decrease of one truck per day from that described in the EIS). Similarly to the EIS to be extremely conservative, for the purposes of analysis it has been assumed that the amended Project will generate six inbound and six outbound tuck movements per hour.

The expected worker activity associated with the amended Project compared with the EIS Project, is displayed in Table 3-29.

[1] The information in the EIS was 668 trucks over six months. Due to the longer construction period for the amended Project (despite the increase in overall truck volumes), there is a slight decrease in the expected monthly/daily traffic volumes compared to the EIS.

Table 3-29 Worker numbers of the amended Project compared with the EIS Project

Package	Number of workers (amended Project)	Number of workers (EIS Project)
Intake	**20**	**10**
Water treatment process plant	**30**	**10**
Power upgrades	**10**	**5**

The data in Table 3-29 indicates:

- Up to 60 workers are expected over the construction period
- The majority of workers (30) are expected during the construction of the water treatment process plant

To be conservative it has been assumed that the amended Project will generate 42 vehicle movements in total in the peak hour (an increase of 20 vehicles from that described in the EIS), consisting of the following:

- AM peak hour:
  - Six inbound truck movements and six outbound truck movements
  - 30 inbound worker movements (light vehicles)
- PM peak hour:
  - Six inbound truck movements and six outbound truck movements
  - 30 outbound worker movements (light vehicles)

The traffic analysis has been updated with the amended traffic volumes, with detailed results provided in Appendix P.

The results of the updated traffic analysis indicates that:

- The intersection of the Pacific Highway and Beach Street is expected to operate with a good Level of Service in 2024 (which is the adopted horizon year for the Traffic Impact Assessment for both the EIS Project and amended Project).
- The forecast increase in traffic associated with the construction of the water treatment process plant for the amended Project is expected to have a negligible impact on the operation of the Pacific Highway/Beach Street intersection.
- The relatively minor increases in construction traffic volumes is expected to have negligible impact on the level of service at the intersection of Pacific Highway/Beach Street.

Maritime traffic

A number of different impacts may arise from unrelated shipping traffic crossing the path of the construction vessels. The planned alignment of the intake pipeline and the location of the intake structure may cross navigational waters and areas utilised for recreational fishing. Accordingly, the construction activity may result in the temporary reduction of accessibility to these areas, or require other vessel operators to re-route their movements.

As such, stakeholder consultation and marine user notifications, which are industry standard processes, would be implemented for the activity in order to inform and mitigate the impacts on vessels. Notifications would also be undertaken to inform all maritime users of action (including location and duration) to support management of collision risk. Additional mitigation measures are provided in Table 3-30.

Operation

During operation, there is potential that fishing apparatus may be damaged upon catching onto the subsea infrastructure or that vessels may be required to change navigational course to avoid collision risk.

Navigation charts (Admiralty Charts) are updated with locations of subsea pipes, as such maritime users are alerted to the presence of the pipes. Normal maritime procedures are followed by all vessels for communications that assist with mitigation of interference risks.

Interference or entanglement risk associated with fishing activities post installation would be minimised by burial of the pipe within soft sediment along the length of the route to the intake structure however, the intake structure itself will result in a small level of risk that cannot be eliminated.

Mitigation measures

Additional mitigation measures for the amended Project are provided in Table 3-30.

Table 3-30 Additional traffic and transport mitigation measures

Impact	Mitigation measure
Maritime traffic	• Pipe-laying related activities will be undertaken in accordance with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and *Navigation Act 2012*. For the vessels, this requires equipment and procedures to comply with AMSA Marine Order - Part 30: Prevention of Collisions, and Marine Order - Part 21: Safety of Navigation and Emergency Procedures. • Stakeholder consultation (local councils, fishing bodies, etc.). • Notification to the following Australian Government agencies will be made prior to moving the pipe laying vessel on location: - The Australian Hydrographic Office of proposed activity, location (i.e. vessel location) and commencement date to enable a Notice to Mariners' to be issued. - The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) of proposed activities, location (i.e. vessel location) and commencement date to enable an AusCoast warning to be issued. • Vessels will also be equipped with all navigational and safety requirements for operation in Australian waters. These may include an automatic identification system (AIS) and an automatic radar plotting aid (ARPA) system capable of identifying, tracking and projecting the closest approach for any vessel (time and location) within radar range (up to approximately 70 km). • Visual observations will be conducted by trained watch keepers on all vessels 24 hours per day to support management of collision risk or entanglement/interference with other users.

Summary

Road traffic

The proposed amendment to DOI and water treatment process plant would result in an average of approximately:

- 94 trucks accessing the Project area per month (a decrease of 16 trucks per month from that described in the EIS)
- Four trucks per day (a decrease of one truck per day from that described in the EIS)
- 30 inbound and 30 outbound worker movements (light vehicles) per day (an increase of 20 inbound and 20 outbound light vehicle movements from that described in the EIS)

While the actual number of vehicle movements associated with the amended Project are higher than the EIS Project, the duration of construction has also increased. Therefore, based on the overall peak traffic volume, the amended Project is expected to result in a minor increase in traffic volumes within typical daily traffic fluctuations. The amended Project would have a negligible impact on the predictions described in the EIS and would not result in a change to EIS mitigation measures reproduced in Appendix E.

Maritime traffic

The proposed amendment to DOI would result in potential impacts to maritime traffic. The presence of construction vessels and intake structure would pose a collision risk to other vessels during both construction and operation. The additional mitigation measures provided in Table 3-30 would be implemented to manage these potential impacts.

3.6.2.7 Noise and Vibration

The information presented in this section is summarised from the Noise and Vibration Amendment Report (GHD, 2020e) (Appendix Q), which should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, 2019a) and *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment* (GHD, 2019b).

No changes to the terrestrial operational noise is expected from the DOI and has therefore not been considered further. There are three main components that need to be constructed for the direct ocean intake structure. All other construction impacts (other activities, compounds, traffic) are expected to remain the same.

Construction of the sea water pump station

The wet well/pump station is comparable to the caisson assessed in the EIS design. The construction noise impacts of the wet well/pump station has been compared to the construction noise impacts of the *'caisson installation'* construction scenario. The '*caisson installation'* construction scenario noise impact is detailed in *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment (GHD, November 2019)*.

The predicted noise impact level due to the construction of the sea water pump station (including associated infrastructure), is shown in Table 3-31. The proposed amendment is predicted to result in:

- Predicted impacts at the nearest active recreational area (Nine Mile Beach) are consistent with EIS predictions
- A 3 dB(A) reduction in predicted noise impacts at the closest residential receiver
- No exceedance of the Construction Noise Management Level (CNML) are expected at any receivers

Table 3-31 Direct ocean intake noise impacts.

Receiver address	Construction Noise Management Level (CNML) dB(A)	EIS predicted contribution noise level, dB(A)[1]	Amended design predicted contribution noise level, dB(A)
Nine Mile Beach	65	54	54
33 Williams Street, Belmont	48	36	33

Note 1: Comparison level based on predicted results detailed in *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment (GHD, November 2019)* report.

Construction of the intake pipeline

The intake pipeline is comparable to the intakes assessed in the EIS design. The construction noise impacts of the intake pipeline has been compared to the construction noise impacts of the *'intake installation'* construction scenario. The '*intake installation'* construction scenario noise impact is detailed in *Belmont Drought Response Desalination Plant – Noise and Vibration Assessment (GHD, November 2019)*.

The predicted noise impact level due to the construction of intake pipeline, is shown in Table 3-32. The proposed amendment is predicted to result in:

- CM1 (HDD):
  - A 10 dB(A) reduction in predicted noise impacts at the at the nearest active recreational area (Nine Mile Beach), with noise levels predicted to be 14 dB(A) below the relevant CNML
  - A 2 dB(A) reduction in predicted noise impacts at the nearest residential receiver (33, with noise levels predicted to be 11 dB(A) below the relevant CNML
  - No exceedance of the Construction Noise Management Level (CNML) are expected at any receivers
- CM2 (Pipejacking/micro-tunnelling):
  - A 7 dB(A) reduction in predicted noise impacts at the at the nearest active recreational area (Nine Mile Beach)
  - A 1 dB(A) increase in predicted noise impacts at the nearest residential receiver
  - No exceedance of the Construction Noise Management Level (CNML) are expected at any receivers

Table 3-32 HDD noise impacts

Receiver address	Construction Noise Management Level (CNML) dB(A)	EIS predicted contribution noise level, dB(A)[1]	Amended design methodology predicted contribution noise level, dB(A)
CM1 – HDD			
Nine Mile Beach	65	61	51
33 Williams Street, Belmont	48	39	37
CM2 – Pipejacking/micro-tunnelling			
Nine Mile Beach	65	61	54
33 Williams Street, Belmont	48	39	40

Note 1: Comparison level based on Intake Installation levels in Belmont Drought Response Desalination Plant – Noise and Vibration Assessment (GHD, November 2019) report, which covers the construction of the lateral arms of the subsurface intake structure.

Construction of intake structure

The intake structure for the Direct Ocean Intake design does not have a comparable component in the EIS design. The construction noise impact of the intake structure has not been compared to any previous construction noise impact, but is noted as an additional noise source during construction.

The predicted noise impact level due to the construction of the intake structure, is shown in Table 3-33. The proposed amendment is predicted to result in:

- Intake structure:
  - Predicted impact at the nearest active recreational area (Nine Mile Beach) is 31 dB(A)
  - Predicted impact at the nearest residential receiver is 23 dB(A)
  - No exceedance of the Construction Noise Management Level (CNML) are expected at any receivers

Table 3-33 Direct ocean intake noise impacts.

Receiver address	Construction Noise Management Level (CNML) dB(A)	EIS predicted contribution noise level, dB(A)[1]	Amended design predicted contribution noise level, dB(A)
Intake structure			
Nine Mile Beach	65	N/A	31
33 Williams Street, Belmont	48	N/A	23

Note 1: No comparison level available as this component (or a representative component) was not in EIS design.

Summary

- On-shore pump station and intake structure: No exceedance of CNML are expected for any receiver.
- Intake pipeline:
  - **CM1 (HDD) and CM2 (Pipejacking/micro-tunnelling):** No exceedance of CNMLs are expected for any receiver

3.6.2.8 Visual Amenity

The information presented in this section is summarised from the Landscape Character and Visual Impact Assessment Report (GHD, 2020f) (Appendix R), which should be read in conjunction with GHD reports titled:

- Belmont Drought Response Desalination Plant – Environmental Impact Statement (GHD, 2019a)
- Belmont Drought Response Desalination Plant – Landscape Character and Visual Impact Assessment (GHD, 2019e)

Landscape character zones (LCZs) and viewpoints

Section 7.14.2 of the EIS identified key landscape character zones (LCZs) and viewpoints relative to the Project area and surrounds. These key LCZs and viewpoints have been revised based for the amended Project as identified in Section 3.5.2.8.

Impact assessment

The direct ocean intake would not result in impacts during operation; therefore, only construction impacts have been considered in Table 3-34 and Table 3-35. The Project is predicted to result in moderate-low impact for viewpoints 1, 2 and 6; low for viewpoint 3; and negligible for viewpoints 4, 5 and 7.

Table 3-34 Landscape character zone assessment

LCZ	Sensitivity	Magnitude	Predicted level of impact – Amended Project	Comment
1 – Coastal Dunes and Beach Scape	Moderate	Low	Moderate-Low	The existing character is vast, exposed and varied. The area in close proximity to the Project has been previously modified by the built structures of the existing WWTW. The Project would not detract from the vast, exposed, beachscape character and being set back from the beach towards the forested vegetation means that it would be relatively camouflaged. Unless a receiver would be directly adjacent to the Project, it is not expected to be visible above the dunes. The requirement of a barge will be more prominent within the landscape, however due to this being temporary it will not cause great impact to this landscape character zone.
2 – Ocean/ sea scape	Negligible	Negligible	Negligible	The existing character of the ocean is an extensive body of water that can range in conditions from extremely calm waters to rough seas with large waves. The impact of the Project on character of this landscape has been identified as negligible, as the barge within the ocean would only be present for a short time during the construction phase of the intake structures. The barge will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant visual impact.

Table 3-35 Visual impact assessment

Viewpoint	Sensitivity	Magnitude	Overall level of impact	Comment
1 – Nine Mile Beach (adjacent to Project area)	Low	Moderate	Moderate-Low	Due to the existing presence of the WWTW, the limited duration of 3 to 4 months of the construction phase, and the location of construction zone located within the prescribed Project site, this phase would have moderate-low impact on this viewpoint as there would be no additional obstruction to the landscape.
2 – Nine Mile Beach (off-shore construction zone)	Low	Moderate	Moderate-Low	The barge would be located approximately 710 m out to sea for a period of 3-4 months over the duration of construction. Due to the nature of the landscape that this viewpoint is capturing, it is important to note its dynamic nature and the range of conditions that may vary due to the presence of vessels within the ocean. Whilst the barge will not heavily impact this viewpoint, it will emit artificial light as a safety precaution. Minimal lighting is required for safety and navigational purposes. This lighting will not cause significant visual impact. As this is temporary during the construction phase, the impact is classified as moderate – low.
3 – Belmont Golf Course	Low	Low	Low	Most of the onshore construction works would be screened by vegetation, and the offshore barge would have minor interference with the landscape due to the dynamic nature of the ocean and the existing presence of vessels.
4 – Anderson Point (elevated residential)	Moderate	Negligible	Negligible	While some residences may be sufficiently elevated to potentially glimpse the onshore and offshore construction zones, the vegetation screening between them and the construction works is such that any sighting would be very limited. The Project is over 1 km away therefore the magnitude of the construction works would be negligible.

Viewpoint	Sensitivity	Magnitude	Overall level of impact	Comment
5 – Belmont North (elevated residential)	Moderate	Negligible	Negligible	The elevated residential enclave of Belmont North has a few residences which face south east towards the Project. The Project is unlikely to be seen above the dense vegetation. The Project is over 2 km away therefore the magnitude of the Project would be negligible.
6 – Belmont Wetlands State Park (Kalaroo Fire Trail)	Low	Moderate	Moderate-Low	Due to the presence of much dense, and reasonably high vegetation surrounding the Project area as viewed from the Kalaroo Fire Trail, the onshore construction zone would only be visible where dense, high forest vegetation between receptors and the onshore Project zone is at a minimum.

Mitigation measures

The mitigation measures identified in Section 7.14.4 of the EIS remain appropriate to mitigate potential visual impacts of the amended Project. Additionally, lighting of the temporary barge for intake pipeline and intake structure construction methods will be required as per NSW Roads and Maritime Night Safety guidelines. This is required as to mitigate issues out at sea, ensuring that other vessels/water activity are able to clearly identify the equipment's location.

Summary

The Project is predicted to result in moderate-low impact for viewpoints 1, 2 and 6; low for viewpoint 3; and negligible for viewpoints 4 and 5. The mitigation measures identified in Section 7.14.4 of the EIS remain appropriate to mitigate potential visual impacts of the amended Project with the additional mitigation measures identified above. These have been reproduced in Appendix E.

3.6.2.9 Greenhouse Gas

This section is dedicated to the overview of the intake pipeline construction greenhouse gas assessment. The intake pipeline was not a part of the original EIS design but now there are two options for intake pipeline construction in the amended design (30 ML/day plant). The assumptions did not change significantly however a few key items increased the amount of emissions considerably.

Assumptions

Assumptions used in estimating GHG emissions for the intake pipeline construction are outlined in more detail in Table 3-36. The assessment was based on emission factors available at the time of the assessment and future changes in emission factors are not considered.

Activity data used for the GHG assessment was provided by Hunter Water Corporation or other studies conducted as part of this EIS. All Emission Factors (EF) used were as per the NGER (Measurement) Determination.

Out of the two options for the intake pipeline construction the most energy intensive option was used to calculate emissions due to uncertainty of which option would be chosen. The worst case scenario would be the option that used the 30 tonne crane and generator since it uses the most diesel per hour which means greater emissions.

Table 3-36 Greenhouse Gas assessment changes- Intake Pipeline

Parameter	EIS design - 15 ML/day Assumptions	Amended design - 30 ML/day Assumptions
Construction		
Construction timing and duration	Estimated construction duration is 8-9 months of which 6 months would be the intake installation phase and the last 3 months would be building the water treatment process plant, with two weeks of power upgrades. Construction timeframe: • Monday to Friday: 7.00 am to 6.00 pm • Saturday: 8.00 am to 1.00 pm • No work on Sundays or Public Holidays	Intake piping has been included in the assessment during a period of 8 month for the intake installation phase.
Diesel - Construction stationary energy	Assumptions were made of the construction equipment energy consumption, based on the size of the equipment being used, where known, e.g.: crane - 30 tonnes; excavator - 15 tonnes. The rest of the machinery (drilling rig, grader, compressor, vibratory roller, and generator) was assumed to be the smallest available. Estimated diesel usage information was as per the manufacturer's data sheets (e.g.: Caterpillar performance handbook). It was estimated that 314 kL of diesel fuel would be used during construction.	The intake pipeline has been added to the scope of this Project which had 2 different options for construction. For the GHG assessment the worst case scenario option was chosen. The worst case for the intake pipeline include the following machinery: micro tunnel/ drilling rig, 15 tonne excavator, 30 tonne crane and small equipment. The intake structure construction added ocean barges and concrete batching on the barge into the construction plan. After the additional equipment added, it was estimated that 802 kL of diesel fuel would be used during construction, plus an additional 247 kL from the intake pipeline construction, plus fuel use from concrete batching
Diesel - construction transport (materials)	Estimated that 66 kL of diesel fuel would be used during transportation of materials. -10 truck movements for delivery of the horizontal intake pipes in large semitrailer.	Updated to 89 kL of diesel fuel for the transportation of materials Assumptions changed that changed were: -40 truck movements for delivery of horizontal intake pipes instead of 10.
Diesel - commuting	For the Intake Installation phase it would be a 10 person workforce over 6 months.	Assumptions regarding changed workforce from 15 FTE to 40 FTE Project as provided in Table 3-1.

Construction stage

The intake pipeline emissions during construction is 22 per cent of the total emissions. Table 3-37 shows that the intake pipeline construction would emit approximately 987 tonnes of CO_2-e for the construction period.

Table 3-37 Intake Pipeline Construction emissions

Activity	15 ML/day Scope 1 Emissions (t CO_2-e)	30 ML/day Scope 1 Emissions (t CO_2-e)
Diesel – intake pipeline	N/A	987

Summary

A comparison of the estimated emissions for the EIS design and the amended design resulted in an approximate increase of construction emissions of approximately 28% (740 tCO_2-e). Since both the EIS design construction emissions and the direct ocean intake construction emissions are minor, and the estimated difference is within the accuracy of the calculations, no further assessment is required.

3.7 Summary of changes to impacts

Table 3-38 provides a summary of the changes to the impacts of the Project due to the amendments.

Table 3-38 Summary of changes to impacts

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Soil, geology and contamination	Water treatment process plant	Construction Operation	The amended Project would result in an increase to the disturbance area. The preliminary environmental impact screening indicates no substantial changes to existing environment considerations provided in Section 7.1.2 of the EIS. The proposed amendment to the water treatment process plant would have negligible effect on impacts to soils and geology during construction and operation, as assessed in Section 7.1.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.2.4 of the EIS and reproduced in Appendix E. The amended Project would result in an increased Project area compared with the EIS. Therefore, review of the EIS contamination assessment (GHD, 2019i) and the amended Project area including additional contamination investigation has been completed (Appendix G). A summary of the review and amended impacts are considered in Section 3.5.2.1. The review identified that the amended Project would not change potential contamination considerations provided in Section 7.2.4 of the EIS and reproduced in Appendix E. Further investigation of the potential mine subsidence impacts was identified during the exhibition period. Potential subsidence impacts to the amended water treatment process plant and direct ocean intake were assessed concurrently (refer to Section 3.6.2.1 and Appendix G). The proposed amendment to the water treatment process plant has been assessed to have a very low likelihood of residual subsidence occurring.	3.5.1
	Direct ocean intake	Construction Operation	The amended Project would result in an increase to the disturbance area in association with the intake pipeline. The preliminary environmental screening indicates there would be no changes to existing environment considerations provided in Section 7.1.2 of the EIS. The proposed amendment to direct ocean intake would have negligible affect on impacts to soils, geology and contamination during construction and operation, as assessed in Section 7.1.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.2.4 of the EIS and reproduced in Appendix E. Management during construction of excess material excavated during construction of the sea water pump station or CM 1 (HDD) or CM 2 (Pipe jacking) would be consistent with mitigation measures in Table 7-2 of the EIS. Further investigation of the potential mine subsidence impacts was identified during the exhibition period. The proposed amendment to direct ocean intake has been assessed to have a very low likelihood of residual subsidence occurring.	3.6.1

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Water resources	Water treatment process plant	Construction	The proposed amendment to the water treatment process plant would result in negligible change to potential impacts to water resources, as assessed in Section 7.2.3 of the EIS.	3.5.1
		Operation	The swale and stormwater basin have been designed for 1 in 100 year ARI storm events, with a 130 m^2 surface area which meets the stormwater pollution reduction targets set by LMCC (LMCC, 2013), managing discharge from impervious surfaces and allowing infiltration of stormwater within the Project area. This is additional detail to the EIS and would not result in change to operational impacts or stormwater management on-site. The amended Project would involve sourcing seawater via a direct ocean intake. This would remove potential for operational groundwater impacts associated with the previous sub-surface intake. The amended Project would include additional pre-treatment to account for differences in water quality as a result of sourcing water via a direct ocean intake.	3.5.2.1 and Appendix G
	Direct ocean intake	Construction	While the amended Project would result in a minor increase to the disturbance area, the preliminary environmental screening indicates there would be no changes to existing environment considerations provided in Section 7.2.2 of the EIS. • The total groundwater volume to be dewatered during the construction of the EIS design is likely to be higher than the volume to be dewatered for CM 1 (HDD) and CM 2 (pipe jacking/micro-tunnelling), as a result of sheet piling required for these methods of construction extending to the base of the sand aquifer. • Potential impacts would be mitigated through the implementation of measures outlined in Table 7-3 of the EIS and additional mitigation measures identified in Section 3.6.2.2, and reproduced in Appendix E.	Section 3.6.2.2
		Operation	The amended Project would involve sourcing seawater via a DOI rather than the sub-surface seawater intake of the EIS Project. Therefore, during operation the amended Project would not result in the predicted groundwater drawdown and associated potential impacts identified from the previous sub-surface intake, in Section 7.2.3 of the EIS. Impacts on groundwater from the amended design would be restricted to the construction phase only.	3.6.1

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Terrestrial and freshwater biodiversity	Water treatment process plant	Construction	The amended Project would impact on an additional 0.51 ha of native vegetation. This includes three PCTs that were not identified in the Project EIS, one of which is commensurate with the EEC listed under the BC Act as Sydney Freshwater Wetlands in the Sydney Basin Bioregion. As a result of amendments to the Project area offsets are now required to offset the impacts of the Project on native vegetation and potential threatened species habitats. Ecosystem credits that would be required to offset the impacts of the amended Project include: • One ecosystem credit for impacts to 0.08 ha of Coast Banksia-Coast Wattle dune scrub of the Sydney Basin Bioregion and South East Corner Bioregion. • Four ecosystem credits for impacts to 0.12 ha of Phragmites australis and Typha orientalis coastal freshwater wetlands of the Sydney Basin Bioregion. • One ecosystem credit for impacts to 0.02 ha of Coastal Freshwater Swamps of the Sydney Basin Bioregion. • The Project would not impact on any species credit species and therefore no species credits are required for the Project. The overall direct and potential indirect impacts of the Project are largely consistent with those described in the Project EIS. No additional mitigation measures beyond those described in the Project EIS are considered necessary.	3.5.2.3
		Operation		
	Direct ocean intake	Construction		
		Operation		
Marine biodiversity	Water treatment process plant	Construction	The proposed amendment to the water treatment process plant would have negligible affect on impacts to marine biodiversity during construction, as assessed in Section 7.4.3 of the EIS, and would be managed in accordance with the measures outlined in Section 7.4.4 of the EIS and reproduced in Appendix E.	3.5.1
		Operation	Brine discharge modelling undertaken for both the EIS Project and amended Project indicates that impacts to water quality at the outfall would meet the required Water Quality Objectives and are likely to have the same or smaller area of impact compared to the amended design capacity from 15 ML/day to 30 ML/day. Examples from operation of much larger capacity plants indicate that increases in salinity are unlikely to have significant effect on the benthic communities and the existing fish assemblages. The same is expected for the amended Project. Ongoing monitoring of outfall benthic communities in accordance with EPL 1771 and integration of pipeline ecology and fish assemblage into that monitoring would allow for better understanding of existing communities and active management of any impacts to species abundance and diversity that may occur through operation. As such, the risk of impact to species abundance and diversity at the outfall is considered to be as low as reasonably practicable.	3.6.2.3

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
	Direct ocean intake	Construction	Construction of the intake structure has the potential to harm the marine environment through activities that would disturb the seabed such as drilling. Vessels would be required to support the construction activities. The risks to the environment from these activities are listed below: • Seabed disturbance and associated turbidity and water quality impacts • Light and noise pollution from vessel platforms and drilling activities • Release of potential wastes, contaminants or pollutants (including hydrocarbon spills) • Atmospheric emissions • Interference with other users of the area affected • Other unplanned events may also arise during construction activities. The risks to the environment from these unplanned activities are listed below: • Pest introduction and proliferation • Accidental release of solid waste • Impacts to the seabed from dropped objects • Marine fauna collisions • Release of hydrocarbon, chemicals and other liquid waste • Damaged fuel tank associated with vessel collision The management and mitigation measures detailed in the Section 7.4.4 of the EIS are still appropriate and would be implemented. Additional mitigation measures would also be implemented to manage these potential impacts. Risks associated with construction, operation and maintenance of the temporary desalination plant are considered to be acceptable and as low as reasonably practicable with the implementation of the management and mitigation measures.	3.6.2.3
		Operation	Operation of the intake pipe and intake structure will result in the following potential impacts: • Entrainment of eggs, larvae and small species and entrapment of larger species on the intake screen • Maintenance activities at the intake structure have potential to harm the marine environment • Habitat creation at the intake structure and parts of the pipe that are above the seabed The management and mitigation measures detailed in Section 7.4.4 of the EIS are still appropriate and will be implemented. Additional mitigation measures will also be implemented to manage these potential impacts as identified in Section 3.6.2.3 and reproduced in Appendix E.	3.6.1

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Coastal processes	Water treatment process plant	Construction	The proposed amendment to the water treatment process plant would result in a minor increase to the disturbance area. The preliminary environmental impact screening indicates no changes to existing environment considerations provided in Section 7.5.2 of the EIS. Therefore, the Project would have negligible effect on impacts to coastal processes during construction and operation, as assessed in Section 7.5.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.5.4 of the EIS and reproduced in Appendix E.	3.5.1
		Operation		
	Direct ocean intake	Construction	Comparison of the potential impacts associated with the amended direct ocean intake and associated intake pipe against those described in the EIS indicates that the amended Project could be expected to create a minor and temporary increase in potential impacts to coastal processes due to the temporary offshore receival infrastructure and associated excavation / stockpiling activities. Risks to coastal processes associated with operation of the Project are considered to be acceptable and as low as reasonably practicable with the implementation of the management and mitigation measures as identified in Section 3.6.2.4 and reproduced in Appendix E.	3.6.2.4
		Operation	Comparison of the amended ocean intake structure with the subsurface intake described in the EIS indicates that there would be impacts to longshore transport that would not have been associated with the sub-surface intake structure. If the intake structure and intake pipe is kept in place during decommissioning, there is no additional impact expected to coastal processes compared to the operations phase. Risks to coastal processes associated with operation of the Project are considered to be acceptable and as low as reasonably practicable with the implementation of the management and mitigation measures as identified in Section 3.6.2.4 and reproduced in Appendix E.	3.6.2.4

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Social	Water treatment process plant	Construction	The amended Project would not change the previously assessed social construction impacts (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.	3.5.2.5
		Operation	The proposed amendment to the water treatment process plant would enhance the positive social impacts identified in the EIS due to increasing the capacity of the facility from 15 ML/d to 30 ML/d. No other changes to previously assessed operation impacts or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.	
	Direct ocean intake	Construction	The proposed amendment to direct ocean intake would result in minor change to construction impacts, including access and connectivity for users of navigable waterways. Access and connectivity mitigation measures: General access would be addressed in the Traffic Management Plan (TMP) consistent with mitigation measures in the EIS (see Appendix E), while the Amended Project requires an Access Management Plan in accordance with NSW Maritime requirements to address consideration of other users of the waterway (see Appendix E).	3.6.2.5
		Operation	No change to previously assessed operation impacts or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.	
Sustainability	Water treatment process plant	Construction	The potential sustainability impacts of the EIS Project (refer to Section 7.7.3 of the EIS) were identified with reference to the outcomes of the various specialist studies undertaken in the EIS using the IS Rating scheme, NSW Government Resource Efficiency Policy (GREP) and Hunter Water policies. A number of specialist studies have been updated to account for the proposed amendment to the Project and used to assess any changes to the assessment of sustainability categories in Table 7-13 of the EIS. Due to the nature of the assessment methodology scheme, which is a category based assessment, the amended Project would not affect the overall assessment of potential sustainability impacts or the proposed sustainability mitigation measures. Potential sustainability impacts outlined Section 7.7.3 of the EIS would not be affected by the proposed amendment and therefore conclusions of the EIS Sustainability section are still applicable. The proposed amendment to the Project and associated construction methodology would not result in a change to the conclusions of the sustainability assessment and associated management and mitigation measures included in Section 7.7 of the EIS and reproduced in Appendix E.	3.5.1 and 3.6.1
		Operation		
	Direct ocean intake	Construction		
		Operation		

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Hazard and risk	Water treatment process plant	Construction	A Level 1 PHA was completed in Section 7.8 of the EIS. While the proposed amendment to the water treatment process plant would result in a minor change to the quantities of chemicals stored onsite, this would not result in: • Any significant change to dangerous goods and chemical storage • Any exceedance of transport screening thresholds Therefore, no change to hazard risks considerations from those assessed in Section 7.8 of the EIS are expected in relation to the proposed amendment to the water treatment process plant. No change to mitigation measures included in Section 7.8.2 of the EIS and reproduced in Appendix E.	3.5.1 and 3.6.1
		Operation		
	Direct ocean intake	Construction		
		Operation		
Aboriginal heritage	Water treatment process plant	Construction	An addendum to the ACHAR prepared for the EIS was required to assess the increased Project area associated with the proposed amendments to the Project. One newly identified Aboriginal cultural site was identified within the Project area (AHIMS #45-7-0402) and would be impacted during the construction of the amended Project. Surface collection of the newly identified Aboriginal cultural site would be required prior to construction. Due to the significant disturbances of the Project area, the potential for sub-surface artefacts to be identified has been assessed as low. However, areas identified as having intact A horizon soils or the potential for A horizon soils in a disturbed context, may contain the potential for either insitu or non-insitu Aboriginal cultural materials. The mitigation measures identified in Table 3-9 and reproduced in Appendix E to minimise potential impacts to Aboriginal Heritage.	3.5.2.6
		Operation		
	Direct ocean intake	Construction		
		Operation		

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Non-Aboriginal heritage	Water treatment process plant	Construction	While the amended Project would result in an increase to the disturbance area, review of background information indicates no changes to existing environment considerations provided in Section 7.10.2 of the EIS. Remnant tank traps identified within the Project area on the beachfront to the east of the dunes. There is potential for the tank traps to be impacted during construction of the direct ocean intake and through ancillary construction activities, including access and laydown areas. The exact location of the tank traps would be identified during detailed design to ensure potential impacts during construction are appropriately mitigated including provision of buffer zones. The proposed amendment to the Project would have negligible effect on impacts to non-Aboriginal heritage during construction and operation, as assessed in Section 7.10.3 of the EIS and would be managed in accordance with the measures outlined in Section 7.10.4 of the EIS and reproduced in Appendix E.	3.5.1 and 3.6.1
		Operation		
	Direct ocean intake	Construction		
		Operation		
Traffic and transport	Water treatment process plant	Construction	The proposed amendment to the water treatment process plant would result in an increase in light vehicle movements during construction. The impacts of this have been assessed concurrently with the impacts associated with the impacts for the direct ocean intake. The amendment would not require additional access.	3.5.1, 3.6.1 and 3.6.2.6
		Operation		
	Direct ocean intake	Construction	The proposed amendment to direct ocean intake and water process treatment plant would result in an average of approximately: • 94 trucks accessing the Project area per month (an decrease of 16 trucks per month from that described in the EIS) • Four trucks per day (a decrease of one truck per day from that described in the EIS) • 30 inbound and 30 outbound worker movements (light vehicles) per day (an increase of 20 inbound and 20 outbound light vehicle movements from that described in the EIS) The relatively minor increases in construction traffic volumes are expected to have negligible impact on impact predictions described in the EIS and would not result in a change to EIS mitigation measures reproduced in Appendix E. The proposed amendment to direct ocean intake would result in potential impacts to maritime traffic. The presence of construction vessels and intake structure would pose a collision risk to other vessels during construction. The additional mitigation measures provided in Table 3-30 would be implemented to manage these potential impacts.	3.6.2.6 and 3.6.1
		Operation	The proposed amendment to direct ocean intake would result in potential impacts to maritime traffic. The presence of the intake structure would pose a collision risk to other vessels during operation. The additional mitigation measures provided in Table 3-30 would be implemented to manage these potential impacts.	

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Noise and vibration	Water treatment process plant	Construction	No change to previously assessed construction impacts or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.	3.5.2.7
		Operation	The amended Project is predicted to result in an exceedance of one dB at the nearest active recreational receiver (Nine Mile Beach) during operation. The mitigation measures provided in Section 7.12.5 of the EIS remain appropriate to manage this potential impact.	
	Direct ocean intake	Construction	• On-shore pump station and intake structure: No exceedance of CNML are expected for any receiver. • Intake pipeline: CM1 (HDD) and CM2 (Pipejacking/micro-tunnelling): No exceedance of CNMLs are expected for any receiver.	3.6.2.7
		Operation	No change to previously assessed operation impacts or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019b)), which have been reproduced in Appendix E.	
Waste management	Water treatment process plant	Construction	The proposed amendments to the water treatment process plant are not expected to result in any significant increase in waste generation. During construction of the Project, the following major wastes would be produced: • *Excess spoil*: Minor cutting and filling would be required to prepare foundation areas, as identified in Appendix D. While exact volumes and site layout would vary slightly from the EIS Project, this would not result in a significant change to the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS. • *Wastewater from groundwater dewatering during excavation*: While the extent of excavation required for the amended water treatment process plant would vary slightly from the EIS Project, the quantity of potential dewatering required would not significantly change compared with the EIS Project and would represent a small proportion of the dewatering required for the overall amended Project. Therefore, there is no significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS. • *General construction waste*: While exact quantities of general construction waste may vary from the EIS Project, this would not result in a significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS.	3.5.1

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
		Commissioning	As discussed in Section 7.13 of the EIS, commissioning of the desalination plant would comprise commissioning of the pre-treatment process and then the RO units. During this process, four waste streams would be generated as described in Table 7-45 of the EIS. The only change to these waste streams would be 'screened groundwater' waste stream is no longer relevant to the amended Project, as raw feed water for the amended Project is via a direct ocean intake, rather than reliant on the sub-surface aquifer. This waste stream would be the same as the wastewater from commissioning of the intake (see Table 3-19), but of lower volume and with some screening which would improve the quality. As such, an impact from disposal of this waste stream via the existing WWTW ocean outfall is not anticipated. Additionally, "potable water (permeate post-dosing with chlorine and fluoride)" waste stream would be dechlorinated using vitamin C or other method, in the clear water tank before being pumped and disposed via the WWTW outfall. Chlorine levels consistent with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2018) would be achieved prior to disposal. The proposed amendment to the water treatment process plant would result in a negligible change to waste management during operation.	
		Operation	While the volumes of operational waste production have changed, associated management measures detailed in the EIS would be sufficient to ensure appropriate waste management, as reproduced in Appendix E. Changes to operational waste production are as follows: • The desalination process in the EIS Project would produce up to 28.2 ML/d of wastewater, comprising 25.5 ML/d of brine, 2.0 ML/d of RO membrane cleaning and pre-treatment waste and 0.75 ML/d of other losses and utilities. • The desalination process in the amended Project would produce up to 56.0 ML/d of wastewater, comprising 51.1 ML/d of brine, 6.0 ML/d of RO membrane cleaning and pre-treatment waste and 1.3 ML/d of other losses and utilities.	

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
	Direct ocean intake	Construction	The proposed amendment to direct ocean intake is not expected to result in any significant increase in waste generation. During construction of the Project, the following major wastes would be produced: • *Excess spoil*: No significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS. • *Wastewater from groundwater dewatering during excavation*: No significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS. Discussion in relation to potential changes to impacts on groundwater as a result of dewatering are considered in Section 3.6.2.2. • *General construction waste*: No significant change from the assessment and associated management and mitigation measures provided in Section 7.13 of the EIS.	3.6.1
		Commissioning	As discussed in Section 7.13 if the EIS, commissioning of the intake would involve pumping seawater through the newly installed intake structures at full capacity for approximately one week. It is expected that the brine discharge pipeline between the desalination plant and the hydraulic control structures (HCS) would be utilised to dispose of commissioning flows without going through the desalination process. For the amended Project a commissioning test would be carried out to confirm performance. Ocean water would likely be pumped from the intake well directly to the brine disposal system. The proposed amendment to the intake structure and associated pipeline construction methodology would result in negligible change, with up to 91.2 ML/d of seawater required to be pumped through the newly installed intake structures at full capacity.	
		Operation	The proposed amendment to direct ocean intake would result in a negligible change to waste management during operation.	

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Visual amenity	Water treatment process plant	Construction	No change to previously assessed impacts for pre-existing LCZs and viewpoints, or associated mitigation measures (see (GHD, 2019a) and (GHD, 2019e)), which have been reproduced in Appendix E. Additional LCZs and viewpoints considered for the amendment to the water treatment process plant identified potential for negligible impacts, with no change to mitigation measures required.	3.5.2.8 and Appendix R
		Operation		
	Direct ocean intake	Construction	The Project is predicted to result in moderate-low impact for viewpoints 1, 2 and 6; low for viewpoint 3; and negligible for viewpoints 4 and 5. The mitigation measures identified in Section 7.14.4 of the EIS remain appropriate to mitigate potential visual impacts of the amended Project with the additional mitigation measures identified above. These have been reproduced in Appendix E.	3.6.2.8 and Appendix R
		Operation	The direct ocean intake would not result in impacts during operation; therefore, only construction impacts have been considered.	
Air quality	Water treatment process plant	Construction and Operation	The proposed amendment to direct ocean intake would result in a negligible change to air quality impacts, as assessed in the EIS, during both construction and operation of the Project.	3.5.1 and 3.6.1
	Direct ocean intake	Construction and Operation		
Greenhouse gas	Water treatment process plant	Construction	The amended Project design would increase emissions due to the larger capacity and additional construction requirements. However, the total operational emissions are still negligible compared to NSW and Australian annual emissions (0.04% NSW annual emissions and 0.009% Australian annual emissions). The overall increase in emissions for the construction and operational phases is approximately 70%, with construction increasing from 1,776 to 3,577 tCO_2-e total and operation increasing from 27,907 tCO_2-e/year to 47,328 tCO_2-e/year.	3.5.2.9
		Operation		
	Direct ocean intake	Construction	A comparison of the estimated emissions for the EIS design and the amended design resulted in an approximate increase of construction emissions of approximately 28% (740 tCO2-e total). As both the EIS design construction emissions and the direct ocean intake construction emissions are minor, and the estimated difference is within the accuracy of the calculations, no further assessment is required.	3.6.2.9
		Operation	The direct ocean intake would not result in impacts during operation; therefore, only construction impacts have been considered.	

Aspect	Amended Project component	Phase Construction/ Operation	Summary of impact	Relevant section
Human health	Water treatment process plant	Construction Operation	The proposed amendment to the water treatment process plant and to direct ocean intake would result in a negligible change to human impacts, as assessed in the EIS, during both construction and operation of the Project.	3.5.1and 3.6.1
	Direct ocean intake	Construction Operation	The proposed amendment to direct ocean intake would result in a negligible change to human health impacts, as assessed in the EIS, during construction of the Project. The proposed amendment to direct ocean intake introduces the potential for recirculation of the co-mingled discharge from the WWTW diffuser to the seawater intake structure. The degree of recirculation was simulated to ensure appropriate spatial separation. A 1% threshold for the proportion of co-mingled discharge provides a preliminary indicator of the risk of treated effluent recirculation into the seawater intake. The simulation found that 99.9% of the time seawater would have less than 1% concentration of co-mingled discharge 500 m from the intake structure. The simulation found that the proportion of treated effluent at the intake ranged from 0% to 0.3%, with enterococci concentrations less than 7.5 MPN/100 ml 99 % of the time. Based on the concept design the operational risk of material recirculation was predicted to be very low.	
Cumulative	Water treatment process plant	Construction Operation	The proposed amendment to the water treatment process plant would result in a negligible change to cumulative impacts, as assessed in Section 7.18 of the EIS.	3.5.1
	Direct ocean intake	Construction Operation	The proposed amendment to direct ocean intake would result in a negligible change to cumulative impacts, as assessed in Section 7.18 of the EIS.	3.6.1

3.8 Proposed additional mitigation measures

Table 3-39 provides a summary of the proposed additional mitigation measures required for the Project due to the amendments.

Table 3-39 Additional mitigation measures

Impact	Mitigation measure	Timing
Soils, Geology and Contamination		
Contamination	Hunter Water commits to undertaking a DSI prior to Project determination. The scope of the DSI will include analysis for heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs and asbestos and has been based on existing contamination data and the low potential for significant contamination to be present on Project area. Hunter Water will also undertake a focused investigation within the area of TP204 to further assess potential asbestos impacts prior to construction. This assessment, will and the outcomes of the DSI will inform the management measures in the Contaminated Site Management Plan (CSMP) andor if remediation is required.	Pre-construction
Water Resources		
Groundwater take	Metering of fresh groundwater removed from excavations for all construction methods. Use sheet piling, or similar, to support excavations and reduce groundwater inflow for all construction methods will be investigated during detailed design. This applies to all construction methods. The infiltration area will be set up with bund walls, or similar, around the entire perimeter to ensure no discharge of groundwater outside the area. Only fresh groundwater (EC less than 1,500 µS/cm) to be sent to the infiltration area.	Detailed design, Construction
Groundwater drawdown	Use of sheet piling, or similar, to support excavation and reduce groundwater inflow for all construction methods will be investigated during detailed design.	Construction
Groundwater quality	Biodegradable drilling fluids will be used during drilling works for CM 1 (HDD). Undertake an ASS investigation in the vicinity of each excavation as part of the detailed design phase to determine the risk of exposure of PASS and prepare and implement an ASSMP if necessary. This is a modification of the mitigation measure identified in the EIS.	Construction
Groundwater monitoring	Groundwater monitoring at sites GW105 and GW108. The monitoring program will include continuous monitoring of groundwater levels and routine sampling for groundwater quality in particular the change in EC associated with the fresh/ saline groundwater interface. Groundwater level and quality triggers will be established based on baseline monitoring data.	Construction
Discharge of dewatered groundwater and brine	Prior to construction, either a new EPL will be obtained or EPL 1771 will be modified to authorise the discharge of dewatered groundwater during construction and additional proposed discharges from the Project to the Belmont WWTW outfall during operation.	Detailed design
Terrestrial and Freshwater Biodiversity		

Impact	Mitigation measure	Timing
Native vegetation	Hunter Water will commit to creating a Native Vegetation Rehabilitation Plan to mitigate potential impacts from any disturbance to native vegetation.	Pre-construction
Marine Biodiversity		
Increased brine discharge	• Integration of pipeline ecology and fish assemblage monitoring into the Ocean Outfall Benthic Monitoring Program for better understanding of potential changes in the species abundance and diversity. • Water quality monitoring program will be developed and implemented to identify long-term impacts from the discharge of brine concentrate on water quality or the marine environment.	Operation
Seabed disturbance	• Construction method will consider option with least disturbance to seabed area and break out of drilling fluids.	Detailed design
	• Speed of drilling will be reduced prior to breakthrough to surface to minimise the volume of drilling fluids released into the marine environment.	Construction
	• Visual observations during drilling for signs of increased turbidity and sedimentation.	
	• Emergency Management Plan in place to support drilling activities.	
Artificial light emissions	• Employ Best Practice Lighting Design for infrastructure such as vessels and barges that require to be lit at night in accordance with DoEE (2020) National Light Pollution Guidelines. Measures will include modification of light wavelengths, prevention of upward light spill and limiting light intensity for seabirds and maintaining a dark zone between any turtle nesting beach and infrastructure, avoiding direct lighting onto nesting beach or screen barriers for marine turtles (DoEE, 2020). • Light spill from the nearshore vessel operations will be minimised where possible using directional lighting. Light shields could be considered to avoid spill if sensitive receptors (i.e. shorebirds, turtles) are determined during activities to be negatively affected. • Lighting on vessel decks will be managed to reduce direct light spill onto marine waters, unless such actions do not comply with navigation and vessel safety standards (AMSA Marine Orders Part 30: Prevention of Collisions; AMSA Marine Orders Part 21: Safety and Emergency Arrangements).	Construction
Artificial noise emissions	• Where activities that generate underwater noise cannot be timed to occur outside of peak migration months the following mitigation measures and controls may be implemented. Where this is not possible, the need for Marine Fauna Observers will be determined on the basis of construction timeframes. • Acoustic harassment/deterrent devices could be sounded prior to commencement of any underwater activity to provide opportunity for sensitive marine fauna to relocate temporarily.	Construction

Impact	Mitigation measure	Timing
	• Vessel machinery will be maintained in accordance with the manufacturer specifications to reduce noise emissions. • The interaction of all vessels with cetaceans and whale sharks will be compliant with Part 8 of the Environment Protection and Biodiversity Conservation (EPBC) Regulations (2000). The Australian Guidelines for Whale and Dolphin Watching (Commonwealth of Australia, 2017)) for sea-faring activities will be implemented across the entire Project.	
Atmospheric emissions	Compliance with MARPOL Annex VI (as implemented in Commonwealth waters by the Commonwealth Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (PSPPS Act); and Marine Order 97: Marine pollution prevention - air pollution).	Construction
Pest introduction and proliferation	• Vessels will be sourced locally wherever possible. • All vessels working on the Project, whether internationally or locally sourced will adhere to Australian quarantine requirements. • The management of ballast water prior to entry to Australian waters must follow AQIS guidelines and compliance requirements in relation to marine pest introduction risk management for any internationally sourced vessel.	Pre-construction, Construction
Accidental release of solid wastes	• Appropriate waste containment facilities will be included on the vessel as well as onshore and managed to avoid overflow or accidental release to the environment. • No waste materials will be disposed of overboard; all non-biodegradable and hazardous wastes will be collected, stored, processed and disposed of in accordance with Regulation 9 of MARPOL Annex V. • Hazardous wastes will be separated, labelled and retained in storage onboard within secondary containment (e.g. bin located in a bund). • All recyclable and general wastes to be collected in labelled, covered bins (and compacted where possible) for appropriate disposal at regulated waste facility. • Solid non-biodegradable and hazardous wastes will be collected and disposed of onshore at a suitable waste facility or to a carrier licensed to receive the waste if required by legislation. • Intake pipe design is such that in the unlikely event of contact damage, the pipe does not break apart into segments or fragments, instead remaining intact to support recovery and repair of the affected segment.	Construction
Dropped objects	• All equipment and gear on the vessels will be securely fastened during mobilisation/demobilisation. • Lifting is to be carried out by competent personnel using equipment that is suitable, certified and maintained. • Waste management controls are to remain effective to reduce risk of release of wastes that could be ingested or cause entanglement. • During the activities, detailed records of equipment lost overboard or dropped will be maintained and reviews will be undertaken to reflect on methods to mitigate repetition of the incident.	Construction

Impact	Mitigation measure	Timing
Marine fauna collision and entanglement	• Operations of vessels will be commensurate with Part 8 of the EPBC Regulations (Interacting with Cetaceans and Whale Watching), DoEE (2016) National Strategy for Mitigating Vessel Strike of Marine Mega Fauna, NSW (2016) Marine Safety Regulation, and NSW (2017) Biodiversity Conservation Regulation. • A member of the vessel crew will act as a marine fauna observer (MFO) at all times during daylight works and will maintain vigilant watch in support of Part 8 of the EPBC Regulations to manage risk of vessel collision with any other vessels or marine fauna. The MFOs will be trained and experienced in whale identification and behaviour, distance estimation, and be capable of making accurate identifications and observations of whales in Australian waters. The MFO will provide advice on appropriate actions to be taken to mitigate risks should whales be encountered. • The Australian Guidelines for Whale and Dolphin Watching (Commonwealth of Australia, 2017) for sea-faring activities will be implemented across the entire Project.	Construction
Hydrocarbon, chemicals and other liquid waste	• Chemicals and hydrocarbons will be packaged, marked, labelled and stowed in accordance with MARPOL Annex I, II and III regulations. These include provisions for all chemicals (environmentally hazardous) and hydrocarbons will be stored in closed, secure and appropriately bunded areas. • A Material Safety Data Sheet (MSDS) will be available for all chemicals and hydrocarbons in locations nearby to where the chemicals/wastes are stored. • Vessel operators will have an up to date Shipboard Oil Pollution Emergency Plan (SOPEP) and Shipboard Marine Pollution Emergency Plan (SMPEP). All shipboard chemical and hydrocarbon spills will be managed in accordance with these plans by trained and competent crew. On board oily water disposal will be managed in accordance with the Marine Pollution Regulation 2006. The vessel operator will record the quantity, time and onshore location of the oily water disposal in the vessel Oil Record Book. • If vessels are equipped with an oily water filter system, they may discharge oily water after treatment to 15 ppm in an oily water filter system (providing they have a current calibration certificate for the bilge alarm) as required by MARPOL Annex I Regulations (for the prevention of pollution by oil). To discharge, the vessels will require a current IOPP certificate for oily water filtering equipment, and a current calibration certificate for the bilge alarm.	Construction

Impact	Mitigation measure	Timing
Damaged fuel tank associated with vessel collision	• Visual observations will be maintained by watch keepers on all vessels. • Regular notification to the following Australian Government agencies before and during operations: - The AMSA RCC of proposed activity, location and commencement date to enable an AusCoast warning to be issued. - The Australian Hydrographic Office of proposed activity, location and commencement date to enable a 'Notice to Mariners' to be issued. - In the event of a spill resulting in notification to AMSA, other sea users (e.g. fishing industry) will be informed of the incident via Marine Notices to prevent vessels entering an area where hydrocarbons have been released. • Vessel will operate in compliance with all marine navigation and vessel safety requirements in the International Convention of the SOLAS 1974 and the Navigation Act 2012. • Marine diesel oil compliant with sulphur content of maximum 0.5% m/m) is the only engine fuel to be used by the vessels, compliant with MARPOL Annex VI. • Oil spill responses will be executed in accordance with the vessel's SOPEP, as required under MARPOL.	Pre-construction, Construction
Maintenance activities	Design considerations such as burial of pipeline, sizing of the pipe and dosing of the intake structure are to be considered to reduce the need for maintenance activities.	Detailed design
	• The pipe and intake structure will be inspected prior to undertaking any maintenance activities particularly for those slow moving species such as syngnathids. • In the event that syngnathids are confirmed, syngnathids and the substrate they are attached to will need to be safely relocated away from the maintenance area prior to maintenance activities commencing.	Operation
Habitat creation	• The pipe may be buried to reduce the area of exposure for encrusting communities, where possible.	Detailed design
	• The pipe (internal) will be inspected during scheduled maintenance activities for any slow moving species such as syngnathids.	Operation
Species abundance and diversity	• Continuation of the Ocean Outfall Benthic Monitoring Program (as part of EPL 1771) throughout operation of the Project. • Integration of pipeline ecology and fish assemblage monitoring into the Ocean Outfall Benthic Monitoring Program for better understanding of potential changes in the species abundance and diversity.	Operation

Impact	Mitigation measure	Timing
Water quality	• Water quality monitoring program will be developed and implemented to identify long-term impacts from the discharge of brine concentrate on water quality or the marine environment. • Volume of chemicals in the aggregate, concentrations and discharge regimes (frequency) (inclusive of chlorine) that will be used during the desalination process will need to be adjusted and dosed in a manner so as to achieve desalination objectives and minimise harm to the marine environment to as low as reasonably practicable and/or as required by regulators.	Operation
Coastal Processes		
Disruption to dune vegetation systems, aeolian processes and associated dune stability leading to a potential increased rate of erosion	Implement a coordinated erosion monitoring and mitigation program in conjunction with the existing strategies and dune restoration project implemented for the adjacent WWTW, including: • Site profiling and revegetation following completion of civil works in accordance with the final design which is to comply with the Lake Macquarie Coastal Zone Management Plan (CZMP) (2015) and DLWC (2001). • Monitoring of recession and implementation of mitigation measures below as needed: - Beach management works such as beach scraping to reshape dunes and increase dune volume/recovery after storms if necessary. - Stabilisation of the frontal dune system by removing invasive species and replacing with locally indigenous dune vegetation. - Installation of sediment fences to minimise the movement of sands during construction. - Control offroad vehicle access and surface runoff. - Potential positive cumulative impact to align these works with Hunter Water's proposed dune protection and restoration project between the Belmont Golf Course and WWTW. • Ensure the public are prevented from entering works areas and potential areas of impact.	Construction, Operation
Consolidating or 'locking up' of coastal dunes by built infrastructure, removing the buffer for coastal erosion and increasing the risk of inland erosion	• The amended design situates the desalination plant behind the foredunes. Avoid locating the water treatment process plant and intake structures more seaward than is currently proposed in the concept design and minimise hardstand areas or structures that would consolidate the coastal dunes.	Detailed Design

Impact	Mitigation measure	Timing
Exposure of the subsurface transfer pipeline by coastal processes including beach level fluctuation and storm bite	• Ensure that infrastructure installed within the active portion of the beach profile is of sufficient depth such that it is below the limit of scour. Alternatively, modify the infrastructure design such that it can be exposed to wave action during extreme events, or ensure plant is decommissioned prior to risk levels increasing under future scenarios.	Detailed Design
	Monitor weather forecasts when working on the intake infrastructure and halt works when extreme coastal warnings are issued by the Bureau of Meteorology. • Prepare and implement a Natural Event Response Plan as part of the Construction Environment Management Plan (CEMP).	Construction
Risk of coastal erosion impacting the plant and associated pipelines under long term future or rare events	• Ensure that infrastructure does not extend into areas of present day erosion and recession risk without appropriate design measures and that the future risk level applied allows for the most conservative operational and decommissioning timeframes.	Detailed Design, Construction and Operation
	• Conduct consistency reviews at major design milestones against the EIS, AR, approval conditions and latest available literature including the Lake Macquarie CZMP (2015). It is understood that the EIS will have a 10 year validity period if approved, and as such it is likely that updated sea level rise guidance and coastal risk maps will be available in the interval between concept design and Project implementation. The review is required to ensure that the Project area remains acceptable from a coastal erosion risk perspective.	Operation
Aeolian sand ingress into the plant leading to operational maintenance issues	• Implement a coordinated erosion monitoring and mitigation program and update if required.	Operation
Wave overtopping impacting the desalination plant	• 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
Localised scour and modified nearshore wave transformation behaviour due to seabed infrastructure	Adopt pipeline and intake designs which minimise impacts to wave reflection and transformation, generation of localised eddy currents and obstructions to longshore transport.	Detailed Design, Operation
Social		
Access and connectivity	I**ntake structure** – As a minimum to consider public safety, an Access Management Plan for navigable waters would be prepared to address access to the waterway for construction and recreational use, in consultation with Roads and Maritime.	Pre-construction, Construction

Impact	Mitigation measure	Timing
Aboriginal Cultural Heritage		
Salvage of artefacts	Hunter Water will develop a care agreement in consultation with Aboriginal parties for the long-term care of Aboriginal objects. This will be integrated into the ACHMP.	Pre-construction, Construction
Unexpected Finds Procedure	An unexpected finds procedure will be prepared to provide a method to manage potential heritage constraints and unexpected finds during construction. If suspected Aboriginal objects are identified during construction, work should stop immediately and Bahtabah Local Aboriginal Land Council, DPIE and an archaeologist contacted to identify and record the objects. This procedure will be made accessible to all relevant employees and contractors working within the Project area via toolbox talks and display in break out rooms/ sites offices.	Pre-construction, Construction
Aboriginal Cultural Heritage Management Plan (ACHMP)	An Aboriginal Cultural Heritage Management Plan (ACHMP) will be formulated following approval of the Project to provide management and protection process for known and unknown Aboriginal objects and places.	Pre-construction, Construction
ACHMP Provisions	The ACHMP will include provision for the completion of the following activities. Additional inspection described within this Recommendation is referring to either further site inspection of A horizon soils after vegetation clearance or the monitoring of ground disturbance works during the works: • Surface collection of AHIMS #45-7-0397 (RPS BEL IF01) and AHIMS #45-7-0402 (RPS_IF2). • Additional inspection and surface collection of any artefacts exposed in the area mapped in Figure 5 of Appendix O as containing A horizon soils in a disturbed context. The opportunity to undertake the additional inspection and surface collection should be provided to an archaeologist and Aboriginal party representatives following vegetation clearance and respreading of A horizon soils currently within the bunds and adjoining area. • Additional inspection of the areas with the potential for intact A horizon soils mapped in Figure 5 of Appendix O, with the opportunity to undertake the additional inspection to be provided to an archaeologist and Aboriginal party representative following vegetation clearance and during earthworks (where the earthworks will occur within A horizon soils). Methodologies should be included for collection of surface artefacts.	Pre-construction, Construction
Site induction	All Hunter Water personnel and subcontractors involved in the proposed works will be advised of the requirements of the NPWS Act 1974 that it is an offence for any person to knowingly destroy, deface, damage or permit destruction, or defacement to an Aboriginal object or place without a relevant approval.	Pre-construction, Construction

Impact	Mitigation measure	Timing
Human Remains Protocol	In the event that skeletal remains are identified, work must cease immediately in the vicinity of the remains and the area must be cordoned off. The proponent must contact the local NSW Police who will make an initial assessment as to whether the remains are part of a crime scene or possible Aboriginal remains. If the remains are thought to be Aboriginal, DPIE must be contacted on Enviroline 131 555. A DPIE officer will determine if the remains are Aboriginal or not; and a management plan must be developed in consultation with the relevant Aboriginal stakeholders before works recommence.	Construction
Visual Amenity		
Minimise light spill into any adjoining landholding or dwelling	Lighting of the temporary barge for intake pipeline and intake structure construction methods will be required as per NSW Roads and Maritime Night Safety guidelines. This is required as to mitigate issues out at sea, ensuring that other vessels/water activity are able to clearly identify the equipment's location.	Construction
Non-Aboriginal Heritage		
Remnant tank traps	The exact location of the tank traps would be identified during detailed design to ensure potential impacts during construction are appropriately mitigated including provision of buffer zones.	Detailed Design
Traffic and Transport		
Traffic control	Hunter Water would ensure relevant requirements of AS 2890.2-2002 Parking facilities - Off-street commercial vehicle facilities are considered and documented in the CEMP for the Project.	Construction
Maritime traffic	• Pipe-laying related activities will be undertaken in accordance with all marine navigation and vessel safety requirements under the International Convention of the Safety of Life at Sea (SOLAS) 1974 and *Navigation Act 2012*. For the vessels, this requires equipment and procedures to comply with AMSA Marine Order - Part 30: Prevention of Collisions, and Marine Order - Part 21: Safety of Navigation and Emergency Procedures. • Stakeholder consultation (local councils, fishing bodies, etc.). • Notification to the following Australian Government agencies will be made prior to moving the pipe laying vessel on location: - The Australian Hydrographic Office of proposed activity, location (i.e. vessel location) and commencement date to enable a Notice to Mariners' to be issued. - The Australian Maritime Safety Authority (AMSA) Rescue Coordination Centre (RCC) of proposed activities, location (i.e. vessel location) and commencement date to enable an AusCoast warning to be issued. • Vessels will also be equipped with all navigational and safety requirements for operation in Australian waters. These may include an automatic identification system (AIS) and an automatic radar plotting aid (ARPA) system capable of identifying, tracking and projecting the closest approach for any vessel (time and location) within radar range (up to approximately 70 km). • Visual observations will be conducted by trained watch keepers on all vessels 24 hours per day to support management of collision risk or entanglement/interference with other users.	Pre-construction, Construction

Impact	Mitigation measure	Timing
Noise and Vibration		
Noise and vibration – high noise intensive works	Hours for highly noise intensive works will be undertaken in accordance with the EPA's requirements detailed in Section 2.4.8.5.	Construction
Noise and vibration – conditions of approval	Hunter Water will commit to undertaking the required Noise and Vibration specifications in the conditions of approval.	Design
Waste Management		
General	Tracking of vehicles transporting waste will be undertaken, including the origin and destination of the waste. Records will be kept for a minimum of four years.	Throughout the Project duration

4. Evaluation of merits

4.1 Project justification

4.1.1 Benefits of the Project

The objective of the Project is to provide a climate independent source of water to help secure the Lower Hunter's water supply during extreme drought, and maintain environmental, social and economic benefits for the region.

In the rare event this drought scenario occurs, the consequences of not taking swift action are extreme and severe. Hunter Water would need to dramatically reduce supply to households and businesses, or in the worst case scenario, the Lower Hunter runs out of water. Either scenario results in extreme social, economic and environmental costs.

Hunter Water commenced design and environmental assessments for the Project to ensure the desalination plant would be operational in the unlikely event overall storages reach 15 per cent. While the chance of such an extreme drought is extremely low, the consequences to the region are severe. These consequences are further described in Section 4.1.2.

The key benefits of the Project include:

- Avoiding financial and non-financial costs for households and businesses related to more severe water restrictions and/or prolonging existing water storages
- Improving the resilience of the Lower Hunter to drought, by reducing the probability of running out of water
- Ensuring minimal disruption to business, households and the environment

4.1.2 Consequences of not proceeding

If the Project does not proceed and an extreme drought occurs, the Lower Hunter region is at risk of running out of water. Hunter Water would be forced to put in place severe and drastic limits on water use as water storages fell below 30 per cent and 15 per cent. At water storage levels below 30 per cent the following limitations and resulting impacts may occur.

- All outdoor potable water use banned, no irrigation of open space or vegetation for any reason
- Intense awareness campaign: residential customers asked to take 3 minute shower or shower every second day, halving clothes washing, and repairs to any leaks
- Compulsory implementation of 'water efficiency management plans' by all businesses
- High-use businesses encouraged to windback operations
- No potable water use for dust or coal suppression or construction activities – tankering only
- Reduced water pressure across the water network to reduce flow rates
- Low water pressure raises the risk of water quality problems from infiltration, potential contamination at points within the network, backflow systems at risk of not functioning.
- Boiled water alerts
- Planning underway to shut down parts of the water distribution system and ration supply
- Wastewater system not functioning as designed – pipe blockages, tree root incursion, significant odour problems, much higher treatment costs given low flows

At water storage levels below 15 per cent, the limits on water use would increase and impacts would become more severe. For those customers receiving supply, there would be harsh limits on types of water use. Residential consumption must be reduced to around 45 litres per person, per day. For example, this may consist of:

- 6 L per day for all drinking, cooking and hand washing
- One minute shower or 3 minute once a week.
- One load of washing per week
- One sink of water per day for dishes
- 2 flushes of toilet per day
- One 5 L bucket of water for house cleaning

Water quality problems in those parts of the reticulation system still functioning, would lead to further shutdowns due to difficulty in maintaining chlorine residual throughout the system, and subsequent breaches of Australian Drinking Water Guidelines.

Insufficient pressure in parts of the water distribution system would lead to additional shutdowns. This would result in customers having to collect containers of water from standpipes located throughout the network or bottled water from depots.

Non-essential businesses would be closed or only operating if other supplies available, such as tankered water or recycled water. There would be a focus on maintaining critical supplies to hospitals, aged care facilities and schools.

Hunter Water's wastewater transport and treatment systems would not be functioning or barely functioning: there would be tree root blockages and odour problems throughout the network and major problems at treatment plants due to anoxic conditions causing wastewater system failure and damage to assets.

Finally, there would be general risks to public health from poor access to potable water, poor sanitation practices and a non-functioning sewerage system.

4.1.3 Consistency with objects of the EP&A Act

The Project's consistency or otherwise with Section 1.3 of the EP&A Act is summarised in Table 4-1.

Table 4-1 Compliance with the Section 1.3 Objects of Act

Object	Comment
(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,	The Project's key objective is to slow the depletion of existing water storages in the event of an extreme drought. The increase in capacity of the amended Project would help to address additional vulnerability to extreme drought identified during Hunter Water's review of the 2014 LHWP. This would likely provide a long-term positive impact for a range of local and regional businesses and the broader community.
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,	Ecologically sustainable development (ESD) is considered in Section 4.1.4. For the reasons discussed in that Section, the Project is considered to be consistent with the principles of ESD.

Object	Comment
(c) to promote the orderly and economic use and development of land,	The water treatment plant would be within Hunter Water-owned land, making use of existing Belmont WWTW infrastructure, ensuring associated impacts are generally restricted to existing Hunter Water assets. The direct ocean intake would be constructed on Crown Land, however, would be located below ground where it traverses the beach and surf zone and so would not impact on the existing use of this land once constructed.
(d) to promote the delivery and maintenance of affordable housing,	Not relevant to the Project.
(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,	The amended Project would impact on 0.51 ha of native vegetation. This includes vegetation which is commensurate with the EEC listed under the BC Act as Sydney Freshwater Wetlands in the Sydney Basin Bioregion. As a result of amendments to the Project area ecosystem credits will be obtained through the NSW Biodiversity Offset Scheme to offset the impacts of the Project on native vegetation and potential threatened species habitats. Additionally, mitigation measures, including a Native Vegetation Rehabilitation Plan will be implement to protect threatened and other species of native animals and plants, ecological communities and their habitats. The construction of the amended Project would impact directly on approximately 104 m^2 (HDD method) or 2,200 m^2 (micro tunnelling method) of open sandy sediment habitat which is widely represented in the wider area. Indirect construction impacts associated with the use of vessels and associated barges and plants (e.g. noise, light, waste, pest introduction, marine collision, accidental spills and collisions) are reduced to as low as reasonably practicable with the implementation of management controls and mitigation measures. Operational impacts (e.g. impingement and entrainment, maintenance activities) associated with the amended Project are unlikely to significantly impact on marine threatened and protected species and their habitats. Mitigation measures will be implement to protect threatened and other species of native animals and plants, ecological communities and their habitats.
(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),	In relation to Aboriginal heritage, a comprehensive ACHA process was completed for the Project in consultation with the RAPs for the Project. Hunter Water has incorporated a range of controls to minimise impacts on Aboriginal and non-Aboriginal heritage, including heritage inductions and preparation of an ACHMP.
(g) to promote good design and amenity of the built environment,	Potential visual amenity impacts have been considered in Section 3.5.2.8 and 3.6.2.8. The Project addresses the requirement to promote good design by ensuring re-use of aspects of the Project, where practicable.

Object	Comment
(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,	All buildings associated with the Project would be constructed to appropriate Australian standards, including consideration to the health and safety of their occupants.
(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State,	There has been ongoing consultation with both local and State government representatives throughout the Project planning and environmental assessment process (Section 2.2.3).
(j) to provide increased opportunity for community participation in environmental planning and assessment.	The community has been involved in the environmental planning and assessment process through consultation (Section 2.2.3).

4.1.4 Ecologically sustainable development

The principles of ecologically sustainable development are defined under the EP&A Regulation (Schedule 2) as:

(a) the precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options,

(b) inter-generational equity, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

(c) conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,

(d) improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

These principles are addressed in turn, as they pertain to the Project, in the following sections.

4.1.5 The precautionary principle

This principle states ‘if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation’.

Evaluation and assessment of alternative options has aimed to reduce the risk of serious and irreversible impacts on the environment. Stakeholder consultation considered issues raised by stakeholders and a range of specialist studies were undertaken for key issues to provide accurate and impartial information to assist in the design development process.

The amendment to the concept design has sought to minimise impacts on the amenity of the study area while maintaining engineering feasibility and safety for the Project. A number of management measures have been identified during the preparation of the EIS, in response to the submissions received during the EIS exhibition period and as a result of assessment of the amended design in this Amendment Report to minimise potential impacts. These management measures would be implemented during construction and operation of the Project. No management measures have been postponed as a result of lack of scientific certainty.

A CEMP would be prepared before construction starts. No management measures or mechanisms would be postponed as a result of a lack of information.

4.1.6 Intergenerational equity

This principle states, ‘the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations’.

The Project has been developed to improve water security for current and future generations. The Project has been designed to minimise environmental impacts for current and future generations. The EIS and this Amendment Report have utilised a risk-based approach to identify potential Project impacts and appropriate mitigation measures to reduce impacts to an acceptable level. As a result of this approach, the Project would not result in significant adverse impacts on the health, diversity or productivity of the environment for future generations, provided that the mitigation measures summarised in Appendix E are implemented.

While the construction and operation of the amended Project would increase energy use compared with the EIS Project, resulting in greenhouse gas emissions contributing to climate change, these emissions have been estimated to be minor in the context of Australia’s greenhouse gas emissions as a whole (Section 3.5.2.9 and 3.6.2.9). The potential greenhouse emissions associated with the amended design have been reduced, including potential for incorporating energy recovery devices into the reverse osmosis system. In addition mitigation measures have been identified in the EIS which would reduce the greenhouse gas impact of the Project, including the adoption of energy reduction targets and measures to reduce the embodied carbon in construction materials.

Moreover, an infrastructure sustainability assessment has been completed for the EIS and the amended Project (Section 3.5.1 and 3.6.1) using assessment criteria from the Infrastructure Sustainability Council of Australia (ISCA) IS rating scheme. The IS rating scheme is broad-ranging and includes criteria for a range of matters of relevance to intergenerational equity, including resource efficiency, greenhouse gas emission reductions, waste avoidance and recovery and conserving ecological and heritage values, amongst others. By assessing the Project against these criteria and identifying measures to reduce impacts, intergenerational equity impacts have been reduced on the Project.

Further assessment of network storage capacity, water delivery options, supply constraints, restricted demand and plant components was undertaken during the design process of the EIS Project. This identified that the increased capacity of the amended Project would more effectively contribute to reducing the depletion of water storages in an extreme drought than the EIS project. The increased infrastructure and energy use associated with the amended Project has been assessed to result in negligible impacts to climate change and sustainability compared with the EIS Project. The increased capacity of the amended Project would therefore result in a greater benefit to current and future generations through improved water security when compared with the EIS Project.

4.1.7 Conservation of biological diversity and ecological integrity.

This principle states the 'diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'.

An assessment of the existing local environment was undertaken to identify and manage any potential impacts of the Project on local biodiversity. The amended Project has been designed to minimise impacts upon biological diversity and ecological integrity. This includes the selection of a pre-existing brownfield site (Belmont WWTW) over a greenfield site which would ultimately result in reduced impacts on biological diversity and ecological integrity.

The Project would impact on a small area of native vegetation, which would require offsetting under the NSW Biodiversity Offsets Scheme, however this would not have a significant impact on biological diversity and ecological integrity. A terrestrial biodiversity assessment and marine assessment have been complete for the EIS and amended Project and appropriate site-specific management measures are provided in Section Appendix E.

4.1.8 Improved valuation, pricing and incentive mechanisms

This principle requires 'costs to the environment should be factored into the economic costs of a proposal'.

The EIS Amendment Report has examined the environmental consequences of the proposal and identified measures to manage the potential for adverse impacts during the preparation of the EIS, in response to the submissions received during the EIS exhibition period and as a result of assessment of the amended design to minimise potential impacts. While the implementation of these mitigation measures would represent an upfront cost for the Project, the mitigation measures would avoid the costs to society of potential environmental impacts. Moreover, the costs of mitigating environmental impacts would be factored into the total cost for the Project. In this way, the costs of the potential environmental impacts of the Project would be appropriately incorporated into the cost of the asset.

4.2 Summary

It is anticipated that the amended Project described in this Amendment Report would not have any significant adverse environmental impacts as a result of construction or operation. Obtaining planning approval would provide significant benefit to the local and wider community, ensuring the Project can be deployed quickly in the event of extreme drought.

Despite the Project amendments, the objectives remain the same: provide a rainfall independent water source in the event of an extreme drought, and slow the depletion of existing water storages in the event of an extreme drought.

Hunter Water is seeking a 10 year approval term for the EIS, during which time further Project stages (including detailed design) will be instigated based on water storage levels. Following completion of the detail design stage, there would be a hold point when construction is commenced. While the 2014 LHWP included a trigger level for commencing construction at around 35 per cent total water storage, Hunter Water proposes to amend the trigger for construction to commence at 45 per cent total water storage level. The construction trigger has been revised as a result of the Project development following the EIS exhibition, with more information becoming available on lead times for key components. It is likely that some procurement and pre-construction activities would be instigated prior to 45 per cent total water storage reaching the trigger level, to ensure the plant can be operational no later than 15 per cent total water storage level. These triggers will continue to be reviewed in order to defer construction to as late as possible to increase the chance of storages recovering from rain, whilst ensuring adequate lead times are provided for construction.

The Project would be implemented as a last resort if water storage levels reach a critical point to ensure water security. The Project would have the capacity to produce up to approximately 30 ML/d of potable water for supply to the local Hunter Water network.

The desalination plant would be run until an appropriate trigger point is reached in total water storage level, currently set at around 35 per cent. At the trigger level operation would cease and the desalination plant would be mothballed. It could then be turned back on at short notice if the operational trigger is reached once again.

The Project does have potential to have short-term impacts during construction works; however, these impacts would be managed through the adoption of appropriate and targeted environmental management and mitigation measures identified in this Amendment Report and summarised in Appendix E.

As outlined in Sections 1.1 and 4, the Project is a robust response to a recognised need and provides a number of benefits. The EIS and Amendment Report have demonstrated that the Project is in the public interest and is consistent with the objects of the EP&A Act and the principles of ESD.

The consequence of the Project not proceeding would compromise water security in the lower Hunter Region. Hunter Water would not be able to slow the depletion of water storages by supplementing supply with desalinated water, which is the only available water source that is not dependent upon rainfall.

The EIS and Amendment Report have documented the potential environmental impacts of the Project, considering both negative and positive impacts. The concept design has been informed by the detailed assessment of potential environmental impacts. This has minimised impacts on the environment while maintaining feasibility. The EIS and Amendment Report have demonstrated that the Project would not have a significant environmental impact, through the implementation of the proposed management and mitigation measures, and the beneficial effects of the Project are considered to outweigh negative impacts, which would generally be temporary in nature.

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6. Glossary

Term/acronym	Definition
ACHA	Aboriginal Cultural Heritage Assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AR	Amendment Report
ARI	Average Recurrence Interval
ASS	Acid sulphate soil
ASSMP	Acid Sulphate Soils Management Plan
AVTG	Assessing Vibration: a technical guideline
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016*
BCD	Biodiversity Conservation Division
BDAR	Biodiversity Development Assessment Report
CEMP	Construction Environmental Management Plan
CZMP	Coastal Zone Management Plan
DAWE	Department of Agriculture, Water and the Environment
DCP	Development Control Plans
DECCW	Department of Environment, Climate Change and Water
DoI	Department of Industry
DOI	Direct Ocean Intake
DotEE	Department of the Environment and Energy
DP	Deposited plan
DPE	NSW Department of Planning and Environment
DPI	NSW Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EEC	Endangered ecological communities
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically sustainable development
FM Act	*Fisheries Management Act 1994*
FTE	Full time equivalent
GREP	NSW Government Resource Efficiency Policy
HCS	Hydraulic control structure
Heritage Act	*Heritage Act 1977*
HNEH	Hunter New England Health
Hunter Water	Hunter Water Corporation
ICNG	Interim Construction Noise Guideline
kV	Kilo volt
L/s	Litres per second
LCZ	Landscape Character Zone
LEP	Local Environmental Plan
LGA	Local Government Area
LHWP	Lower Hunter Water Plan
LMSNA	Lake Macquarie Sustainable Neighbourhood Alliance

Term/acronym	Definition
ML/d	Mega litres per day
MPN	Most probable number
MW	Megawatt
Native Title Act	*Native Title Act 1993*
NPI	National Pollutant Inventory
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PHA	Preliminary Hazard Analysis
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997*
RAPs	Registered Aboriginal Parties
RF Act	*Rural Fires Act 1997*
RO	Reverse osmosis
Roads Act	*Roads Act 1993*
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SIA	Social Impact Assessment
SMP	Sustainability Management Plan
SRD	State and Regional Development
SSI	State Significant Infrastructure
SWMP	Soil and Water Management Plan
TfNSW	Transport for New South Wales
WM Act	*Water Management Act 2000*
WQO	Water Quality Objective
WWTW	Wastewater Treatment Works

Appendices

Appendix A – Submissions summary

Appendix B – Register of submitters

Appendix C – Stakeholder Consultation Letters

Appendix D – Updated Project Description

Appendix E – Updated management and mitigation measures

Appendix F – Amended Project Conceptual Design Drawings

Appendix G – Contamination Assessment

Appendix H – Mine Subsidence Assessment

Appendix I – Stormwater Assessment

Appendix J – Groundwater Assessment

Appendix K – Biodiversity Development Assessment Report

Appendix L – Marine Assessment

Appendix M – Brine Discharge Modelling Report

Appendix N – Coastal Processes Assessment

Appendix O – Aboriginal Cultural Heritage Assessment Report

Appendix P – Traffic Assessment

Appendix Q – Noise and Vibration Impact Assessment

Appendix R – Landscape Character and Visual Impact Assessment

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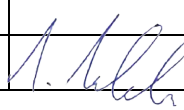
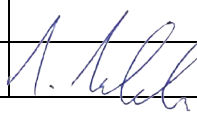
Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	M. Kiejda	N. Malcolm		N. Malcolm		29/06/2020
1	M. Kiejda	N. Malcolm		N. Malcolm		30/07/2020
2	M. Kiejda	N. Malcolm		N. Malcolm		27/08/2020

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