Belmont Permanent Desalination Plant – Modification 1: Traffic and Transport Assessment

Document no:
IA411110_BelmontDesal_Mod_Traffic_Assessment_20231221_Final

Version: V003

Hunter Water
SR00413

Belmont Desalination
21 December 2023

Belmont Permanent Desalination Plant – Modification 1: Traffic and Transport Assessment

Client name:	Hunter Water		
Project name:	Belmont Desalination		
Client reference:	SR00413	**Project no:**	IA411110
Document no:	R001	**Project manager:**	Rachel Vazey
Version:	V003	**Prepared by:**	Rachel Vazey
Date:	21/12/2023	**File name:**	IA411110_BelmontDesal_Mod_Traffic_Assessment_20231221_Final_1

Document status: Final

Document history and status

Version	Date	Description	Author	Checked	Reviewed	Approved
V001	7/12/2023	Draft	J Zhang R Conrad	R Vazey	M Mansour	
V002	18/12/2023	Draft	R Conrad	R Vazey	M Luger	
V003	20/12/2023	Final	R Conrad	R Vazey	M Luger	M Luger

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Executive summary

Overview

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces on the 23 July 2021. The approved Project involves the construction and operation of a drought response desalination plant producing up to 30 megalitres per day (ML/day) including seawater intake infrastructure; desalination units; brine discharge via existing ocean outfall; electricity/water supply; ancillary works. The approved Project is being developed on land (Part Lot 1 DP 433549) at 12a Ocean Park Road, Belmont South ('the Project area') that comprises a portion of the Belmont Waste Water Treatment Works (WWTW) which is located to the southeast of the town of Belmont, NSW within the Lake Macquarie Council local government area (LGA).

An Environmental Impact Statement (EIS) and Response to Submissions and Amendment Report were submitted to the Department of Planning and Environment (DPE) in November 2019 and August 2020 respectfully, for the State Significant Infrastructure (SSI) project. Hunter Water proposes modifying the approved Project, from a drought response desalination plant with a 30 ML/d capacity (the approved Project) to a desalination plant that is permanently available for operation with the same capacity. Some other changes to the design and construction have also been identified by Hunter Water during design refinement which also require assessment as part of this modification and which together are referred to as the 'Proposed Modification'.

Changes associated with the Proposed Modification that may impact construction and operation traffic and include:

- Increases in heavy vehicle movements primarily to cater for the increased volume of fill required to raise the area beneath the building are footprint 1.5 – 2.5 metres higher than that previously assessed
- Increases in light vehicle movements to cater for the increase in construction workforce required on site.

Key changes in construction traffic during the Proposed Modification include:

- Increase in construction workforce numbers peaking at around 215 Full Time Equivalent (FTE) construction personnel
- Increase in heavy vehicle movements to about 10,000 vehicle movements over the three year duration of construction (peaking at around 180 – 200 heavy vehicle movements per day – equating to around 10 inbound and 10 outbound per hour which is an increase from 15 heavy vehicles per day) to cater for the increased volume of fill required, transport of pipe segments and other construction material
- Increase in light vehicle movements to around 72,000 over the three year duration of construction (peaking at around 430 light vehicles movements a day which is an increase from around 144 per day) to cater for the increase in construction workforce required on site. Generally, around 80% of the staff (i.e. 172 of the 215 FTE peak) would arrive before the start of the day shift which is scheduled to start at 7AM and around 80% (i.e. 172 of the 215 FTE peak) would depart after the end of the day shift which is scheduled for 6PM
- Light vehicle movements required for the FTE staff would also vary over the 36 months as follows:
  - The first 11 months 18 - 82 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months 147 - 215 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months 32 - 79 light vehicles inbound in the morning and repeated in the afternoon.

The purpose of this Traffic and Transport Assessment is to assess the changes in traffic and transport impacts associated with the construction phase of the Proposed Modification. Revised Secretary's Environmental Assessment Requirements (SEARs) issued on the 24 January 2018 for the EIS and the Amendment Report completed for the Project required an assessment of the construction and operational traffic and transport

impacts in accordance with current guidelines including RMS' *Guide to Traffic Generating Developments 2002* and *Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development*. This included:

- Consideration of current and anticipated traffic counts for the main traffic routes and intersections
- Identification of anticipated vehicular traffic generated during construction and operation and the relevant peak periods for traffic generated in these stage
- Capacity of utilised roads and intersections as well as the anticipated future impacts of other proposed developments in the area
- Traffic analysis using SIDRA or similar traffic model
- Detail of any other impacts upon the regional or state road network, including consideration of pedestrian, cyclist and public transport facilities and service vehicles
- Identification of necessary road network infrastructure upgrades.

No additional SEARs have been issued by the Department of Planning and Environment (DPE) in response to the Scoping Letter (dated 8 November 2023) for this EIS Modification.

Methodology for the updated assessment

A traffic and transport assessment was included in the EIS and an updated traffic assessment was completed for the Amendment Report. Due to the significant changes to construction traffic for the Proposed Modification an updated Traffic and Transport Assessment has been completed using the following methodology:

- The SIDRA traffic model used for the traffic assessment in the Amendment Report has been updated with the revised heavy and light vehicle traffic volumes for the Proposed Modification during the AM peak hour and the PM peak hour for the Beach Street and Pacific Highway intersection
- An assessment of the intersection performance through an average delay per vehicle, Level of Service (LoS), and 95th percentile queue approach has been completed which uses the base traffic conditions (without project) (2024) and the updated construction traffic volumes (2024)
- Results of the SIDRA modelling has been reviewed to analyse impacts of the changed traffic scenarios on the public and active transport networks
- An assessment of impacts due to the use of Over Size, Over Mass (OSOM) vehicle movement and other modes of transport required for the Proposed Modification has been completed.

Results of assessment

The results from the traffic modelling indicates that the overall impact of the construction traffic on the existing transport network is expected to be minimal as a result of the Proposed Modification. The LoS at the Pacific Highway / Beach Street intersection is expected to remain at LoS A as a result of increased traffic from the Proposed Modification. Further, the potential impacts to public transport, active transport, and other modes of transport is expected to be negligible or have minor impacts. Measures to manage new impacts have been provided.

Mitigation measures

The traffic and transport mitigation measures included in the EIS and Amendment Report have been reviewed. A Construction Traffic Management Plan (CTMP) has already been identified and would be implemented by the construction contractor to minimise potential impacts of the Project. Relevant traffic safety measures have already been included in the CTMP would be traffic control and signage, driver conduct, safety protocols and management of OSOM vehicles.

Additional measures have been identified for inclusion in the CTMP following the assessment of the Proposed Modification. This includes measures to manage the impacts of the increased volumes of heavy and light vehicles on the surrounding road network, some additional road safety measures to manage pedestrians and cyclists, inclusion of a Driver Code of Conduct and a measure to notify emergency services of any traffic disruption.

A separate OSOM Transport Management Plan and a separate Helicopter Transport Management Plan will be prepared to manage impacts associated with the Proposed Modification. The OSOM Transport Management Plan will include a detailed overview of management measures for the OSOM movements, including identification of route, escort measures, time of transporting and a communications strategy.

The Helicopter Transport Management Plan will include mitigation measures to manage helicopter movements to and from the Lake Macquarie Airport and the jack-up barge, including details of flight paths, a schedule for operations that minimises out of hours flights where possible, and a protocol for interactions with other airport users including emergency services who will be given precedence at all times.

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Appendices

Tables

Figures

1. Introduction

1.1 Background

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces on the 23 July 2021. The approved Project (refer to **Figure 1-1**) involves the construction and operation of a drought response desalination plant producing up to 30ML/day including seawater intake infrastructure; desalination units; brine discharge via existing ocean outfall; electricity/water supply; ancillary works.

An Environmental Impact Statement (EIS), Response to Submissions and Amendment Report (Amendment Report) were submitted to the Department of Planning and Environment (DPE) in November 2019 and August 2020 respectfully, for the State Significant Infrastructure (SSI) project. Hunter Water proposes to modify the approved Project, from a drought response desalination plant with a 30 megalitres per day (ML/d) capacity (the approved Project) to a desalination plant that is permanently available for operation with the same capacity. Some other changes to the design and construction have also been identified by Hunter Water during design refinement which also require assessment as part of this modification and which together are referred to as the 'Proposed Modification'. Further description of the Proposed Modification is included in **Chapter 2.**

1.2 Location

The approved Project is being developed on land (Part Lot 1 DP 433549) at 12a Ocean Park Road, Belmont South ('the Project area') that comprises a portion of the Belmont Waste Water Treatment Works (WWTW) which is located to the southeast of the town of Belmont, NSW within the Lake Macquarie Council local government area (LGA), refer to **Figure 1-2**.

1.3 Purpose of this report

The purpose of this Traffic and Transport Assessment is to assess the changes in traffic impacts associated with the construction phase of the Proposed Modification. Revised Secretary's Environmental Assessment Requirements (SEARs) issued on the 24 January 2018 by the Secretary of the then NSW Department of Planning, Industry and Environment, now the Department of Planning and Environment (DPE). The SEARs were assessed as part of the EIS and the Amendment Report completed for the Project approval. The SEARs relevant to this assessment of the Proposed Modification are presented in **Table 1-1**.

Table 1-1 Secretary's environmental assessment requirements

SEARs - Traffic	Relevant section
An assessment of construction and operational traffic and transport impacts in accordance with current guidelines including TfNSW's *Traffic Modelling Guidelines (2013)* for the following items:	
Current and anticipated traffic counts for traffic routes and intersections	Section 4
Identification of anticipated vehicular traffic generated during construction and operation and the relevant peak periods for traffic generated in these stages	Section 4
Capacity of utilised roads and intersections as well as the anticipated future impacts of other proposed developments in the area	Section 5
Traffic analysis using SIDRA or similar traffic model	Section 5
Detail of any other impacts upon the regional or state road network, including consideration of pedestrian, cyclist and public transport facilities and service vehicles	Section 5

SEARs - Traffic	Relevant section
Identification of necessary road network infrastructure upgrades.	Section 6

No additional SEARs have been issued by the DPE in response to the Scoping Letter (dated 8 November 2023) for this EIS Modification.

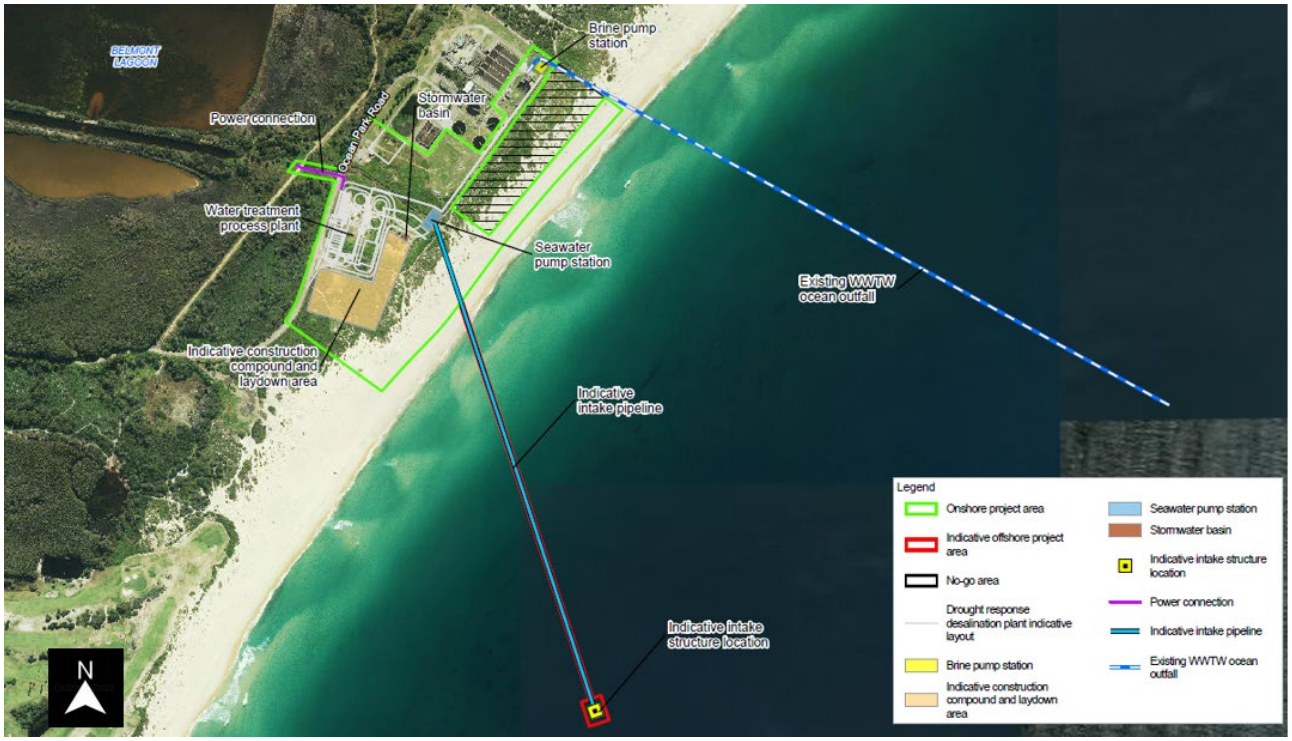


Figure 1-1 The approved Project (from GHD, 2020)

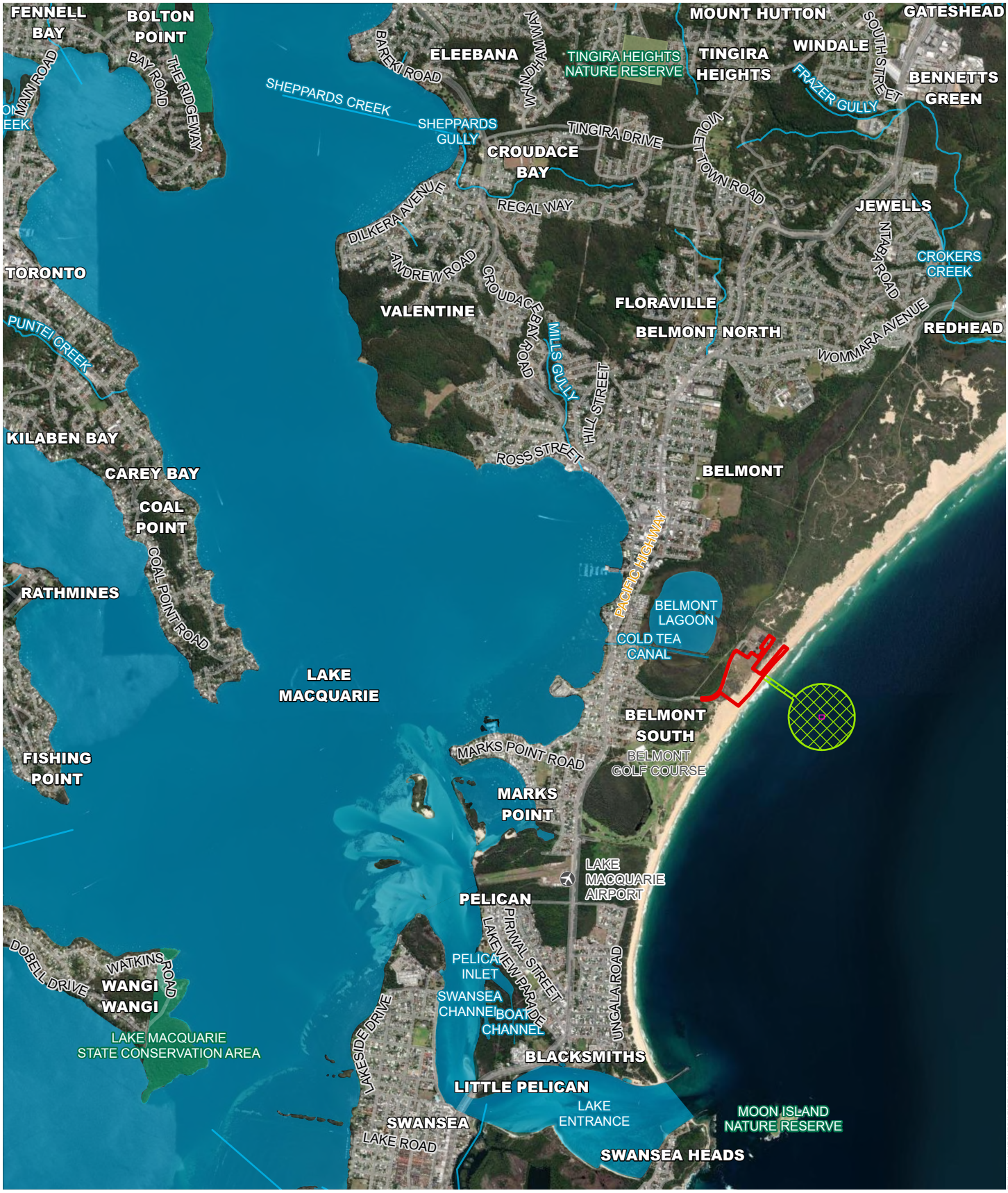


Figure 1-2 Locality

2. Description of the Proposed Modification

2.1 The Proposed Modification

Key elements of the Proposed Modification are shown in **Figure 2-1** and include the following (noting some further refinements may occur during compilation of the Modification):

- A 30 ML/d desalination plant that is permanently available for operation
- Infilling to raise the area underneath the building and infrastructure footprint by between 1.5 and 2.5 metres to a height of around 3.8 - 4.3 metres Australian Height Datum (AHD), to cater for the 1 in 100 year flood event under predicted climate change conditions
- Increase in building area footprint (but all located in the approved Project footprint)
- Increase in height of the lime tower up to 15 metres above the infilled ground level
- Relocation of the Direct Ocean Intake (DOI) system, further to the north, resulting in a decrease in the length of the ocean intake pipeline to around 850 metres
- Increase in the diameter of the DOI marine intake structure to up to 14 metres
- Increase in the size of DOI elements including the on-shore seawater pump station structure, ocean intake pipeline and riser which connects the ocean intake pipeline to the above seafloor intake structure to allow for future proofing of the system
- Option of an underground brine pipeline (between the desalination plant and the Belmont WWTW) in addition to the approved Project above ground pipeline option
- Power connection changed to a dual 11 kilovolt (kV) system that would tie into the existing network located to the south-west of the Project area. This would require a 200 metre long upgrade to an underground/overhead power supply under or on the southern side of Ocean Park Road at the south west end of the approved Project footprint. The 33 kV power connection identified in the approved Project would be removed (refer to **Figure 1-1**). There would also be a new 11kV power connection from the sub-station at Pelican to the Hunter Water gate however this would be assessed separately by AusGrid
- Change in the approved Project footprint associated with the realigned marine elements and the change in power supply connection described above
- Change in stormwater management
- Some aspects of the construction methodology have changed and include:
  - Small changes in the dredging impact area at the proposed ocean intake site and inclusion of an additional option to dispose of dredged material in Coastal Waters at an approved marine reception area
  - Inclusion of a larger crane (up to 700 tonne (t)) that would be up to 60 metres above sea level on the offshore jack-up barge during construction of the DOI offshore elements. The offshore jack-up barge would also include onsite accommodation for construction staff working shifts
  - A helicopter would be used to transfer construction personnel and materials to and from the offshore jack-up barge to construct intake structure of the DOI offshore elements and generally there would not be more than 24 flights per day and around 3,000 flights in total for around 8 months allowing time for weather contingencies
  - Change of the construction ancillary facilities location from the southern end of the Project area to the northern end of the Project area

- A requirement for out of hours work (OOHW) during construction including 24 hours 7 days per week (24/7) over a 9-12 month period associated with the micro Tunnel Boring Machine (micro-TBM) activities for the DOI pipeline.
- Some short duration OOHW associated with some crane lifts to avoid windy weather periods in the early morning; a small amount of light and heavy vehicle movements, and some cut-over and commissioning activities
- Some changes to the plant and equipment required to construct the Project
- Increase in project construction duration to 36 months
- Increase in construction workforce numbers peaking at around 215 Full Time Equivalent (FTE) construction personnel
- Increase in heavy vehicle movements to about 10,000 vehicle movements over the three year duration of construction (peaking at around 180 – 200 heavy vehicle movements per day – equating to around 10 inbound and 10 outbound per hour which is an increase from 15 heavy vehicles per day) to cater for the increased volume of fill required, transport of pipe segments and other construction material
- Increase in light vehicle movements to around 72,000 over the three year duration of construction (peaking at around 430 light vehicles movements a day which is an increase from around 144 per day) to cater for the increase in construction workforce required on site. Generally, around 80% of the staff (i.e. 172 of the 215 FTE peak) would arrive before the start of the day shift which is scheduled to start at 7AM and around 80% (i.e. 172 of the 215 FTE peak) would depart after the end of the day shift which is scheduled for 6PM.

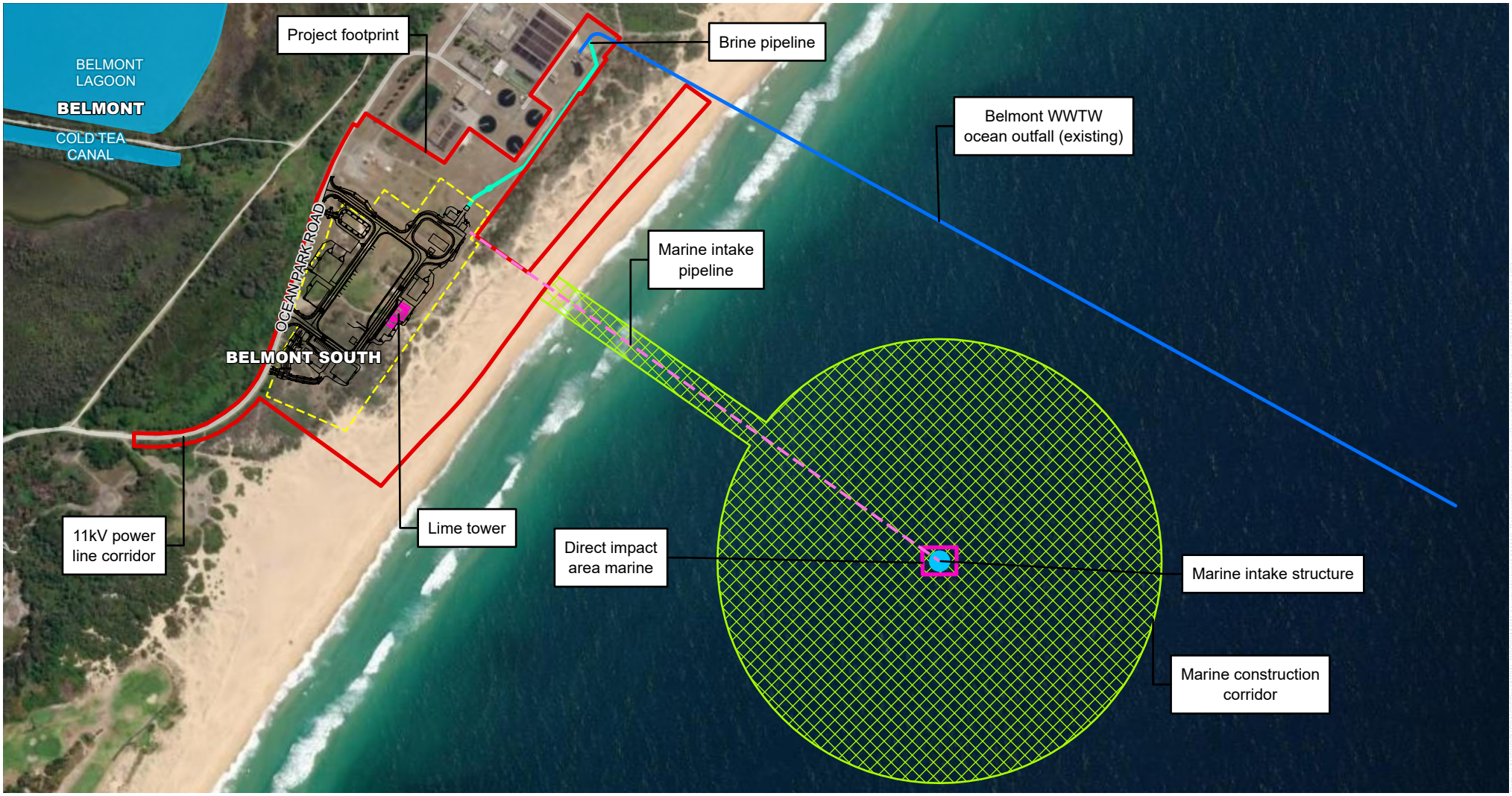


Figure 2-1 Key elements of the Proposed Modification

3. Relevant policy documents

3.1 NSW Legislation

3.1.1 Environmental Planning and Assessment Act 1979

Project approval

The Belmont Drought Response Desalination Plant was approved as SSI-8896 by the then New South Wales (NSW) Minister for Planning and Public Spaces under Division 5.2 of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on the 23 July 2021 following submission of an EIS and Amendment Report to DPE in November 2019 and August 2020 respectively. The Project is identified as a State Significant Infrastructure (SSI) project as it satisfies Clause 4(1) of the then 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.

Proposed Modification

Under Section 5.25 of the EP&A Act, a proponent may request the Minister to modify the approval for State Significant Infrastructure. Such approval is required if the infrastructure as modified is not consistent with the existing approval issued under section 5.13 of the Act. After consultation with the DPE, Hunter Water considers that the Project as modified is not consistent with the Minister's approval under Section 5.13 of the EP&A Act. Therefore, a Modification Report has been prepared to support a request by Hunter Water for the Minister to modify the approval to allow the changes discussed in **Section 2** of this Report. An updated Traffic and Transport Assessment (this report) has been completed to assess the construction traffic impacts of the Proposed Modification as part of the Modification Report. The Minister may modify the approval with or without changes to the (existing) conditions of approval.

3.2 NSW Guidelines

3.2.1 Transport for NSW (TfNSW) Traffic Modelling Guidelines (2013)

The TfNSW (2013) T*raffic Modelling Guidelines* are designed to provide guidance in modelling for developing consistency in traffic modelling practice and promote high quality model outputs leading to high quality project design. The scope of work includes data collection, model development, calibration, validation, forecasting, congestion, and road performance assessments. The guideline outlines the following:

- Data requirements for traffic modelling including traffic volume, land use, road network, and other parameters to build traffic models.
- Modelling techniques and software suitable for different road projects. This includes microsimulation, macroscopic modelling, mesoscopic simulation, strategic modelling, and other approaches of simulating traffic behaviour.
- Ensuring the accuracy and reliability of models through quality assurance i.e., using reliable data sources, appropriate model selection, and rigorous calibration processes.
- Utilising traffic models in the planning and design phases of projects to forecast traffic demand, assess the impact of new developments, optimise traffic flow, and analyse for improvements.
- Proper documentation of the modelling process including assumptions made and results obtained, for stakeholders to understand the decision making process using the traffic models.

4. Assessment methodology

4.1 Background

This assessment considers the traffic and transport impacts associated with changes from the Proposed Modification to the approved Project. Therefore, this report should be read in conjunction with project reports including:

- *Belmont Drought Response Desalination Plant – Environmental Impact Statement* (GHD, November 2019)
- *Belmont Drought Response Desalination Plant – Appendix O: Traffic Assessment* (GHD, November 2019)
- *Belmont Drought Response Desalination Plant – Submissions and Amendment Report* (GHD, August 2020)
- *Belmont Drought Response Desalination Plant – Appendix P: Technical Advice Memo – Traffic* (GHD, June 2020).

4.2 Changes associated with the Proposed Modification related to potential traffic impacts

An updated Traffic and Transport Assessment has been prepared to assess changes associated with the Proposed Modification that may impact traffic, specifically construction traffic including:

- Increases in heavy vehicles movements primarily to cater for the increased volume of fill required to raise the area underneath the building and infrastructure footprint 1.5 – 2.5 metres higher than that previously assessed
- Increases in light vehicle movements to cater for the increase in construction workforce required on site.

Key changes in construction traffic during the Proposed Modification include:

- Increase in construction workforce numbers peaking at around 215 Full Time Equivalent (FTE) construction personnel
- Increase in heavy vehicle movements to about 10,000 vehicle movements over the three year duration of construction (peaking at around 180 – 200 heavy vehicle movements per day – equating to around 10 inbound and 10 outbound per hour which is an increase from 15 heavy vehicles per day) to cater for the increased volume of fill required, transport of pipe segments and other construction material
- Increase in light vehicle movements to around 72,000 over the three year duration of construction (peaking at around 430 light vehicles movements a day which is an increase from around 144 per day) to cater for the increase in construction workforce required on site. Generally, around 80% of the staff (i.e. 172 of the 215 FTE peak) would arrive before the start of the day shift which is scheduled to start at 7AM and around 80% (i.e. 172 of the 215 FTE peak) would depart after the end of the day shift which is scheduled for 6PM
- Light vehicle movements required for the FTE staff would also vary over the 36 months as follows:
  - The first 11 months 18 - 82 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months 147 - 215 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months 32 - 79 light vehicles inbound in the morning and repeated in the afternoon.

A comparison of the changes in traffic numbers assessed in the Amendment Report compared to the Proposed Modification is provided in **Table 6-1** below.

4.3 Proposed methodology

The updated Traffic and Transport Assessment has been prepared in consideration with the SEARs identified in **Table 1-1**. This includes consideration of the relevant policy and guidelines, including the Transport for NSW (TfNSW) *Traffic Modelling Guidelines* (2013).

The methodology used to assess the impact of transport during construction of the Proposed Modification is as follows:

- Assessment of the intersection performance through an average delay per vehicle, Level of Service (LoS), Degree of Saturation (DoS) and 95th percentile queue
- Analysis of impacts on the public and active transport networks
- Analysis of impacts due to OSOM vehicles and other modes of transport.

Traffic impacts associated with the operation of the Proposed Modification are expected to be minimal and are therefore excluded from the assessment.

Table 4-1 Comparison of changes in traffic numbers from the Amendment Report to the Proposed Modification

Amendment Report traffic numbers	Proposed Modification traffic numbers	Comparison of changes
Relevant total construction traffic movements [defined as a two way movements including one inbound and one outbound movement] for the amended Project [include a total of 38,222 vehicle movements over the 12 month construction period and is broken down as follows]: ▪ Heavy vehicles movements = 782 total [over a 12 month period, averaging out at around 15 heavy vehicle movements per work day]: - DOI = 752 total - Water treatment process plant = 25 total - Power upgrades = 5 total ▪ Light vehicles per week = 720 total [equating to around 144 per day or 37,440 over 12 months]: - Intakes = 240 total - Water treatment process plant = 360 total - Power upgrades = 120 total.	Relevant total construction traffic movements (two way) for the Proposed Modification include a total of around 82,000 vehicle movements over a three year period: ▪ Heavy vehicles movements - 10,000 over a three year period (peaking at around 180 – 200 heavy movements per day) to cater for the increased volume of fill required, transport of pipe segments and other construction material and is broken down as follows: - Spoil import over 9 weeks = 3,000 - Concrete trucks over 18 months = 2,400 - Material deliveries over 12 months = 3,000 - Marine works over 8 months = 500 - General deliveries over 18 months = 1100 ▪ Light vehicles movements (72,000 over the three year period - peaking at around 430 light movements a day) to cater for the increase in construction workforce required on site. ▪ Generally around 80% of the staff (i.e. 172 of the 215 FTE peak) would arrive before the start of the day shift which is scheduled to start at 7AM and around 80% (i.e. 172 of the 215 FTE peak) would depart after the end of the day shift which is scheduled to end at around 6PM. ▪ Light vehicle movements required for the FTE staff would also vary over the 36 months as follows: - The first 11 months 18 - 82 light vehicles inbound in the morning and repeated in the afternoon	There is an increase in construction traffic movements of 24 months. This includes: ▪ An increase in heavy vehicles from around 15 vehicle movements (comprised of one inbound and one outbound movement) per day to a peak of around 180 to 200 vehicle movements per day i.e. around 10 heavy vehicles arriving at site every hour and 10 heavy vehicles departing site every hour. This is an increase of around 165 – 185 heavy vehicle movements per day ▪ An increase in light vehicle movements from 144 per day to around 430 light vehicle movements per day which is around 286 extra vehicle movements per day. The majority of light vehicle movements (around 344) would be outside peak hour periods. This includes up to 172 vehicles arriving before the morning peak at 7:30AM to 8:30 AM at the Beach Street and Pacific Highway intersection and 172 vehicles departing the site after the afternoon peak at 4:30PM – 5:30PM at the Beach Street and Pacific Highway intersection. A helicopter would be required to make up 24 flight movements per day (worst case scenario) over an 8month period (allowing for weather contingencies) with around 3000 flights in total. Some of the helicopter movements would be OOHW but at least half would occur prior to shift changes to transfer staff which would be around 6AM- 7PM and 6PM to 7PM.

Amendment Report traffic numbers	Proposed Modification traffic numbers	Comparison of changes
	- The next 12 months 147 – 215 light vehicles inbound in the morning and repeated in the afternoon - The next 12 months 32 - 79 light vehicles inbound in the morning and repeated in the afternoon . A helicopter would also be required to transfer personnel to the jack-up barge. It is anticipated that there would be up to 24 (worst case scenario) helicopter movements per day with around 3000 flights in total, for a period of around 8 months, allowing for weather contingencies. Some of the helicopter movements would be OOHW but at least half would occur prior to shift changes to transfer staff which would be around 6AM- 7PM and 6PM to 7PM.	

4.4 Construction traffic generation

4.4.1 Key assumptions

The following inputs and assumptions were used for the intersection analyses:

- Around 90 – 100 heavy vehicles would access and egress the construction site per day. The assumption of ten inbound and ten outbound trucks per hour based on a ten hour working day is considered to facilitate a robust analysis. The majority of heavy vehicles would arrive at the Proposed Modification site during standard construction hours i.e. between 7AM and 6PM where possible
- The Proposed Modification construction morning peak time would be from 6:00 AM to 7:00 AM with around 80% of all light vehicles arriving to the site (i.e. 172 of the 215 FTE peak). The remaining 20% of staff would arrive during the rest of the day (43 light vehicles).
- Based on traffic surveys undertaken as part of the EIS Amendment Report assessment, the observed traffic morning peak hour time at the Beach Street and Pacific Highway intersection was 7:30 AM to 8:30 AM. Given the fairly established land use within the study area, it is unlikely that the traffic patterns, and specifically the traffic peak hour, would have changed since.
- The Proposed Modification construction afternoon peak time would be from 6:00 PM to 7:00 PM with 80% of all light vehicles leaving the site (i.e. 172 of the 215 FTE peak). The remaining 20% of staff would leave during the rest of the day (43 light vehicles).
- Based on traffic surveys undertaken as part of the EIS Amendment Report assessment, the observed traffic evening peak hour time at the Beach Street and Pacific Highway intersection is 4:30 PM to 5:30 PM.
- Light vehicle movements required for the FTE staff would vary over the 36 months as follows:
  - The first 11 months around 18 – 82 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months around 147 - 215 light vehicles inbound in the morning and repeated in the afternoon
  - The next 12 months around 32 - 79 light vehicles inbound in the morning and repeated in the afternoon.

4.4.2 Peak hour construction traffic

During the peak construction scenario, it has been conservatively estimated that the Proposed Modification is expected to generate up to 63 vehicle movements in total in the peak hour, consisting of the following:

- In the AM peak hour, there would be ten inbound truck movements, ten outbound truck movements, and 43 inbound light vehicle movements.
- In the PM peak hour, there would be ten inbound truck movements, ten outbound truck movements, and 43 outbound light vehicle movements.

The above peak hour traffic volumes have been adopted for the updated SIDRA modelling assessment for the Beach Street and Pacific Highway intersection.

4.4.3 Heavy vehicle and OSOM construction traffic

During construction of the Proposed Modification , heavy vehicle and OSOM vehicle movements would be required and would include:

- Potential OSOM or other large deliveries (not OSOM) including tunnel boring machine (TBM) would be transported on a number of lowloaders (likely 3), travelling from the Port of Newcastle to Belmont
- The Crawler Crane would travel from Kooragang on a mixture of lowloaders and semi-trailers (minimum 6 vehicles total). The other cranes do not require as many trucks as the crawler and would be transported to the site during restricted hours based on their transport licences
- General delivery to site using semitrailers, rigid trucks, semi rigid trucks, tilt trays and truck and dog trailer used to carry pipe, steel and steel cladding, mechanical equipment, precast, spoil and quarry materials
- Other heavy vehicles for general site works include five-tonne trucks, site utes, manitou, telehandlers, posi-track loaders, concrete agitators, street sweepers, Vac trucks, water carts, and minitankers.

For the purposes of this traffic impact assessment, the bulk of the standard heavy vehicle construction traffic is modelled as occurring within standard construction hours (i.e. between 7AM and 6PM) with a small number of heavy vehicle movements required during OOHW.

The OSOM deliveries are expected to occur outside traffic peak hours or overnight. As there would only be a very small number of OSOM vehicle traffic these have been excluded from the traffic modelling completed for the Proposed Modification.

4.4.4 Other transport modes

The Proposed Modification would require the use of a helicopter to transfer construction personnel and materials to and from the offshore jack-up barge to construct intake structure of the DOI system. Generally, there would not be more than 24 flights per day and around 3000 flights in total in accordance with the following:

- The most suitable light twin engine helicopter would be an EC 135 as aviation regulations would require the night operations to be conducted in a twin engine helicopter
- The aim is to move up to 12 personnel twice a day by helicopter from Lake Macquarie Airport to the jack-up platform positioned off Blacksmith's Beach and return
- The shift changes would be 12 hours apart and there would be a requirement to conduct some operations after dark
- It is likely that up to 3-4 personnel would be transferred at a time and it would require 3-4 flights to and from the platform for each shift change
- The operation would commence at the start of 2025 and last for eight months to allow for weather contingencies
- Generally there would not be more than 24 flights per day and around 3000 flights in total
- The majority of helicopter movements would be centred around the start and end of shifts at 7 AM and 6 PM to transfer construction personnel to and from Lake Macquarie Airport and the jack-up barge and flights would commence around 5:30AM and end around 8:30PM.

A summary of the indicative helicopter movements timing throughout the day is detailed in **Table 4-2**.

Table 4-2 Indicative timing of daily helicopter movements

Hour	Airport to Jack-up Barge	Jack-up Barge to Airport	Total
5:00 – 6:00	1	1	2
6:00 – 7:00	1	1	2

Hour	Airport to Jack-up Barge	Jack-up Barge to Airport	Total
7:00 – 8:00	2	2	4
8:00 – 9:00	2	2	4
18:00 – 19:00	2	2	4
19:00 – 20:00	2	2	4
20:00 – 21:00	2	2	4
TOTAL	**12 Inbound**	**12 Outbound**	**24 Movements**

The use of ocean barges were identified in the Amendment Report. For the Proposed Modification a review of ocean barge, jack-up barge and marine vessel movements have been considered and it is estimated that there would be:

- Around 30 ocean barge movements comprised of 30 inbound movements and 30 outbound movements over a two month period
- Around 60 marine vessel movements comprised of 60 inbound movements and 60 outbound movements over a nine month period. This would include marine vessels for the transfer of construction personnel, the transfer of materials, marine inspection and hydro survey vessels
- Two jack-up barge movements comprised of one inbound movement and one outbound movement prior to the mobilisation and after the demobilisation of the jack-up barge.

4.5 Modelling assumptions

To assess the performance of the base and construction phase conditions with the Proposed Modification, intersection traffic models for the Beach Street and Pacific Highway intersection have been developed using SIDRA Intersection software. SIDRA is an advanced micro-analytical tool widely used to evaluate signalised and unsignalised intersection designs in terms of LoS, DoS, queue length, and other performance measures. SIDRA analysis was conducted for the Beach Street and Pacific Highway intersection as this was determined to be the key access location for all traffic entering and exiting the construction site.

For consistency with the previous Amendment Report analysis (*Belmont Drought Response Desalination Plant – Appendix P: Technical Advice Memo)* the following assumptions were adopted:

- SIDRA Version 8 was used
- The 2024 base traffic volumes were assumed to be unchanged from previous assessment and directly adopted for this assessment
- Modelling peak hours were based on traffic peaks identified during the EIS and Amendment Report assessments, being 7:30AM – 8:30AM and 4:30PM – 5:30PM respectively.

5. Assessment of impacts

This section documents the traffic impact during the construction phase of the Proposed Modification. The traffic impact is reported in terms of average intersection delay, LoS and queue lengths for the Beach Street and Pacific Highway intersection.

The following scenarios were modelled and assessed:

- 2024 Base traffic volumes **without** traffic generated during construction of the Proposed Modification
- 2024 Base traffic volumes **with the addition of** traffic generated during construction of the Proposed Modification.

5.1 Impacts on intersection performance

5.1.1 Traffic volumes

The peak hour traffic volumes for the Beach Street and Pacific Highway intersection during the construction phase of the Proposed Modification are summarised in **Figure 5-1**.

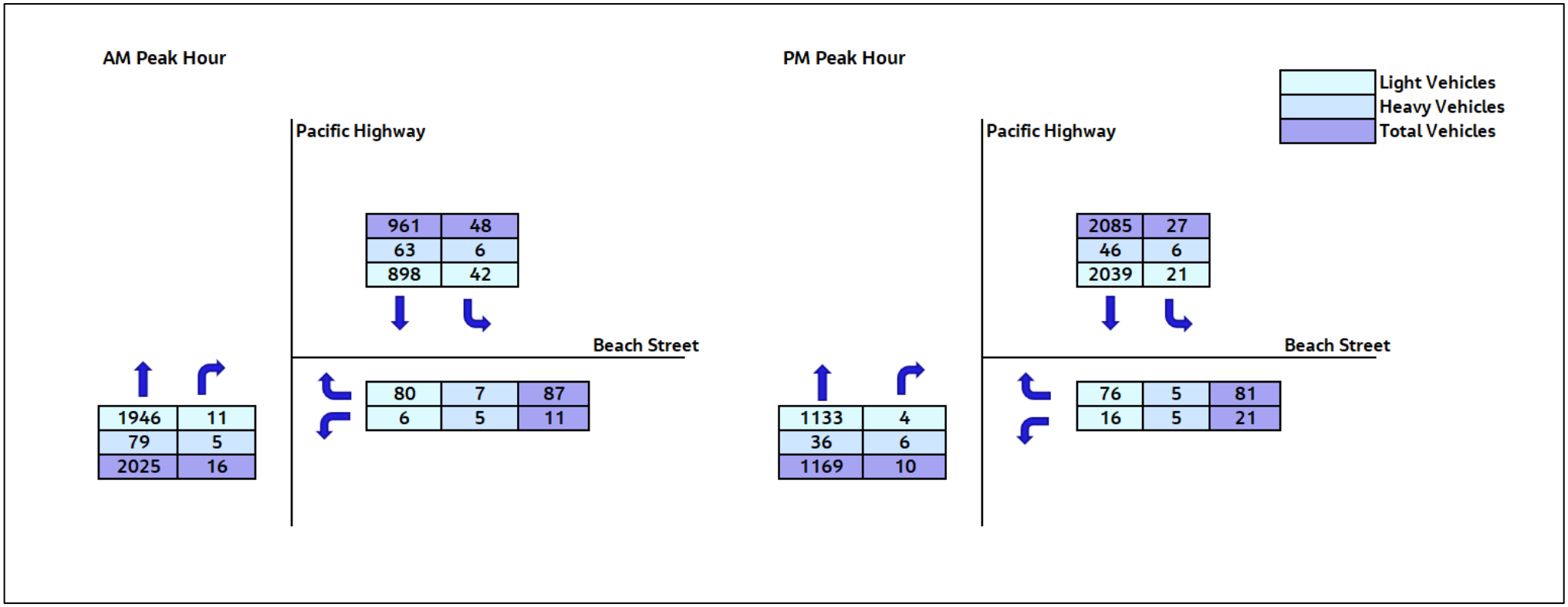


Figure 5-1 2024 AM and PM Peak Traffic Volumes during the construction phase of the Proposed Modification

5.1.2 Modelling results

SIDRA analysis was undertaken for the 2024 horizon year accounting for the expected peak construction activity. **Figure 5-2** shows the layout of the Pacific Highway and Beach Street intersection, as modelled in SIDRA.

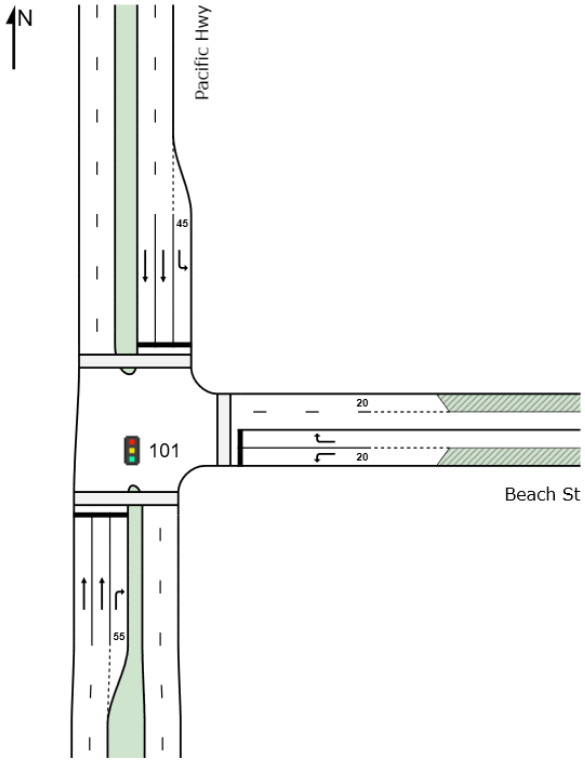


Figure 5-2 Pacific Highway/Beach Street intersection layout

To assess the intersection performance at the Pacific Highway/Beach Street intersection, the average delay and LoS criteria detailed in **Table 5-1** was used. Level of service is reported in accordance with the TfNSW *Traffic Modelling Guidelines*. For traffic signals, the LoS criteria is related to the average intersection delay, measured in seconds per vehicle.

Table 5-1 Level of Service (LoS) criteria for intersections

LoS	Average delay per vehicle (sec/veh)	Traffic Signals
A	<14	Good operation
B	15 to 28	Good with acceptable delays & spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals, incidents would cause excessive delays. Roundabouts require other control mode
F	>70	Unsatisfactory with excessive queuing

Source: TfNSW Traffic Modelling Guidelines, Version 1.0, February 2013

To assess the DoS of the intersection, the criteria in **Table 5-2** was used. DoS is defined as the ratio of the arrival flow (demand) to the capacity of the approach during the same period. The DoS of an intersection ranges from close to zero for very low traffic flows and up to one for saturated flows. The overall intersection DoS is defined as the highest DoS of all individual movements calculated at the intersection.

In theory, a DoS of 1.0 means that the intersection is operating at maximum capacity. However, a lower practical DoS is normally used, depending on the intersection control type.

Table 5-2 DoS rating

DoS	Rating
Excellent	DoS < 0.60
Very good	0.60 < DoS < 0.70
Good	0.70 < DoS < 0.80
Acceptable	0.80 < DoS < 0.90
Poor	0.90 < DoS < 1.0
Very poor	DoS > 1.0

Source: SIDRA Intersection 9.0

A summary of modelled results including the delay, LoS, DoS, and 95th percentile queue for the intersection with and without construction, is shown in **Table 5-3** and **Table 5-4** for the morning and afternoon peak periods respectively. Detailed SIDRA modelling results are included in **Appendix A.**

Table 5-3 Modelled intersection outputs - 2024 AM peak

Approach	Without construction					With construction				
	Volume (veh/h)	DoS (v/c)	Delay (s)	LoS	Queue* (m)	Volume (veh/h)	DoS (v/c)	Delay (s)	LoS	Queue* (m)
Pacific Highway (southern approach)	2134	0.8	8	A	215	2148	0.8	8	A	225
Beach Street	93	0.4	46	D	25	103	0.4	46	D	30
Pacific Highway (northern approach)	1021	0.4	5	A	60	1062	0.4	5	A	60
Average intersection delay			**8**	**A**				**8**	**A**	

Table 5-4 Modelled intersection outputs - 2024 PM peak

Approach	Without construction					With construction				
	Volume (veh/h)	DoS (v/c)	Delay (s)	LoS	Queue* (m)	Volume (veh/h)	DoS (v/c)	Delay (s)	LoS	Queue* (m)
Pacific Highway (southern approach)	1236	0.5	5	A	75	1241	0.5	5	A	75
Beach Street	52	0.2	44	D	15	107	0.4	46	D	25
Pacific Highway (northern approach)	2218	0.8	8	A	225	2223	0.8	8	A	225
Average intersection delay			**8**	**A**				**8**	**A**	

*Note: Reported queues represent 95th percentile queues rounded to the nearest five meters.

The traffic modelling results indicate the following:

- Traffic generated by the Proposed Modification would have minimal impact to the intersection performance. The results show that both the existing and construction scenarios for the Beach Street and the Pacific Highway intersection operate at an average of LoS A with a DoS of 0.8, indicating spare capacity on Pacific Highway.
- It is to be noted that the Beach Street approach operates at LoS D in both scenarios due to the allocation of green time, which is more heavily weighted to Pacific Highway. The traffic generated by the Proposed Modification would, however, have minimal impact to the performance of the Beach Street approach.

5.2 Impacts on public transport

Within proximity to the Beach Street and the Pacific Highway intersection, local bus services regularly operate along Pacific Highway. The intersection analysis shows that that the road is expected to maintain an average service flow rate of LoS A, particularly during the AM and PM peak periods within the construction phase, thus the impact of construction traffic on the public transport services is expected to be minimal.

5.3 Impacts on active transport

There are no additional or existing formal off-road cycling or shared path facilities provided within proximity to the site. There would be an increased risk to safety as construction vehicles would access the site through roads with existing pedestrian and cyclist activity. As there is no formal off-road cycling infrastructure, cyclists would share the local road network with vehicles, including additional construction traffic. Pedestrians are expected to continue to utilise existing footpath and crossing facilities.

5.4 Impacts on other transport modes

The Proposed Modification would require the use of marine and helicopter vehicles operating during construction. Marine vessels would be travelling from the Port of Newcastle or from Swansea Channel. The number of marine vessels proposed are small and would have a negligible impact on existing marine vessel

activities operating within the area of the Proposed Modification. Marine traffic impacts would be temporary and would occur over a 12 – 18 month period.

The use of helicopters to access the jack-up barge to construct the offshore components of the DOI would also be temporary but would only occur over an eight month period. Helicopter would be used in preference to boats to convey people and certain supplies to the jack up barge due to improved flexibility and ease of access to getting on and off the jack-up barge compared to using boats which has the added complication of managing changing tides and ocean conditions. In some instances boats will still be used to convey people and materials.

The majority of helicopter movements would be centred around the start and end of shifts at 7 AM and 6 PM to transfer construction personnel to and from Lake Macquarie Airport and the jack-up barge, refer to **Table 4-2**. Flight paths to and from Lake Macquarie Airport to the jack-up barge would be dependent on the prevailing wind conditions but would generally follow the flight paths shown in **Figure 5-3**. The Lake Macquarie Airport also houses the Westpac Emergency Helicopter Services and all emergency services flights would take precedence over any flights required for the Proposed Modification. However the helicopters would likely generate more noise than marine transportation methods to nearby sensitive receivers. An assessment of noise impacts resulting from the helicopters for the Proposed Modification has been included in the updated Construction Noise Assessment for the Proposed Modification, refer further to Appendix F of the Modification Report. From a transport perspective to manage the impacts of helicopters for the Proposed Modification, flight paths would be minimal over land, and operate over bodies of water where possible.

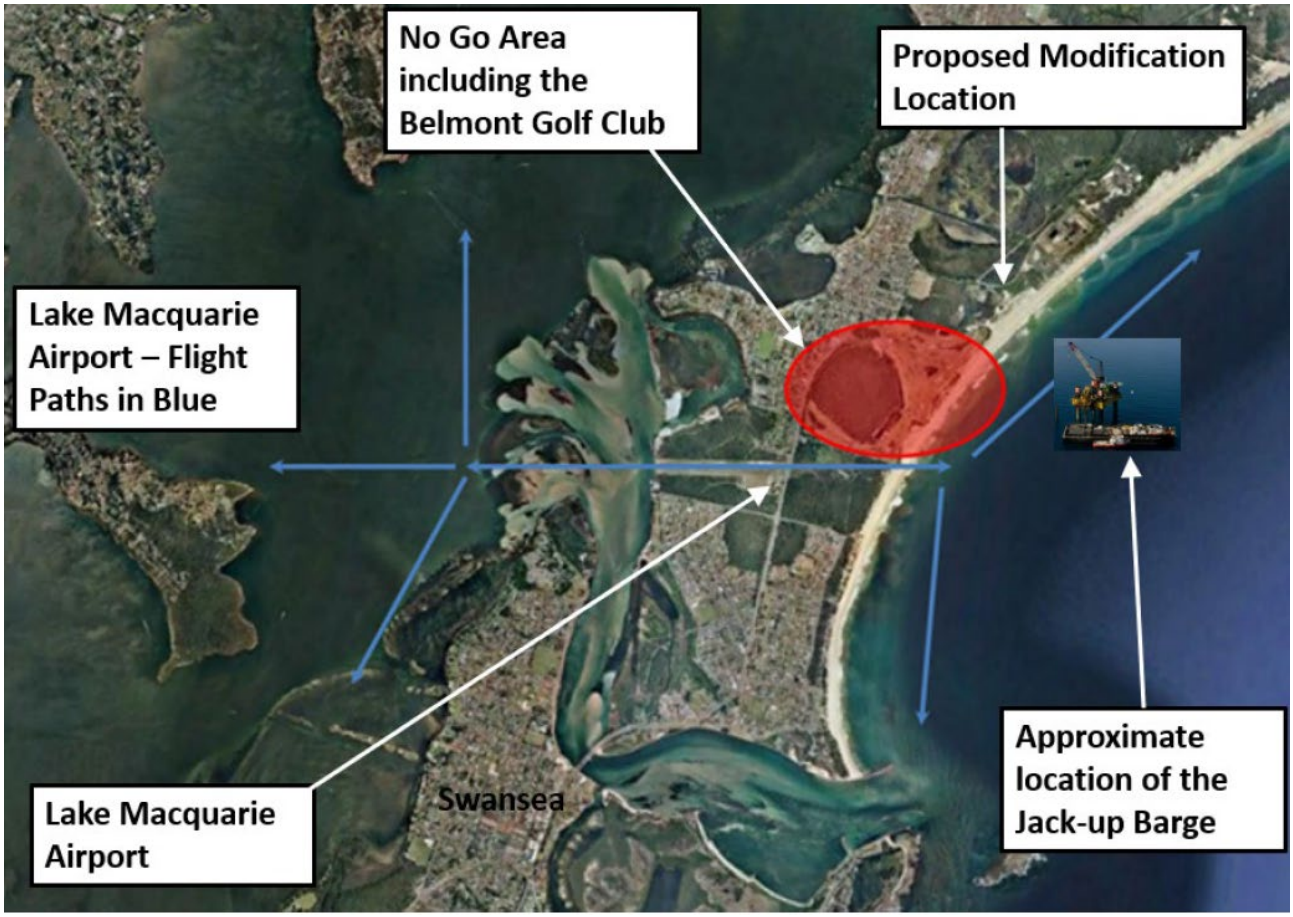


Figure 5-3 Flight paths from lake Macquarie Airport (image sourced from the 2017 Lake Macquarie Airport Operating Procedure Manual)

5.5 Impacts of OSOM vehicles

OSOM vehicles would be required to transport certain oversized equipment to the Project area during the construction phase of the Project. To manage OSOM vehicles, an access permit from the National Heavy Vehicle Regulator (NHVR) is required. The permit would undergo a separate approval process and a suitable contractor would be engaged for transportation. As part of the permit, the subcontractor would develop an OSOM Traffic Management Plan and determine the suitable route based on the required OSOM vehicle dimensions and mass in consultation with Hunter Water and the NHVR. These traffic movements would be undertaken at night or outside of peak traffic periods under police escort if required and in accordance with any OSOM permit conditions.

The traffic management plan for the movement of these OSOM vehicles would be undertaken to identify risks and minimise impacts to the wider road network. The plan would cover:

- Identification of route
- Measures to provide an escort for the loads
- Times of transporting to minimise impacts on the road network
- Communication strategy and liaising with emergency services and police
- Any minor temporary civil infrastructure works may be required to accommodate OSOM movements.

Swept path analyses were undertaken to demonstrate the turning movement of OSOM vehicles at the Beach Street and Pacific Highway intersection, detailed in **Appendix B**. The swept path analysis at this intersection indicates that there would be minimal impact caused by the design vehicle to the road furniture.

Further, due to the low number of OSOM vehicle movements and the occurrence of OSOM vehicle movements outside of peak periods, it is expected that the traffic impact of OSOM vehicles on the road network would be minimal.

6. Review of mitigation measures

A review of the mitigation measures already proposed for the approved Project has been completed as part of this assessment. Based on the outcomes of the construction traffic assessment in **Section 5.1**, some additional safeguards and mitigation measures to manage traffic and transport impacts from the construction of the Proposed Modification are summarised in **Table 6-1**.

Table 6-1 Summary of traffic and transport mitigation measures

Impact	Mitigation measures
Road network	Independent dilapidation surveys will be undertaken prior to and following the construction of the Project assess impacts to the condition of Beach Street, Ocean Park Road prior to the start of construction.
Construction traffic	The Construction Traffic Management Plan (CTMP) will include the following additional measures to manage impacts associated with additional construction traffic from the Proposed Modification: ▪ An arrival and departure plan will be developed for heavy and light vehicles during construction to minimise congestion at the Beach Street and Pacific Highway intersection ▪ A strategy for car-pooling for construction personnel to reduce the number of light vehicles required to park at the Project area, especially during the peak construction period ▪ Heavy vehicles would be scheduled to arrive at site between standard construction hours i.e. 7AM and 6PM where possible ▪ Confirmation of haulage routes ▪ Consultation with the emergency services to ensure that procedures are in place to maintain safe, priority access for emergency vehicles ▪ A response plan for any construction related traffic incident ▪ Monitoring, review and amendment mechanisms.
OSOM	To manage oversize overmass (OSOM) vehicle movements, a permit will be sought from the NHVR and a separate OSOM Transport Management Plan will be prepared and will include: ▪ Identification of route ▪ Measures to provide an escort for the loads ▪ Times of transporting to minimise impacts on the road network ▪ Communication strategy and liaising with emergency services and police.
Emergency services	Affected parties including emergency services will be notified in advance of any disruptions to traffic and restriction of access impacted by project activities.
Road safety	A site induction must be conducted to inform construction personnel of the risk of collisions, speeding and fatigue on safety. A Driver Code of Conduct must be prepared and used to outline the rules and behaviours which drivers associated with the Project would be required to adhere to. The Driver Code of Conduct will outline arrangements for light and heavy vehicle drivers including: ▪ General requirements including site induction requirements ▪ Travelling speeds and safe driving practices, particularly through residential areas and school zones

Impact	Mitigation measures
	▪ Fatigue management ▪ Adherence to designated transport routes and heavy vehicle noise ▪ Public complaint resolution, penalties, and disciplinary action ▪ Drivers must report any queueing or other potential safety issues.
Active transport	Pedestrians and cyclists using Ocean Park Road and Beach Street must be made aware of the construction activities and educated on safety surrounding construction vehicles during construction.
Use of helicopters	To manage helicopter movements a Helicopter Transportation Plan will be prepared and will include: ▪ Identification of flight paths between Lake Macquarie Airport and the jack -up barge where over land flight movements will be minimised and located over bodies of water where possible ▪ An operation schedule of operation will be developed where the use of helicopters outside of standard construction hours is minimised where possible ▪ A communications plan for interacting with other airport users ▪ A protocol for interacting with other users of Lake Macquarie Airport including emergency helicopter movements which will be given precedence over helicopter use for the Proposed Modification.

7. Conclusion

This Traffic and Transport Assessment has been prepared to assess the impacts from the changes of the Proposed Modification on traffic and transport, specifically the significant change in in the volume of heavy and light vehicle traffic during construction. This Traffic and Transport Assessment provides an overview of the background traffic and transport environment, and assessment of potential traffic and transport impacts of the Proposed Modification. SIDRA modelling of the revised heavy and light vehicle traffic volumes for the Proposed Modification during the AM peak hour and the PM peak hour for the Beach Street and Pacific Highway intersection has been completed.

The results from the SIDRA modelling indicates that the overall impact of the construction traffic on the existing transport network is expected to be minimal as a result of the Proposed Modification. The overall LoS at the Pacific Highway / Beach Street intersection is expected to remain at LoS A as a result of increased Proposed Modification traffic. Further, the potential impacts to public transport, active transport, and other modes of transport is expected to be negligible or have minor impacts. Measures to manage new impacts have been provided.

The traffic and transport mitigation measures included in the EIS and Amendment Report have been reviewed. A Construction Traffic Management Plan (CTMP) has already been identified and would be implemented by the construction contractor to minimise potential impacts of the Project. Relevant traffic safety measures have already been included in the CTMP would be traffic control and signage, driver conduct, safety protocols and management of OSOM vehicles.

Additional measures have been identified for inclusion in the CTMP following the assessment of the Proposed Modification. This includes measures to manage the impacts of the increased volumes of heavy and light vehicles on the surrounding road network, some additional road safety measures to manage pedestrians and cyclists, inclusion of a Driver Code of Conduct and a measure to notify emergency services of any traffic disruption.

A separate OSOM Transport Management Plan and a separate Helicopter Transport Management Plan will be prepared to manage impacts associated with the Proposed Modification. The OSOM Transport Management Plan will include a detailed overview of management measures for the OSOM movements, including identification of route, escort measures, time of transporting and a communications strategy.

The Helicopter Transport Management Plan will include mitigation measures to manage helicopter movements to and from the Lake Macquarie Airport and the jack-up barge, including details of flight paths, a schedule for operations that minimises out of hours flights where possible, and a protocol for interactions with other airport users including emergency services who will be given precedence at all times.

8. References

GHD (2019a) *Belmont Drought Response Desalination Plant – Environmental Impact Statement.*

GHD (2019a) *Belmont Drought Response Desalination Plant – Appendix O: Traffic Assessment.*

GHD (2020a) *Belmont Drought Response Desalination Plant – Submissions and Amendment Report.*

GHD (2020a) *Belmont Drought Response Desalination Plant – Appendix P: Technical Advice Memo – Traffic.*

Lake Macquarie Airport, (2017). *Lake Macquarie Airport Operating Procedure Manual.*

Transport for New South Wales (TfNSW) (2013) *Traffic Modelling Guidelines.*

Appendix A. Detailed SIDRA output

Table A-1 SIDRA results for the 2024 base traffic model at the Beach Street and Pacific Highway intersection during the AM peak

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Hwy												
2	T1	2132	3.9	0.788	8.1	LOS A	29.3	212.3	0.69	0.64	0.69	50.7
3	R2	2	0.0	0.006	12.9	LOS A	0.0	0.2	0.38	0.65	0.38	31.8
Approach		2134	3.9	0.788	8.1	LOS A	29.3	212.3	0.69	0.64	0.69	50.6
East: Beach St												
4	L2	6	0.0	0.029	42.7	LOS D	0.2	1.7	0.90	0.65	0.90	14.5
6	R2	86	2.4	0.398	45.7	LOS D	3.7	26.2	0.96	0.77	0.96	14.9
Approach		93	2.3	0.398	45.5	LOS D	3.7	26.2	0.96	0.76	0.96	14.9
North: Pacific Hwy												
7	L2	9	11.1	0.008	10.9	LOS A	0.1	0.9	0.30	0.65	0.30	36.3
8	T1	1012	6.6	0.380	4.7	LOS A	8.1	59.8	0.40	0.36	0.40	59.8
Approach		1021	6.6	0.380	4.8	LOS A	8.1	59.8	0.40	0.36	0.40	59.5
All Vehicles		3247	4.7	0.788	8.1	LOS A	29.3	212.3	0.60	0.56	0.60	50.0

Table A-2 SIDRA results for the 2024 base traffic model at the Beach Street and Pacific Highway Pacific Highway intersection during the PM peak

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Hwy												
2	T1	1231	3.1	0.452	5.1	LOS A	10.6	76.3	0.43	0.39	0.43	58.6
3	R2	5	20.0	0.059	28.9	LOS C	0.2	1.4	0.68	0.69	0.68	19.7
Approach		1236	3.2	0.452	5.2	LOS A	10.6	76.3	0.43	0.39	0.43	58.2
East: Beach St												
4	L2	7	0.0	0.033	42.8	LOS D	0.3	2.0	0.91	0.66	0.91	14.5
6	R2	44	0.0	0.201	44.3	LOS D	1.8	12.7	0.94	0.73	0.94	15.3
Approach		52	0.0	0.201	44.1	LOS D	1.8	12.7	0.93	0.72	0.93	15.2
North: Pacific Hwy												
7	L2	23	4.5	0.019	10.9	LOS A	0.3	2.1	0.30	0.66	0.30	36.6
8	T1	2195	2.2	0.807	8.3	LOS A	31.4	223.9	0.70	0.66	0.70	50.2
Approach		2218	2.2	0.807	8.3	LOS A	31.4	223.9	0.70	0.66	0.70	50.0
All Vehicles		3505	2.5	0.807	7.7	LOS A	31.4	223.9	0.61	0.57	0.61	51.1

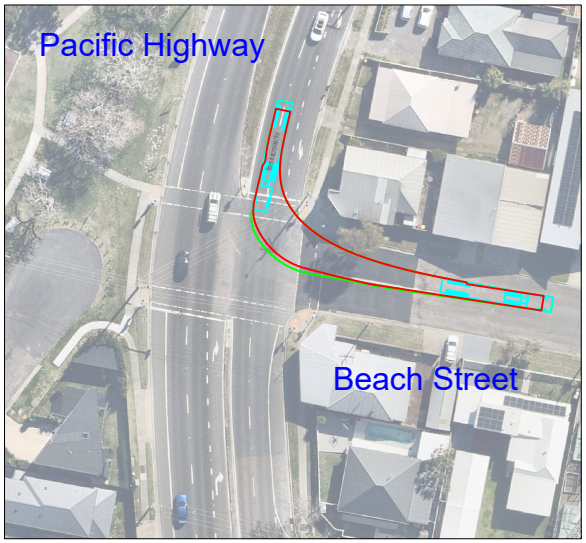
Table A-3 SIDRA results for the 2024 model with construction at the Beach Street and Pacific Highway intersection during the AM peak

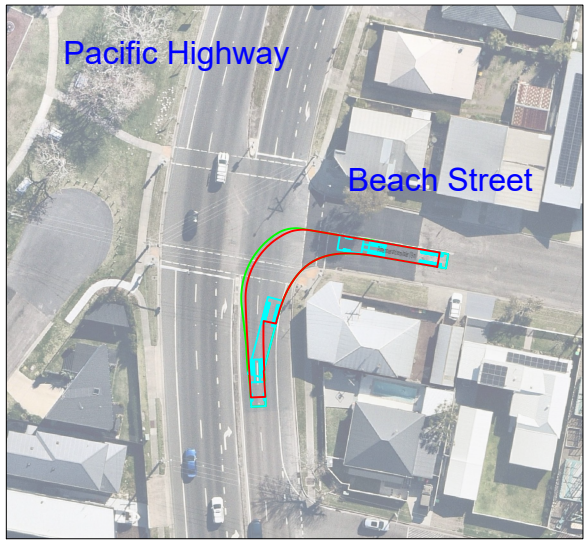
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Hwy												
2	T1	2132	3.9	0.806	8.2	LOS A	30.9	223.9	0.69	0.64	0.69	50.3
3	R2	17	31.3	0.069	13.4	LOS A	0.3	2.6	0.40	0.69	0.40	29.7
Approach		2148	4.1	0.806	8.3	LOS A	30.9	223.9	0.69	0.64	0.69	50.1
East: Beach St												
4	L2	12	45.5	0.070	44.2	LOS D	0.5	4.6	0.91	0.68	0.91	13.7
6	R2	92	8.0	0.439	46.1	LOS D	3.9	29.3	0.97	0.77	0.97	14.8
Approach		103	12.2	0.439	45.9	LOS D	3.9	29.3	0.96	0.76	0.96	14.6
North: Pacific Hwy												
7	L2	51	12.5	0.043	11.1	LOS A	0.6	5.0	0.31	0.68	0.31	36.0
8	T1	1012	6.6	0.380	4.7	LOS A	8.1	59.8	0.40	0.36	0.40	59.8
Approach		1062	6.8	0.380	5.0	LOS A	8.1	59.8	0.39	0.37	0.39	58.2
All Vehicles		3314	5.2	0.806	8.4	LOS A	30.9	223.9	0.60	0.56	0.60	49.1

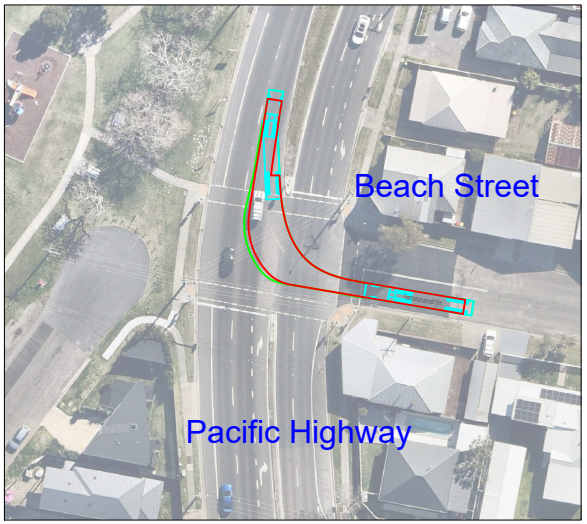
Table A-4 SIDRA results for the 2024 model with construction at the Beach Street and Pacific Highway intersection during the PM peak

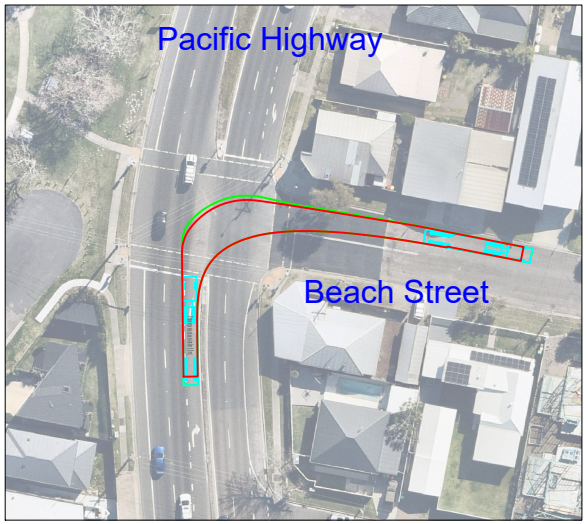
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Hwy												
2	T1	1231	3.1	0.452	5.1	LOS A	10.6	76.3	0.43	0.39	0.43	58.6
3	R2	11	60.0	0.137	30.9	LOS C	0.4	3.8	0.72	0.72	0.72	18.1
Approach		1241	3.6	0.452	5.3	LOS A	10.6	76.3	0.43	0.39	0.43	57.7
East: Beach St												
4	L2	22	23.8	0.117	44.2	LOS D	0.9	7.6	0.92	0.70	0.92	13.9
6	R2	85	6.2	0.404	45.8	LOS D	3.6	26.7	0.97	0.77	0.97	14.8
Approach		107	9.8	0.404	45.5	LOS D	3.6	26.7	0.96	0.75	0.96	14.7
North: Pacific Hwy												
7	L2	28	22.2	0.026	11.0	LOS A	0.4	3.0	0.31	0.67	0.31	35.5
8	T1	2195	2.2	0.810	8.3	LOS A	31.6	225.4	0.70	0.66	0.71	50.1
Approach		2223	2.5	0.810	8.4	LOS A	31.6	225.4	0.70	0.66	0.70	49.8
All Vehicles		3572	3.1	0.810	8.4	LOS A	31.6	225.4	0.61	0.57	0.62	49.1

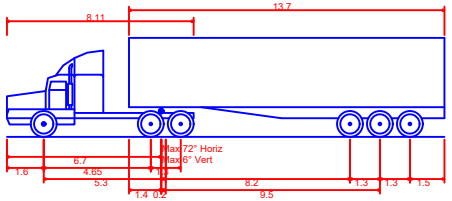
Appendix B. Swept path analysis











Prime mover and semi-trailer (19 m)

Overall Length	19.000m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.540m
Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12.500m

REV	BY	DATE	DESCRIPTION	APPD.
P1	MG	21.09.2023	ORIGINAL ISSUE	MG

UPDATED

COORDINATE SYSTEM: | HEIGHT DATUM: | SCALE:

DRAWN BY:	MG
DRW CHECK:	MG
APPROVED:	KB
IND REVIEW:	N/A

PROJECT

JOHN HOLLAND

JOHN HOLLAND

NOTES
-

SWEPT PATH CHECK
PACIFIC HIGHWAY AND BEACH STREET
STAGE 1

DRAWING No: BELMONT DESALINATION PLANT

SHEET 1 OF 1

REVISION P1

Plot Date: 21 September 2023 - 9:45 AM

Cad File No: C:\Users\mghanbarikarekan\OneDrive - John Holland Group\Newcastle Swept Path\Newcastle Swept Path.dwg