Appendix O – Traffic Assessment

Hunter Water Corporation

Belmont Drought Response Desalination Plant

Traffic Assessment

November 2019

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1. Introduction

1.1 Overview

The Lower Hunter has sufficient water to meet its needs in average climate conditions in the medium term. However, the region's reliance on rain-fed dams and groundwater supplies makes it vulnerable to severe drought.

The Lower Hunter Water Plan (LHWP) was developed in 2014 with the aim to ensure that the Lower Hunter is able to withstand a severe drought as well as meeting community needs in the medium term. Within the plan, a desalination plant is proposed in conjunction with other staged drought response measures in the event of extreme drought. A drought response desalination plant would help make the water supply system more resilient to climate variability, with the primary benefit being that it would provide a drought contingency measure that is not dependant on rainfall.

Following a number of options assessments, a drought response desalination plant (also referred to as the temporary desalination plant), to be located within the existing wastewater treatment works site at Belmont, was selected as the preferred option. Hunter Water submitted a State Significant Infrastructure (SSI) application for the Project to the Department of Planning and Environment in November 2017 and received the Secretary's Environmental Assessment Requirements (SEARs) in December 2017 (SSI 8896). These SEARs outline the requirements for the preparation of an Environmental Impact Statement (EIS) to assess the future construction and operation of the Project, with particular requirements for the assessment of traffic and transport.

1.2 Purpose and scope of this report

This Traffic Assessment report has been prepared as a supporting document to the Environmental Impact Statement (EIS). The purpose of this report is to assess the likely traffic and transport impacts associated with the proposed construction and operation of the drought response desalination plant.

1.3 Secretary's Environmental Assessment Requirements

Hunter Water submitted a State Significant Infrastructure (SSI) application for the proposal with the Department of Planning and Environment (DPE) in November 2017 and received Secretary's Environmental Assessment Requirements (SEARs) in December 2017.

A revised SEARs was issued following comment and discussed between Hunter Water and DPE on 24 January 2018. The SEARs relevant to traffic and transport issues are summarised in Table 1-1.

Table 1-1 SEARs (SSI 8896) – Traffic and transport

Requirements	Where addressed
An assessment of 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,* including:	
• Current and anticipated traffic counts for traffic routes and intersections	Current traffic volumes, refer to Section 3.3 Anticipated traffic volumes, refer to Section 5.

Requirements	Where addressed
• Identification of anticipated vehicular traffic generated during construction and operation and the relevant peak periods for traffic generated in these stages	Refer to Section 4 and Section 4.2.
• Capacity of utilised roads and intersections as well as the anticipated future impacts of other proposed developments in the area	Refer to Section 3.4 and Section 5.
• Traffic analysis using SIDRA or similar traffic model	Refer to Section 3.5 and 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	Refer to Section 5
• Identification of necessary road network infrastructure upgrades.	No infrastructure upgrades have been identified

1.4 Study assumptions and limitation

The following assumptions and limitations have been applied to this Traffic Assessment:

- Intersection modelling using SIDRA 8 has been undertaken for the intersection of Pacific Highway and Beach Street.
- The operational traffic volumes associated with the temporary desalination plant are expected to be negligible. As such, this Traffic Assessment focuses the construction packages of the project, which represent the “worst-case” in terms of traffic generation.
- Analysis has been undertaken for the “intakes” component of the construction program, as this represents the “worst-case” scenario in terms of traffic generation for the proposal.
- It has been assumed that the temporary desalination plant will be constructed in 2024.
- An annual growth rate of one per cent has been applied to the observed 2019 traffic volumes on the Pacific Highway to determine forecast AM and PM peak hour 2024 horizon year traffic volumes.
- All construction vehicles (light and heavy) will access the subject site via the intersection of Pacific Highway and Beach Street.
- It has been assumed that 50 per cent of trucks will access the construction site from the north, with 50 per cent accessing the site from the south.
- It has been assumed that 80 per cent of workers will access the construction site from the north and 20 per cent from the south, in accordance with the existing pattern of traffic flows.

1.5 Disclaimer

This report has been prepared by GHD for Hunter Water Corporation and may only be used and relied on by Hunter Water Corporation for the purpose agreed between GHD and the Hunter Water Corporation as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Hunter Water Corporation arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no

responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. The Project

2.1 Project location

The drought response desalination plant is proposed to be located on the southern portion of the current wastewater treatment works (WWTW) site, off Ocean Park Road, to the east of the Pacific Highway. The proposed plant is located to the east of the Belmont Lagoon and to the west of the coastal dunes along Nine Mile Beach, as shown in Figure 2-1.

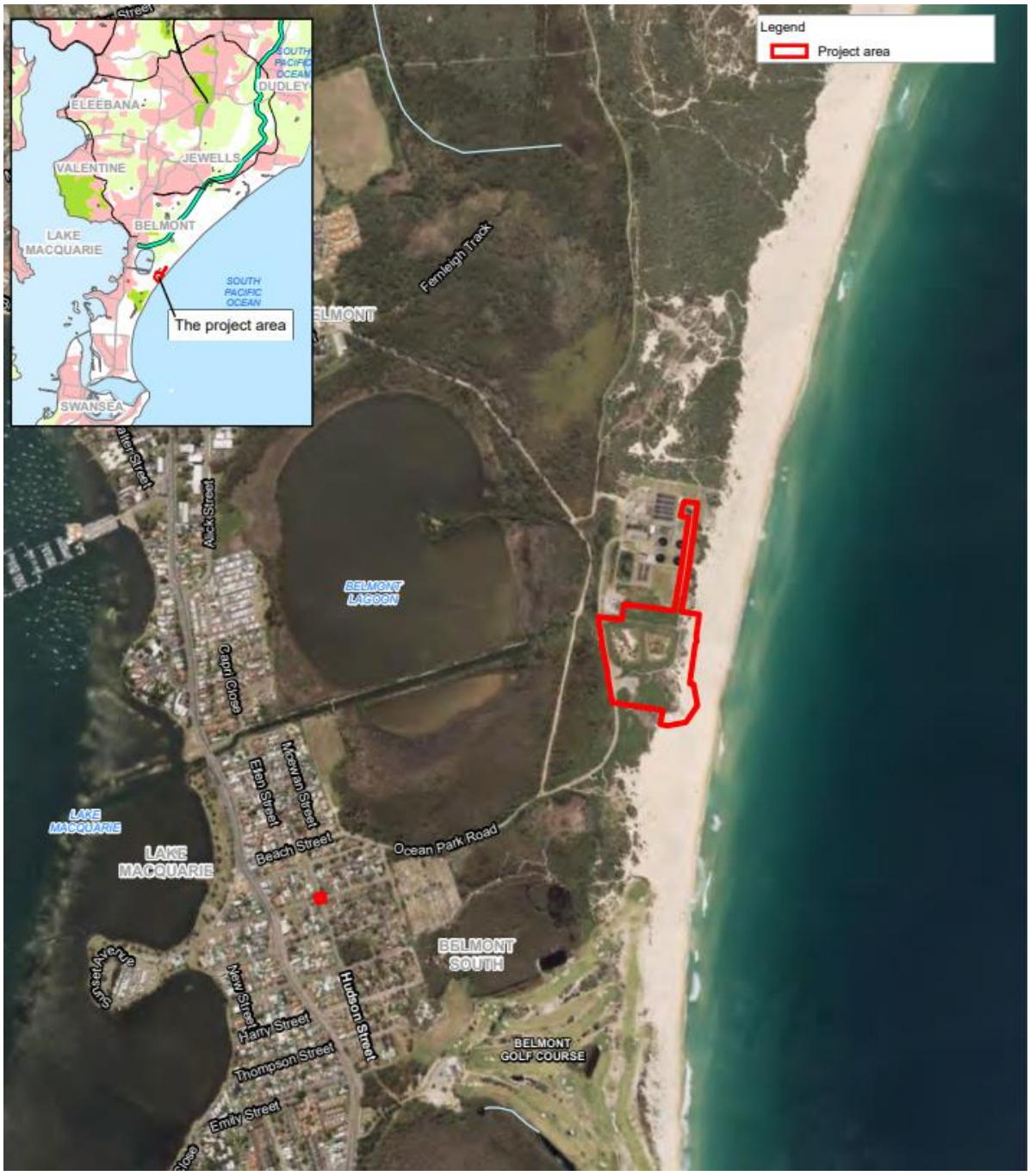


Figure 2-1 Project location

The key roads in the proximity of the subject site are shown in Figure 2-2.

Figure 2-2 Study Area

Source: Google Maps (2019), modified by GHD

2.2 Project description

2.2.1 Objectives

The key objectives of the Project are to:

- 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.

2.2.2 Key features

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

- **Seawater intakes** – The central intake structures would be a concrete structure (referred to as a caisson) of approximately nine to 11 metres diameter, installed to a depth up to 20 m below existing surface levels. The intake structures will be finished above the existing surface (0.5 m to 1 m) to prevent being covered by dune sands over time. The raw feed water (seawater) input is proposed to be extracted from a sub-surface saline aquifer. This would be extracted by 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 around 28 ML/day 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 the existing nearby Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – Power requirements of the plant would be met by 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.

A description of each of the key components of the Project is provided in Section 4 of the EIS.

The potable water pipelines connecting the Project to the potable water network do not form part of the Project and would be constructed separately. The construction and operation of the potable water pipeline would be part of a separate design and approvals process.

3. Existing conditions

3.1 Existing road network characteristics

3.1.1 Road hierarchy

Roads within NSW are categorised in the following two ways:

- By Classification (ownership)
- By the function that they perform.

Road classification

Roads are classified (as defined by the *Roads Act 1993*) based on their importance to the movement of people and goods within NSW (as a primary means of communication).

The classification of a road allows Roads and Maritime Services (Roads and Maritime) to exercise authority of all or part of the road. Classified roads include Main Roads, State Highways, Tourist Roads, Secondary Roads, Tollways, Freeways and Transitways.

For management purposes, Roads and Maritime has three administrative classes of roads. These are:

- **State Roads** – Major arterial links through NSW and within major urban areas. They are the principal traffic carrying roads and fully controlled by Roads and Maritime with maintenance fully funded by Roads and Maritime. State Roads include all Tollways, Freeways and Transitways; and all or part of a Main Road, Tourist Road or State Highway.
- **Regional Roads** – Roads of secondary importance between State Roads and Local Roads which, with State Roads provide the main connections to and between smaller towns and perform a sub-arterial function in major urban areas.
- **Local Roads** – The remainder of the council controlled roads. Local Roads are the responsibility of councils for maintenance funding. Roads and Maritime may fund some maintenance and improvements based on specific programs (e.g. urban bus routes, road safety programs). Traffic management on Local Roads is controlled under the delegations to local government from Roads and Maritime.

Functional hierarchy

Functional road classification involves the relative balance of the mobility and access functions. Roads and Maritime define four levels in a typical functional road hierarchy, ranking from high mobility and low accessibility, to high accessibility and low mobility. These road classes are:

- **Arterial Roads** – generally controlled by Roads and Maritime, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-Arterial Roads** – can be managed by either Roads and Maritime or local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links).
- **Collector Roads** – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles per day.
- **Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

A summary of the key roads analysed in this study is provided in the following sections.

3.1.2 Pacific Highway

The Pacific Highway is a state/arterial road that runs along the east coast of Australia.

The key features of the Pacific Highway within proximity of site are subject site are outlined in Table 3-1.

Table 3-1 Pacific Highway key features

Feature	Description
Carriageway	A divided carriageway (approximately 20 m – 35 m) with two lanes in each direction and additional turning lanes at signalised intersections.
Parking	Typically there is no parking permitted
Speed Limit	60 km/h
Pedestrian Facilities	Footpaths are typically provided on both sides of the road. Signal controlled pedestrian crossings are provided at signalised intersections.
Bicycle Facilities	Roads and Maritime's cycleway finder website identifies the Pacific Highway as moderate/high difficulty on-road route. No dedicated facilities are provided for bicycle riders.
Public Transport	Bus services operate along the Pacific Highway. Short "bus jump" lanes are provided on the Pacific Highway at the intersection with Ntaba Road.

Figure 3-1 Pacific Highway looking south from Beach Street

3.1.3 Beach Street

Beach Street is a local road which forms a signal controlled intersection with the Pacific Highway at its western end.

The key features of Beach Street are outlined in Table 3-2.

Table 3-2 Beach Street key features

Feature	Description
Carriageway	An undivided carriageway (approximately 10 m) with a single travel lane in each direction
Parking	Unrestricted
Speed Limit	50 km/h.
Pedestrian Facilities	None, grassed verges are provided to facilitate pedestrian movement
Bicycle Facilities	No dedicated facilities
Public Transport	No dedicated facilities

Figure 3-2 Beach Street looking east from the Pacific Highway

To the east of McEwan Street, Beach Street becomes Ocean Park Road.

Ocean Park Road functions as a rural local road and has a relatively poor pavement condition. It has a carriageway width of approximately five metres and accommodates bi-directional traffic flows. It provides vehicular access to the Belmont WWTW.

Figure 3-3 Ocean Park Road looking east from Beach Street

3.2 Crash data

Crash data was obtained from Roads and Maritime for the previous five years (2013 – 2017) at the intersection of Pacific Highway and Beach Street.

The data indicated that:

- There was a single crash at the intersection of the Pacific Highway and Beach Street, which occurred in 2013. This crash involved a rear-end collision that resulted in a “moderate injury”.

3.3 Traffic surveys

Weekday AM and PM peak period traffic surveys were undertaken at the intersection of the Pacific Highway/Beach Street on 19 June 2019. The traffic counts were undertaken in 15-minute intervals for the following times, to coincide with peak periods of road network activity:

- 7:00 am – 9:30 am
- 4:30 pm – 7:00 pm

The observed traffic network peak hours were identified between 7:30 am – 8:30 am and 4:30 pm – 5:30 pm.

The current peak hour traffic volumes for the intersection of interest is displayed in Figure 3-4, with a copy of the traffic survey data provided in Appendix A.

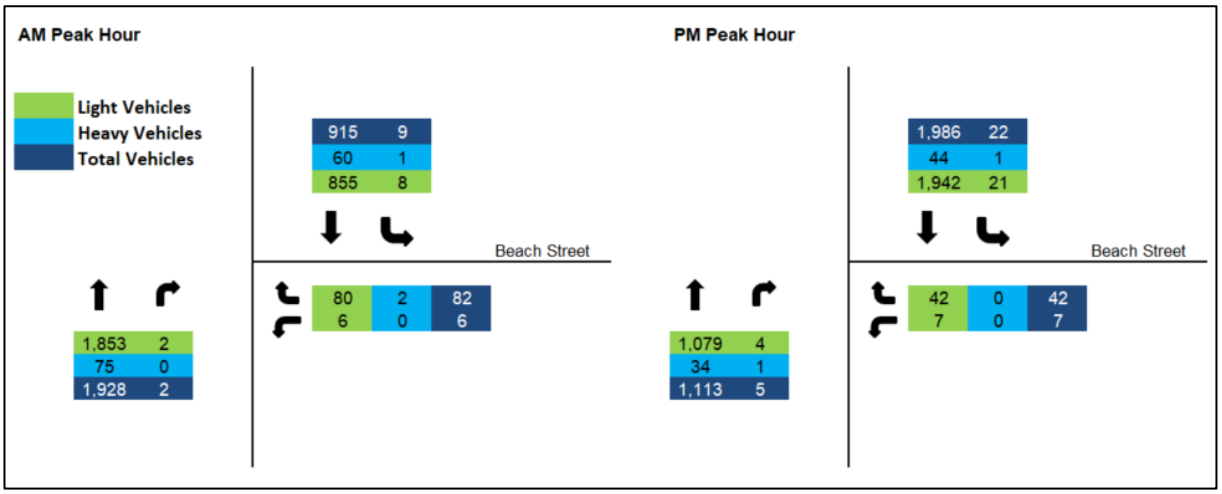


Figure 3-4 Current Peak Hour Traffic Volumes

The traffic count data in Figure 3-4 indicates that:

- Traffic volumes on the Pacific Highway are tidal with higher northbound traffic flows in the AM peak and higher southbound traffic flows in the PM peak.
- Traffic volumes on Beach Street are relatively minor, with between 11 and 88 vehicles per hours in each direction.

3.4 Mid-block capacity assessment

The Roads and Maritime *Guide to Traffic Generating Developments* (2002) specifies that for urban roads:

- Single lanes have mid-block capacities (to a Level of Service D) of 900 veh/h
- Two lanes have mid-block capacities (to a Level of Service D) of 2,200 veh/h

The traffic data indicates that the Pacific Highway and Beach Street are operating within the acceptable limits of their mid-block capacities.

3.5 Current network operation

The operation of the intersections of interest has been assessed using SIDRA 8. SIDRA calculates the amount of delay to vehicles using an intersection and, amongst other performance measures, gives a Level of Service (LoS) rating which indicates the relative performance of traffic movements within the intersection.

Table 3-3 presents the criteria generally applied to intersection performance. The LoS is determined from the calculated delay to traffic movements, which is a representation of driver frustration, fuel consumption and increased travel time. There are six LoS measures ranging from A (very low delay and very good operating conditions) to F (over saturation where arrival rates exceed intersection capacity) Typically a LoS D or better is considered to be acceptable. However, a LoS E may be acceptable if it also operates with a low degree of saturation.

Table 3-3 Intersection Level of Service Criteria

LoS	Average Delay/Vehicle (sec)	Traffic Signals & Roundabouts	Give-way & Stop signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory, but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays; roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory; requires additional capacity	Unsatisfactory, requires other control mode

The layout of Pacific Highway and Beach Street (as modelled in SIDRA) is displayed in Figure 3-5.

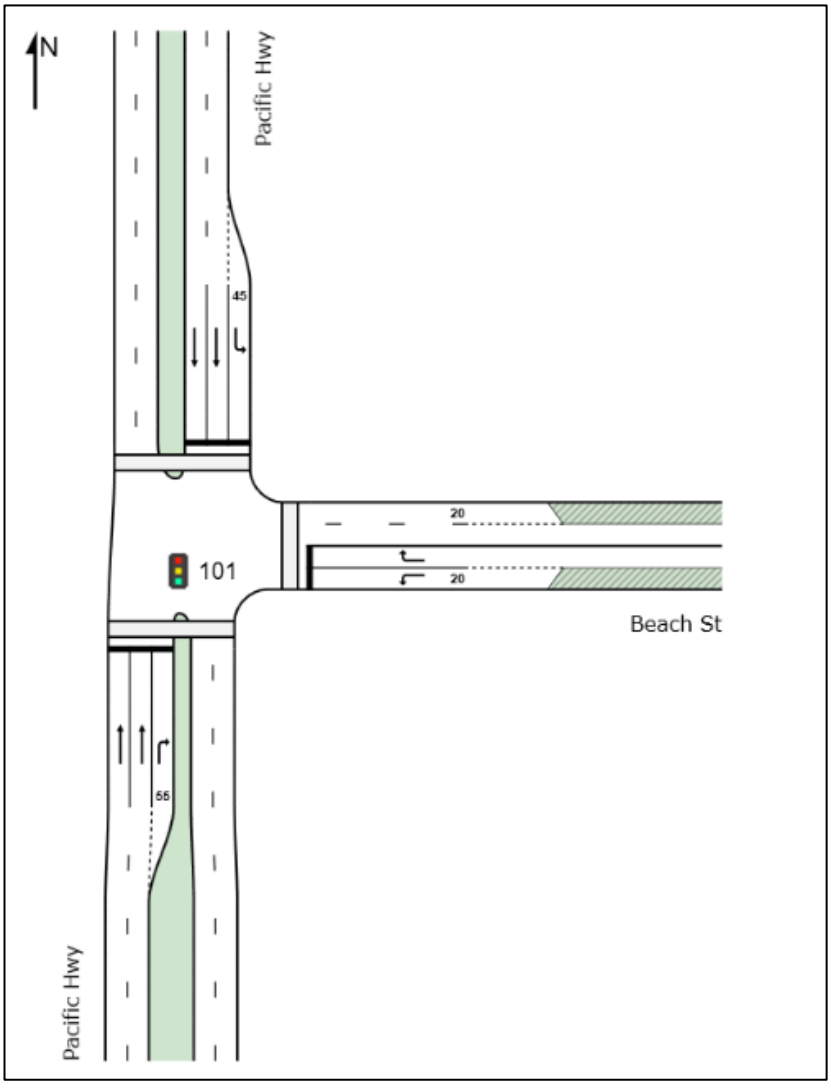


Figure 3-5 Pacific Highway and Beach Street Intersection Layout

Source: SIDRA

The results of the SIDRA intersection modelling analysis, based on the existing traffic volumes and road geometry, are summarised in Table 3-4.

Table 3-4 Current Intersection Performance

Intersection	AM Peak			PM Peak		
	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)
Pacific Highway and Beach Street						
Pacific Highway - south	7.9	A	182	5.1	A	71
Beach Street	40.9	C	23	44.1	D	13
Pacific Highway - north	4.9	A	53	7.8	A	199
All vehicles	**7.9**	**A**	**182**	**7.4**	**A**	**199**

The data in Table 3-4 indicates that the intersection of Pacific Highway and Beach Street currently operates with an overall good LoS.

SIDRA outputs for the existing situation are included in Appendix B.

4. Project conditions

4.1 Operational traffic

During operation, there would be routine chemical and supply deliveries and relatively small amounts of waste removed from the facility. It is not certain if full-time attendance by an operator would be necessary, but at times operators would attend site. Further, there would be periodic maintenance to various parts of the facility.

4.2 Construction traffic

4.2.1 Introduction

Table 4-1 provides a breakdown of anticipated light and heavy vehicle movements and expected duration for each construction package.

Table 4-1 Indicative Total Vehicle Traffic Movements

Package	Heavy vehicles movements	Workforce (people)	Construction Period
Intakes	668	10	6 months
Temporary treatment plant	25	10	2 months
Power upgrades	5	5	2 weeks

4.2.2 Heavy vehicles

The data in Table 4-1 indicates that the largest traffic impacts are expected to occur during the intakes package of the construction program when 668 trucks are expected to access the construction site. This would comprise of the following:

- 522 truck movements for the import of fill (based on a truck capacity of six metres squared)
- 136 truck movements for the delivery of concrete (based on a truck capacity of seven metres squared)
- Ten trucks movements associated with the delivery of intake pipes

The intakes package will be completed in two stages:

- Construction of a watertight restraining structures (the caissons) – approximately three months
- Construction of the well floor and laying of horizontal pipes – approximately three months

It is noted that:

- The 668 heavy vehicles are expected to access the construction site over six months, corresponding to an average of approximately 110 trucks accessing the site per month.
- Based on four working weeks in a month and six working days per week, there is expected to be approximately five trucks accessing the construction site per day.

To account for peak periods of activity within the six months of construction it has been assumed that up to ten trucks will access the construction site per day.

For the purposes of providing a highly conservative assessment, it has been assumed that up to six trucks will access the construction site per hour.

4.2.3 Light vehicles

Up to ten construction workers are expected on site. It is assumed that the workforce will access the construction site in the morning and depart the site in the afternoon.

4.2.4 Peak hour traffic volumes

For this assessment, the highest peak hour traffic generation during the construction of the temporary desalination plant is assumed to be 22 vehicle trips in total, which would consist of the following:

- AM peak hour:
  - Six inbound truck movements and six outbound truck movements
  - Ten inbound worker movements (light vehicles)
- PM peak hour:
  - Six inbound truck movements and six outbound truck movements
  - Ten outbound worker movements (light vehicles)

There is expected to be opportunities for construction workers to car share. However, to provide a conservative assessment, a car occupancy of one person per car has been assumed for worker trips.

4.2.5 Decommissioning

The traffic volumes associated with the decommissioning of the temporary desalination are not currently known.

However, as it is proposed that the intake structure would be capped and retained in place for potential re-use in the future, it is assumed that the vehicle activity associated with decommissioning of the temporary desalination plant will be less than the construction traffic.

4.3 Trip distribution

Access to the construction site will occur via the intersection of Pacific Highway and Beach Street.

The direction that the trucks are expected to access the construction site from is currently unknown. For the purposes of this assessment, it has been assumed that 50 per cent will access/egress the site to/from the north, 50 per cent accessing/egressing the site to/from the south.

It is expected that the majority of workers (80 per cent) will access/egress the construction site to/from the north with the remainder (20 per cent) from the south.

The expected construction vehicle trips are displayed in Figure 4-1 .

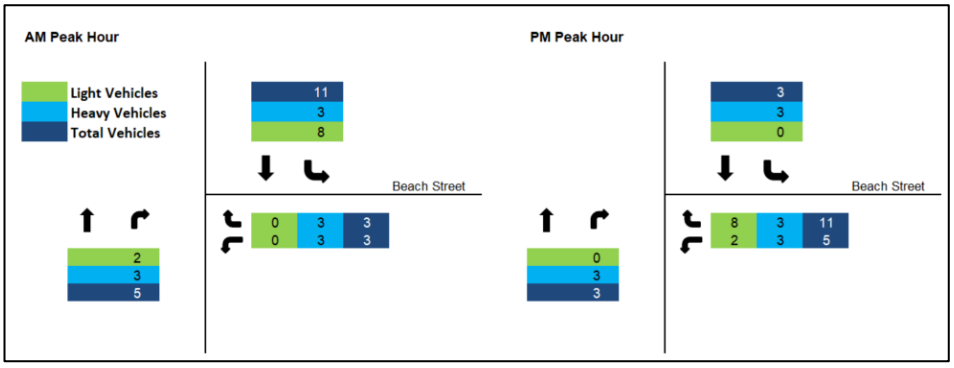


Figure 4-1 Peak Hour Construction Vehicle Trips

5. Impact assessment

The trigger for the construction of the temporary desalination plant will only occur if/when Hunter Water's total dam storage falls below 35 per cent. It is currently unknown when or if it will be constructed. However, for this assessment, it has been assumed that temporary desalination plant will be constructed in five years (by 2024).

Intersection traffic modelling has therefore been undertaken for the following two scenarios in the 2024 horizon year:

- A "no-build" scenario, accounting for background traffic growth only
- A "build" scenario accounting for the background traffic growth and the expected peak construction traffic associated with the temporary desalination plant

The difference between the "no build" and "build" scenario quantifies the traffic impacts associated with the construction of the proposed temporary desalination plant.

A linear annual growth rate of one per cent has been applied to the surveyed traffic volumes (2019) to determine the 2024 "no build" traffic volumes.

The 2024 "no build" traffic volumes are displayed in Figure 5-1, with the 2024 "build" traffic volumes are displayed in Figure 5-2.

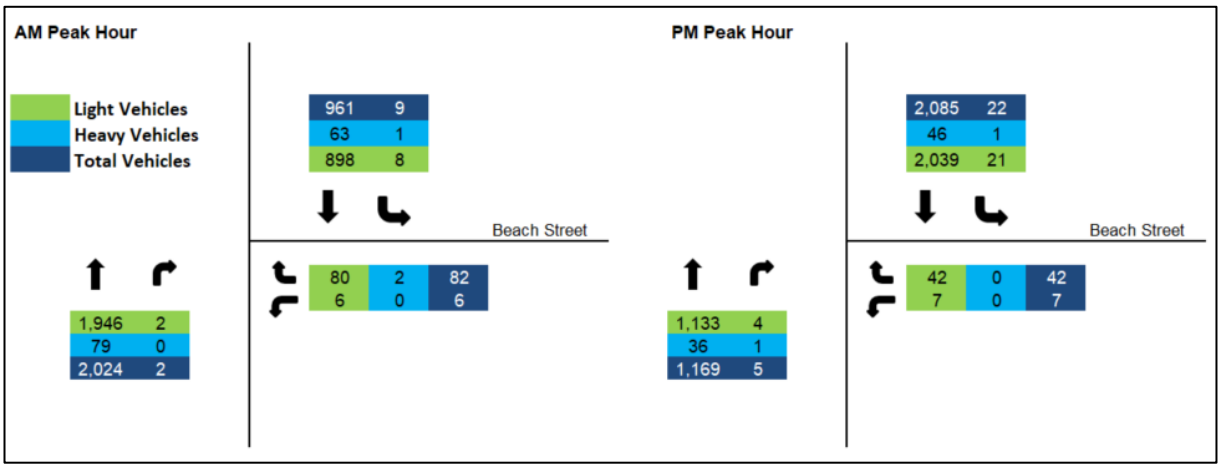


Figure 5-1 2024 No Build Traffic Volumes

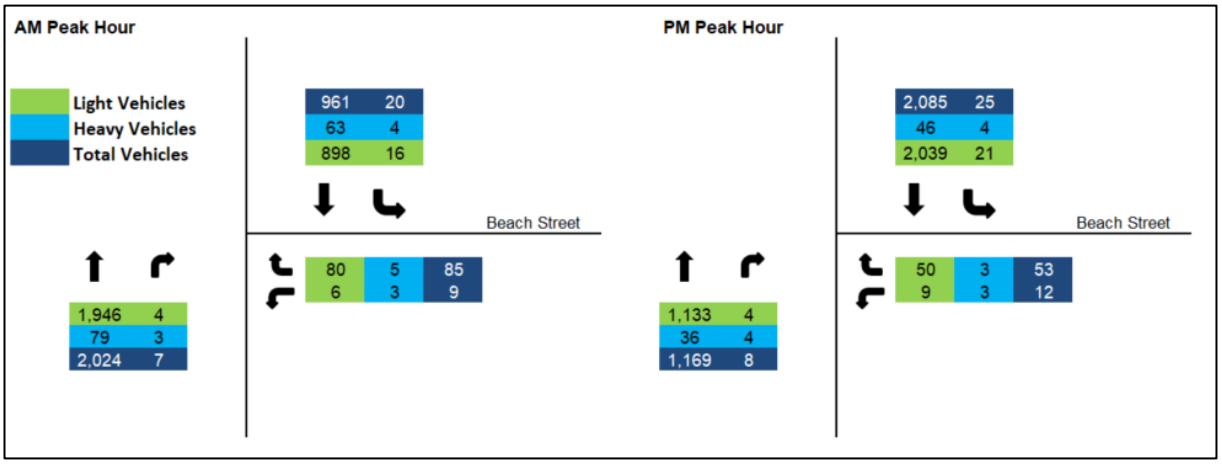


Figure 5-2 2024 Build Traffic Volumes

The results of the SIDRA analysis are summarised in Table 5-1, which indicates the following:

- The intersection of interest is expected to operate with a good LoS in 2024.
- The vehicles associated with the construction of the proposed temporary desalination plant are expected to have a negligible impact to the intersection operation.

In traffic engineering terms, it is considered that this forecast variation in traffic movements within the surrounding road network would have no adverse impacts on the road system and/or intersection operation. The forecast increase in traffic associated with the proposal would fall within typical daily traffic fluctuations.

The impacts to the adjoining active transport and public transport networks are expected to be negligible.

SIDRA outputs for the 2024 horizon year are displayed in Appendix C.

Table 5-1 Intersection Performance (2024)

Intersection	No Build						Build					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)	Av Delay (sec)	LOS	95th % Queue (m)
Pacific Highway and Beach Street												
Pacific Highway - south	8.1	A	212	5.2	A	76	8.1	A	217	5.2	A	76
Beach Street	45.5	D	26	44.1	D	13	45.7	D	28	44.6	D	17
Pacific Highway - north	4.8	A	60	8.3	A	224	4.8	A	60	8.3	A	224
All vehicles	**8.1**	**A**	**212**	**7.7**	**A**	**224**	**8.2**	**A**	**217**	**7.9**	**A**	**224**

6. Management and mitigation

The results of the SIDRA intersection modelling indicate that the intersection of Pacific Highway and Beach Street is expected to operate with an acceptable Level of Service (LoS) in the 2024 horizon year with the additional traffic generation associated with the construction of temporary desalination plant.

As such, no road upgrades or changes are required to the regional road network as a result of the project. In order to guide traffic management during the construction phase the following mitigation measures to minimise the potential traffic and access impacts associated with the Project are recommended:

- A Construction Traffic Management Plan (CTMP) should be prepared in consultation with Lake Macquarie City Council prior to construction commencing. The CTMP would include appropriate Traffic Control Plans and include detail with respect to:
  - Traffic control measures in works areas
  - Controls associated with the delivery of heavy plant and materials to site during peak traffic periods
  - Appropriate entry/exit points for the proposed construction compound areas
  - Advising motorists of the change in traffic conditions associated with the work
- Appropriate exclusion barriers, signage and site supervision is to be employed so that the project site is controlled and that unauthorised vehicles and pedestrians are excluded from the works area.
- Only existing roads and access roads are to be utilised.
- The community is to be kept informed about the project through appropriate means such as advertisements in the local media, notices and/or signs.
- All traffic control devices are to be in accordance with AS 1742.3-2009 – Manual of uniform traffic control Devices: Traffic control for works on roads and Roads and Maritime Traffic control at worksites manual.

7. Conclusion

The LHWP was developed in 2014 with the aim to ensure that the Lower Hunter is able to withstand a severe drought as well as meeting community needs in the medium term. Within the plan, temporary desalination is proposed in conjunction with other staged drought response measures in the event of an extreme drought. A temporary desalination plant would help make the water supply system more resilient to climate variability, with the primary benefit being that it would provide a drought contingency measure that is not dependant on rainfall.

The trigger for the construction of the proposed temporary desalination plant will occur if/when Hunter Water's total dam storage falls below 35 per cent.

This Traffic Assessment has been prepared as a supporting document to the EIS. The purpose of this report is to assess the likely traffic and transport impacts of the future construction and operation of the temporary desalination plant.

7.1 Traffic generation

7.1.1 Operational

There is expected to be very little operational or maintenance input for the temporary desalination plant, which would be operated under standard operating procedures for Hunter Water.

7.1.2 Construction

The largest traffic impacts are expected to occur during the intakes package of the construction program when 668 trucks are expected to access the construction site.

The highest peak hour traffic generation for the peak construction scenario has assumed to be 22 vehicle trips in total, which would consist of the following:

- AM peak hour:
  - Six inbound truck movements and six outbound truck movements
  - Ten inbound worker movements (light vehicles)
- PM peak hour: volumes of vehicles
  - Six inbound truck movements and six outbound truck movements
  - Ten outbound worker movements (light vehicles)

7.2 Traffic impacts

SIDRA 8 traffic modelling has been completed for the intersection of Pacific Highway and Beach Street. The analysis was completed in the 2024 horizon year for the following scenarios:

- A "no-build" scenario, accounting for background traffic growth only
- A "build" scenario accounting for the background traffic growth and the expected peak construction traffic associated with the temporary desalination plant

The SIDRA intersection modelling indicates that:

- The intersection of interest is expected to operate with a good LoS in 2024.
- The forecast increase in traffic associated with the construction of the proposed temporary desalination plant is expected to have a negligible impact on the intersection operation.

7.3 Conclusion

In traffic engineering terms, it is considered that this forecast variation in traffic movements within the surrounding road network would have no adverse impacts on the road system and/or intersection operation. The forecast increase in traffic associated with the proposal would fall within typical daily traffic fluctuations.

Appendices

Appendix A – Traffic Survey Outputs

TRANS TRAFFIC SURVEY

www.trafficsurvey.com.au

TURNING MOVEMENT SURVEY

Intersection of Beach St and Pacific Hwy, Lake Macquari

GPS -33.048998, 151.654984

Date:	Wed 19/06/19
Weather:	Overcast
Suburban:	Lake Macquarie
Customer:	GHD

North:	Pacific Hwy
East:	Beach St
South:	Pacific Hwy
West:	N/A

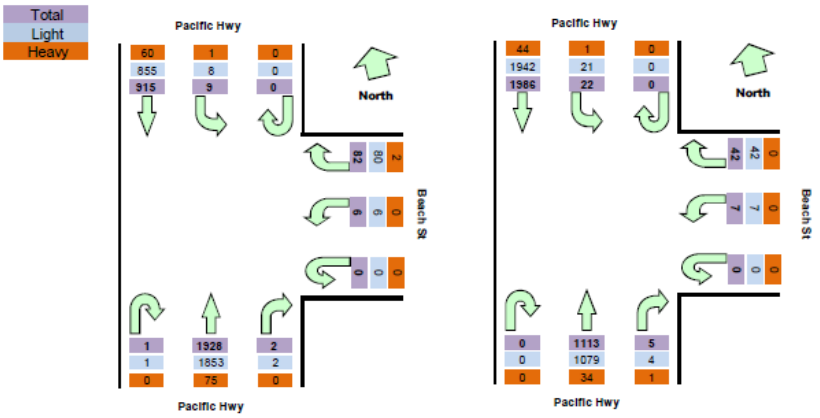
Survey	AM:	7:00 AM-9:30 AM
Period	PM:	4:30 PM-7:00 PM
Traffic	AM:	7:30 AM-8:30 AM
Peak	PM:	4:30 PM-5:30 PM

All Vehicles

Time		North Approach Pacific Hwy			East Approach Beach St			South Approach Pacific Hwy			Hourly Total	
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	Hour	Peak
7:00	7:15	0	208	3	0	16	1	0	1	373	2760	
7:15	7:30	0	208	1	0	13	2	0	0	451	2891	
7:30	7:45	0	245	1	0	27	4	0	0	487	2943	Peak
7:45	8:00	0	233	2	0	9	0	0	0	475	2867	
8:00	8:15	0	226	2	0	23	1	1	1	479	2887	
8:15	8:30	0	211	4	0	23	1	0	1	487	2704	
8:30	8:45	0	225	1	0	16	2	0	2	442	2651	
8:45	9:00	0	254	5	0	18	0	0	1	461		
9:00	9:15	0	216	5	0	14	4	0	1	310		
9:15	9:30	0	247	11	0	7	2	0	2	405		
16:30	16:45	0	518	6	0	8	1	0	1	282	3175	Peak
16:45	17:00	0	487	2	0	12	3	0	3	271	3120	
17:00	17:15	0	493	6	0	5	0	0	0	279	3044	
17:15	17:30	0	488	8	0	17	3	0	1	281	2796	
17:30	17:45	0	500	5	0	17	1	0	0	238	2466	
17:45	18:00	0	445	11	0	6	1	0	0	239	2056	
18:00	18:15	0	348	7	0	6	3	0	0	171	1664	
18:15	18:30	0	287	2	0	13	0	0	0	166		
18:30	18:45	0	193	2	0	3	0	0	0	153		
18:45	19:00	0	184	3	0	7	1	0	0	115		

Peak Time		North Approach Pacific Hwy			East Approach Beach St			South Approach Pacific Hwy			Peak
Period Start	Period End	U	SB	L	U	R	L	U	R	NB	total
7:30	8:30	0	915	9	0	82	6	1	2	1928	2943
16:30	17:30	0	1986	22	0	42	7	0	5	1113	3175

Note: Site sketch is for illustrating traffic flows. Direction is indicative only, drawing is not to scale and not an exact streets configuration.



Appendix B – SIDRA Outputs (existing situation)

MOVEMENT SUMMARY

Site: 101 [2019_AM_BASE_PACIFIC HWY & BEACH ST - Existing]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

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	2029	3.9	0.772	7.8	LOS A	25.2	182.4	0.69	0.64	0.69	51.2
3	R2	2	0.0	0.006	12.8	LOS A	0.0	0.2	0.40	0.65	0.40	31.9
Approach		2032	3.9	0.772	7.9	LOS A	25.2	182.4	0.69	0.64	0.69	51.1
East: Beach St												
4	L2	6	0.0	0.028	38.4	LOS C	0.2	1.6	0.90	0.65	0.90	15.6
6	R2	86	2.4	0.389	41.1	LOS C	3.3	23.3	0.96	0.77	0.96	16.1
Approach		93	2.3	0.389	40.9	LOS C	3.3	23.3	0.96	0.76	0.96	16.0
North: Pacific Hwy												
7	L2	9	11.1	0.008	11.1	LOS A	0.1	0.9	0.33	0.65	0.33	36.0
8	T1	963	6.6	0.372	4.8	LOS A	7.3	53.8	0.42	0.37	0.42	59.5
Approach		973	6.6	0.372	4.9	LOS A	7.3	53.8	0.42	0.38	0.42	59.2
All Vehicles		3097	4.7	0.772	7.9	LOS A	25.2	182.4	0.62	0.56	0.62	50.4

MOVEMENT SUMMARY

Site: 101 [2019_PM_BASE_PACIFIC HWY & BEACH ST - Existing]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

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	1172	3.1	0.430	5.0	LOS A	9.9	71.0	0.42	0.38	0.42	59.0
3	R2	5	20.0	0.056	26.6	LOS B	0.2	1.3	0.65	0.69	0.65	20.8
Approach		1177	3.1	0.430	5.1	LOS A	9.9	71.0	0.42	0.38	0.42	58.6
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	2091	2.2	0.769	7.7	LOS A	28.0	199.4	0.66	0.62	0.66	51.4
Approach		2114	2.2	0.769	7.8	LOS A	28.0	199.4	0.66	0.62	0.66	51.2
All Vehicles		3342	2.5	0.769	7.4	LOS A	28.0	199.4	0.58	0.53	0.58	51.9

Appendix C – SIDRA Outputs (2024)

MOVEMENT SUMMARY

Site: 101 [AM_BASE_PACIFIC HWY & BEACH ST - 2024 No Build]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue 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

MOVEMENT SUMMARY

Site: 101 [PM_BASE_PACIFIC HWY & BEACH ST - 2024 No Build]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue 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

MOVEMENT SUMMARY

Site: 101 [AM_BASE_PACIFIC HWY & BEACH ST - 2024 Build]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Hwy												
2	T1	2132	3.9	0.796	8.1	LOS A	30.0	217.0	0.69	0.64	0.69	50.7
3	R2	7	42.9	0.032	13.2	LOS A	0.1	1.2	0.39	0.67	0.39	29.3
Approach		2139	4.0	0.796	8.1	LOS A	30.0	217.0	0.69	0.64	0.69	50.6
East: Beach St												
4	L2	9	33.3	0.053	43.8	LOS D	0.4	3.4	0.91	0.67	0.91	13.9
6	R2	89	5.9	0.423	45.9	LOS D	3.8	28.1	0.97	0.77	0.97	14.8
Approach		99	8.5	0.423	45.7	LOS D	3.8	28.1	0.96	0.76	0.96	14.7
North: Pacific Hwy												
7	L2	21	20.0	0.019	11.0	LOS A	0.3	2.2	0.30	0.66	0.30	35.6
8	T1	1012	6.6	0.380	4.7	LOS A	8.1	59.8	0.40	0.36	0.40	59.8
Approach		1033	6.8	0.380	4.8	LOS A	8.1	59.8	0.40	0.36	0.40	59.1
All Vehicles		3271	5.1	0.796	8.2	LOS A	30.0	217.0	0.60	0.56	0.60	49.6

MOVEMENT SUMMARY

Site: 101 [PM_BASE_PACIFIC HWY & BEACH ST - 2024 Build]

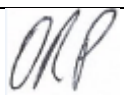
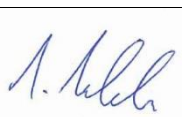
New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue 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	8	50.0	0.106	29.7	LOS C	0.3	2.8	0.70	0.71	0.70	18.7
Approach		1239	3.4	0.452	5.2	LOS A	10.6	76.3	0.43	0.39	0.43	58.0
East: Beach St												
4	L2	13	25.0	0.067	43.7	LOS D	0.5	4.3	0.91	0.68	0.91	14.0
6	R2	56	5.7	0.263	44.9	LOS D	2.3	17.0	0.94	0.74	0.94	15.1
Approach		68	9.2	0.263	44.6	LOS D	2.3	17.0	0.94	0.73	0.94	14.9
North: Pacific Hwy												
7	L2	26	16.0	0.023	11.0	LOS A	0.3	2.6	0.31	0.67	0.31	35.9
8	T1	2195	2.2	0.809	8.3	LOS A	31.5	224.8	0.70	0.66	0.71	50.1
Approach		2221	2.4	0.809	8.3	LOS A	31.5	224.8	0.70	0.66	0.70	49.9
All Vehicles		3528	2.9	0.809	7.9	LOS A	31.5	224.8	0.61	0.57	0.61	50.4

2219573-34278/https://projects.ghd.com/oc/newcastle1/cs0865hwctemporaryde/Delivery/Documents/2219573-REP_Traffic Assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	M Lucas	O Peel		N Malcolm		11/10/2019
1	M Lucas	O Peel		N Malcolm		5/11/2019

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