Appendix P – Traffic Assessment

Technical Advice Note

29 June 2020

To	Hunter Water Corporation		
Copy to			
From	Nathan Malcolm	Tel	+61 2 49799978
Subject	Belmont Drought Response Desalination Plant - AR Traffic Assessment	Job no.	2219573

1 Introduction

1.1 Background

Hunter Water Corporation (Hunter Water) is seeking approval to construct and operate a drought response desalination plant (the 'Project'), adjacent to the Belmont Wastewater Treatment Works (WWTW) in Belmont South, a suburb of Lake Macquarie Local Government Area (LGA) of New South Wales (NSW) (the 'Project area'); (see Figure 2-1).

Like much of NSW, the Lower Hunter region continues to experience ongoing drought conditions. In response to the drought, Hunter Water is rolling out a program of drought response measures as outlined in the 2014 Lower Hunter Water Plan (LHWP). Measures include the staged introduction of water restrictions, implementation of a broad range of water conservation and water loss initiatives as well as various operational measures. The 2014 LHWP identified the implementation of emergency desalination as a measure of last resort in response to a severe drought, and would only be implemented if water storage levels reached a critical point and all other measures have been implemented.

GHD Pty Ltd (GHD) were engaged by Hunter Water to prepare an Environmental Impact Statement (EIS) (GHD, 2019a) to support a development application for the Project as State Significant Infrastructure (SSI) under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The EIS was prepared in accordance with the provisions of the EP&A Act and the EP&A Regulation and addresses the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning, Industry and Environment (DPIE) for the Project on 12 December 2017 and revised on 24 January 2018. The EIS was publicly exhibited by DPIE for 28 days from 21 November 2019 to 19 December 2019.

The Project described in the EIS included the construction and operation of a desalination plant, designed to produce up to 15 megalitres per day (ML/day) of potable water, with two sub-surface intake structures.

Since commencing this Project, Hunter Water has begun a major review of the 2014 LHWP, now referred to as the Lower Hunter Water Security Plan (LHWSP). The LHWSP seeks to determine the preferred portfolio of supply and demand side options to ensure a sustainable and resilient supply for the region, over the long term as well as during drought. This work indicates that a drought response portfolio including a desalination plant at Belmont with a nominal production capacity of up to 30 ML/day would provide the best balance of meeting the community's needs should a severe drought occur, while still providing value for money.

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In addition to the proposed increase in plant capacity, further design development and assessment following completion of the EIS has identified that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including, reliability, efficiency and scalability.

1.2 Purpose and structure of this report

This report has been prepared to support the Amendment Report and addresses the requirements for the SEARs in considering the revised impacts of the amended Project.

This report provides a brief overview of the amended Project, a more detailed description of the project is provided in Appendix C of the Amendment Report. This assessment considers the impacts associated with the proposed amendments to the Project. Therefore, this report should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement (GHD, November 2019)* and *Belmont Drought Response Desalination Plant Traffic Assessment (GHD, November 2019*).

1.2.1 Consideration of design changes

The SEARs relevant to traffic issues for the Project are summarised in Table 1-1 below, including identification of where in this report this requirement has been addressed with consideration to the Project, as amended (see Section 2).

Table 1-1 SEARs (SSI-8896) – traffic impacts

SEARs requirement	Relevant section?
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 Sections 3.3 and 5 of the Traffic Assessment (Appendix O of the EIS)
• 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
• 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 of the Traffic Assessment (Appendix O of the EIS)
• Traffic analysis using SIDRA or similar traffic model	Refer to Sections 3.3, 4 and 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 Sections 4 and 5
• Identification of necessary road network infrastructure upgrades.	No infrastructure upgrades have been identified

2 The Project

2.1 Overview

In addition to the proposed increase in plant capacity, the amended Project includes the following design changes:

- Seawater intake: Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability (see Section 2.2).
- Power supply: The EIS proposed to meet power requirements for the Project via a minor upgrade to the existing 11 kV power supply network in the vicinity of Hudson and Marriot Street. The amendment to the capacity of the water treatment process plant means this is now unfeasible, due to inability to meet energy requirements. Instead, the Project will connect to Ausgrid's 33 kV network in the vicinity of the Project.

2.2 Key features of the amended Project

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

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

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

Each of these elements are described further in Appendix C of the Amendment Report.

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

Paper Size ISO A4

0 140 280 420 560

Metres

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

N

GHD

Hunter Water Corporation
Belmont Drought Response Desalination Plant
Traffic Assessment Amendment

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

Project Location

Figure 1

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Print date: 29 Jun 2020 - 09:43

The Project area is located on the southern portion of the current Belmont wastewater treatment works site, off Ocean Park Road and to the east of the Pacific Highway as shown in Figure 2-1.

All construction vehicles, including light and heavy vehicles, are expected to access the Project Area via the intersection of Pacific Highway and Beach Street.

Based on the information provided by Hunter Water, it has been assumed that the desalination plant would be constructed by 2024.

3 Construction Traffic (EIS Project)

3.1 Background Traffic

Table 3-1 provides a breakdown of the total anticipated light and heavy vehicle movements and expected duration for each construction package for the EIS Project (as previously presented in the *Belmont Drought Response Desalination Plant Traffic Assessment)*.

Table 3-1 Indicative Total Vehicle Traffic Movements (EIS Project)

Package	Heavy vehicles movements	Workforce (people)	Construction Period
Sub surface Intake structure	668	10	6 months
Water treatment process plant	25	10	2 months
Power upgrades	5	5	2 weeks

Table 3-1 indicates that the largest traffic impacts were expected to occur during the sub surface intake structure package of the construction program, when 668 heavy vehicles were expected to access the construction site over a six month period, including:

- 522 truck movements for the import of fill, based on a typical truck capacity of six cubic metres
- 136 truck movements for the delivery of concrete, based on typical a truck capacity of seven cubic metres
- Ten trucks movements associated with the delivery of intake structure pipes

For the previously proposed EIS Project, the *Belmont Drought Response Desalination Plant Traffic Assessment* report (November 2019) identified that:

- Around 110 trucks would access and egress the site per month over a six month period.
- Based on four working weeks in a month and six working days per week, approximately five trucks would be accessing and egressing the construction site per day.

3.2 Peak hour traffic generation

During the peak construction scenario, it has been conservatively estimated that the proposed EIS Project is expected to generate up to 22 vehicle movements in total in the peak hour, consisting 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)

As construction vehicle assessment indicated that, on average, five trucks will access and egress the construction site per day, the assumption of six inbound and outbound trucks per hour is considered to facilitate a robust analysis.

3.3 Traffic Impacts

As part of the works associated with *Belmont Drought Response Desalination Plant Traffic Assessment* the following tasks were undertaken:

- Traffic surveys were commissioned at the intersection of Pacific Highway/Beach Street on 19 June 2019.
- SIDRA intersection modelling was undertaken for the existing situation, which indicates that the intersection of Pacific Highway/Beach Street currently operates with a good Level of Service.
- The peak hour traffic generation associated with construction activities was quantified (see Section 3.2).
- Trip distribution was undertaken based on the patterns identified in the traffic surveys.
- SIDRA analysis was undertaken for the 2024 horizon year[1] accounting for the expected peak construction activity.

The layout of the Pacific Highway/Beach Street, as modelled in SIDRA, is displayed in Figure 3-1, which the expected 2024 horizon year traffic volumes are shown in Figure 3-2.

[1] A one percent growth rate was applied to the traffic volumes on the Pacific Highway to determine the 2024 background traffic volumes. Similarly to the 15 ML a day facility, the 30 ML a day facility is expected to be constructed by 2024.

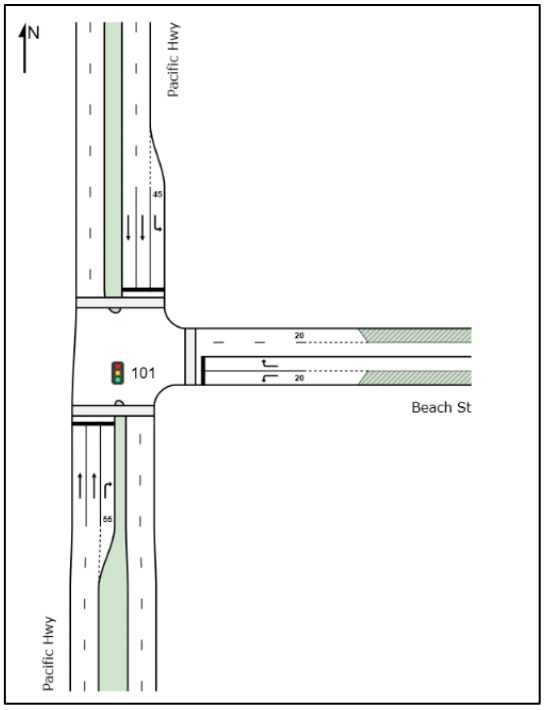

Figure 3-1 Pacific Highway and Beach Street Intersection Layout

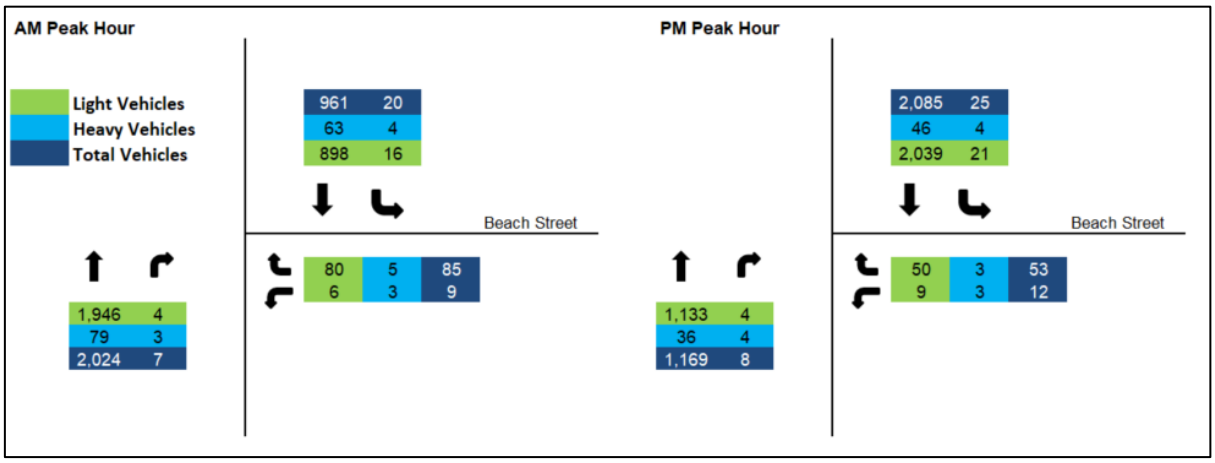

Figure 3-2 2024 Horizon Year Traffic Volumes

The weekday AM and PM peak SIDRA results for the 2024 horizon year, accounting for the background traffic volumes and peak construction vehicle activity, are summarised in Table 3-2.

Table 3-2 2024 Horizon Year Intersection Outputs (construction scenario EIS Project)

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	8.1	A	217	5.2	A	76
Beach Street	45.7	D	28	44.6	D	17
Pacific Highway - north	4.8	A	60	8.3	A	224
All vehicles	**8.2**	**A**	**217**	**7.9**	**A**	**224**

The results of the SIDRA analysis indicated:

- 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 desalination plant is expected to have a negligible impact on the operation of the Pacific Highway/Beach Street intersection.

4 Construction traffic (Amended Project)

The updated construction vehicle activity associated with the DOI indicates that 752 heavy vehicles are expected to access and egress the construction site (over an eight-month period), including:

- 522 truck movements for the import of fill, based on a typical truck capacity of six cubic metres
- 190 truck movements for the delivery of concrete, based on a typical truck capacity of seven cubic metres)
- 40 trucks movements associated with the delivery of intake pipes

It is noted that for the amended Project:

- The 752 heavy vehicles are expected to access and egress the construction site over eight months, corresponding to an average of approximately 94 trucks accessing the site per month.
- Based on four working weeks in a month and six working days per week, the proposal is expected to generate approximately four trucks accessing and egressing the construction site per day.

Therefore, the assumption of six trucks an hour (previously adopted for the assessment of the EIS Project) represents a conservative analysis.

Similarly to the EIS to be extremely conservative, for the purposes of analysis, it has been assumed that the amended Project will generate six inbound and six outbound truck movements per hour.

The expected worker activity associated with the amended Project, is displayed in Table 4-1.

Table 4-1 Amended Project Worker Volumes

Package	No. Workers
Direct Ocean Intake	20
Water treatment process plant	30
Power upgrades	10

The data in Table 4-1 indicates:

- Up to 60 workers are expected over the construction period
- The majority of workers (30) are expected during the construction of the water treatment process plant

To be conservative, it has been assumed that the amended Project will generate up to 42 vehicle movements in total in the peak hour, consisting of the following:

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

The expected traffic volumes associated with the amended Project (based upon the trip distribution assumptions specified in the EIS), are displayed in Table 4-1.

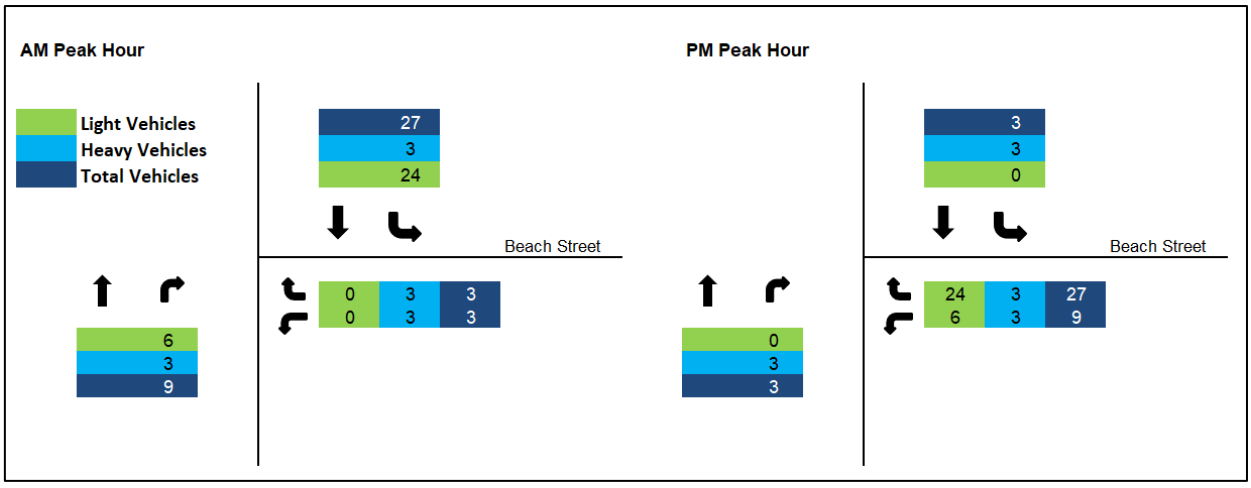

Figure 4-1 Peak Hour Construction Vehicles (amended Project)

The 2024 horizon year traffic volumes associated with the amended Project construction trips are displayed in Figure 4-2.

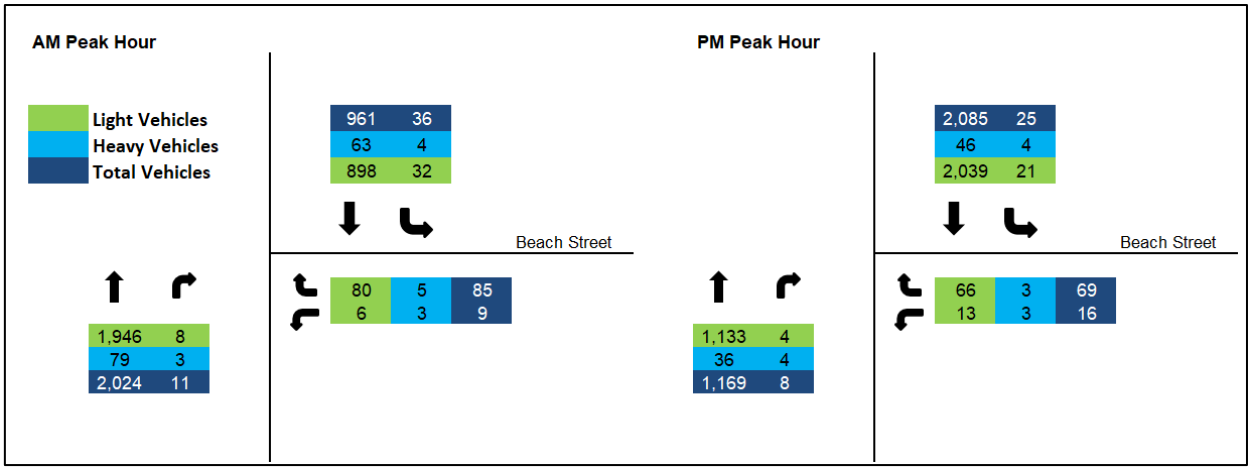

Figure 4-2 2024 Horizon Year Traffic Volumes (amended Project)

The 2024 SIDRA files have been updated, with the traffic volumes in Figure 4-2, and the results are displayed in Table 4-2.

Table 4-2 2024 Horizon Year Intersection Outputs (construction scenario amended Project)

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	8.1	A	220	5.2	A	77
Beach Street	45.7	D	28	45.0	D	22
Pacific Highway - north	4.9	A	60	8.3	A	225
All vehicles	**8.2**	**A**		**8.2**	**A**	

The results of the SIDRA analysis 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 desalination plant for the amended Project is expected to have a negligible impact on the operation of the Pacific Highway/Beach Street intersection.

It is further noted that the construction vehicle activity associated with each of the construction techniques for the intake pipeline (HDD and pipe jacking) is expected to be approximately the same.

In accordance with the relatively minor increases in traffic volumes and the good Level of Service (current and in 2024 under the peak construction traffic scenario) at the intersection of Pacific Highway/Beach Street, the difference in traffic generation associated with the construction of the amended Project is expected to have a negligible impact on the adjoining road network.

The SIDRA outputs for the amended Project are attached to this technical memorandum.

5 Operational traffic

There is expected to be very little operational or maintenance input for the desalination plant for either the EIS Project or the amended Project, which would function under standard operating procedures for Hunter Water.

Therefore the traffic impacts associated with the operation of the amended desalination plant are expected to be negligible.

6 Summary

In traffic engineering terms, it is considered that this forecast variation in traffic movements for the amended Project is expected to have negligible traffic impacts, compared to the EIS Project. The forecast increase in traffic associated with the amended Project would fall within typical daily traffic fluctuations.

In conclusion, the Project is not expected to result in any adverse impacts to the operation of the surrounding road network.

Regards

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Attachment A – SIDRA Outputs Amended Project

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	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	0.799	8.1	LOS A	30.3	219.4	0.69	0.64	0.69	50.7
3	R2	12	27.3	0.045	13.3	LOS A	0.2	1.7	0.39	0.68	0.39	30.0
Approach		2143	4.0	0.799	8.1	LOS A	30.3	219.4	0.69	0.64	0.69	50.5
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	38	11.1	0.032	11.0	LOS A	0.5	3.7	0.31	0.67	0.31	36.1
8	T1	1012	6.6	0.380	4.7	LOS A	8.1	59.8	0.40	0.36	0.40	59.8
Approach		1049	6.7	0.380	4.9	LOS A	8.1	59.8	0.39	0.37	0.39	58.6
All Vehicles		3292	5.0	0.799	8.2	LOS A	30.3	219.4	0.60	0.56	0.60	49.5

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	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	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	17	18.8	0.087	43.8	LOS D	0.7	5.5	0.92	0.69	0.92	14.0
6	R2	73	4.3	0.340	45.3	LOS D	3.1	22.2	0.96	0.76	0.96	15.0
Approach		89	7.1	0.340	45.0	LOS D	3.1	22.2	0.95	0.75	0.95	14.8
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		3549	2.8	0.809	8.2	LOS A	31.5	224.8	0.61	0.57	0.61	49.8