



Appendix K

Traffic and access



Australian Industrial Energy

Port Kembla Gas Terminal Traffic Impact Assessment

November 2018

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1. Introduction

1.1 Background

Australian Industrial Energy (AIE) proposes to develop the Port Kembla Gas Terminal (the project) in Port Kembla, New South Wales (NSW). The project involves the development of a liquified natural gas (LNG) import terminal including a Floating Storage and Regasification Unit (FSRU) moored at Berth 101 in the Inner Harbour, visiting LNG carriers, wharf offloading facilities and the installation of new pipeline to connect to the existing gas transmission network. The project will be the first of its kind in NSW and provide a simple, flexible solution to the state's gas supply challenges.

NSW currently imports more than 95% of its natural gas requirements from Victoria, South Australia and Queensland. An import terminal would enable NSW to control and secure its own direct supplies. The project has the capacity to deliver in excess of 100 petajoules of natural gas per annum to NSW. This is equivalent to more than 70% of the State's annual needs. Supply could be increased further to around 140–150 petajoules per annum through a slight increase in scheduled deliveries and pipeline upgrades.

The project has been declared Critical State Significant Infrastructure (CSSI) in accordance with Section 5.13 of the *Environmental Planning and Assessment Act 1979* and Schedule 5 of *State Environmental Planning Policy (State and Regional Development) 2011*.

An Environmental Impact Statement (EIS) is required to support the application for approval for determination by the NSW Minister for Planning.

1.2 Project overview

1.2.1 Objectives

Key objectives of the project are to:

- Introduce a new source of competitively priced gas to meet predicted supply shortfalls and help put downward pressure on prices
- Provide gas security to NSW with ability to supply more than 70% of the State's gas needs
- Provide long term contracts to industrial users and ability to meet 100% of the State's industrial demand (manufacturers, power stations, hospitals, small businesses etc.)
- Help support the 300,000 jobs across NSW, and the 15,000 jobs in the Illawarra region, which rely on the competitive, reliable supply of natural gas
- Support the diversification and future growth of Port Kembla consistent with the NSW Ports 30 Year Master Plan.

1.2.2 The project

The project consists of four key components:

- LNG carrier vessels — there are hundreds of these in operation worldwide transporting LNG from production facilities all around the world to demand centres;
- Floating Storage and Regasification Unit (FSRU) — a cape-class ocean-going vessel which would be moored at Berth 101 in Port Kembla. There are around 30 such vessels currently in operation around the world;

- Berth and wharf facilities – including landside offloading facilities to transfer natural gas from the FSRU into a natural gas pipeline located on shore; and
- Gas pipeline – a Class 900 carbon steel high-pressure pipeline connection from the berth to the existing gas transmission network.

The project design and layout, construction, operation and decommissioning is described in the EIS.

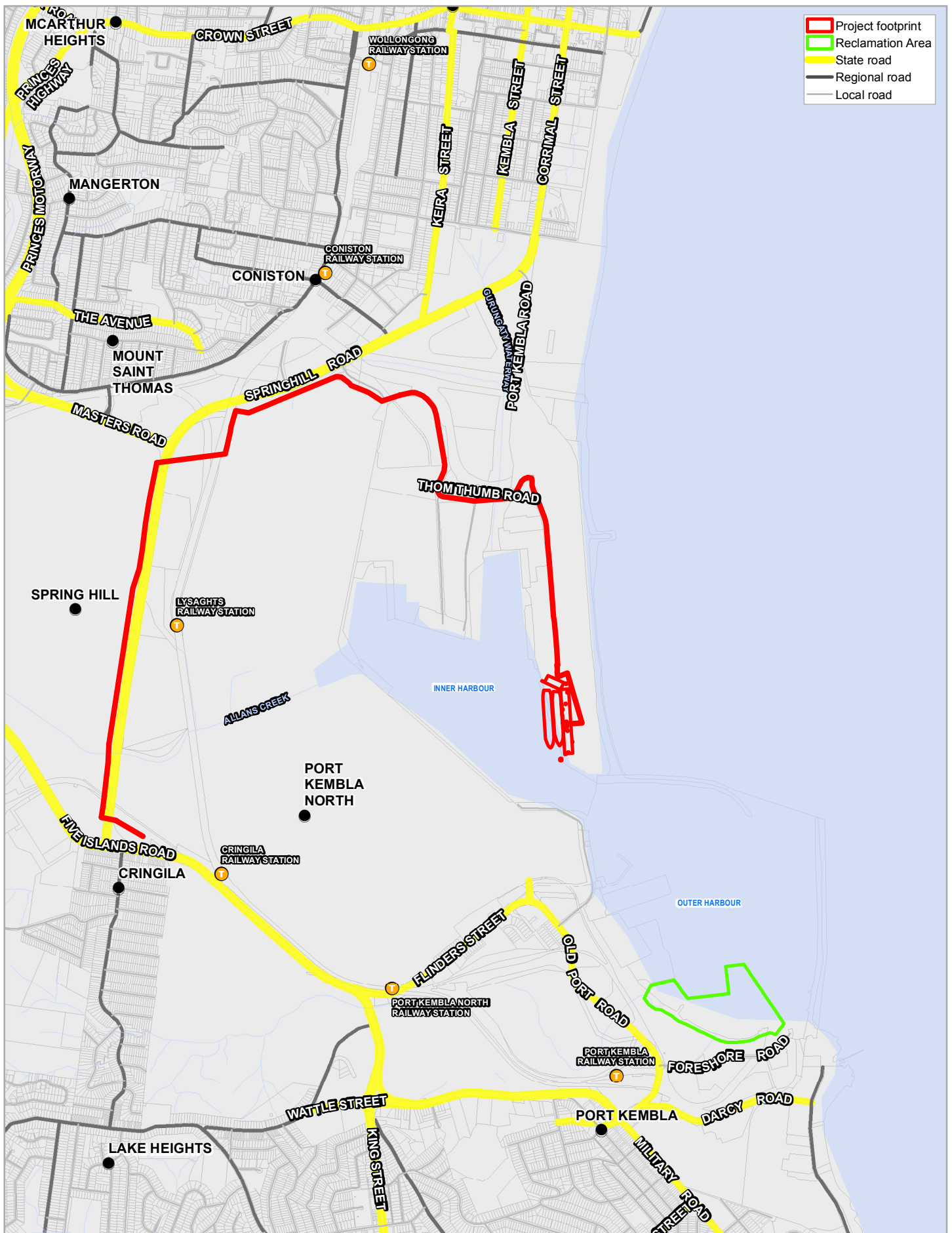
The project, subject to approvals, is scheduled for construction in 2019 with first gas delivery in 2020. The project life is 10–15 years but could be extended with sufficient demand.

Construction of the project is expected to involve a capital investment of about \$200–250 million and employ about 150 workers at its peak. Once fully operational, the project is expected to employ about 40–50 workers.

1.3 Project location

The project is located at Port Kembla, with three sites considered as part of this traffic study, as shown at Figure 1-1. These include:

- The wharf and berth facilities site (referred to as the wharf site in this report) at Berth 101 on the eastern side of the Inner Harbour at Port Kembla, accessed from Port Kembla Road. This would be the location of the FSRU.
- The gas pipeline alignment, with temporary access proposed from a number of locations as the pipeline is developed, including Port Kembla Road, Tom Thumb Road and the BlueScope Steel works access roads.
- The disposal site, located to the south of Port Kembla Outer Harbour and accessed from Foreshore Road, via Old Port Road and Flinders Street.

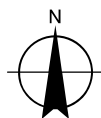


Paper Size ISO A4

0 280 560 840 1,120

Metres

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



Australian Industrial Energy
Port Kembla Gas Terminal

Project No. 21-27477
Revision No. A
Date 31 Oct 2018

Site location plan

Figure 1-1

1.4 Scope of this report

This Traffic Impact Assessment (TIA) identifies the potential environmental issues associated with traffic and transport impacts during construction and operation of the project and addresses the *Secretary's environmental assessment requirements* (SEARs) for the project (see Section 2.1). The assessment will be used to support the EIS for the Project.

The requirements addressed in this report include an assessment of traffic and transport impacts during the construction and operation of the project.

1.5 Study assumptions and limitations

The preparation of this study was limited by the following:

- Site inspections undertaken at the surrounding road network in September 2018. The site inspections were limited to the public road network only.
- Intersection traffic counts commissioned by GHD, undertaken during a weekday AM and PM peak period undertaken in September 2018 at the following intersections:
 - Port Kembla Road / Springhill Road;
 - Five Islands Road / Flinders Street;
 - Old Port Road / Foreshore Road; and
 - Five Islands Road / Darcy Street / Military Road.
- 2015 intersection count data for the following locations provided by the Proposed Port Kembla Bulk Liquids Terminal Traffic Impact Assessment (Cardno, 2015);
 - Springhill Road / Tom Thumb Road; and
 - Springhill Road / Masters Road.
- 2015 midblock traffic count data, supplied by Roads and Maritime Services (Roads and Maritime) for Springhill Road, Flinders Street and Five Islands Road.
- 2017 intersection traffic count data, supplied by Roads and Maritime for the Springhill Road / Five Islands Road intersection.

Assumptions used in this TIA are as follows:

- Assumptions on construction and operational traffic generation and distribution for the Project, provided by AIE, as detailed in Section 4.
- Construction of the project is expected to occur in 2019, with construction expected to occur over a ten - twelve month period.
- No background traffic growth has been applied to the surveyed traffic volumes for the assessment of the construction and operational traffic impacts. Analysis of historical traffic growth trends at roads within the study area identified that traffic has generally declined over the last five years.
- Cumulative traffic impacts of the proposed Bulk Liquids terminal project have been considered as part of the assessment, which is expected to be operational by 2019. This is based on information provided from the Proposed Port Kembla Bulk Liquids Terminal Traffic Impact Assessment (Cardno, 2015).

1.6 Report structure

The remaining Sections of this report are structured as follows:

- **Section 2 – Method:** describes the steps undertaken in the assessment
- **Section 3 – Existing environment:** provides a review of existing road features, adjacent developments, traffic volumes and crash data
- **Section 4 – Construction arrangements:** details the additional traffic generated as a result of construction of the Project
- **Section 5 – Impact assessment:** examines the potential traffic and transport impacts associated with the construction and operation of the Project
- **Section 6 – Mitigation measures:** outlines the proposed mitigation strategies to be implemented during the life of the project to manage the potential environmental impacts
- **Section 7 – Conclusion:** presents a conclusion to the report and presents the next steps in the advancement of the project.

2. Method

This Section outlines the method and evaluation criteria used in the assessment of the project.

2.1 Scope

- This report focuses on the ultimate peak construction traffic generation scenario for each road impacted by the project and the overall effect on the higher order road network.
- Traffic generation associated with operation of the project will be significantly lower than during the peak construction period. Traffic impacts will therefore be reduced during the operational period compared to the construction period.

Secretary's Environmental Assessment Requirements

This report addresses the SEARs, which state that the EIS must address the following specific issues in relation to transport:

- *Details of traffic types and volumes likely to be generated by the project;*
- *Details of the proposed transport routes, site access, rail crossings and safety issues;*
- *An assessment of the likely transport impacts of the project on the capacity, condition, safety and efficiency of the road network, in particular heavy vehicles, oversize / over-mass vehicles; and*
- *Details of measures to mitigate and / or manage potential impacts during construction, developed in consultation with the relevant road and rail authorities (if required)*

2.1 Method of assessment

This TIA has been undertaken with reference to the *Guide to Traffic Generating Development* (Roads and Maritime 2002). While not mandatory, the Guide provides a process and methodology to undertake the TIA. The traffic operation assessment process outlined in the guide identifies the operating characteristics which need to be compared with agreed performance criteria.

The Guide states that existing daily traffic volumes on roads adjacent to a proposed development should be compared with estimated daily traffic volumes. This enables the functions of roads in the overall hierarchy of roads to be reviewed in the context of the proposed development.

The assessment criteria adopted for this report is outlined in the following Sections.

2.1.1 Intersection assessment criteria

The performance of the existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. The SIDRA 8 intersection modelling software was used to assess the proposed peak hour operating performance of intersections on the surrounding road network.

The criteria for evaluating the operational performance of intersections is provided by the *Guide to Traffic Generating Developments* (Roads and Maritime Services, 2002) and reproduced in Table 2-1. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. Level of Service), which is applied to each band of average vehicle delay.

Table 2-1 Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (seconds/veh)	Traffic Signals, Roundabouts	Give Way & Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control modes	At capacity, requires other control mode
F	> 70	Over Capacity Unstable operation	Over Capacity Unstable operation

Source: *Guide to Traffic Generating Developments* (Roads and Maritime Services 2002)

2.1.2 Midblock assessment criteria

According to *Austroads Guide to Traffic Management, Part 3: Traffic Studies and Analysis, Section 5.2.1*, the one-way mid-block capacity of an urban arterial road with interrupted flow varies depending on the type of lane. The typical mid-block capacity for urban roads with interrupted flow is outlined in Table 4.3.

An interrupted flow facility road is one in which traffic flow conditions are subject to the influence of fixed elements such as traffic signals, stop signs, give-way signs, roundabouts

or other controls which cause traffic to stop periodically, irrespective of the total amount of traffic; examples include urban streets, unsignalised and signalised intersections.

Table 4.3 Typical mid-block capacity for urban roads with interrupted flow

Type of lane	One-way mid-block capacity (pc/h)
Median or inner lane	
Divided road	1000
Undivided road	
Middle lane (of a 3 lane carriageway)	900
Divided road	900
Undivided road	1000
Kerb lane	
Adjacent to parking lane	900
Occasional parked vehicles	600
Clearway conditions	900

Source: Table 5.1 in Austroads

Note: pc/h = passenger cars per hour

Austroads Guide to Traffic Management Part 3 – Traffic Studies, Section 5.2.1 outlines however that:

Peak period mid-block traffic volumes may increase to 1200 to 1400 pc/h/lane on any approach road when the following conditions exist or can be implemented:

- Adequate flaring at major upstream intersections
- Uninterrupted flow from a wider carriageway upstream of an intersection approach and flowing at capacity
- Control or absence of crossing or entering traffic at minor intersections by major road priority controls
- Control or absence of parking
- Control or absence of right turns by banning turning at difficult intersections
- high volume flows of traffic from upstream intersections during more than one phase of a signal cycle
- Good co-ordination of traffic signals along the route.

For the purposes of this assessment:

- A one-way mid-block capacity of 1,200 pc/h/lane has been adopted for arterial roads in the study area, including Springhill Road, Five Islands Road and Masters Road.
- A one-way mid-block capacity of 900 pc/h/lane has been adopted for other roads in the study area, including Port Kembla Road, Flinders Street, Old Port Road, Darcy Street and Foreshore Road.

This is in keeping with the Austroads special conditions which are reflective on the existing conditions for roads in the study area. This capacity is used to assess the Volume Capacity Ratio (VCR) of a particular road.

The VCR is a measure of the level of congestion on a road given the traffic volume and road capacity. When the VCR reaches 1, this indicates that the road is operating at 100% capacity.

3. Existing conditions

3.1 Existing road network characteristics

This Section provides an understanding of the existing road network surrounding the site.

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 throughout 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, together with State Roads provide the main connections to and between smaller towns and perform a sub arterial function in major urban areas. Regional roads are the responsibility of councils for maintenance funding, though Roads and Maritime funds some maintenance based on traffic and infrastructure. Traffic management on Regional Roads is controlled under delegation by local government. Regional Roads maybe all or part of a Main Road, Secondary Road, Tourist Road or State Highway; or other roads as determined by Roads and Maritime.
- **Local Roads** – The remainder of roads are 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 delegation by local government.

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 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.

3.1.2 M1 Princes Motorway

The M1 Princes Motorway is a State Highway, which provides a link towards Sydney in the north to the Victorian Border via the Princes Highway. It carries approximately 66,000 vehicles per day (based on average daily traffic volumes of approximately 33,000 vehicles in the northbound direction, provided from the Roads and Maritime Traffic Volume Viewer website – count station ID 07594).

To the west of Port Kembla, grade separated interchanges are provided with Five Islands Road and Masters Road. No northbound access to Masters Road is provided from The M1 Princess Motorway. It has generally three traffic lanes in each direction and has a signposted speed limit of 100 km/h in the vicinity of the Five Islands Road interchange.

3.1.3 Springhill Road (B65)

Springhill Road is a state road and forms part of the B65, which connects Wollongong CBD and Port Kembla. It runs in an approximately northeast to southwest alignment between Corrimal Street and the signal controlled intersection with Masters Road. To the south of Masters Road, Springhill Road runs in an approximate north to south alignment and forms the northern approach to a signal controlled intersection with Five Islands Road.

Springhill Road provides access to mainly industrial and port related land uses, including access roads to the BlueScope Steelworks which are accessed via signal controlled intersections.

Springhill Road has the following key features outlined in Table 3-1 and shown in Figure 3-4.

Table 3-1 Springhill Road key features

Feature	Description
Carriageway	Sealed carriageway divided by a raised centre median, with three traffic lanes each direction
Parking	No stopping
Speed Limit	80 km/h signposted, which changes to 60 km/h to the north of Port Kembla Road.
Pedestrian Facilities	Footpaths are available: <ul style="list-style-type: none"> • on shared path along the southern side of the road to the east of Masters Road and along the eastern side of the road to the south of Masers Road. • on the northern side of the road between Bridge Street and Tom Thumb Road. • Signal controlled pedesrian crossings at all signal controlled intersections
Bicycle Facilities	Shared paths are available:

Feature	Description
	<ul style="list-style-type: none"> Along the southern side of the road to the east of Masters Road and along the eastern side of the road to the south of Masers Road. Along the western side of the road between Boral Asphalt acces and and Five Islands Road
Public Transport	Bus stops are located on either side of Springhill Road, with bus routes: 37, 51, 53, 57, 65 operating from these stops



Figure 3-1 Springhill Road, viewed westwards from Port Kembla Road

3.1.4 Five Islands Road (B65)

Five Islands Road is a state road, which forms part of the B65 between Wollongong and Port Kembla. It forms a signal controlled intersection with Springhill Road and Flinders Street within the study area and provides a connection between the Princes Motorway and Port Kembla.

Five Islands Road has the following key features outlined in Table 3-1 and shown in Figure 3-4.

Table 3-2 Five Islands Road key features

Feature	Description
Carriageway	Sealed carriageway divided by a raised centre median Three traffic lanes are provided in each direction
Parking	No stopping
Speed Limit	60 km/h sign posted
Pedestrian Facilities	Footpaths are provied on both sides of the road at the following locations: <ul style="list-style-type: none"> between Springhill Road and Wattle Street between Spring Road and the railway line overpass
Bicycle Facilities	A shared path is provided along the northern side of the road between Springhill Road and Flinders Street
Public Transport	Cringila Station is located on the northern side of Five Islands Road Two bus stops are located approximately 45m to the south of Cringila Railway Station, with bus routes 27SC, 51 and 53 operating from these bus stops.



Figure 3-2 Five Islands Road, viewed westwards towards Springhill Road

3.1.5 Masters Road

Masters Road is a state road, providing connection between Springhill Road to the east and Princes Motorway to the west. At its eastern end, it forms a signal controlled intersection with Springhill Road.

Masters Road has the following key features outlined in Table 3-3 and shown in Figure 3-3.

Table 3-3 Masters Road key features

Feature	Description
Carriageway	Sealed carriageway divided by a raised centre median Three traffic lanes are provided in each direction
Parking	No stopping
Speed Limit	80 km/h sign posted
Pedestrian Facilities	A shared path is provided on northern side of the road between Springhill Road and Drummond Street
Bicycle Facilities	A shared path is provided on northern side of the road between Springhill Road and Drummond Street
Public Transport	No public transport



Figure 3-3 Masters Road, viewed westwards

Source: Google streetview (2018)

3.1.6 Port Kembla Road

Port Kembla Road is a state road at its northern end where it forms a signal controlled intersection with Springfield Road. Port Kembla Road provides access to industrial and port land uses at Port Kembla.

Port Kembla Road has the following key features as outlined in Table 3-4 and shown in Figure 3-4.

Table 3-4 Port Kembla Road key features

Feature	Description
Carriageway	Sealed carriageway, generally divided by a single barrier line which is currently faded One traffic lane is provide in each direction
Parking	There are generally no kerbside parking restrictions, except near intersections / driveways
Speed Limit	50 km/h default urban speed limit
Pedestrian Facilities	No dedicated pedestrian facilities, although there is a short section of shared path at its northern end
Bicycle Facilities	A short section of shared path is provided along the western side of the road, at its northern end (near the intersection with Springhill Road)
Public Transport	No public transport services operate along Port Kembla Street. The nearest bus stops are located approximately 270m to the north of the Springhill Road / Port Kembla Road intersection (north of Swan Street). Bus routes 51, 53 and 57 operate from these bus stop



Figure 3-4 Port Kembla Road, viewed southwards from Springhill Road

3.1.7 Flinders Street

Flinders Street is a state road, which provides access to general industrial and port land uses at the southern end of Port Kembla. At its western end, it forms a signal controlled intersection with Five Islands Road. To the east, Flinders Street becomes Old Port Road which also provides access to industrial land uses. Flinders Street also provides access to Port Kembla North Station, which is located near the intersection with Springhill Road.

Flinders Street has the following key features outlined in Table 3-1 and shown in Figure 3-4.

Table 3-5 Flinders Street key features

Feature	Description
Carriageway	Sealed carriageway divided by a double solid line (BB line) One traffic lane is provided in each direction
Parking	Generally unrestricted parking along both sides of the road
Speed Limit	60 km/h signposted
Pedestrian Facilities	A footpath is provided along the northern side of the road
Bicycle Facilities	On-road bicycle route, within road shoulders (with marked bicycle symbols)
Public Transport	Port Kembla North Station is located to the north of Flinders Street, near the intersection with Five Islands Road. Pedestrian access to the station is provided from Flinders Street. There is one eastbound bus stop on Flinders Street, located approximately 50m to the south of Port Kembla Station. Bus route 27SC operates from this bus stop.



Figure 3-5 Flinders Street, viewed eastwards from Port Kembla North Station

3.1.8 Old Port Road / Darcy Road

Old Port Road is classified as a state road and provides access to industrial and port related land uses within the southern part of Port Kembla. At its southern end it forms a roundabout intersection with Foreshore Road and further to the south becomes Darcy Road.

At its Southern end, Darcy Road forms the minor approach to a priority “Stop” controlled intersection with Five Islands Road and Military Road.

Old Port Road has the following key features outlined in Table 3-1 and shown in Figure 3-4.

Table 3-6 Old Port Road / Darcy Road key features

Feature	Description
Carriageway	Sealed carriageway divided by a double solid line (BB line) One traffic lane in each direction
Parking	Unrestricted parking
Speed Limit	60 km/h sign posted
Pedestrian Facilities	A shared path is provided along the eastern side of the road to the north of Foreshore Road
Bicycle Facilities	A shared path is provided along the eastern side of the road to the north of Foreshore Road
Public Transport	Port Kembla Station is located to the west of Old Port Road, south of the intersection with Foreshore Road. One bus stop is located adjacent to the Port Kembla Station. Bus routes 34, 43 and 65 operate from this bus stop.



Figure 3-6 Old Port Road, viewed southwards from Flinders Street

3.1.9 Foreshore Road

Foreshore Road is a local road, situated on the western side of Old Port Road. It provides access to Breakwater Battery Museum to the east.

Foreshore Road has the following key features outlined in Table 3-7 and shown in Figure 3-7.

Table 3-7 Foreshore Road key features

Feature	Description
Carriageway	No carriageway. Two-way road, with one lane travelling in each direction
Parking	No parking and No stopping
Speed Limit	50 km/h
Pedestrian Facilities	No facilities
Bicycle Facilities	On road bicycle route, within the western side of road shoulder
Public Transport	No facilities.



Figure 3-7 Foreshore Road, viewed eastwards from Old Port Road

3.2 Traffic volumes

3.2.1 Midblock traffic counts

Mid-block traffic counts for Springhill Road, Five Islands Road and Flinders Street were provided by Roads and Maritime. These traffic counts were undertaken during various months in 2015 and are summarised below.

Springhill Road

The traffic data for Springhill Road was collected between Wednesday 28 October and Tuesday 10 November 2015. The average hourly weekday and weekend traffic volumes are shown in Figure 3-8.

The traffic data indicates that the morning peak period occurs between 9:00 am and 10:00 am. The peak volume in both directions during this period is approximately 1,860 vehicles, with around 1,320 vehicles in the northbound direction and 540 vehicles in the southbound direction.

The weekday evening peak was observed to be between 6:00 pm and 7:00 pm. The peak traffic volume in both directions during this period is approximately 1,445 with around 540 vehicles in the northbound direction and 905 vehicles in the southbound direction.

The weekend peak hour was observed to be between 1:00 pm and 2:00 pm, with approximately 1,160 two-way movements.

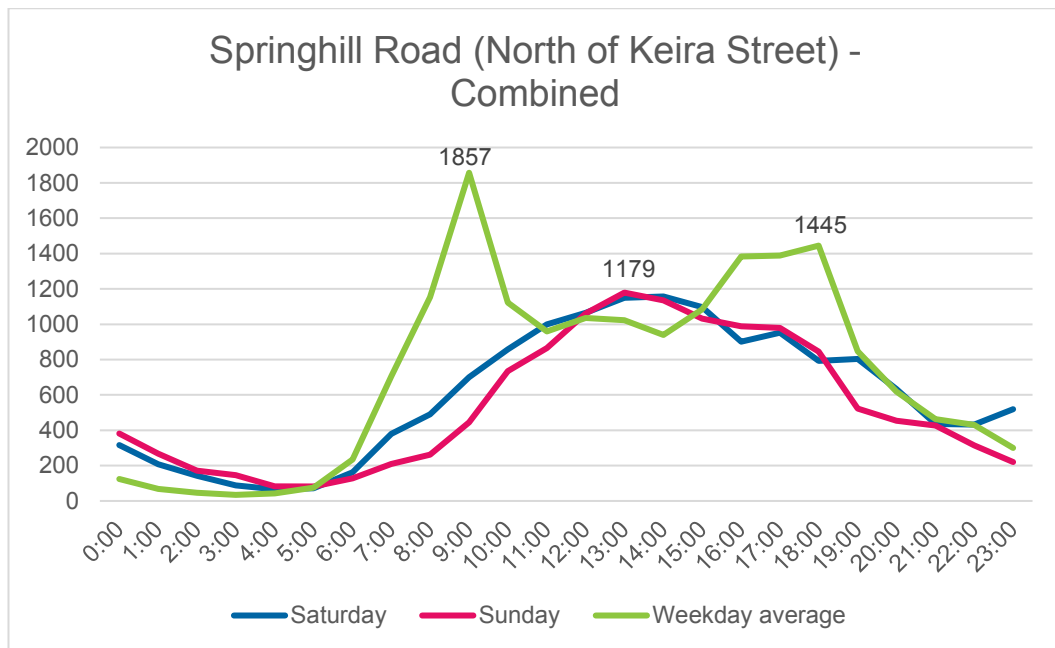


Figure 3-8 Average hourly traffic profiles - Springhill Road (2015)

Five Islands Road

Mid-block traffic data was collected between Monday 16 February to Wednesday 10 May 2015. The average weekday and weekend hourly traffic profiles are shown in Figure 3-9.

The weekday morning peak was observed to be between 8:00 am to 9:00 am. The peak volume in both directions during this period is approximately 3,480 vehicles, consisting of around 1,430 and 2,050 vehicles in the northbound and southbound directions respectively.

The weekday evening peak hour was observed between 3:00 pm and 4:00 pm. The peak volume in both directions during this period is approximately 3,480 vehicles, with around 2,050 vehicles and 1,430 vehicles in the westbound and eastbound directions respectively.

The weekend peak hour was observed on a Saturday between 12:00 pm and 1:00 pm, with approximately 2,160 vehicles. Traffic volumes were observed to be generally much lower on a Sunday.

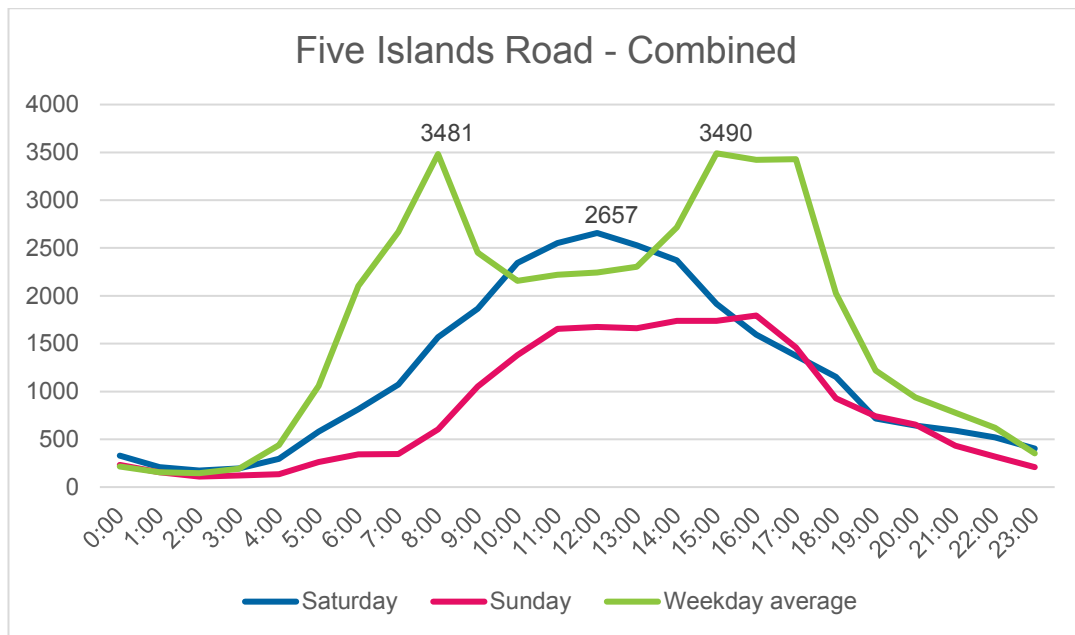


Figure 3-9 Average hourly traffic profiles - Five Islands Road (2015)

Flinders Street

Mid-block traffic data was collected between Tuesday 12 May 2015 to Wednesday 20 May 2015. The average weekday and weekend hourly traffic profiles are shown in Figure 3-10.

Analysis of the data identified that the weekday morning peak hour occurs between 6:00 am and 7:00 am. The peak volume in both directions during this period is approximately 400 vehicles, consisting of around 310 and 90 vehicles in the eastbound and westbound directions respectively.

The evening peak hour was observed to be between 3:00 pm and 4:00 pm. The peak volume in both directions during this period was approximately 440 vehicles, consisting of around 120 and 320 vehicles in the eastbound and westbound directions respectively.

The weekend peak was observed to be between 5:00 am and 6:00 am on a Saturday, with average two-way traffic volume of approximately 150 vehicles.

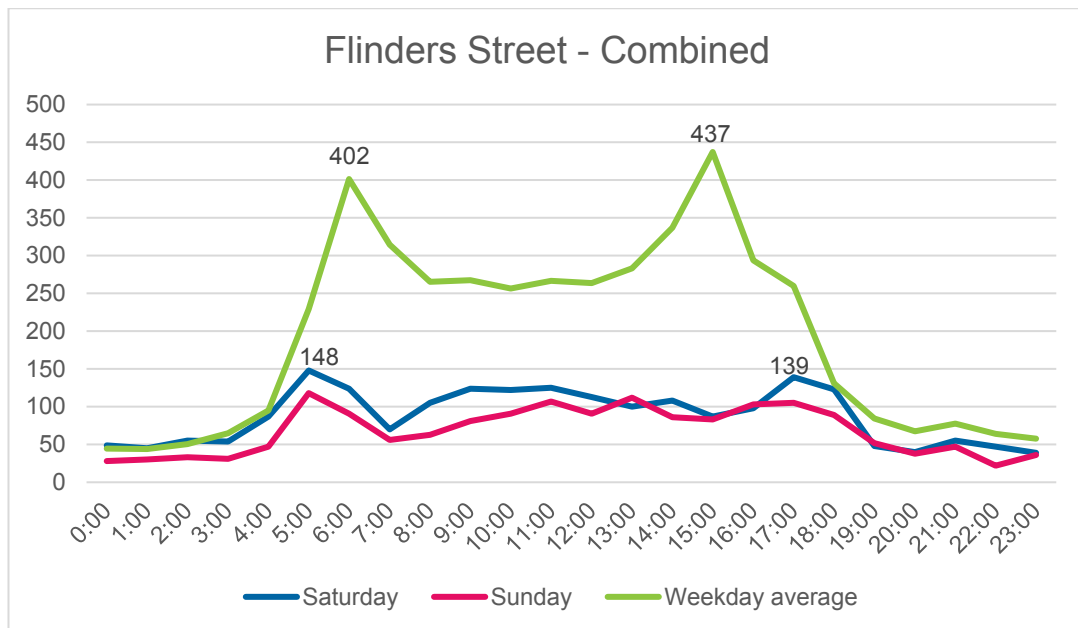


Figure 3-10 Average hourly traffic profiles - Flinders Street (2015)

3.2.2 Intersection traffic counts

GHD engaged Matrix Traffic and Transport Data Pty Ltd to undertake intersection traffic turning counts on Tuesday 18 September 2018. The surveys were undertaken during the following time periods:

- Weekday AM peak (four hours): 5:30 am to 9:30 am
- Weekday PM peak (three hours): 3:30 pm to 6:30 pm

The intersection turning count surveys were undertaken at the following intersections:

- Springhill Road / Port Kembla Road, signalised intersection;
- Five Islands Road / Flinders Street, signalised intersection;
- Five Islands Road / Darcy Road / Military Road, priority controlled intersection; and
- Old Port Road / Foreshore Road priority, roundabout intersection.

Analysis of the traffic survey data identified the following observed weekday AM and PM network peak hours:

- Weekday AM peak hour, between 8.00 am and 9.00 am;
- Weekday PM peak hour, between 3.30 pm and 4.30 pm

A summary of the surveyed AM and PM peak hour traffic volumes, for the above network peak hours, is provided in Table 3-8 and Table 3-9.

In addition, the following intersection traffic count data has been sourced for the purposes of this assessment:

- Intersection traffic counts undertaken on Wednesday 27 May 2015 at the following locations, provided by the Proposed Port Kembla Bulk Liquids Terminal Traffic Impact Assessment (Cardno, 2015);
 - Springhill Road / Tom Thumb Road; and
 - Springhill Road / Masters Road.
- Intersection traffic counts undertaken on Thursday 24 August 2017 at the Springhill Road / Five Islands Road intersection, supplied by Roads and Maritime.

Table 3-8 AM Peak hour surveyed traffic volumes (2018)

Road	Location	Direction	Total vehicles	% Heavy vehicles	% B-Doubles
Springhill Road	Southwest of Port Kembla Road	Northbound	1,366	2%	0%
		Southbound	547	4%	0%
Port Kembla Road	South of Springhill Road	Eastbound	38	3%	0%
		Westbound	26	12%	4%
Tom Thumb Road**	South of Springhill Road	Northbound	77	35%	NA
		Southbound	49	55%	NA
Springhill Road**	North of Masters Road	Northbound	3,004	4%	NA
		Southbound	963	13%	NA
Masters Road**	West of Springhill Road	Eastbound	1,448	7%	NA
		Westbound	1,125	11%	NA
Springhill Road**	South of Masters Road	Northbound	3,186	4%	NA
		Southbound	1,468	7%	NA
Five Islands Road*	West of Springhill Road	Eastbound	1,463	8%	NA
		Westbound	808	10%	NA
Five Islands Road	Northwest of Flinders Street	Northbound	2,186	5%	1%
		Southbound	1,598	7%	1%
Flinders Street	East of Five Islands Road	Eastbound	159	28%	9%
		Westbound	96	40%	14%
Five Islands Road	Northwest of Darcy Road	Northbound	267	7%	1%
		Southbound	219	6%	0%
Darcy Road	East of Five Islands Road / Military Road	Eastbound	142	18%	0%
		Westbound	88	19%	1%
Old Port Road	North of Darcy Road	Northbound	67	27%	4%
		Southbound	67	24%	3%
Foreshore Road	East of Old Port Road	Eastbound	46	11%	2%
		Westbound	36	14%	8%

Note, proportion of B-Doubles is also included in the proportion of Heavy vehicles

*=2017 traffic counts

** = 2015 traffic counts

NA = not available

Table 3-9 PM Peak hour surveyed traffic volumes (2018)

Road	Location	Direction	Total vehicles	% Heavy vehicles	% B-Doubles
Springhill Road	Southwest of Port Kembla Road	Northbound	649	4%	0%
		Southbound	756	4%	1%
Port Kembla Road	South of Springhill Road	Eastbound	25	8%	0%
		Westbound	54	11%	9%
Tom Thumb Road**	South of Springhill Road	Northbound	32	31%	NA
		Southbound	125	8%	NA
Springhill Road**	North of Masters Road	Northbound	1,388	5%	NA
		Southbound	2,094	4%	NA
Masters Road**	West of Springhill Road	Eastbound	966	7%	NA
		Westbound	2,091	6%	NA
Springhill Road**	South of Masters Road	Northbound	2,097	5%	NA
		Southbound	1,678	4%	NA
Five Islands Road*	West of Springhill Road	Eastbound	2,607	5%	NA
		Westbound	1,094	8%	NA
Five Islands Road	Northwest of Flinders Street	Northbound	1,838	5%	1%
		Southbound	2,222	5%	1%
Flinders Street	East of Five Islands Road	Eastbound	96	33%	0%
		Westbound	285	14%	3%
Five Islands Road	Northwest of Darcy Road	Northbound	280	6%	1%
		Southbound	280	9%	1%
Darcy Road	East of Five Islands Road / Military Road	Eastbound	79	27%	5%
		Westbound	206	8%	0%
Old Port Road	North of Darcy Road	Northbound	68	32%	4%
		Southbound	103	19%	2%
Foreshore Road	East of Old Port Road	Eastbound	44	36%	7%
		Westbound	56	30%	2%

Note, proportion of B-Doubles is also included in the proportion of Heavy vehicles

*=2017 traffic counts

** = 2015 traffic counts

NA = not available

3.2.3 Functional classification

The classification of roads within the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. Roads and Maritime Services have developed a set of road hierarchy classifications detailed in Table 3-10, which indicate typical nominal average annual daily traffic (AADT) volumes for various classes of roads.

Table 3-10 Functional classification of roads

Location	Traffic Volume (veh/d*)	Peak Hour Volume (veh/h*)
Motorway/Freeway	>15,000	>5,600
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 – 20,000	500 – 2,000
Collector Road	2,000 – 10,000	200 – 1,000
Local Road	<2,000	0 – 200

Source: NSW Roads and Maritime Service (formerly NSW RTA), Road Design Guide and AMCORD

*Note veh/d = vehicles per day, veh/h = vehicles per hour

Based upon the survey results outlined in Table 3-8 and Table 3-9, the peak hour traffic volumes generally fall within the criteria provided in Table 3-10 for the relevant classification.

3.2.4 Mid-block capacity analysis

For the purposes of this assessment, a one-way mid-block capacity of 1,200 pc/h/lane has been adopted for the arterial roads, including Springhill Road and Five Islands Road, which is in keeping with the Austroads special conditions which are reflective on the existing conditions. For Port Kembla Street, Flinders Street, Darcy Road and Old Port Road, a one-way mid-block capacity of 900 pc/h/lane has been adopted.

Table 3-11 and Table 3-12 provide the VCR results for the existing AM and PM peak hours respectively. The following Passenger Car Units (PCU) factors have been applied to the survey, based on the PCU values provided in Table 10.1 in Roads and Maritime's *Traffic Modelling Guidelines* report (Roads and Maritime, 2013):

- Passenger car = 1.0
- Light commercial vehicle = 1.0
- Rigid heavy = 2.0
- Heavy vehicles (if number of heavy articulated vehicles is unknown) = 2.5
- Bus = 2.0
- Articulated heavy = 4.0

The data indicates that the majority of key roads in the vicinity of the project are operating well within the acceptable capacity for weekday morning and evening peak periods. However, Springhill Road to the north of Masters Road has a V/C ratio of 0.94 in the northbound direction during the weekday AM peak, which indicates that these traffic lanes are approaching capacity.

Table 3-11 Midblock volume / capacity analysis – AM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Southwest of Port Kembla Road	Northbound	1,200	2	1392	0.58
		Southbound	1,200	2	571	0.24
Port Kembla Road	South of Springhill Road	Eastbound	900	1	39	0.04
		Westbound	900	1	31	0.03
Tom Thumb Road	South of Springhill Road	Northbound	900	1	118	0.13
		Southbound	900	1	90	0.10
Springhill Road	North of Masters Road	Northbound	1,200	3	3,192	0.89
		Southbound	1,200	3	1,149	0.32
Masters Road	West of Springhill Road	Eastbound	1,200	4	1,609	0.34
		Westbound	1,200	3	1,313	0.36
Springhill Road	South of Masters Road	Northbound	1,200	3	3,378	0.94
		Southbound	1,200	3	1,632	0.45
Five Islands Road	West of Springhill Road	Eastbound	1,200	3	1,631	0.45
		Westbound	1,200	3	934	0.26
Five Islands Road	Northwest of Flinders Street	Northbound	1,200	3	2,346	0.65
		Southbound	1,200	3	1,723	0.48
Flinders Street	East of Five Islands Road	Eastbound	900	1	232	0.26
		Westbound	900	1	160	0.18
Five Islands Road	Northwest of Darcy Road	Northbound	1,200	2	289	0.12
		Southbound	1,200	2	232	0.10
Darcy Road	East of Five Islands Road / Military Road	Eastbound	900	1	167	0.19
		Westbound	900	1	107	0.12
Old Port Road	North of Darcy Road	Northbound	900	1	91	0.10
		Southbound	900	1	87	0.10
Foreshore Road	East of Old Port Road	Eastbound	900	1	53	0.06
		Westbound	900	1	47	0.05

*veh = vehicles, hr = hour, PCU = passenger car units

Note, PCU factors = 1 for light vehicles, 2.5 for heavy vehicles and 5 for B-Doubles

Table 3-12 Midblock volume / capacity analysis – PM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Southwest of Port Kembla Road	Northbound	1,200	2	673	0.28
		Southbound	1,200	2	793	0.33
Port Kembla Road	South of Springhill Road	Eastbound	900	1	27	0.03
		Westbound	900	1	70	0.08
Tom Thumb Road	South of Springhill Road	Northbound	900	1	47	0.05
		Southbound	900	1	140	0.16
Springhill Road	North of Masters Road	Northbound	1,200	3	1501	0.42
		Southbound	1,200	3	2,211	0.61
Masters Road	West of Springhill Road	Eastbound	1,200	4	1,071	0.22
		Westbound	1,200	3	2,268	0.63
Springhill Road	South of Masters Road	Northbound	1,200	3	2,268	0.63
		Southbound	1,200	3	1,782	0.49
Five Islands Road	West of Springhill Road	Eastbound	1,200	3	2,798	0.78
		Westbound	1,200	3	1,222	0.34
Five Islands Road	Northwest of Flinders Street	Northbound	1,200	3	1,963	0.55
		Southbound	1,200	3	2,380	0.66
Flinders Street	East of Five Islands Road	Eastbound	900	1	128	0.14
		Westbound	900	1	344	0.38
Five Islands Road	Northwest of Darcy Road	Northbound	1,200	2	302	0.13
		Southbound	1,200	2	312	0.13
Darcy Road	East of Five Islands Road / Military Road	Eastbound	900	1	108	0.12
		Westbound	900	1	223	0.25
Old Port Road	North of Darcy Road	Northbound	900	1	96	0.11
		Southbound	900	1	127	0.14
Foreshore Road	East of Old Port Road	Eastbound	900	1	66	0.07
		Westbound	900	1	75	0.08

*veh = vehicles, hr = hour, PCU = passenger car units

Note, PCU factors = 1 for light vehicles, 2.5 for heavy vehicles and 5 for B-Doubles

3.2.5 Historical traffic growth trends

Traffic count data from the Roads and Maritime Traffic Volumes Viewer website was used to determine historical traffic growth trends for roads within the study area.

A summary of the historical average weekday traffic volumes at Five Islands Road, east of Springhill Road (Roads and Maritime Count Station ID: 07097) is shown in Table 3-13. The historical traffic count data indicates that there has been a decline in traffic in the study area since 2014.

Table 3-13 Average Weekday Traffic Volumes (24 hours) – Five Islands Road, east of Springhill Road

	2014	2015	2016	2017	2018
Northbound	22,366	22,190	22,620	23,185	22,998
Southbound	22,815	23,009	22,852	17,776	17,625
Total	45,181	45,199	45,472	40,961	40,623

Source: Roads and Maritime Traffic Volume Viewer website

3.3 Crash data review

A review of crash data provided from the Transport for NSW Centre for Road Safety website has been undertaken. The five-year period (2013-2017) crash data summary is given for the following road sections:

- Springhill Road between Port Kembla Road and Masters Road, refer to Figure 3-11
- Springhill Road between Masters Road and Five Islands Road, refer to Figure 3-12
- Flinders Street and Old Port Road, refer to Figure 3-13
- Foreshore Road, refer to Figure 3-14

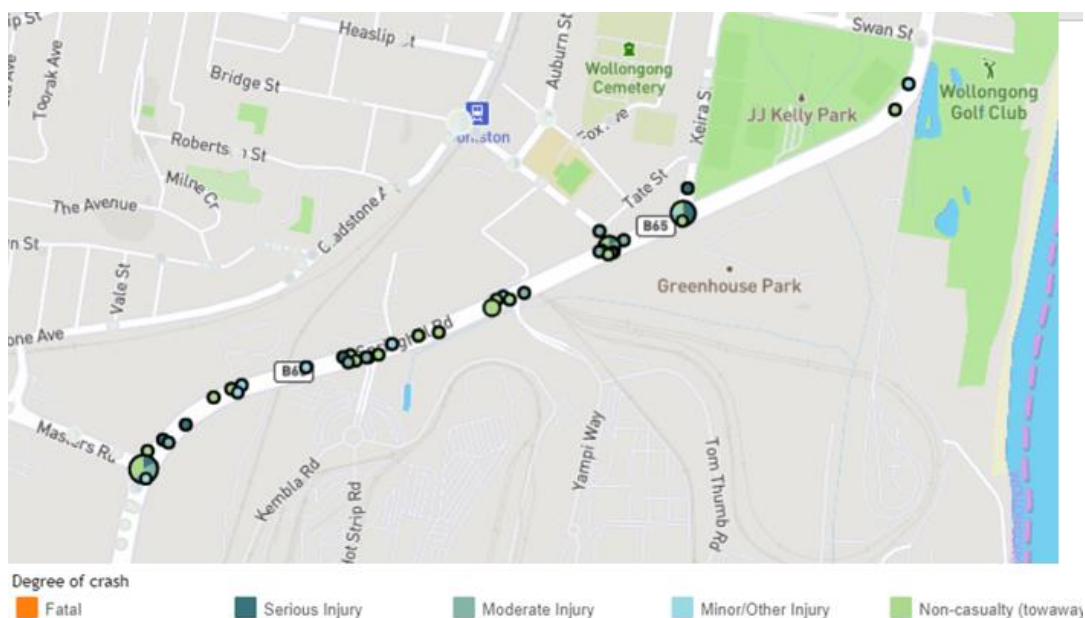


Figure 3-11 Crash locations (2013-2017) – Springhill Road between Port Kembla Road and Masters Road

Source: Transport for NSW Centre for Road Safety

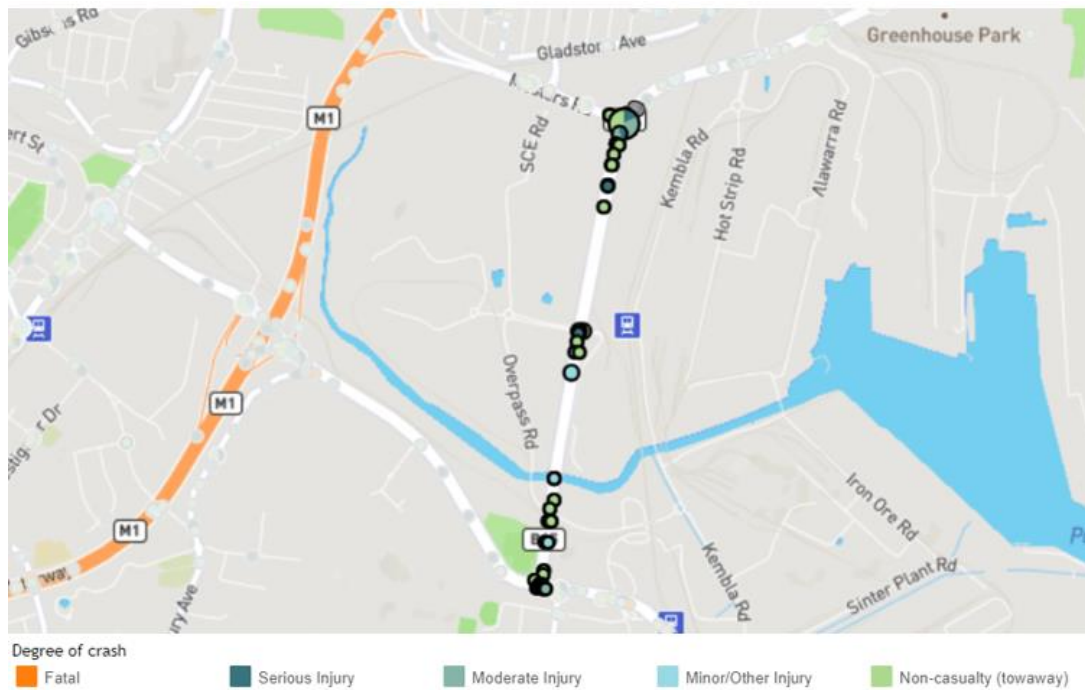


Figure 3-12 Crash locations (2013-2017) - Springhill Road, between Masters Road and Five Islands Road

Source: Transport for NSW Centre for Road Safety

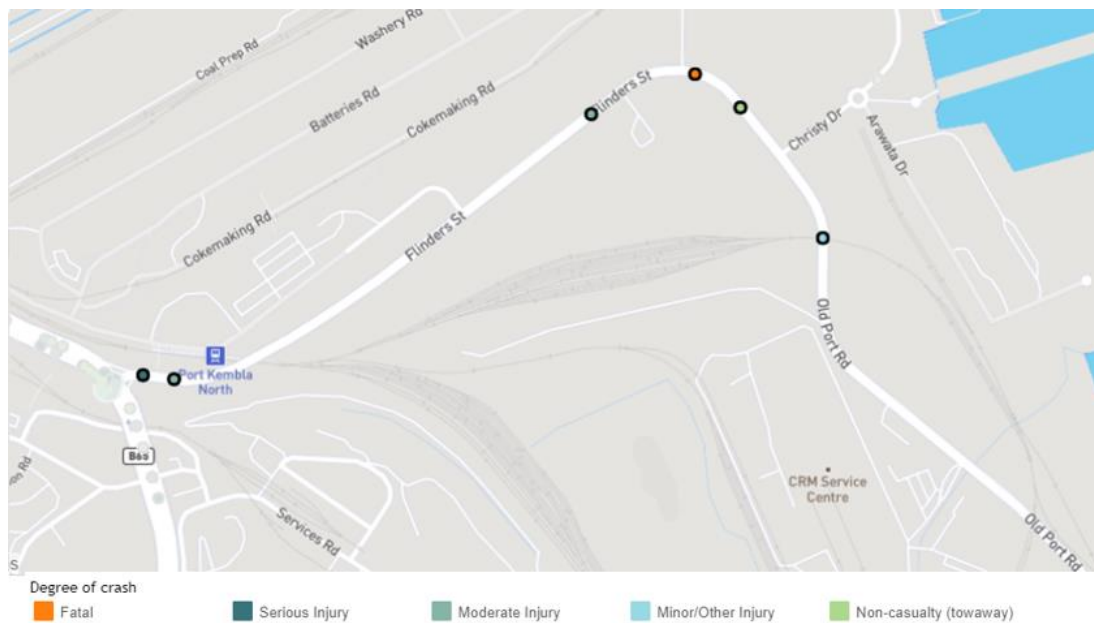


Figure 3-13 Crash locations (2013-2017) – Flinders Street and Old Port Road

Source: Transport for NSW Centre for Road Safety

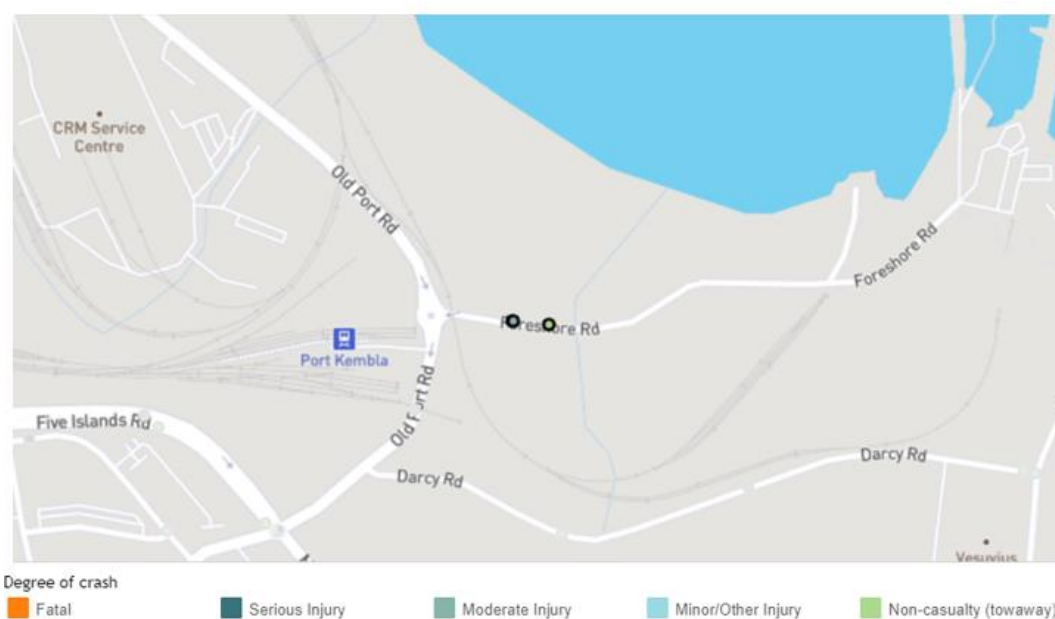


Figure 3-14 Crash locations (2013-2017) – Foreshore Road

Source: Transport for NSW Centre for Road Safety

A summary of the number of crashes, including crash severity (injury / non-injury etc.), is provided in Table 3-14. Analysis of the five year crash data indicates that there were a total of 220 crashes recorded, with:

- 133 crashes recorded along Springhill Road;
- 78 crashes recorded along Five Islands Road;
- six crashes recorded along Flinders Street / Old Port Road; and
- Three crashes recorded along Foreshore Road.

One crash resulted in a fatality, with 91 crashes resulting in injuries.

Table 3-14 Number of recorded crashes by road section (2013-2017)

Location	Number of crashes			
	Fatal	Injured	Not injured	Total
Springhill Road between Port Kembla Road and Masters Road	0	28	41	69
Springhill Road between Masters Road and Five Islands Road	0	27	37	64
Five Islands Road between Springhill Road and Flinders Street	0	30	48	78
Flinders Street and Old Port Road	1	4	1	6
Foreshore Road	0	2	1	3
Total	0	91	128	220

A summary of the crash types, by road section, is provided in Table 3-15. Analysis of this data indicates:

- Rear end crashes were the highest crash type along Springhill Road, which can be associated with driver observation being a factor to this type of crash;
- At Five Islands Road, Flinders Street and Old Port Road, collisions with objects off the roadway were the most common crash type. This indicates that driver behaviour, such as fast driving speeds or poor observation, could be a factor.

Table 3-15 Summary of crash types by location (2013-2017)

Location	Number of crashes					
	Fatal	Injured	Not injured	Total	Pedestrian involved	Cyclists involved
Springhill Road between Port Kembla Road and Masters Road	0	28	41	69	2	1
Springhill Road between Masters Road and Five Islands Road	0	27	37	64	1	2
Five Islands Road between Springhill Road and Flinders Street	0	30	48	78	0	1
Flinders Street and Old Port Road	1	4	1	6	0	0
Foreshore Road	0	2	1	3	0	1
Total	0	91	128	220	3	5

3.4 Public and active transport

In reviewing the site and its accessibility to public transport opportunity, reference was made to the *NSW Planning Guidelines for Walking and Cycling (2004)*. This document outlines a recommended walkable distance of 400 m to 800 m to public transport and other local amenities or a 1.5 km bicycle riding distance.

Details of the accessibility to public transport, walking and bicycle riding access is provided in the following Sections.

3.4.1 Bus services

Bus services operating roads in the vicinity of the Project study area summarised in Table 3-16. The bus routes are shown in Appendix C, with the bus frequency summarised in Table 3-16.

Table 3-16 Bus services

Route	Number of bus services per hour	Coverage
27SC	Weekday: 1 service per hour Weekend: 1 service per hour	Wollongong all train stations to Port Kembla and return
43	Weekday: 1 service per hour Saturday: 1 service per hour (8 services) Sunday & public holidays: 1 service per hour (5 services)	Port Kembla Route
51	Weekday: AM peak: 2 services per hour PM peak: 3 services per hour Weekend peak: 1 service per hour	Wollongong to Shellharbour
53	Weekday: AM peak: 1 service per hour PM peak: 1 service per hour Weekend: 1 service per hour	Wollongong to Shellharbour
57	Weekday: AM peak: 1 service per hour PM peak: 1 service per hour Weekend peak: 1 service per hour	Wollongong to Shellharbour
65	Weekday: AM peak: 1 service per hour PM peak: 1 service per hour Saturday: 1 service per hour (12 services) Sunday & public holidays: 1 service per hour (6 services)	North Wollongong to Port Kembla

Bus service maps are provided at Appendix C

3.4.2 Bicycle riding

The bicycle network in the study area is shown at Figure 3-15, which is an extract from the *Roads and Maritime Services Cycleway Finder* website. There are off-road bicycle (shared path) routes in the vicinity of the site, including along Port Kembla Road, Springhill Road, Five Islands Road and Old Port Road. On road bicycle routes are provided along Flinders Street.

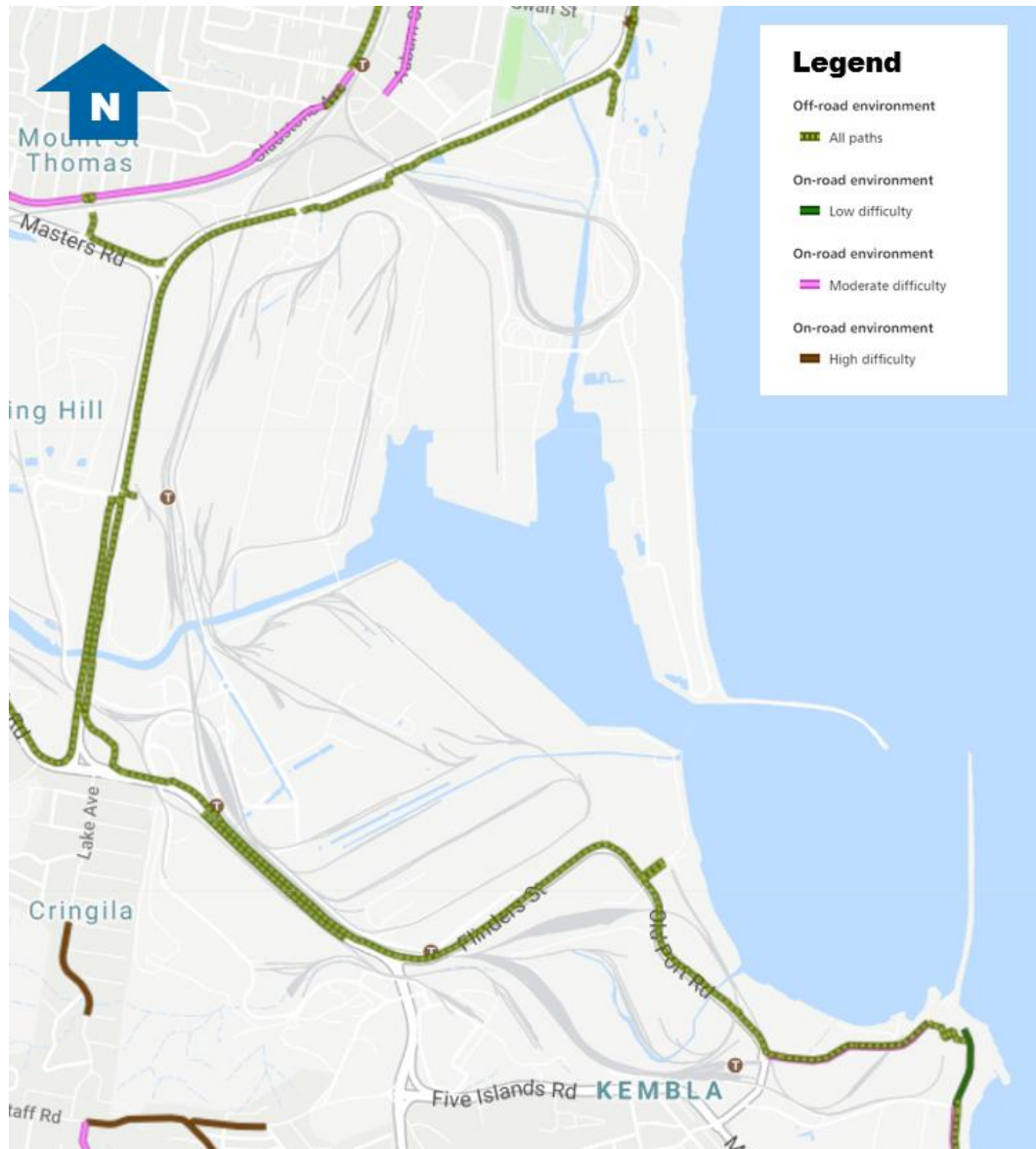


Figure 3-15 Existing bicycle network

Source: http://www.rms.nsw.gov.au/maps/cycleway_finder

4. Construction Activities

This Section of the report provides details of key construction activities that have informed the TIA. The activities assessed as part of this TIA include vehicle traffic associated with construction and delivery of the project, including workers accessing the site.

Construction of the project involves the following key activities:

- Mobilisation;
- Wharf demolition and construction;
- Dredging and disposal;
- Pipeline construction; and
- Demobilisation.

4.1 Construction program

A summary of the construction staging and duration for each of the construction activities is provided in Table 4-1.

Table 4-1 Construction staging

Day	Duration	Timing
Mobilisation	One week	Week one
Wharf demolition and construction	Ten months	Month 1 – 10
Dredging and disposal	Ten months	Month 1 – 10
Pipeline construction	Six months	Month 1 – 6
Demobilisation	One week	Month 11

4.2 Workforce

4.2.1 Working hours

The construction of the project would generally be carried out 24 hours a day and the construction workforce would generally work ten or 12 hour shifts.

Changeover of the construction workforce would generally occur at the start of a morning shift at around 7.00 am, and evening shift at around 5.00 pm or a night shift at around 7.00 pm.

Changeover of the workforce conducting dredging activities would generally occur at 6.00 am and 6.00 pm or 12.00 am and 12.00 pm.

4.2.2 Workforce

During the peak construction period, it is estimated that up to 150 personnel would be required for the project, including:

- Approximately 76 personnel at the Port Kembla wharf site per day, with 38 personnel per shift;
- Approximately 37 personnel at the Port Kembla (disposal) site per day, with 19 personnel per shift; and
- Approximately 37 personnel at the pipeline site per day, with 19 personnel per shift.

4.3 Construction vehicles

The hauling of excavated material from the wharf site to the disposal site would be by road truck and trailer (32 T/18m³).

A summary of the construction equipment is provided in Table 4-2. Most of this equipment would mobilise to site and stay for duration of the construction period.

Table 4-2 Construction equipment

Activity	Equipment	Quantity
Demolition	Excavator	9
	Barge with crane/excavator	1
	Loader	2
	Dump truck (50 t)	4
	Truck and trailer	4
Construction	Piling rig	4
	Pile driving hammer	4
	Vibro-hammer	3
	Crane (150–300 t)	5
	Crane (30–150 t)	6
	Drilling machine (90 t)	3
	Concrete pump	2
	Truck and jinker	2
	Telehandler	2
	Backhoe dredger	1
Dredging	Survey crew/boat	1
	Tug boat (1200 HP)	2
	Tug boat (600 HP)	1
	Barge	2
	Long reach excavator	1
Excavation	Loader	1
	Dozer	1
	Excavator	3
	Haul truck (32 t)	10
	Long reach excavator	1
Disposal	Loader	1
	Dozer	1
	Dump truck (50 t)	2

4.1 Traffic generation

4.1.1 Mobilisation

Initial mobilisation of the project would involve delivery of plant and equipment to the Port Kembla Wharf site, via Port Kembla Road. This is expected to occur over a period of a week, with a summary of the expected two-way (i.e. one vehicle trip) traffic generation provided in Table 4-3.

As shown, mobilisation of the project is expected to generate:

- Approximately 20 vehicle trips accessing the site per day; and
- Approximately four vehicle trips during the peak hour.

Construction traffic associated with mobilisation of the Project is expected to access the Port Kembla wharf site, from Port Kembla Road via the signal controlled intersection with Springhill Road.

This traffic generation is considered to be low and within the daily fluctuation in traffic at roads in the surrounding road network. The mobilisation activities are therefore expected to have negligible traffic impacts.

Table 4-3 Mobilisation traffic generation - two-way traffic

	Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	60	10	2
Light vehicles	12	10	2
Total	72	20	4

4.1.2 Wharf demolition and construction

Construction activities associated with the wharf demolition and construction is expected to occur over a period of ten months. A summary of the expected two-way (i.e. one vehicle trip) traffic generation is provided in Table 4-4.

There would be up to 75 personnel working at the project site per day, with around 38 personnel working each shift. For a conservative assessment of the proposal, it has been assumed that each person would arrive at the site by single occupancy private vehicle.

This results in the following peak hour traffic generation:

- AM peak hour (6.45 am – 7.45 am):
 - 38 light vehicles arriving and departing the wharf site
 - 1 heavy vehicle arriving and departing the wharf site
- PM peak hour (4.45 pm – 5.45 pm):
 - 38 light vehicles arriving and departing the wharf site
 - 1 heavy vehicle arriving and departing the wharf site

Table 4-4 Wharf demolition and construction traffic generation - two-way traffic

	Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	924	10	1
Light vehicles	23,100	76	38
Total	24,024	89	39

4.1.3 Dredging and disposal

Construction traffic generation associated with the dredging and disposal activities includes the following:

- Heavy vehicle trips associated with general deliveries accessing the Port Kembla disposal site, accessed from Foreshore Road.
- Light vehicle trips associated with personnel accessing the Port Kembla disposal site, accessed from Foreshore Road.

- Heavy vehicles associated with transportation of dredge material from the Port Kembla wharf site (accessed from Port Kembla Road) to the Port Kembla disposal site, accessed from Foreshore Road.

Dredging and disposal construction activities are expected to occur over a period of ten months.

There is expected to be approximately 38 personnel working at the dredging and disposal site, with around 19 personnel working during each shift. For a conservative assessment, it has been assumed that each person would arrive at the site by single occupancy private vehicle.

A summary of the expected two-way (i.e. one vehicle trip) traffic generation provided in Table 4-5 for general construction traffic and trips associated with personnel accessing the site. This results in the following peak hour traffic generation:

- AM peak hour (6.45 am – 7.45 am):
 - 19 light vehicles arriving and departing the disposal site
 - 1 heavy vehicle arriving and departing the disposal site, associated with general deliveries
- PM peak hour (4.45 pm – 5.45 pm):
 - 19 light vehicles arriving and departing the disposal site
 - 1 heavy vehicle arriving and departing the disposal site

Table 4-5 Dredging and disposal traffic generation (general deliveries and staff movements) - two-way traffic

		Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	General deliveries	924	3	1
Light vehicles	Construction workforce movements	11,550	38	19
Total		12,474	41	20

A summary of the heavy vehicle movements associated with transportation of dredge material from the wharf site to the disposal site is provided in Table 4-6. For a conservative assessment, the in following hourly traffic generation has been assumed:

- 11 heavy vehicle movements in each direction, travelling between the wharf site and disposal site

Table 4-6 Transport of dredge material from Port Kembla (wharf) to Port Kembla (disposal) - two-way traffic

		Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	General deliveries	34,444	112	11*

*Note – the assumed peak hour traffic generation is a highly conservative estimate

4.1.4 Pipeline construction

Construction of the pipeline is expected to occur over a period of approximately six months and would require approximately 38 construction personnel.

There is expected to be around 19 personnel working during each shift. For a conservative assessment, it has been assumed that each person would arrive at the site by single occupancy private vehicle.

A summary of the expected two-way (i.e. one vehicle trip) traffic generation is provided in Table 4-7 for general construction traffic and trips associated with personnel accessing the site. This results in the following peak hour traffic generation:

- AM peak hour (6.45 am – 7.45 am):
 - 19 light vehicles arriving and departing the pipeline construction site
 - 1 heavy vehicle arriving and departing the pipeline construction site
- PM peak hour (4.45 pm – 5.45 pm):
 - 19 light vehicles arriving and departing the pipeline construction site
 - 1 heavy vehicle arriving and departing the pipeline construction site

Table 4-7 Pipeline construction traffic generation - two-way traffic

		Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	Pipeline and general deliveries	6,825	38	19
Light vehicles	Construction workforce movements	546	3	1
Total		7,371	41	20

4.1.5 Demobilisation

Demobilisation of the project would involve delivery of plant and equipment from both the wharf site and disposal site. This is expected to occur over a period of a week.

A summary of the expected two-way (i.e. one vehicle trip) traffic generation associated with demobilisation activities at the wharf site and disposal sites is provided in Table 4-9 and Table 4-9 respectively.

As shown, demobilisation of the project is expected to generate:

- Approximately eight vehicle trips accessing the wharf and disposal sites (each) per day; and
- Approximately two vehicle trips during the peak hour accessing the wharf and disposal sites.

This traffic generation is considered to be low and within the daily fluctuation in traffic at roads in the surrounding road network. The demobilisation activities are therefore expected to have negligible traffic impacts.

Table 4-8 Demobilisation traffic generation, wharf site - two-way traffic

	Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	50	7	1
Light vehicles	10	1	1
Total	60	8	2

Table 4-9 Demobilisation traffic generation, disposal site - two-way traffic

	Total traffic generation (vehicles)	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	50	7	1
Light vehicles	10	1	1
Total	60	8	2

4.2 Construction vehicle access routes

Three typical construction traffic access routes have been considered for the purpose of this assessment. These include the following routes:

- **Route A:** access to the wharf site, accessed from Port Kembla Road, as shown Figure 4-1.
- **Route B:** access to the disposal site, accessed from Foreshore Road, as shown in Figure 4-2.
- **Route C:** access between the wharf and disposal sites, as shown in Figure 4-3.
- **Route D:** access to the pipeline construction site, as shown in Figure 4-4.

A summary of these routes is provided in Table 4-10.

Table 4-10 Construction access routes to each construction site

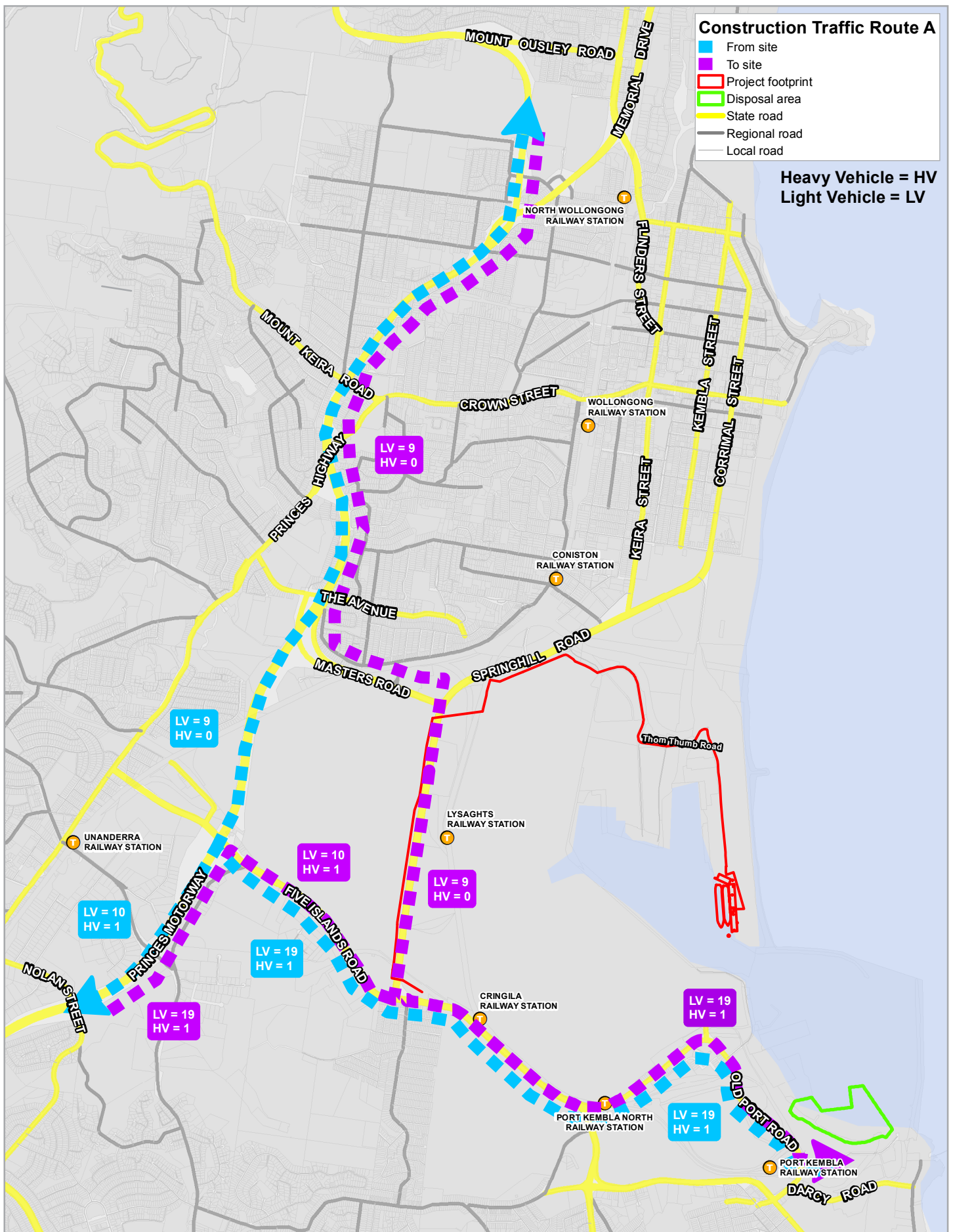
Traffic Route ID	Description	Route	Assumptions
Route A	Access to wharf site	Port Kembla Road	Trips on Princes Motorway assumed to be split 50/50 north/south
		Springhill Road	
		Masters Road	
		Princes Motorway	
Route B	Access to disposal site	Foreshore Road	Trips on Princes Motorway assumed to be split 50/50 north/south
		Old Port Road	
		Flinders Street	
		Five Islands Road	
		Masters Road	
		Princes Motorway	
Route C	Access between wharf site disposal site	Port Kembla Road	Trips on Princes Motorway assumed to be split 50/50 north/south
		Springhill Road	
		Five Islands Road	
		Flinders Street	
		Old Port Road	
		Foreshore Road	
Route D	Access to pipeline site	Port Kembla Road / Tom Thumb Road / BlueScope Northgate access / BlueScope western access as required	Trips on Princes Motorway assumed to be split 50/50 north/south
		Springhill Road	
		Masters Road	
		Princes Motorway	

Access to the pipeline construction site

The gas pipeline would follow a route about 6km in length from Berth 101 to the north along the road verge of Road No 1 within the Port Kembla Coal Terminal. It would then turn west along the road verge of Tom Thumb Road, including horizontal directional drill beneath Gurungaty Waterway. It would continue along the road verge of Tom Thumb Road to the north and west, generally following the boundary of the existing car storage facilities and BlueScope facilities, including horizontal directional drill beneath the crossings of Tom Thumb Road, the Pacific National railway and BlueScope's Northgate access.

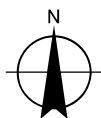
It would then continue east including a horizontal directional drill beneath the crossing of NSW Railcrop's South Coast Line and Springhill Road and the intervening vegetated area. It would then run adjacent to the road verge of Springhill Road south including horizontal directional drill beneath Allans Creek. It would then tie in to Jemena's assets connected to the Eastern Gas Pipeline.

For the construction of the pipeline, there will be no need for partial road closures at Springhill Road. Works will be located on BlueScope land to the west of Springhill Road and accessed via the existing private road network and along electricity easements.



Paper Size ISO A4
0 390 780 1,170 1,560
Metres

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

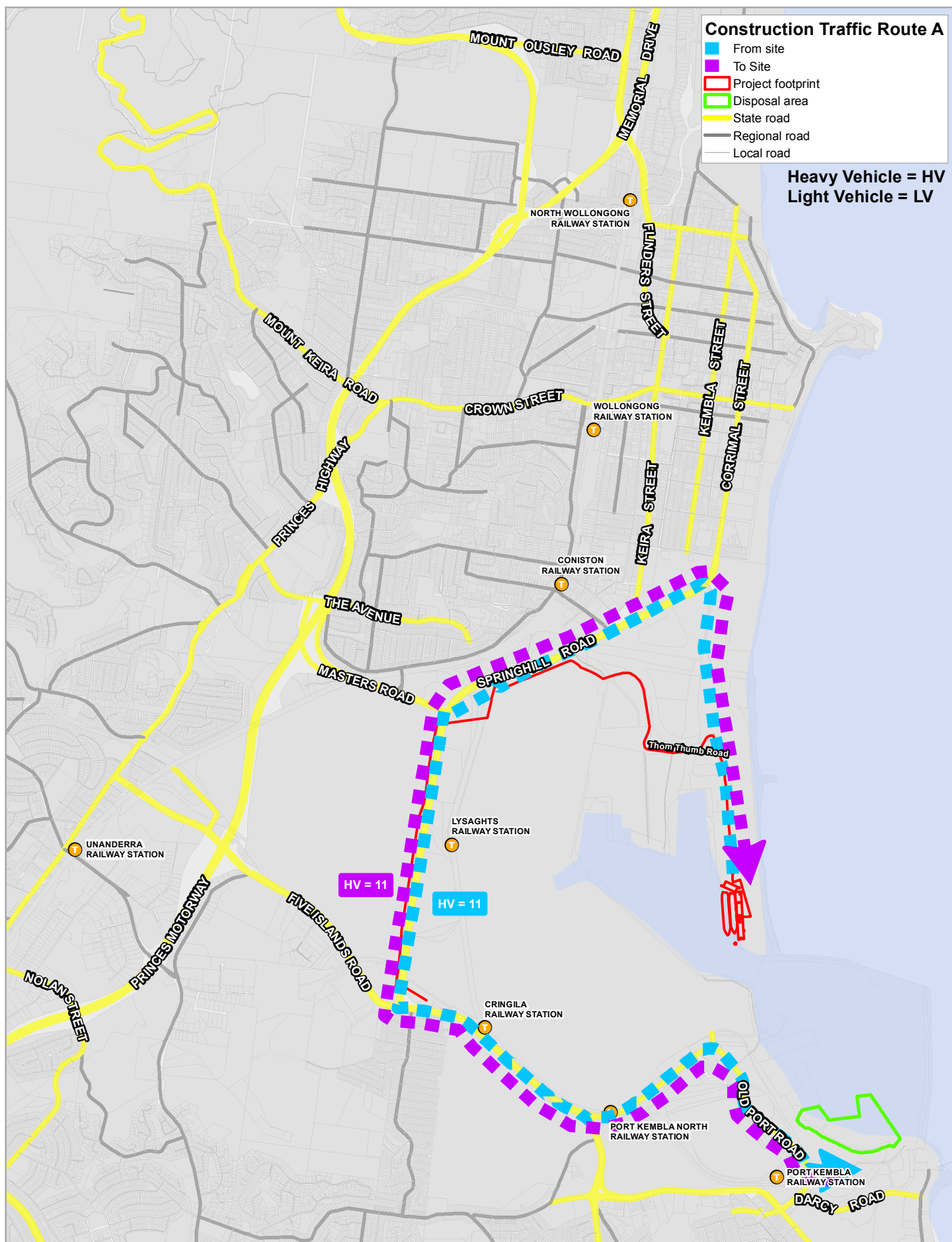


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**Construction Traffic Route B
access to disposal site**

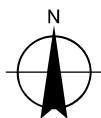
Project No. 21-27477
Revision No. A
Date 01 Nov 2018

Figure 4-2



Paper Size ISO A4
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Metres

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

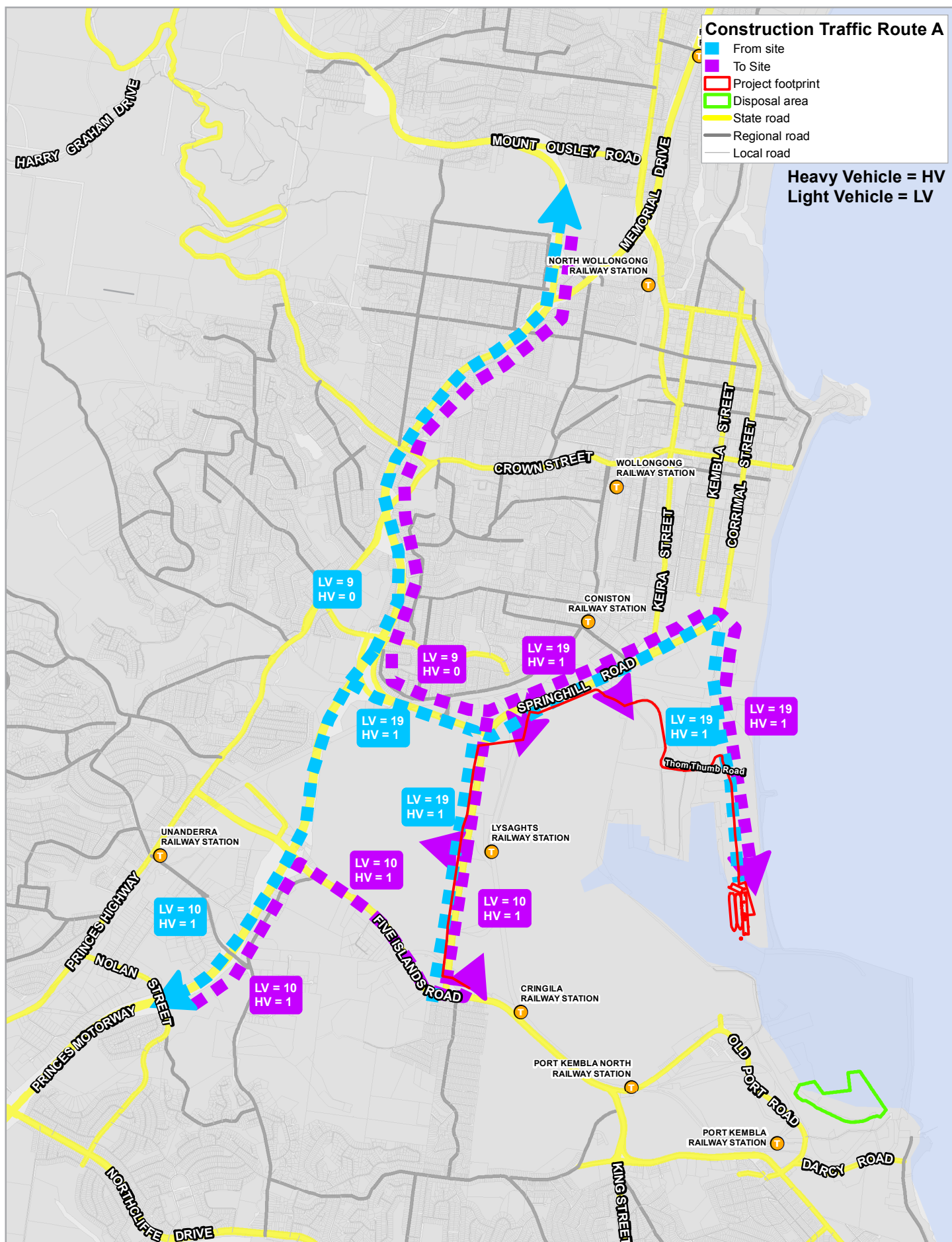


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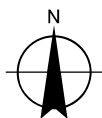
Construction Traffic Route C
access between wharf and disposal

Project No. 21-27477
Revision No. A
Date 01 Nov 2018

Figure 4-3



Paper Size ISO A4
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Metres



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



Australian Industrial Energy
Port Kembla Gas Terminal

Project No. 21-27477
Revision No. A
Date 01 Nov 2018

Construction Traffic Route D
access to pipeline alignment

Figure 4-4

5. Impact Assessment

This Section outlines the traffic implications during the construction and operation of the project.

5.1 Construction impacts

5.1.1 Traffic impact

Based on the traffic generation and traffic distributions outlined in Section 4.2.2 and 4.2, the following Sections summarise the expected increase in daily and peak hour traffic during peak construction activities. This peak construction period includes traffic associated with the following construction activities, which are expected to occur at the same time for a period of up to six months:

- Wharf demolition and construction;
- Dredging and disposal; and
- Pipeline construction.

Daily traffic construction traffic

The expected increase in daily traffic associated with the peak construction activity for the project is summarised in Table 5-1.

It should be noted that the peak hour traffic generation is associated with light vehicle movements during shift changeover periods. Light vehicle movements during other times of the day are expected to be minimal. Outside of shift change over hours, construction of the project would result in an increase of around 13 two-way heavy vehicle movements per hour.

Table 5-1 Increase in construction traffic generation – daily traffic

Road	Location	Direction	Light vehicles	Heavy vehicles (general)	Heavy vehicles (dredge material)	Total vehicles
Springhill Road	Southwest of Port Kembla Road	Northbound	114	13	112	239
		Southbound	114	13	112	239
Port Kembla Road	South of Springhill Road	Eastbound	114	13	112	239
		Westbound	114	13	112	239
Port Kembla Road / Tom Thumb Road / BlueScope Northgate access / BlueScope western	Access as required	Northbound or westbound	38	3	0	41
		Southbound or eastbound	38	3	0	41
Springhill Road	North of Masters Road	Northbound	114	13	112	239
		Southbound	114	13	112	239
Masters Road	West of Springhill Road	Eastbound	76	7	0	83
		Westbound	74	13	0	87

Road	Location	Direction	Light vehicles	Heavy vehicles (general)	Heavy vehicles (dredge material)	Total vehicles
Springhill Road	South of Masters Road	Northbound	57	7	112	176
		Southbound	19	7	112	138
Five Islands Road	West of Springhill Road	Eastbound	38	10	0	48
		Westbound	38	10	0	48
Five Islands Road	Northwest of Flinders Street	Northbound	38	3	112	153
		Southbound	38	3	112	153
Flinders Street	East of Five Islands Road	Eastbound	38	3	112	153
		Westbound	38	3	112	153
Five Islands Road	Northwest of Darcy Road	Northbound	0	0	0	0
		Southbound	0	0	0	0
Darcy Road	East of Five Islands Road / Military Road	Eastbound	0	0	0	0
		Westbound	0	0	0	0
Old Port Road	North of Darcy Road	Northbound	38	3	112	153
		Southbound	38	3	112	153
Foreshore Road	East of Old Port Road	Eastbound	38	3	112	153
		Westbound	38	3	112	153

Peak hour construction traffic

The expected increase in peak hour traffic associated with the peak construction activity for the project is summarised in Table 5-1.

Table 5-2 Peak hour construction traffic generation on surrounding road network

Road	Location	Direction	Light vehicles	Heavy vehicles (general)	Heavy vehicles (dredge material)	Total vehicles
Springhill Road	Southwest of Port Kembla Road	Northbound	57	2	11	70
		Southbound	57	2	11	70
Port Kembla Road	South of Springhill Road	Eastbound	57	2	11	70
		Westbound	57	2	11	70
Port Kembla Road / Tom Thumb Road / BlueScope Northgate access / BlueScope western	Access as required	Northbound or westbound	19	1	0	20
		Southbound or eastbound	19	1	0	20
Springhill Road	North of Masters Road	Northbound	57	2	11	70
		Southbound	57	2	11	70
Masters Road		Eastbound	37	1	0	38

Road	Location	Direction	Light vehicles	Heavy vehicles (general)	Heavy vehicles (dredge material)	Total vehicles
	West of Springhill Road	Westbound	57	2	0	59
Springhill Road	South of Masters Road	Northbound	19	1	11	31
		Southbound	29	1	11	41
Five Islands Road	West of Springhill Road	Eastbound	20	2	0	22
		Westbound	38	1	0	39
Five Islands Road	Northwest of Flinders Street	Northbound	19	1	11	31
		Southbound	19	1	11	31
Flinders Street	East of Five Islands Road	Eastbound	19	1	11	31
		Westbound	19	1	11	31
Five Islands Road	Northwest of Darcy Road	Northbound	0	0	0	0
		Southbound	0	0	0	0
Darcy Road	East of Five Islands Road / Military Road	Eastbound	0	0	0	0
		Westbound	0	0	0	0
Old Port Road	North of Darcy Road	Northbound	19	1	11	31
		Southbound	19	1	11	31
Foreshore Road	East of Old Port Road	Eastbound	19	1	11	31
		Westbound	19	1	11	31

Midblock assessment

For a highly conservative midblock assessment of the proposal, the peak hour construction traffic movements have been added to the observed road network AM and PM peak hour traffic volumes. However, it should be noted that:

- During the AM peak, the network peak hour was observed to be between 8.00 am and 9:00 am although the construction traffic peak hour is expected to be between 6.45 am and 7.45 am; and
- During the PM peak, the network peak hour was observed to be bet between 3.30 pm and 4.30 pm, although the construction traffic peak hour would be between 4.45 pm – 5.45 pm.

Table 5-3 and Table 5-4 provide the VCR results for the AM and PM peak hours respectively for the peak construction period. As stated above, this is a highly conservative assessment, given that the peak hours for the construction traffic generation would not occur during the surrounding road network peak hours.

The data indicates that the majority of key roads in the vicinity of the project are expected to operate well within the acceptable capacity for weekday morning and evening peak periods. Springhill Road, to the north of Masters Road, has a V/C ratio of 0.94 in the northbound direction during the weekday AM peak, which is similar to the existing situation.

The traffic generation associated with the peak construction activity for the project would result in a 3% increase in traffic for this movement (an increase of 31 vehicles or 61 PCUs).

This is considered to be a minimal traffic impact and would be within the daily fluctuation in traffic at this location. In addition, it should be noted that the AM peak hour for the construction traffic (6.45 am – 7.45 am) would also not occur at the same time as the traffic network peak hour (8.00 am – 9.00 am).

Impacts to the M1 Princes Motorway are expected to be minimal given that this is a state Highway which carries high traffic volumes (around 66,000 vehicles per day as discussed in Section 3.1.2).

Table 5-3 Peak construction midblock volume / capacity – AM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Southwest of Port Kembla Road	Northbound	1,200	2	1,497	0.62
		Southbound	1,200	2	676	0.28
Port Kembla Road	South of Springhill Road	Eastbound	900	1	144	0.16
		Westbound	900	1	136	0.15
Tom Thumb Road	South of Springhill Road	Northbound	900	1	139	0.15
		Southbound	900	1	111	0.12
Springhill Road	North of Masters Road	Northbound	1,200	3	3,297	0.92
		Southbound	1,200	3	1,254	0.35
Masters Road	West of Springhill Road	Eastbound	1,200	4	1,648	0.34
		Westbound	1,200	3	1,374	0.38
Springhill Road	South of Masters Road	Northbound	1,200	3	3,443	0.96
		Southbound	1,200	3	1,707	0.47
Five Islands Road	West of Springhill Road	Eastbound	1,200	3	1,655	0.46
		Westbound	1,200	3	974	0.27
Five Islands Road	Northwest of Flinders Street	Northbound	1,200	3	2,411	0.67
		Southbound	1,200	3	1,788	0.50
Flinders Street	East of Five Islands Road	Eastbound	900	1	297	0.33
		Westbound	900	1	225	0.25
Five Islands Road	Northwest of Darcy Road	Northbound	1,200	2	289	0.12
		Southbound	1,200	2	232	0.10
Darcy Road	East of Five Islands Road / Military Road	Eastbound	900	1	167	0.19
		Westbound	900	1	107	0.12
Old Port Road	North of Darcy Road	Northbound	900	1	156	0.17
		Southbound	900	1	152	0.17
Foreshore Road	East of Old Port Road	Eastbound	900	1	118	0.13
		Westbound	900	1	112	0.12

*veh = vehicles, hr = hour, PCU = passenger car units, V/C = volume to capacity ratio

Note, PCU factors = 1 for light vehicles, 2 for heavy vehicles (or 2.5 if number of B-Doubles is unknown) and 4 for B-Doubles

Table 5-4 Peak construction midblock volume / capacity analysis – PM peak hour

Road	Location	Direction	Capacity (veh/hr/lane)	Number of lanes	Total vehicles (PCUs)	V/C ratio
Springhill Road	Southwest of Port Kembla Road	Northbound	1,200	2	778	0.32
		Southbound	1,200	2	898	0.37
Port Kembla Road	South of Springhill Road	Eastbound	900	1	132	0.15
		Westbound	900	1	175	0.19
Tom Thumb Road	South of Springhill Road	Northbound	900	1	68	0.08
		Southbound	900	1	161	0.18
Springhill Road	North of Masters Road	Northbound	1,200	3	1,606	0.45
		Southbound	1,200	3	2,316	0.64
Masters Road	West of Springhill Road	Eastbound	1,200	4	1,110	0.23
		Westbound	1,200	3	2,329	0.65
Springhill Road	South of Masters Road	Northbound	1,200	3	2,333	0.65
		Southbound	1,200	3	1,857	0.52
Five Islands Road	West of Springhill Road	Eastbound	1,200	3	2,822	0.78
		Westbound	1,200	3	1,262	0.35
Five Islands Road	Northwest of Flinders Street	Northbound	1,200	3	2,028	0.56
		Southbound	1,200	3	2,445	0.68
Flinders Street	East of Five Islands Road	Eastbound	900	1	193	0.21
		Westbound	900	1	409	0.45
Five Islands Road	Northwest of Darcy Road	Northbound	1,200	2	302	0.13
		Southbound	1,200	2	312	0.13
Darcy Road	East of Five Islands Road / Military Road	Eastbound	900	1	108	0.12
		Westbound	900	1	223	0.25
Old Port Road	North of Darcy Road	Northbound	900	1	161	0.18
		Southbound	900	1	192	0.21
Foreshore Road	East of Old Port Road	Eastbound	900	1	131	0.15
		Westbound	900	1	140	0.16

*veh = vehicles, hr = hour, PCU = passenger car units, V/C = volume to capacity ratio

Note, PCU factors = 1 for light vehicles, 2 for heavy vehicles (or 2.5 if number of B-Doubles is unknown) and 4 for B-Doubles

5.1.2 Intersection performance

The following key intersections within the study area have been assessed using the SIDRA 8 intersection modelling software, as these intersection provide access to the wharf site and disposal site:

- Port Kembla Road / Springhill Road;
- Flinders Street / Five Islands Road; and
- Old Port Road / Foreshore Road.

The intersection traffic modelling has been undertaken for the following weekday peak hour periods, to coincide with the construction traffic generation peak hours for the project, which is associated with the shift changeover periods:

- AM peak – between 6.45 am and 7.45 am; and
- PM peak – between 4.45 am and 5.45 am.

Construction traffic generated by project outside of these periods would be minor, with an increase of around 13 two-way heavy vehicle movements per hour on the surrounding road network.

A summary of the SIDRA intersection modelling results for the “without construction traffic” scenario and the “with construction” scenario is provided in Table 5-5 and Table 5-6 respectively. The intersection modelling indicates that the construction traffic would have minor impacts to the operation of these intersections, which would continue to operate with a satisfactory LoS under the peak construction traffic scenario for the project.

Table 5-5 SIDRA modelling results – 2018 surveyed traffic volumes

Intersection	AM Peak (6.45 am – 7.45 am)				PM Peak (4.45 am – 5.45 am)			
	Average Delay (s)	LoS	Control Type	Degree of Saturation	Average Delay (s)	LoS	Control Type	Degree of Saturation
Port Kembla Road / Springhill Road	8.0	A	Signals	0.151	5.5	A	Signals	0.232
Flinders Street / Five Islands Road	10.6	A	Signals	0.518	10.1	A	Signals	0.685
Old Port Road / Foreshore Road	9.5	A	Roundabout	0.017	9.5	A	Give Way Priority	0.040

*Note - LoS = Level of Service

Table 5-6 SIDRA modelling results - during construction

Intersection	AM Peak (6.45 am – 7.45 am)				PM Peak (4.45 am – 5.45 am)			
	Average Delay (s)	LoS	Control Type	Degree of Saturation	Average Delay (s)	LoS	Control Type	Degree of Saturation
Port Kembla Road / Springhill Road	13.4	A	Signals	0.180	11.0	A	Signals	0.291
Flinders Street / Five Islands Road	11.5	A	Signals	0.529	10.8	A	Signals	0.693
Old Port Road / Foreshore Road	10.0	A	Roundabout	0.036	9.5	A	Give Way Priority	0.076

*Note - LoS = Level of Service

The SIDRA modelling assessment summarised in Table 5-6 assumes that construction vehicle access to the pipeline alignment is via the Springhill Road / Port Kembla Road intersection. As discussed in Section 4.2, access to the pipeline alignment would also be via Tom Thumb Road or the BlueScope access driveways, as required.

Although these intersections have not been assessed as part of the intersection traffic modelling, impacts to the operation of these intersections is expected to be minor, with only 19 light vehicles movements (in each direction) and one heavy vehicle movement (in each direction) expected during the AM and PM peak hours.

In addition, reference to the *Port Kembla Bulk Liquids Terminal Traffic Impact Assessment* (Cardno, 2015) indicates that the Springhill Road / Tom Thumb Road intersection currently operate with ample spare capacity during the weekday AM and PM peak hours, at LoS B during both peak hours. The additional construction traffic associated with the project, is therefore expected to have minor impacts to the Springhill Road / Tom Thumb Road intersection.

5.1.3 Car parking area

Personnel are expected to park at car parking areas provided at the construction sites, which would be managed by the contractor. As such, there is expected to be minimal impacts to on-street car parking in the study area.

5.1.4 Public transport

The proposed construction arrangements would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the construction activities is expected to have minimal impacts to public transport services.

5.1.5 Pedestrians and bicycle riders

The proposed construction arrangements is not expected to impact pedestrian or bicycle facilities. The additional traffic generated by the construction activities is expected to have minimal impacts to pedestrians and bicycle riders.

5.2 Operational impacts

5.2.1 Traffic generation

Traffic generation associated with the operation of the project would be limited to workforce accessing the wharf site via Port Kembla Road. The operation of the project is expected to require approximately 40 - 50 personnel, with 20 – 25 of these personnel on board the FSRU.

During operation of the project, there would be occasional truck movements associated with the transportation of goods and waste to and from the FSRU. This is expected to result in around ten vehicle trips per month.

This is expected to result in the following peak hour traffic generation, as summarised in Table 5-7:

- AM peak hour (6.45 am – 7.45 am):
 - 25 light vehicles arriving and departing the FSRU site
 - 1 heavy vehicle arriving and departing the FSRU site
- PM peak hour (4.45 pm – 5.45 pm):
 - 25 light vehicles arriving and departing the FSRU site
 - 1 heavy vehicle arriving and departing the FSRU site

Table 5-7 Operational traffic generation - two-way traffic

	Daily traffic generation (vehicles)	Peak Hour traffic generation (vehicles)
Heavy vehicles	1	1
Light vehicles	50	25
Total	51	26

5.2.2 Traffic impacts

The operational peak hour traffic is expected to be lower than the peak hour traffic associated with the construction activities. The operation of the project traffic is therefore expected to have minimal traffic impacts to the surrounding road network.

5.2.3 Car parking

Personnel are expected to park at a designated off street location, close to the FSRU. As such, there is expected to be minimal impacts to on-street car parking in the study area.

5.2.4 Public transport

The operation of the project would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the operation of the project is expected to have minimal impacts to public transport services.

5.2.5 Pedestrians and bicycle riders

Operation of the project would not impact pedestrian or bicycle facilities. The minor increase in traffic movements associated with the project is expected to have minimal impacts to pedestrians and bicycle riders.

5.3 Cumulative impacts

Planning approval was granted in 2016 for the construction and operation of a bulk liquids terminal in Port Kembla for the import, storage and distribution of petroleum fuel products and ethanol. This facility was expected to be operational by 2017/2018.

The bulk liquids terminal site is located within Port Kembla, accessed from Tom Thumb Road, approximately 1.5km to the south of the Tom Thumb Road / Springhill Road intersection.

A TIA report for the Proposed Port Kembla Bulk Liquids Terminal was provided as part of the EIS for the facility (Cardno, 2015). This TIA was prepared to assess the traffic impacts associated with construction and operations of the proposed Bulk Liquids Terminal. The TIA for the Bulk Liquids Terminal has been considered in the preparation of this report, although the operations are not yet complete.

The weekday modelled AM and PM peak hour traffic generation for the operation of the Bulk Liquids Terminal is shown in Figure 5-1 and Figure 5-2 respectively.

Updated Traffic Generation – AM Peak Stage 3 Operations

LV Light Vehicles
HV Heavy Vehicles

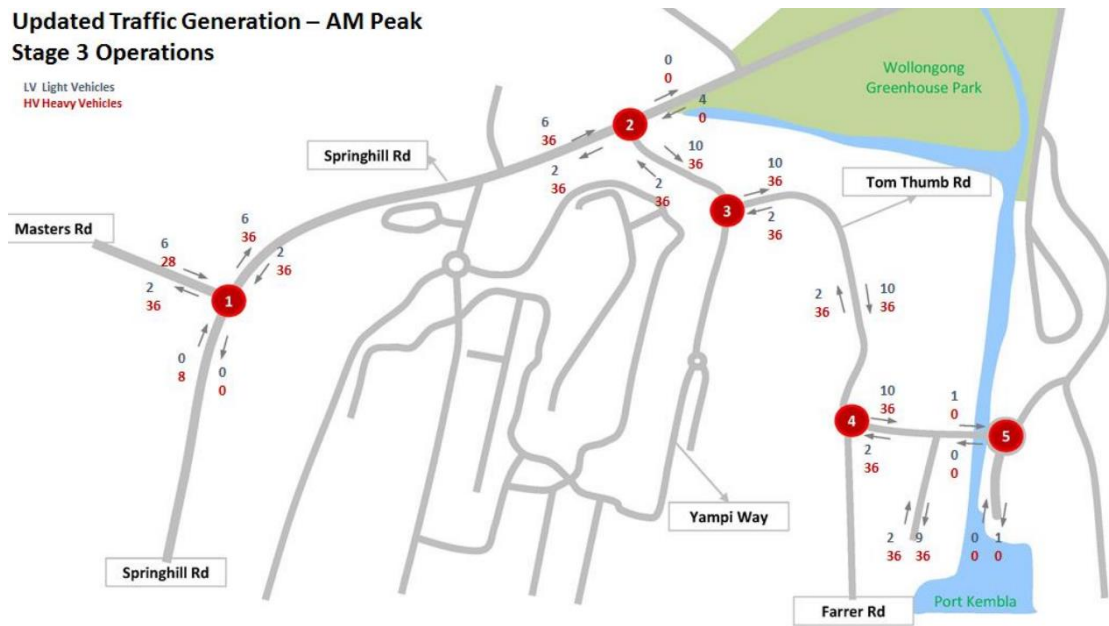


Figure 5-1 Port Kembla Bulk Liquids Operational Traffic Distribution – AM Peak Hour

Source: Port Kembla Bulk Liquids Terminal EIS Traffic Impact Assessment (Cardno, 2015)

Updated Traffic Generation – PM Peak Stage 3 Operations

LV Light Vehicles
HV Heavy Vehicles

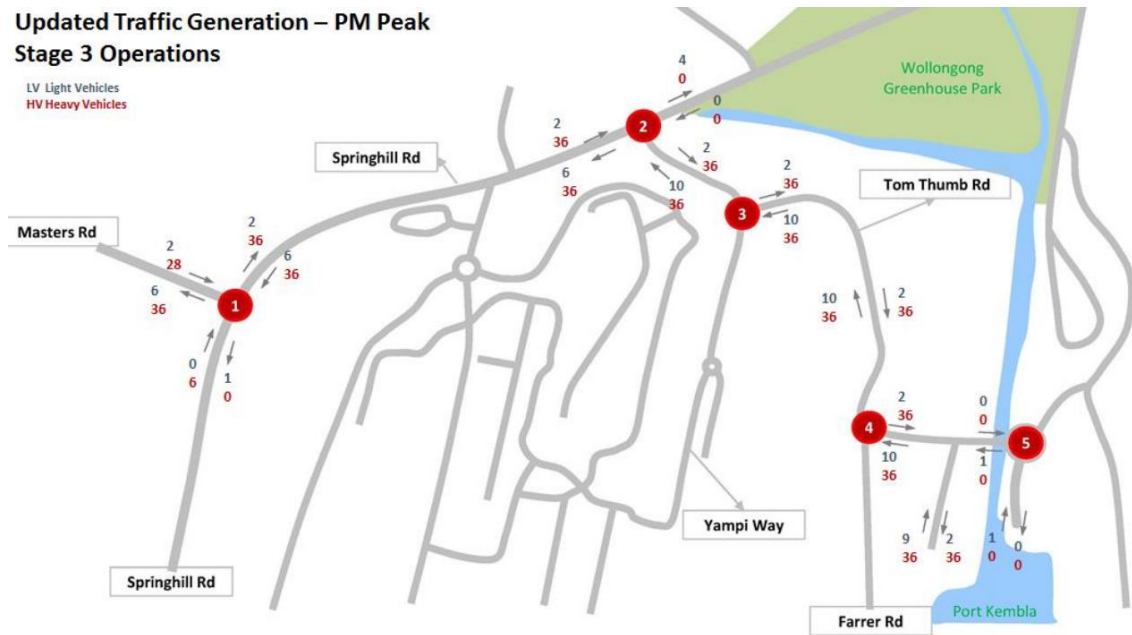


Figure 5-2 Port Kembla Bulk Liquids Operational Traffic Distribution – PM Peak Hour

Source: Port Kembla Bulk Liquids Terminal EIS Traffic Impact Assessment (Cardno, 2015)

Springhill Road / Tom Thumb Road intersection

SIDRA intersection modelling undertaken for the Bulk Liquids Terminal TIA report indicated that the Springhill Road / Tom Thumb Road intersection is expected to operate at LoS B during both the AM and PM peak periods in 2026 with the Bulk Liquids Terminal operational traffic.

The assessment of the Bulk Liquids Terminal was based on the weekday peak hours occurring between 8:15 AM and 9:15 AM and between 4:30 PM and 5:30 PM. As such, the construction peak hour for the proposal during the AM peak would occur before the assumed peak hour for the Bulk Liquids Terminal.

With the additional construction traffic associated with the project, the impacts to the operation of the Springhill Road / Tom Thumb Road intersections is expected to be minor, with an increase of only 19 light vehicles and one heavy vehicle movement (in each direction) expected at Tom Thumb Road during the AM and PM peak hours. Following construction of the project, there would be no additional traffic accessing Tom Thumb Road.

Springhill Road / Masters Road intersection

The Bulk Liquids Terminal TIA report indicated that the Masters Road / Springhill Road intersection also currently operates at a satisfactory LoS C. The additional traffic associated with the project at Masters Road and Springhill Road is as follows, which is expected to be within the daily fluctuation in traffic:

- Masters Road, peak construction traffic percentage increase in PCUs:
 - AM Peak = 3%
 - PM peak = 3%
- Springhill Road (north of Masters Road) percentage increase in PCUs:
 - AM Peak = 4%
 - PM peak = 5%

The Bulk Liquids Terminal TIA report indicated that an improvement to the Masters Road / Springhill Road intersection is required to support the operational traffic associated with the Bulk Liquids Terminal in 2026. This would provide a continuous left turn slip lane from Masters Road. SIDRA traffic modelling undertaken as part of the Bulk Liquids Terminal TIA indicates that this upgrade would result in a satisfactory LoS in 2026.

Traffic associated with the operation of the project is expected to be low, with around 25 light vehicles and one heavy vehicle movement during the AM and PM peak hours. This traffic is expected to have minimal impacts to the operation of the Masters Road / Springhill Road intersection.

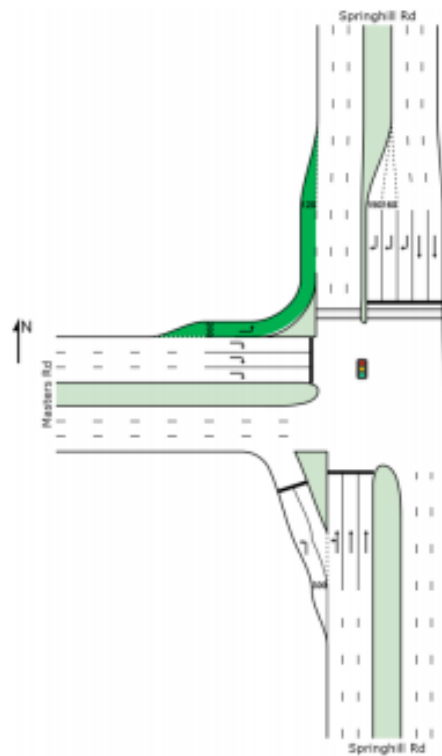


Figure 5-3 Proposed Masters Road / Springhill Road intersection upgrade

Source: Port Kembla Bulk Liquids Terminal EIS Traffic Impact Assessment (Cardno, 2015)

6. Mitigation measures

6.1 Construction activity traffic management

6.1.1 Construction traffic management objective

A Construction Traffic Management Plan (CTMP) will need to be prepared prior to the commencement of works with site induction for construction personnel being undertaken to outline the requirements of the CTMP. The aim of the CTMP is to maintain the safety of all workers and road users within the vicinity site and the following are the primary objectives:

- To minimise the impact of the construction vehicle traffic on the overall operation of the road network.
- To provide continuous, safe and efficient movement of traffic for both the general public and construction workers.
- Installation of appropriate advance warning signs to inform users of the changed traffic condition.
- To provide a description of the construction vehicles and the volume of these construction vehicles accessing the construction site.
- To provide information regarding the changed access arrangement and also a description of the proposed external routes for vehicles including the construction vehicles accessing the site.
- Establishment of a safe pedestrian environment in the vicinity of the site.

6.1.2 Traffic management

Access to the surrounding public road network will be maintained throughout the construction period. Vehicles will be permitted to travel past the work site with traffic signage in accordance with a Traffic Control Plan (TCP) to be developed in accordance with *RMS Traffic Control at Works Sites and AS1742.3 – Traffic Control for Works on Roads*. This is to advise motorists of changes in road network or vehicle movements to/from the site including “Truck turning” activity.

It is not anticipated to implement road closures within the public road network as part of the construction activity.

Traffic Control Plans will need to be developed as part of the CTMP prior to commencing of construction activity on the site.

6.1.3 Construction traffic routes

To reduce the potential impacts on intersection performance surrounding the site, it is recommended that construction vehicles access the site via the construction traffic routes identified in Section 4.2.

Peak heavy vehicle traffic movements should be minimised, where possible, during the AM and PM peak hour and during the middle of the day on the weekend, when higher traffic volumes occur within the road network.

6.1.4 Parking for construction workers

Encouraging carpooling between workers will decrease traffic activity and parking demand.

However, parking for construction workers is provided within the site. Parking within the public road network will not be undertaken.

Workers could also access the site by public transport. Although the wharf site is not located within walking distance from a bus stop or train station, the disposal site is located adjacent to Port Kembla Station, accessed via Old Port Road.

6.1.5 Pedestrian management

Site access is to be restricted to authorised personnel only and existing employees on site. Pedestrian access to and around the site is to be maintained at all times. It is anticipated the pedestrian activity in public areas surrounding the site will be low due to the nearby industrial land uses.

Within the site pedestrian travel paths are to be maintained to key areas such as building entrances and be free from trip hazards.

6.1.6 Road hazards

The CTMP should identify specific road hazards associated with the area including but not limited to:

- wet weather;
- pedestrians and bicycle riders;
- general traffic; and
- bus infrastructure.

6.2 Post development traffic and parking management

To encourage and promote alternate transport opportunities to the site, consideration should be given to the development of Transport Access Guide (TAG) specific for the Project. The TAG summarises alternate transport options to access the development, outlining where and how these services can be accessed and frequency of the service. This could include but is not limited to:

- Public transport locations (bus and train connection);
- Active transport (cycle / walking) opportunities; and
- Bicycle infrastructure facilities.

Staff and visitors should be encouraged to utilise such facilities, with the TAG provided to visitors to the facility and advertised in prominent visitation areas. Providing the TAG to staff could be included as part of staff inductions for new employees and raised at regular team meetings and internal messaging systems (i.e. email).

7. Conclusion

The broad conclusion of this traffic impact assessment report is summarised as follows:

7.1 Construction impacts

7.1.1 Traffic generation

The peak construction of the project is expected to generate the following traffic during the AM and PM peak hours:

Wharf demolition and construction

AM peak hour (6.45 am – 7.45 am):

- 38 light vehicles arriving and departing the wharf site
- 1 heavy vehicle arriving and departing the wharf site
- PM peak hour (4.45 pm – 5.45 pm):
 - 38 light vehicles arriving and departing the wharf site
 - 1 heavy vehicle arriving and departing the wharf site

Pipeline construction

- AM peak hour (6.45 am – 7.45 am):
 - 19 light vehicles arriving and departing the pipeline construction site
 - 1 heavy vehicle arriving and departing the pipeline construction site
- PM peak hour (4.45 pm – 5.45 pm):
 - 19 light vehicles arriving and departing the pipeline construction site
 - 1 heavy vehicle arriving and departing the pipeline construction site

Dredging and disposal (disposal site general traffic)

- AM peak hour (6.45 am – 7.45 am):
 - 19 light vehicles arriving and departing the disposal site
 - 1 heavy vehicle arriving and departing the disposal site, associated with general deliveries
- PM peak hour (4.45 pm – 5.45 pm):
 - 19 light vehicles arriving and departing the disposal site
 - 1 heavy vehicle arriving and departing the disposal site

Dredging and disposal (transportation of dredge material from the wharf site to the disposal site)

- 11 heavy vehicle movements per hour in each direction, travelling between the wharf site and disposal site

7.1.2 Traffic impacts

Based on a highly conservative assessment, the VCR results for the AM and PM peak hours indicates that the majority of key roads in the vicinity of the project are expected to operate well within the acceptable capacity for weekday morning and evening peak periods.

Springhill Road, to the north of Masters Road, is expected to have a V/C ratio of 0.94 in the northbound direction during the weekday AM peak, which is similar to the existing situation. However, this is a highly conservative assessment, as the peak hours for the construction traffic generation would not occur at the same period as the surrounding road network peak hours.

SIDRA intersection traffic modelling indicates that the key intersections in the study area would operate with a satisfactory LoS under the construction traffic conditions.

7.1.3 Car parking

Personnel are expected to park at off street locations close to each construction site, which would be managed by the contractor. As such, there is expected to be minimal impacts to on-street car parking in the study area.

7.1.4 Public transport

The proposed construction arrangements would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the construction activities is expected to have minimal impacts to public transport services.

7.1.5 Pedestrians and bicycle riders

The proposed construction arrangements are not expected to impact pedestrian or bicycle facilities. The additional traffic generated by the construction activities is expected to have minimal impacts to pedestrians and bicycle riders.

7.2 Operational impacts

7.2.1 Traffic generation

Traffic generation associated with the operation of the project would be limited to workforce accessing the wharf site via Port Kembla Road. The operation of the project is expected to require approximately 40 - 50 personnel, with 20 - 25 of these personnel on board the FSRU.

During operation of the project, there would be occasional truck movements associated with the transportation of goods and waste to and from the FSRU. This is expected to result in around ten vehicle trips per month.

The operation of the project is expected to result in the following peak hour traffic generation:

- AM peak hour (6.45 am – 7.45 am):
 - 25 light vehicles arriving and departing the FSRU site
 - 1 heavy vehicle arriving and departing the FSRU site
- PM peak hour (4.45 pm – 5.45 pm):
 - 25 light vehicles arriving and departing the FSRU site
 - 1 heavy vehicle arriving and departing the FSRU site

7.2.2 Traffic impacts

The operational peak hour traffic is expected to be lower than the peak hour traffic associated with the construction activities. The operation of the project traffic is therefore expected to have minimal traffic impacts to the surrounding road network.

7.2.3 Car parking

Personnel are expected to park at a designated off street location, close to the FSRU. As such, there is expected to be minimal impacts to on-street car parking in the study area.

7.2.4 Public transport

The operation of the project would not impact train or bus services operating in the vicinity of the construction sites. The additional traffic generated by the operation of the project is expected to have minimal impacts to public transport services.

7.2.5 Pedestrians and bicycle riders

Operation of the project would not impact pedestrian or bicycle facilities. The minor increase in traffic movements associated with the project is expected to have minimal impacts to pedestrians and bicycle riders.

7.3 Mitigation measures

It is recommended that the following key mitigation measures be implemented for the development:

- A Construction Traffic Management Plan (CTMP) be prepared prior to the commencement of works with site induction for construction personnel being undertaken to outline the requirements of the CTMP. The aim of the CTMP is to maintain the safety of all workers and road users within the vicinity site including but not limited to:
 - Site access routes;
 - Construction parking arrangement;
 - Traffic management;
 - Pedestrian and bicycle rider management; and
 - Roadside hazards.
- The construction site access layout be reviewed during design development to consider the turn path required for the construction vehicles.
- A Transport Access Guide to identify alternate travel options for visitors and staff to encourage sustainable transport and reduce parking demand.

7.4 Conclusion

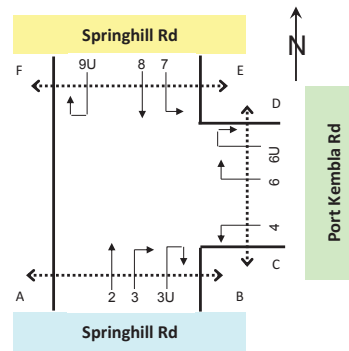
Based on the assumptions and investigations undertaken by GHD and the conclusions drawn in this report, it is considered that the proposed development does not have an adverse impact on the road system subject to the recommended mitigation measures being applied.

Appendices

Appendix A - Traffic survey data

Job No. : N4508
 Client : GHD
 Suburb : Port Kembla
 Location : 1. Springhill Rd / Port Kembla Rd

Day/Date : Tue, 18th Sept 2018
 Weather : Fine
 Description : Classified Intersection Count
 : Peak Hour Summary

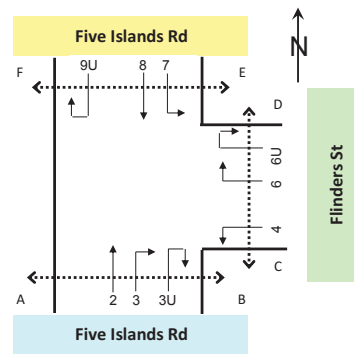


Approach	Springhill Rd							Port Kembla Rd							Springhill Rd							Grand Total
Time Period	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	
AM 8:00 to 9:00	1,340	11	0	0	15	0	1,366	23	2	0	1	0	0	26	534	9	1	0	10	1	555	1,947
PM 16:45 to 17:45	672	5	0	0	2	1	680	48	0	0	6	0	0	54	986	5	1	0	4	2	998	1,732

Approach	Springhill Rd							Port Kembla Rd							Springhill Rd							Grand Total
Time Period	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	
5:30 to 6:30	223	10	0	2	4	2	241	12	1	0	3	0	0	16	132	3	0	1	1	2	139	396
5:45 to 6:45	288	14	1	2	5	0	310	12	1	0	3	0	0	16	200	5	0	1	2	3	211	537
6:00 to 7:00	361	16	2	1	4	0	384	12	1	0	3	0	0	16	243	5	1	1	2	5	257	657
6:15 to 7:15	427	16	2	0	7	0	452	11	1	0	3	0	0	15	278	6	1	0	2	4	291	758
6:30 to 7:30	511	15	2	0	7	0	535	8	0	0	3	0	0	11	316	7	1	1	3	6	334	880
6:45 to 7:45	609	11	1	0	9	1	631	10	0	0	4	0	0	14	343	6	1	1	2	6	359	1,004
7:00 to 8:00	738	10	0	0	10	1	759	14	0	0	6	0	0	20	375	6	0	1	6	5	393	1,172
7:15 to 8:15	914	11	0	0	13	1	939	16	0	0	5	0	0	21	448	5	0	1	7	5	466	1,426
7:30 to 8:30	1,098	13	0	0	15	1	1,127	22	1	0	4	0	0	27	504	7	0	0	8	3	522	1,676
7:45 to 8:45	1,245	14	0	0	14	0	1,273	25	1	0	2	0	0	28	535	9	0	0	11	2	557	1,858
8:00 to 9:00	1,340	11	0	0	15	0	1,366	23	2	0	1	0	0	26	534	9	1	0	10	1	555	1,947
8:15 to 9:15	1,300	15	0	0	10	0	1,325	21	3	0	1	0	0	25	478	11	1	0	10	1	501	1,851
8:30 to 9:30	1,160	18	0	0	7	0	1,185	17	3	0	1	0	0	21	431	9	2	0	9	1	452	1,658
AM Totals	2,992	56	2	2	33	3	3,088	59	5	0	11	0	0	75	1,383	26	3	2	21	12	1,447	4,610
15:30 to 16:30	625	13	1	0	10	0	649	48	0	1	5	0	0	54	722	6	0	0	15	0	743	1,446
15:45 to 16:45	640	10	2	0	6	0	658	38	2	1	3	0	0	44	724	8	0	0	9	0	741	1,443
16:00 to 17:00	632	9	1	0	6	0	648	32	2	1	2	0	0	37	748	7	0	0	5	0	760	1,445
16:15 to 17:15	667	8	1	0	5	1	682	43	2	1	4	0	0	50	835	8	0	0	4	1	848	1,580
16:30 to 17:30	662	7	1	0	3	1	674	45	2	0	6	0	0	53	969	6	1	0	3	2	981	1,708
16:45 to 17:45	672	5	0	0	2	1	680	48	0	0	6	0	0	54	986	5	1	0	4	2	998	1,732
17:00 to 18:00	639	1	0	0	2	1	643	52	0	0	7	0	0	59	958	3	1	0	6	2	970	1,672
17:15 to 18:15	578	0	0	0	3	0	581	47	0	0	6	0	0	53	792	2	1	0	8	1	804	1,438
17:30 to 18:30	563	0	0	0	3	0	566	44	0	0	5	0	0	49	592	2	0	0	8	0	602	1,217
PM Totals	1,850	20	2	0	16	1	1,889	137	2	1	16	0	0	156	2,283	14	1	0	26	2	2,326	4,371

Job No. : N4508
 Client : GHD
 Suburb : Port Kembla
 Location : 2. Flinders St / Five Islands Rd

Day/Date : Tue, 18th Sept 2018
 Weather : Fine
 Description : Classified Intersection Count
 : Peak Hour Summary

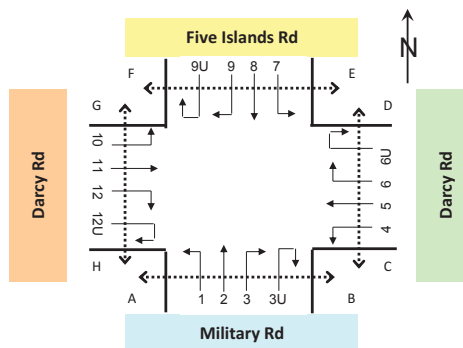


Approach	Five Islands Rd							Flinders St							Five Islands Rd							Grand Total
Time Period	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	
AM 7:30 to 8:30	2,283	57	6	7	8	0	2,361	54	11	5	13	3	0	86	1,390	63	15	18	11	0	1,497	3,944
PM 15:30 to 16:30	1,581	32	7	9	14	0	1,643	244	10	20	9	2	0	285	2,108	50	32	22	10	2	2,224	4,152

Approach	Five Islands Rd							Flinders St							Five Islands Rd							Grand Total
Time Period	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Tru	Articulate	B-Double	Buses	Cycles	Total	
5:30 to 6:30	1,122	55	4	3	0	0	1,184	71	4	15	4	0	0	94	532	18	22	10	1	1	584	1,862
5:45 to 6:45	1,250	55	7	2	1	0	1,315	67	6	20	5	0	0	98	708	27	23	14	3	1	776	2,189
6:00 to 7:00	1,445	57	6	2	3	0	1,513	56	7	21	7	0	0	91	842	46	24	11	8	1	932	2,536
6:15 to 7:15	1,569	59	10	5	5	0	1,648	43	9	22	7	1	0	82	940	58	24	14	9	0	1,045	2,775
6:30 to 7:30	1,604	52	13	10	5	0	1,684	45	10	16	9	4	0	84	1,005	70	23	13	13	0	1,124	2,892
6:45 to 7:45	1,742	56	13	9	4	0	1,824	45	12	10	10	6	0	83	1,041	73	22	14	15	0	1,165	3,072
7:00 to 8:00	1,832	55	12	9	6	0	1,914	56	14	8	8	7	0	93	1,136	65	21	19	13	0	1,254	3,261
7:15 to 8:15	2,074	53	9	10	4	0	2,150	52	12	6	12	6	0	88	1,307	67	14	17	14	0	1,419	3,657
7:30 to 8:30	2,283	57	6	7	8	0	2,361	54	11	5	13	3	0	86	1,390	63	15	18	11	0	1,497	3,944
7:45 to 8:45	2,177	58	7	7	10	0	2,259	61	14	5	14	3	0	97	1,467	60	17	15	10	0	1,569	3,925
8:00 to 9:00	2,055	58	9	12	7	0	2,141	58	14	7	13	4	0	96	1,493	68	16	10	11	0	1,598	3,835
8:15 to 9:15	1,784	59	12	11	9	0	1,875	65	17	6	8	5	0	101	1,423	69	24	8	13	0	1,537	3,513
8:30 to 9:30	1,478	59	12	9	5	0	1,563	58	20	8	5	5	0	96	1,364	70	23	8	11	0	1,476	3,135
AM Totals	6,487	223	35	29	18	0	6,792	228	45	44	31	12	0	360	4,291	221	83	49	36	1	4,681	11,833
15:30 to 16:30	1,581	32	7	9	14	0	1,643	244	10	20	9	2	0	285	2,108	50	32	22	10	2	2,224	4,152
15:45 to 16:45	1,533	29	6	12	14	0	1,594	213	11	21	8	2	0	255	1,994	38	31	23	5	0	2,091	3,940
16:00 to 17:00	1,586	21	5	20	10	0	1,642	178	8	18	8	3	0	215	2,063	33	27	20	5	0	2,148	4,005
16:15 to 17:15	1,567	18	5	18	8	0	1,616	140	7	22	9	4	0	182	1,982	28	26	14	5	0	2,055	3,853
16:30 to 17:30	1,583	15	6	15	5	0	1,624	123	3	27	10	3	0	166	2,063	21	24	13	5	0	2,126	3,916
16:45 to 17:45	1,531	11	5	12	3	0	1,562	111	3	23	8	3	0	148	2,132	23	19	5	5	0	2,184	3,894
17:00 to 18:00	1,444	12	5	4	4	0	1,469	121	4	24	9	1	0	159	1,952	29	17	4	4	0	2,006	3,634
17:15 to 18:15	1,313	15	5	2	4	0	1,339	105	4	22	8	0	0	139	1,798	23	16	8	4	0	1,849	3,327
17:30 to 18:30	1,117	14	3	3	5	0	1,142	100	5	13	4	1	0	123	1,525	20	10	9	5	1	1,570	2,835
PM Totals	4,281	61	16	27	24	0	4,409	467	18	60	23	6	0	574	5,696	91	66	44	20	3	5,920	10,903

Job No. : N4508
 Client : GHD
 Suburb : Port Kembla
 Location : 3. Five Islands Rd / Darcy Rd / Military Rd

Day/Date : Tue, 18th Sept 2018
 Weather : Fine
 Description : Classified Intersection Count
 : Peak Hour Summary

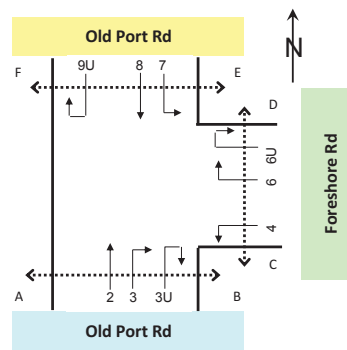


Approach	Military Rd							Darcy Rd							Five Islands Rd							Darcy Rd							Grand Total
Time Period	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	
AM 7:45 to 8:45	299	19	2	0	0	1	321	59	11	2	1	2	0	75	204	10	1	0	2	0	217	25	2	1	0	3	0	31	644
PM 15:30 to 16:30	221	1	1	0	1	1	225	189	8	5	0	4	7	213	256	9	9	4	2	0	280	23	2	0	0	4	0	29	747

Approach	Military Rd							Darcy Rd							Five Islands Rd							Darcy Rd							Grand Total
Time Period	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid True	Articulate	B-Double	Buses	Cycles	Total	
5:30 to 6:30	144	11	1	0	1	3	160	26	2	2	0	1	0	31	73	2	2	0	0	1	78	11	2	0	0	0	0	13	282
5:45 to 6:45	173	25	0	1	1	4	204	28	2	4	0	1	0	35	85	3	1	1	0	1	91	17	2	0	0	0	3	22	352
6:00 to 7:00	231	27	2	1	1	4	266	25	2	3	0	1	0	31	97	5	2	2	0	1	107	24	2	0	0	0	3	29	433
6:15 to 7:15	247	34	3	1	1	4	290	25	1	3	0	1	0	30	115	6	2	2	2	0	127	29	1	0	0	0	3	33	480
6:30 to 7:30	240	33	4	1	1	3	282	24	4	5	0	2	0	35	119	10	3	2	3	0	137	35	2	0	0	0	3	40	494
6:45 to 7:45	261	21	4	0	1	2	289	31	8	3	1	2	0	45	126	11	3	1	5	0	146	29	2	0	0	0	0	31	511
7:00 to 8:00	249	19	2	0	1	2	273	37	12	3	1	3	0	56	136	8	2	0	6	0	152	27	2	0	0	0	0	29	510
7:15 to 8:15	278	15	2	0	0	1	296	37	12	2	1	2	0	54	139	10	1	0	5	0	155	25	1	0	0	1	0	27	532
7:30 to 8:30	307	15	2	0	0	1	325	50	12	0	2	1	0	65	166	8	0	0	4	0	178	21	1	1	0	2	0	25	593
7:45 to 8:45	299	19	2	0	0	1	321	59	11	2	1	2	0	75	204	10	1	0	2	0	217	25	2	1	0	3	0	31	644
8:00 to 9:00	277	22	3	0	2	1	305	71	10	3	1	3	0	88	206	11	1	0	1	0	219	22	2	1	0	4	1	30	642
8:15 to 9:15	247	17	2	0	2	0	268	81	11	4	1	3	0	100	224	11	1	0	0	0	236	22	2	1	0	4	1	30	634
8:30 to 9:30	217	17	1	0	2	0	237	85	13	4	0	4	1	107	216	14	2	1	1	0	234	28	1	0	0	4	1	34	612
AM Totals	908	76	8	1	4	7	1,004	185	31	11	2	8	1	238	574	34	7	3	8	1	627	95	6	1	0	6	4	112	1,981
15:30 to 16:30	221	1	1	0	1	1	225	189	8	5	0	4	7	213	256	9	9	4	2	0	280	23	2	0	0	4	0	29	747
15:45 to 16:45	204	1	1	0	1	0	207	160	8	5	1	3	2	179	250	6	6	5	1	0	268	26	4	0	0	5	0	35	689
16:00 to 17:00	182	3	1	1	0	0	187	164	6	3	2	2	2	179	242	8	5	4	0	0	259	25	2	0	0	4	0	31	656
16:15 to 17:15	176	4	2	1	0	0	183	132	6	2	2	2	2	146	220	9	3	2	0	0	234	23	2	0	0	3	0	28	591
16:30 to 17:30	171	4	1	1	0	0	177	114	5	2	2	2	2	127	216	12	5	2	0	0	235	20	2	0	0	3	0	25	564
16:45 to 17:45	176	5	3	1	0	0	185	111	6	1	1	2	4	125	209	12	5	0	0	0	226	17	0	0	0	2	1	20	556
17:00 to 18:00	164	4	3	0	0	0	171	97	5	2	0	2	4	110	203	10	4	0	0	0	217	18	0	0	0	2	2	22	520
17:15 to 18:15	157	4	2	0	0	0	163	98	6	3	0	2	3	112	184	7	3	0	0	0	194	19	0	0	0	3	2	24	493
17:30 to 18:30	162	3	2	0	1	0	168	85	6	2	0	2	2	97	178	4	1	0	0	0	183	15	0	0	0	2	2	19	467
PM Totals	554	8	4	1	2	1	570	388	19	9	2	8	11	437	650	25	15	6	2	0	698	58	4	0	0	9	2	73	1,778

Job No. : N4508
 Client : GHD
 Suburb : Port Kembla
 Location : 4. Old Port Rd / Foreshore Rd

Day/Date : Tue, 18th Sept 2018
 Weather : Fine
 Description : Classified Intersection Count
 : Peak Hour Summary



Approach	Old Port Rd							Foreshore Rd							Old Port Rd							Grand Total
Time Period	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	
AM 8:30 to 9:30	67	5	6	0	6	2	86	31	3	1	3	0	6	44	62	4	12	1	0	5	84	214
PM 15:30 to 16:30	55	2	4	3	3	1	68	39	3	12	1	1	0	56	83	6	12	2	0	12	115	239

Approach	Old Port Rd							Foreshore Rd							Old Port Rd							Grand Total
Time Period	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	Lights	Rigid Truck	Articulate	B-Double	Buses	Cycles	Total	
5:30 to 6:30	64	3	9	0	1	1	78	5	0	8	0	0	1	14	37	0	10	1	0	2	50	142
5:45 to 6:45	77	5	8	1	1	5	97	5	0	10	0	0	3	18	33	0	9	1	0	2	45	160
6:00 to 7:00	84	10	7	2	1	6	110	7	0	9	1	0	3	20	23	0	8	1	0	2	34	164
6:15 to 7:15	86	17	5	2	1	9	120	7	0	9	1	0	3	20	24	1	9	1	0	1	36	176
6:30 to 7:30	81	17	6	2	2	8	116	9	0	5	1	0	3	18	17	4	7	1	0	0	29	163
6:45 to 7:45	73	16	4	1	2	4	100	14	1	2	1	0	1	19	28	9	7	4	0	0	48	167
7:00 to 8:00	60	16	6	0	3	4	89	16	1	2	1	0	0	20	35	9	8	4	0	1	57	166
7:15 to 8:15	55	9	8	0	2	2	76	24	1	0	3	0	0	28	42	11	6	3	0	4	66	170
7:30 to 8:30	54	11	7	0	1	3	76	27	1	0	3	0	0	31	50	11	7	4	0	4	76	183
7:45 to 8:45	58	14	9	0	3	3	87	26	2	0	4	0	1	33	47	6	8	1	0	5	67	187
8:00 to 9:00	56	10	7	0	4	4	81	31	2	0	3	0	3	39	51	7	7	2	0	5	72	192
8:15 to 9:15	61	8	6	0	5	3	83	31	3	1	2	0	6	43	57	5	9	2	0	3	76	202
8:30 to 9:30	67	5	6	0	6	2	86	31	3	1	3	0	6	44	62	4	12	1	0	5	84	214
AM Totals	266	36	28	2	10	14	356	72	4	14	7	0	10	107	166	19	36	7	0	11	239	702
15:30 to 16:30	55	2	4	3	3	1	68	39	3	12	1	1	0	56	83	6	12	2	0	12	115	239
15:45 to 16:45	47	4	1	3	3	0	58	45	3	15	2	1	0	66	72	4	9	2	0	8	95	219
16:00 to 17:00	37	2	1	2	2	1	45	48	2	16	2	0	1	69	69	2	7	3	0	6	87	201
16:15 to 17:15	28	2	2	2	2	2	38	37	2	16	3	0	1	59	62	2	6	2	0	7	79	176
16:30 to 17:30	20	2	3	0	2	2	29	36	1	13	2	0	2	54	51	2	7	2	0	5	67	150
16:45 to 17:45	20	0	3	0	2	3	28	29	2	7	2	0	3	43	55	3	8	2	0	6	74	145
17:00 to 18:00	22	0	3	0	1	2	28	24	1	7	3	0	2	37	53	2	7	0	0	6	68	133
17:15 to 18:15	25	0	2	0	2	1	30	28	2	4	2	0	2	38	45	2	9	0	0	3	59	127
17:30 to 18:30	24	0	1	0	3	2	30	25	2	4	2	0	1	34	39	2	4	0	0	2	47	111
PM Totals	99	4	8	3	8	5	127	100	6	29	5	1	3	144	173	10	23	4	0	19	229	500

Appendix B - SIDRA outputs

MOVEMENT SUMMARY

Site: TCS 1857 [2018_AM_Springhill Rd / Port Kembla Rd_BASE]

Springhill Rd / Port Kembla Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Port Kembla Rd												
21	L2	12	50.0	0.036	34.6	LOS C	0.5	6.1	0.69	0.68	0.69	36.5
23	R2	6	33.3	0.104	69.7	LOS E	0.4	4.0	0.98	0.66	0.98	21.8
Approach		18	44.4	0.104	46.3	LOS D	0.5	6.1	0.79	0.67	0.79	31.1
NorthEast: Springhill Rd												
24	L2	22	4.5	0.111	19.2	LOS B	3.2	23.1	0.51	0.47	0.51	43.2
25	T1	331	2.7	0.111	13.6	LOS A	3.2	23.1	0.51	0.43	0.51	45.2
Approach		353	2.8	0.111	13.9	LOS A	3.2	23.1	0.51	0.43	0.51	45.1
SouthWest: Springhill Rd												
31	T1	580	3.3	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
32	R2	50	4.0	0.109	44.4	LOS D	2.3	16.6	0.82	0.73	0.82	34.3
Approach		630	3.3	0.151	3.5	LOS A	2.3	16.6	0.07	0.06	0.07	55.4
All Vehicles		1001	3.9	0.151	8.0	LOS A	3.2	23.1	0.23	0.20	0.23	50.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 1857 [2018_PM_Springhill Rd / Port Kembla Rd_BASE]

Springhill Rd / Port Kembla Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Port Kembla Rd												
21	L2	38	31.6	0.204	54.9	LOS D	2.0	21.6	0.91	0.74	0.91	30.6
23	R2	22	0.0	0.232	68.3	LOS E	1.3	9.2	0.99	0.70	0.99	22.8
Approach		60	20.0	0.232	59.8	LOS E	2.0	21.6	0.94	0.73	0.94	27.9
NorthEast: Springhill Rd												
24	L2	7	0.0	0.231	10.9	LOS A	6.1	43.3	0.34	0.31	0.34	51.3
25	T1	989	1.0	0.231	5.4	LOS A	6.1	43.3	0.34	0.30	0.34	53.2
Approach		996	1.0	0.231	5.4	LOS A	6.1	43.3	0.34	0.30	0.34	53.2
SouthWest: Springhill Rd												
31	T1	670	0.9	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
32	R2	9	11.1	0.096	67.3	LOS E	0.5	4.1	0.98	0.67	0.98	28.2
Approach		679	1.0	0.172	0.9	LOS A	0.5	4.1	0.01	0.01	0.01	58.7
All Vehicles		1735	1.7	0.232	5.5	LOS A	6.1	43.3	0.24	0.20	0.24	53.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 0608 [2018_AM_Five Islands Rd / Flinders St_BASE]

Five Islands Rd / Flinders St
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

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
SouthEast: Five Islands Rd												
22	T1	1746	4.7	0.518	5.7	LOS A	14.4	105.6	0.33	0.51	0.33	62.1
23b	R3	86	10.5	0.402	59.5	LOS E	4.7	37.2	0.95	0.78	0.95	32.1
Approach		1832	5.0	0.518	8.2	LOS A	14.4	105.6	0.36	0.52	0.36	59.5
East: Flinders St												
4b	L3	22	22.7	0.016	7.1	LOS A	0.0	0.0	0.00	0.56	0.00	53.9
6a	R1	71	60.6	0.479	68.9	LOS E	2.2	26.7	1.00	0.75	1.00	25.8
Approach		93	51.6	0.479	54.2	LOS D	2.2	26.7	0.76	0.70	0.76	29.5
NorthWest: Five Islands Rd												
27a	L1	227	22.5	0.151	6.5	LOS A	0.0	0.0	0.00	0.60	0.00	59.5
28	T1	952	9.1	0.382	12.0	LOS A	12.6	94.3	0.53	0.47	0.53	63.4
Approach		1179	11.7	0.382	10.9	LOS A	12.6	94.3	0.43	0.49	0.43	62.6
All Vehicles		3104	8.9	0.518	10.6	LOS A	14.4	105.6	0.40	0.52	0.40	58.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 0608 [2018_PM_Five Islands Rd / Flinders St_BASE]

Five Islands Rd / Flinders St
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Five Islands Rd												
22	T1	1550	2.4	0.456	5.4	LOS A	11.8	84.8	0.31	0.49	0.31	62.4
23b	R3	23	26.1	0.395	74.5	LOS F	1.4	13.9	1.00	0.72	1.00	28.3
Approach		1573	2.7	0.456	6.4	LOS A	11.8	84.8	0.32	0.50	0.32	61.3
East: Flinders St												
4b	L3	32	15.6	0.021	7.0	LOS A	0.0	0.0	0.00	0.56	0.00	54.4
6a	R1	124	32.3	0.659	69.5	LOS E	3.9	37.4	1.00	0.82	1.14	27.1
Approach		156	28.8	0.659	56.7	LOS E	3.9	37.4	0.79	0.77	0.91	30.3
NorthWest: Five Islands Rd												
27a	L1	91	30.8	0.064	6.6	LOS A	0.0	0.0	0.00	0.60	0.00	57.4
28	T1	2098	1.4	0.685	9.6	LOS A	30.5	215.6	0.58	0.54	0.58	66.1
Approach		2189	2.6	0.685	9.5	LOS A	30.5	215.6	0.56	0.54	0.56	65.7
All Vehicles		3918	3.7	0.685	10.1	LOS A	30.5	215.6	0.47	0.53	0.47	61.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2018_AM_Old Port Rd /Foreshore Rd_BASE]

Old Port Rd /Foreshore Rd
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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: Old Port Rd												
2	T1	61	29.5	0.070	4.6	LOS A	0.3	2.9	0.07	0.52	0.07	52.9
3	R2	33	12.1	0.070	8.6	LOS A	0.3	2.9	0.07	0.52	0.07	53.1
Approach		94	23.4	0.070	6.0	LOS A	0.3	2.9	0.07	0.52	0.07	53.0
East: Foreshore Rd												
4	L2	12	8.3	0.017	4.3	LOS A	0.1	0.7	0.15	0.52	0.15	52.7
6	R2	7	57.1	0.017	9.5	LOS A	0.1	0.7	0.15	0.52	0.15	52.2
Approach		19	26.3	0.017	6.2	LOS A	0.1	0.7	0.15	0.52	0.15	52.5
North: Old Port Rd												
7	L2	24	37.5	0.050	4.8	LOS A	0.2	2.5	0.15	0.45	0.15	53.1
8	T1	27	55.6	0.050	5.1	LOS A	0.2	2.5	0.15	0.45	0.15	53.1
Approach		51	47.1	0.050	4.9	LOS A	0.2	2.5	0.15	0.45	0.15	53.1
All Vehicles		164	31.1	0.070	5.7	LOS A	0.3	2.9	0.10	0.50	0.10	53.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2018_PM_Old Port Rd /Foreshore Rd_BASE]

Old Port Rd /Foreshore Rd
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Old Port Rd												
2	T1	15	13.3	0.019	4.6	LOS A	0.1	0.7	0.13	0.50	0.13	53.4
3	R2	8	12.5	0.019	8.7	LOS A	0.1	0.7	0.13	0.50	0.13	53.0
Approach		23	13.0	0.019	6.0	LOS A	0.1	0.7	0.13	0.50	0.13	53.2
East: Foreshore Rd												
4	L2	18	5.6	0.040	4.4	LOS A	0.2	1.7	0.18	0.55	0.18	52.0
6	R2	24	50.0	0.040	9.5	LOS A	0.2	1.7	0.18	0.55	0.18	51.9
Approach		42	31.0	0.040	7.3	LOS A	0.2	1.7	0.18	0.55	0.18	52.0
North: Old Port Rd												
7	L2	16	56.3	0.049	4.7	LOS A	0.2	1.9	0.06	0.44	0.06	52.8
8	T1	51	5.9	0.049	4.4	LOS A	0.2	1.9	0.06	0.44	0.06	55.2
Approach		67	17.9	0.049	4.5	LOS A	0.2	1.9	0.06	0.44	0.06	54.6
All Vehicles		132	21.2	0.049	5.6	LOS A	0.2	1.9	0.11	0.48	0.11	53.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 1857 [2018_AM_Springhill Rd / Port Kembla Rd_CONSTRUCTION]

Springhill Rd / Port Kembla Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Port Kembla Rd												
21	L2	23	73.9	0.067	20.9	LOS B	0.6	12.1	0.50	0.67	0.50	41.6
23	R2	6	33.3	0.104	69.7	LOS E	0.4	4.0	0.98	0.66	0.98	21.8
Approach		29	65.5	0.104	31.0	LOS C	0.6	12.1	0.60	0.67	0.60	36.5
NorthEast: Springhill Rd												
24	L2	23	8.7	0.176	34.3	LOS C	4.6	34.0	0.73	0.62	0.73	34.3
25	T1	331	2.7	0.176	28.7	LOS C	4.8	34.2	0.73	0.60	0.73	35.6
Approach		354	3.1	0.176	29.1	LOS C	4.8	34.2	0.73	0.60	0.73	35.6
SouthWest: Springhill Rd												
31	T1	580	3.3	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
32	R2	120	12.5	0.180	28.0	LOS B	4.3	37.8	0.65	0.73	0.65	40.3
Approach		700	4.9	0.180	4.8	LOS A	4.3	37.8	0.11	0.13	0.11	53.9
All Vehicles		1083	5.9	0.180	13.4	LOS A	4.8	37.8	0.33	0.30	0.33	45.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 1857 [2018_PM_Springhill Rd / Port Kembla Rd_CONSTRUCTION]

Springhill Rd / Port Kembla Rd
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Port Kembla Rd												
21	L2	108	23.1	0.286	40.1	LOS C	4.9	49.9	0.80	0.77	0.80	35.1
23	R2	22	0.0	0.127	61.0	LOS E	1.2	8.5	0.95	0.71	0.95	24.3
Approach		130	19.2	0.286	43.7	LOS D	4.9	49.9	0.83	0.76	0.83	33.3
NorthEast: Springhill Rd												
24	L2	7	0.0	0.291	18.7	LOS B	9.6	68.0	0.54	0.47	0.54	44.3
25	T1	989	1.0	0.291	13.2	LOS A	9.6	68.0	0.54	0.47	0.54	45.7
Approach		996	1.0	0.291	13.3	LOS A	9.6	68.0	0.54	0.47	0.54	45.7
SouthWest: Springhill Rd												
31	T1	670	0.9	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
32	R2	20	60.0	0.173	56.4	LOS D	1.1	18.5	0.90	0.73	0.90	30.0
Approach		690	2.6	0.173	1.7	LOS A	1.1	18.5	0.03	0.02	0.03	57.6
All Vehicles		1816	2.9	0.291	11.0	LOS A	9.6	68.0	0.36	0.32	0.36	47.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 0608 [2018_AM_Five Islands Rd / Flinders St_CONSTRUCTION]

Five Islands Rd / Flinders St
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows 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
SouthEast: Five Islands Rd												
22	T1	1746	4.7	0.529	6.4	LOS A	15.8	115.3	0.36	0.53	0.36	61.4
23b	R3	86	10.5	0.402	59.5	LOS E	4.7	37.2	0.95	0.78	0.95	32.1
Approach		1832	5.0	0.529	8.9	LOS A	15.8	115.3	0.39	0.54	0.39	58.9
East: Flinders St												
4b	L3	22	22.7	0.016	7.1	LOS A	0.0	0.0	0.00	0.56	0.00	53.9
6a	R1	82	65.9	0.525	67.7	LOS E	2.5	35.2	1.00	0.78	1.03	25.7
Approach		104	56.7	0.525	54.9	LOS D	2.5	35.2	0.79	0.73	0.81	29.0
NorthWest: Five Islands Rd												
27a	L1	258	24.4	0.185	6.5	LOS A	0.0	0.0	0.00	0.60	0.00	58.8
28	T1	952	9.1	0.393	13.0	LOS A	13.1	98.5	0.55	0.49	0.55	62.2
Approach		1210	12.4	0.393	11.7	LOS A	13.1	98.5	0.43	0.51	0.43	61.5
All Vehicles		3146	9.5	0.529	11.5	LOS A	15.8	115.3	0.42	0.54	0.42	57.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: TCS 0608 [2018_PM_Five Islands Rd / Flinders St_CONSTRUCTION]

Five Islands Rd / Flinders St
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 120 seconds (Site User-Given Cycle Time)

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
SouthEast: Five Islands Rd												
22	T1	1550	2.4	0.460	5.7	LOS A	12.3	88.7	0.32	0.50	0.32	62.1
23b	R3	23	26.1	0.395	74.5	LOS F	1.4	13.9	1.00	0.72	1.00	28.3
Approach		1573	2.7	0.460	6.7	LOS A	12.3	88.7	0.33	0.50	0.33	61.0
East: Flinders St												
4b	L3	32	15.6	0.021	7.0	LOS A	0.0	0.0	0.00	0.56	0.00	54.4
6a	R1	144	28.5	0.658	68.1	LOS E	4.5	41.4	1.00	0.82	1.12	27.6
Approach		176	26.1	0.658	57.0	LOS E	4.5	41.4	0.82	0.78	0.92	30.4
NorthWest: Five Islands Rd												
27a	L1	91	30.8	0.064	6.6	LOS A	0.0	0.0	0.00	0.60	0.00	57.4
28	T1	2098	1.4	0.693	10.2	LOS A	31.4	222.0	0.60	0.55	0.60	65.5
Approach		2189	2.6	0.693	10.0	LOS A	31.4	222.0	0.57	0.56	0.57	65.1
All Vehicles		3938	3.7	0.693	10.8	LOS A	31.4	222.0	0.49	0.55	0.49	60.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2018_AM_Old Port Rd /Foreshore Rd_CONSTRUCTION]

Old Port Rd /Foreshore Rd
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue	Distance	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed
		Total veh/h	HV %	v/c	sec		Vehicles veh	m				km/h
South: Old Port Rd												
2	T1	61	29.5	0.077	4.8	LOS A	0.4	3.2	0.15	0.51	0.15	52.6
3	R2	33	12.1	0.077	8.8	LOS A	0.4	3.2	0.15	0.51	0.15	52.8
Approach		94	23.4	0.077	6.2	LOS A	0.4	3.2	0.15	0.51	0.15	52.7
East: Foreshore Rd												
4	L2	12	8.3	0.036	4.4	LOS A	0.1	2.1	0.14	0.54	0.14	52.7
6	R2	18	83.3	0.036	10.0	LOS A	0.1	2.1	0.14	0.54	0.14	50.4
Approach		30	53.3	0.036	7.8	LOS A	0.1	2.1	0.14	0.54	0.14	51.2
North: Old Port Rd												
7	L2	35	57.1	0.070	5.2	LOS A	0.3	4.3	0.17	0.46	0.17	52.1
8	T1	27	55.6	0.070	5.2	LOS A	0.3	4.3	0.17	0.46	0.17	52.9
Approach		62	56.5	0.070	5.2	LOS A	0.3	4.3	0.17	0.46	0.17	52.4
All Vehicles		186	39.2	0.077	6.1	LOS A	0.4	4.3	0.16	0.50	0.16	52.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2018_PM_Old Port Rd /Foreshore Rd_CONSTRUCTION]

Old Port Rd /Foreshore Rd
Site Category: (None)
Roundabout

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: Old Port Rd												
2	T1	15	13.3	0.020	4.8	LOS A	0.1	0.7	0.22	0.50	0.22	53.0
3	R2	8	12.5	0.020	9.0	LOS A	0.1	0.7	0.22	0.50	0.22	52.6
Approach		23	13.0	0.020	6.3	LOS A	0.1	0.7	0.22	0.50	0.22	52.9
East: Foreshore Rd												
4	L2	18	5.6	0.076	4.4	LOS A	0.4	4.0	0.20	0.57	0.20	51.2
6	R2	55	43.6	0.076	9.5	LOS A	0.4	4.0	0.20	0.57	0.20	51.1
Approach		73	34.2	0.076	8.3	LOS A	0.4	4.0	0.20	0.57	0.20	51.2
North: Old Port Rd												
7	L2	27	74.1	0.066	5.1	LOS A	0.3	3.4	0.07	0.45	0.07	51.6
8	T1	51	5.9	0.066	4.4	LOS A	0.3	3.4	0.07	0.45	0.07	55.1
Approach		78	29.5	0.066	4.6	LOS A	0.3	3.4	0.07	0.45	0.07	53.7
All Vehicles		174	29.3	0.076	6.4	LOS A	0.4	4.0	0.14	0.50	0.14	52.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C - Bus service maps



Figure 0-1 Bus route 43

Source: www.transportnsw.info website



Figure 1-2 Bus routes 51 and 53

Source: www.transportnsw.info website



Figure 1-3 Bus routes 57 and 65

Source: www.transportnsw.info website

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