Sydney Water Corporation

Vaucluse Diamond Bay - Concept Design
Construction Traffic Impact Assessment

April 2020

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Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Project summary

In November 2018, the NSW Government announced its commitment to address the flow of untreated wastewater from three ocean outfalls at Vaucluse and Diamond Bay. To address this issue, Sydney Water proposes to construct and operate sewerage infrastructure at Vaucluse and Diamond Bay (the "project"), which will redirect untreated wastewater through the wastewater network to the catchment of Bondi Wastewater Treatment Plant, mitigating the associated risks to water quality and public health.

The project will include the construction and operation of the following key components:

- Sewage pumping station at Parsley Bay, Vaucluse (SP1216)
- Sewage pumping station at Eastern Avenue Reserve, Diamond Bay (SP1217)
- Wastewater mains connecting the pumping stations to the existing outfalls and network.

The two sewage pumping stations at Vaucluse and Diamond Bay would be constructed mainly below existing ground level. The wastewater mains would be constructed by a mix of open trenching and trenchless methods such as horizontal directional drilling or microtunneling, as suited to site conditions.

The key components of the project and indicative construction footprint, including sections of wastewater mains that would be constructed by trenched or trenchless methods as shown in Appendix A.

During normal operation, the project will redirect untreated wastewater through the wastewater network to the catchment of the Bondi Wastewater Treatment Plant. During wet weather, when the receiving catchment is at full capacity, wastewater may continue to flow through ocean outfalls.

1.2 Purpose of this report

This Construction Traffic Impact Assessment (CTIA) has been prepared to assess the potential traffic related impacts of the proposal and, where required, to develop corresponding measures to avoid, minimise or mitigate environmental impacts.

The structure of this report is as follows:

- **Section 2: Existing environment** – Reviews the existing traffic, parking and transport features in the vicinity of the site including adjacent land uses, traffic volumes, active and public transportation.
- **Section 3: Construction traffic impact assessment** – Considers the construction traffic to be generated during construction, examines the potential traffic, parking and transport impacts, proposed routes and access/egress arrangements.
- **Section 4: Mitigation measures** – Includes a Preliminary Construction Traffic Management Plan to guide the Contractor in the development of a Detailed Construction Traffic Management Plan before commencement of the works.
- **Section 5: Conclusion** – Summarises the key findings of this assessment.

1.3 Basis of assessment and limitations

This assessment is based upon the following limitations:

- Intersection survey counts for the AM and PM periods were conducted on Wednesday 11 December 2019 and Saturday 14 December 2019 by Matrix Traffic and Transport Data Pty Ltd.
- Automatic seven-day tube count survey conducted between on Wednesday 11 December 2019 and Tuesday 17 December 2019 by Matrix Traffic and Transport Data Pty Ltd.
- Parking utilisation survey conducted between 8 am and 6 pm on Wednesday 11 December 2019 and Saturday 14 December 2019 by Matrix Traffic and Transport Data Pty Ltd.
- Construction trip traffic generation based on the concept design as provided by the GHD project team.
- The analysis is a desktop study, and no detailed site inspections have been undertaken.
- The conditions of the surrounding network are based on a desktop assessment of information based on traffic surveys and Google Maps / Streetview.

2. Existing environment

2.1 Key work areas

The location of the project and the existing outfalls is shown in Figure 2-1.

The key work areas associated with the project include:

- Parsley Bay: Sewage pumping station installation
- Diamond Bay A: Works at Kimberley Street and Oceanview Avenue
- Diamond Bay B: Sewage pumping station at Oceanview Avenue, Eastern Avenue Reserve
- Rose Bay: Open trench pipe installation along Carlisle Street.

Figure 2-1 Key work areas

2.2 Existing road characteristics

This section provides an understanding of the existing road network surrounding the key work areas.

2.2.1 Road hierarchy

Roads within NSW are categorised in the following two ways:

- By classification (ownership); and
- 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 Transport Roads and Maritime Services 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, Transport Roads and Maritime Services has three administrative classes of roads. These are:

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

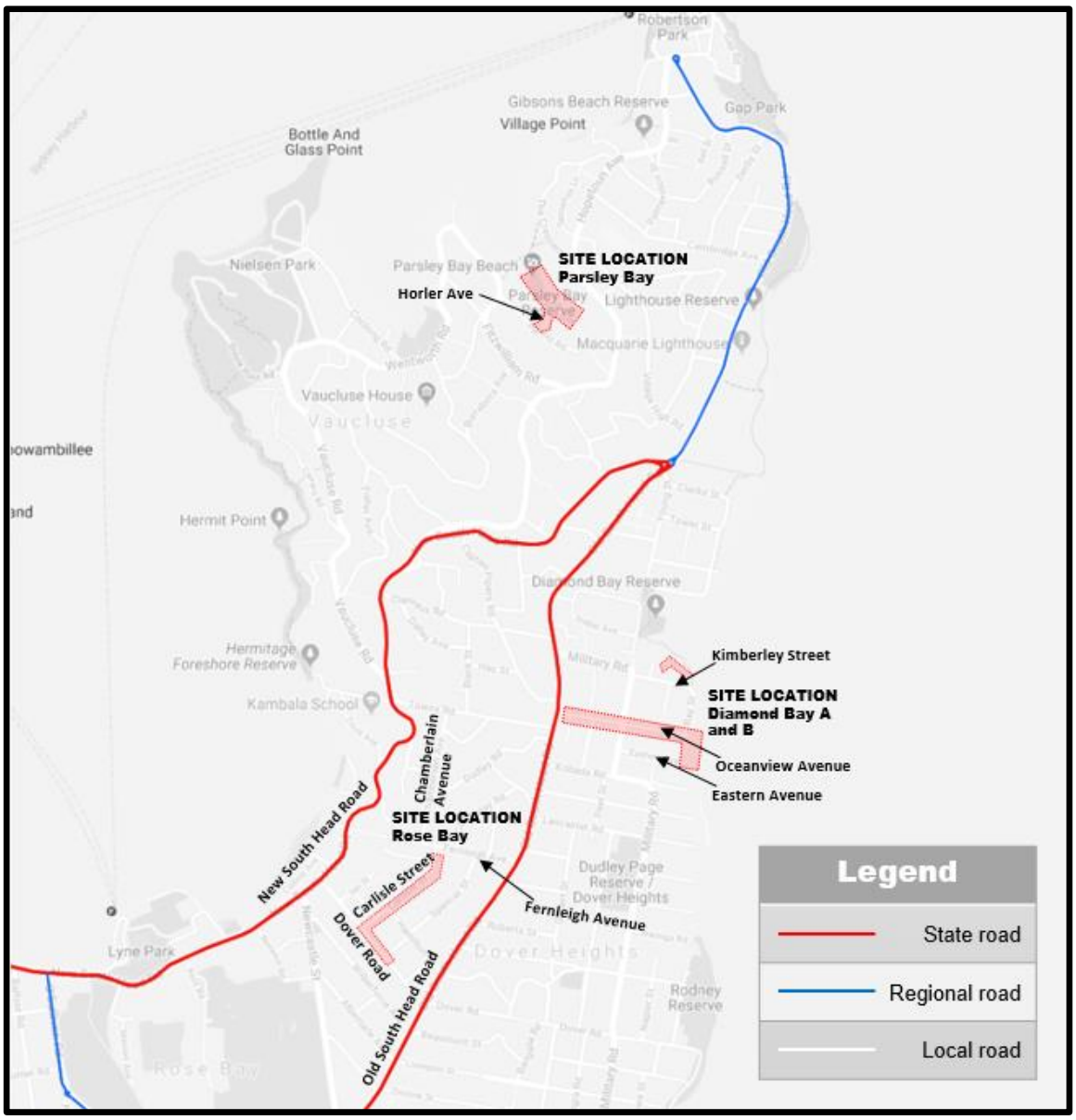
Functional Hierarchy

Functional road classification involves the relative balance of the mobility and access functions. Transport Roads and Maritime Services 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 Transport Roads and Maritime Services, typically no limit in flow and designed to carry vehicles long distance between regional centres.
- **Sub-Arterial Roads** – can be managed by either Transport Roads and Maritime Services or the local council. Typically, their operating capacity ranges between 10,000 and 20,000 vehicles per day, and their aim is to carry through traffic between specific areas in a sub region, or provide connectivity from arterial road routes (regional links).

- **Collector Roads** – provide connectivity between local roads and the arterial road network and typically carry between 2,000 and 10,000 vehicles per day.
- **Local Roads** – provide direct access to properties and the collector road system and typically carry between 500 and 4,000 vehicles per day.

The surrounding road network providing access to the sites is shown in Figure 2-2.



Source: Transport for NSW maps – Modified by GHD

Figure 2-2 Surrounding road network

2.2.2 New South Head Road

New South Head Road is a state road that in proximity to the sites, is orientated in a north-south direction. The road begins approximately at Kings Cross, passes Dover Road and connects to Old South Head Road past Diamond Bay Reserve.

It provides access to Dover Road and Carlisle Street and may be utilised to travel to Parsley Bay Reserve. New South Head Road has the following key features within proximity of the sites, as outlined in Table 2-1 and shown in Figure 2-3.

Table 2-1 New South Head road key features

Feature	Description
Carriageway	Sealed undivided carriageway consisting of four traffic lanes with double unbroken continuous lines separating the two directions of travel. There are two lanes for northbound travel and two lanes for southbound travel, each lane separated by broken white lines. At the T intersection with Dover Road, there are three pedestrian crossings within the signalised intersection.
Parking	Kerbside parking available on both sides of the road.. A loading zone and bus zone, and 30-minute parking restrictions are situated on the west side of the road northbound from the Dover Road intersection in front of properties 730 and 736A. A bus zone is also on the east side southbound of the intersection in front of properties 801 and 803.
Speed Limit	The general speed limit is 60 km/h with a School Zone speed limit (40 km/h) which is enforced during 8:00 to 9:30 am and 2:30 pm to 4:00 pm school days near Cranbrook School.
Pedestrian Facilities	Footpaths are on either side of the road. Along the road from Tingira Memorial Park, past the intersection with Dover Road up until Fernleigh Avenue is a busy business district consisting of supermarkets, banks, food joints, schools and a church. Rose Bay Beach is situated approximately 130 m north-west of the Dover Road intersection. There are side benches, bins, decorative plant boxes and pedestrian crossings at traffic lights at intersections.
Bicycle Facilities	The road is a high-difficulty bicycle on-road environment. There is room for children under 16 years of age to ride on the footpath on either side of the road. There is a bike rack in front of property 730, northbound from Dover Road intersection
Public Transport	There is a bus stop in front of property 736A, on the west side of the road, northbound from the Dover Road intersection. There is also a bus stop on the east side of the road southbound from the Dover Road intersection in front of property 789.
Weight Restriction Load Limit	No identified weight restriction road limit

Source: Google Maps

Figure 2-3 New South Head Road (viewed northbound)

2.2.3 Horler Avenue

Horler Avenue functions as a local road providing access to Parsley Bay Reserve, and is generally oriented in the south-east direction. The southern end connects at a narrow T intersection with Parsley Road, and at the northern end provides access to a public parking area. Horler Avenue has the following key features within proximity of the sites, as outlined in Table 2-2 and shown in Figure 2-4.

Table 2-2 Horler Avenue key features

Feature	Description
Carriageway	Sealed and narrow carriageway with arrow road markings on either side to indicate the direction of travel is two way. The carriageway consists of grass on the east side and a footpath on the west side of the road. The entrance to Horler Avenue is narrow, approximately 2.7 – 3.2 m wide, and on the east side, there is a sharp bend and a driveway. Approximately 12 m north of the intersection, the road widens to approximately 3.1 – 3.3 m (passing bay), then narrows to approximately 2.7 m around the bend. North of the bend, the road widens to approximately 3.3 m (passing bay) prior to narrowing to approximately 2.7 m to access the car park area.
Parking	'No parking' restrictions apply along Horler Avenue at all times. A parking area (Parsley Bay Reserve) is located at the northern end of Horler Avenue with 27 car parking spaces. The parking area is open from Monday to Sunday from 3.30 am to 6 pm.
Speed Limit	The road functions as access to recreational areas and a car park thus the speed limit is 50 km/h. Also, the car park has a speed limit of 20 km/h.
Pedestrian Facilities	A footpath is on the west side of the road, which ends at the entrance to the parking area. Parsley Bay Café and the children play equipment, which is directly opposite of the café, is located on the west side of the road before entering the car park. Other pedestrian amenities nearby include picnic areas, a walking track, and Parsley Bay Beach.
Bicycle Facilities	No dedicated bicycle facilities
Public Transport	No dedicated public transport facilities
Weight Restriction Load Limit	No identified weight restriction road limit. Note: narrow road and alignment would restrict larger vehicles
Gate Access	Gates are located just before reaching the northern end of Horler Avenue into the parking area. Signage indicates the gates are closed at 6 pm, but are closed at 8 pm during daylight savings. There is also a security contact number provided. Gates are also located on the west side before the path begins, which leads to the entrance of the café and rest of Parsley Bay Reserve.

Source: Google Maps

Figure 2-4 Horler Avenue (viewed northbound)

2.2.4 Oceanview Avenue

Oceanview Avenue is a local road orientated in the east-west direction and connects to Old South Head Road at a priority controlled T-intersection and Military Road at a priority controlled four-way intersection. Towards the eastern end access is provided to Ray Street and a cul-de-sac. Oceanview Avenue has the following key features within the proximity of the sites, as outlined in Table 2-3 and shown in Figure 2-5.

Table 2-3 Oceanview Avenue key features

Feature	Description
Carriageway	Sealed undivided two-way carriageway, approximately 7.2 m wide, with generally no markings. A cul-de-sac is located on the eastern end. There are double white lines at the four-way intersection with Military Road. On the west end is a T intersection with Old South Head Road.
Parking	Restricted one-hour parking on Oceanview Avenue near the Old South Head Road intersection. Generally unrestricted kerbside parking.
Speed Limit	Default urban speed limit of 50 km/h.
Pedestrian Facilities	Footpaths are located on both sides of the road.
Bicycle Facilities	No dedicated bicycle facilities but it is a low-difficulty bicycle road environment.
Public Transport	No dedicated public transport facilities along Oceanview Avenue but some buses travel through the intersection of Oceanview Avenue and Military Road.
Weight Restriction Load Limit	No identified weight restriction road limit

Source: Google Maps

Figure 2-5 Oceanview Avenue (viewed eastbound)

2.2.5 Eastern Avenue

Eastern Avenue is a no-through local road which is connected to Military Road at a priority controlled T-intersection and is orientated in the east-west direction. At the eastern end of Eastern Avenue is the Eastern Avenue Reserve / Dover Heights, as well as the only access point and entrance to Bulga Lane which connects to Bulga Road. Eastern Avenue has the following key features within the proximity of the subject site, as outlined in Table 2-4 and shown in Figure 2-6.

Table 2-4 Eastern Avenue key features

Feature	Description
Carriageway	Sealed and narrow undivided carriageway, approximately 7 m wide, with no line marking for two-way traffic operation ending with a cul-de-sac.
Parking	Generally unrestricted kerbside parking.
Speed Limit	Default urban speed limit of 50 km/h.
Pedestrian Facilities	Footpaths are located on both sides of the road.
Bicycle Facilities	No dedicated bicycle facilities.
Public Transport	No dedicated public transport facilities.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-6 Eastern Avenue (viewed westbound)

2.2.6 Kimberley Street

Kimberley Street is a local road, generally orientated in an east-west direction. Kimberley Street may act as an alternate route to Ray Street and the eastern end of Oceanview Avenue. Kimberley Street has the following key features within the proximity of the sites, as outlined in Table 2-5 and shown in Figure 2-7.

Table 2-5 Kimberley Street key features

Feature	Description
Carriageway	Sealed undivided two-way carriageway has no lane markings, approximately 7.2 m wide.
Parking	Unrestricted kerbside parking on both sides of the road.
Speed Limit	Default urban speed limit of 50 km/h.
Pedestrian Facilities	Footpaths are on both sides of the road.
Bicycle Facilities	The street provides a low difficulty on-road environment for bicycle usage.
Public Transport	No dedicated public transport facilities.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-7 Kimberley Avenue (viewed westbound)

2.2.7 Dover Road

Dover Road is a local road that is generally orientated in a northwest-southeast direction and connects to New South Head Road at the northern end and Old South Head Road at the southern end. Dover Road has the following key features within proximity of the sites, as outlined in Table 2-6 and shown in Figure 2-8.

Table 2-6 Dover Road key features

Feature	Description
Carriageway	Sealed undivided two-way carriageway. In the northern section of Dover Road, at the intersection with New South Head Road to the Ian Street roundabout, there are white continuous double lines. The roundabout is situated approximately 90 m from the New South Head Road. South of the roundabout there are zig-zag line markings, and continuous white double lines until Carlisle Street. A Give Way white line is present at the intersection of Dover Road and Spencer Lane.
Parking	Close to the intersection with New South Head Road and in front of the local businesses there is restricted kerbside parking with 30 minute or one hour parking and loading zone time limits for Monday to Friday and Saturday. There is a one way parking area that is accessible from Dover Road between properties 19-21 and 11. Accessible parking is available in this area. South of the roundabout there is generally unrestricted kerbside parking. Another parking area with a two hour time limit restriction is present south of Ian Street.
Speed Limit	General urban speed limit (50 km/h).
Pedestrian Facilities	In the vicinity of the New South Head Road intersection, there are many local businesses, bins, benches at bus stops. There are footpaths on either side of the road, and a pedestrian crossing at the intersection of Dover Road and Carlisle Street where St Andrew's Scots Presbyterian Church is located.
Bicycle Facilities	On the southern end of Dover Road between Short Lane and the intersection with Old South Head Road are bike lane markings.

Feature	Description
Public Transport	There is a bus stop at the intersection of Dover Road and Old South Head Road (bus route 323), and a bus stop on Dover Road before Carlisle Street (bus routes 323 and 386). There is also a bus stop before Ian Street for bus routes 323 and 386 and a bus stop on Dover Road at New South Head Road for bus route 323.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-8 Dover Road (viewed southbound)

2.2.8 Carlisle Street

Carlisle Street is orientated in a southwest to northeast to north direction and functions as a local street providing access to Fernleigh Avenue at the northern end and Dover Road at the southern end. Carlisle Street has the following key features within the proximity of the site, as outlined in Table 2-7 and shown in Figure 2-9.

Table 2-7 Carlisle Street key features

Feature	Description
Carriageway	Sealed two-way undivided carriageway with a width of approximately 11.5 m. There are double line markings at the intersection with Fernleigh Avenue, and at the bend south of Conway Avenue. Dragon's teeth marking are present at the bend, and next to St Andrews Scots Presbyterian Church and Rose Bay Early Years Centre indicating the commencement of a School Zone. Towards the southern end, Ian Lane and Hamilton Street may be accessed via Carlisle Street.
Parking	There is parking on either side of the road. Towards the Dover Road intersection there are No Stopping restrictions and a school drop off and pick up zone and No Parking restrictions between 8.30 am to 9.30 am and 3 pm to 4 pm.
Speed Limit	Default urban speed limit (50 km/h), with a School Zone speed limit of 40 km/h between 8 am to 9.30 am and 2.30 pm to 4 pm school days.

Feature	Description
Pedestrian Facilities	A footpath is located on both sides of the road. Stairs and a ramp with guard rails are located on the western side of the road just outside McAuley Catholic Primary School before the intersection with Hamilton Street. Stairs are also on the eastern side with a guard rail. A pedestrian crossing is in between these facilities. There is also a pedestrian bench outside the St Andrews Scots Presbyterian Church on Carlisle Street.
Bicycle Facilities	The street provides a low difficulty on-road environment for bicycle usage.
Public Transport	No dedicated public transport facilities.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-9 Carlisle Street (viewed southbound)

2.2.9 Chamberlain Avenue

Chamberlain Avenue is orientated in a north-south direction and functions as a local street providing access to Towns Road at the northern end and Fernleigh Avenue at the southern end. Chamberlain Avenue provides access to Cecil Road and Dudley Road on the east side and Churchill Road on the west side. Chamberlain Avenue has the following key features within the proximity of the site, as outlined in Table 2-8 and shown in Figure 2-10.

Table 2-8 Chamberlain Avenue key features

Feature	Description
Carriageway	Sealed two-way undivided carriageway with no lane markings and approximately 8.7 m wide.
Parking	Unrestricted kerbside parking available on both sides of the road. However, there are No Stopping restrictions present on Chamberlain Avenue beside the intersection with Churchill Road.
Speed Limit	Default urban speed limit (50 km/h).
Pedestrian Facilities	Footpaths are on both sides of the road.
Bicycle Facilities	The street provides a low difficulty on-road environment for bicycle usage.

Feature	Description
Public Transport	No dedicated public transport facilities.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-10 Chamberlain Avenue (viewed southbound)

2.2.10 Fernleigh Avenue

Fernleigh Avenue is orientated in an east-west direction and functions as a local street providing access to Chamberlain Avenue at the western end and Old South Head Road at the eastern end. Fernleigh Avenue provides access to Carlisle Street. Chamberlain Avenue has the following key features within the proximity of the site, as outlined in Table 2-9 and shown in Figure 2-11.

Table 2-9 Fernleigh Avenue key features

Feature	Description
Carriageway	Sealed one-way westbound between Old South Head Road and Carlisle Street. Two-way between Carlisle Street and Chamberlain Avenue and west to the cul-de-sac of Fernleigh Avenue. Carriageway width is generally 4 m wide in the one-way section and 4.2 m in the two-way section.
Parking	Unrestricted kerbside parking available on both sides of the road. However, due to the road width, parking is limited in the two-way sections.
Speed Limit	Default urban speed limit (50 km/h).
Pedestrian Facilities	Footpaths are on both sides of the road.
Bicycle Facilities	The street provides a low difficulty on-road environment for bicycle usage.
Public Transport	No dedicated public transport facilities.
Weight Restriction Load Limit	No identified weight restriction road limit.

Source: Google Maps

Figure 2-11 Fernleigh Avenue (viewed westbound)

2.3 Existing road network performance

2.3.1 Existing peak hour traffic volumes

Intersection turn count survey

GHD engaged Matrix Traffic and Transport Data Pty Ltd to undertake intersection traffic turning counts on Wednesday 11 December 2019 and Saturday 14 December 2019. The surveys were undertaken during the following periods:

- Weekday AM peak (3 hours): 6:30 am to 9:30 am.
- Weekday PM peak (3 hours): 3:30 pm to 6:30 pm.
- Saturday peak (3 hours): 11:00 am to 2:00 pm.

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

- Site 1: New South Head Road / Dover Road – signal controlled intersection.

The traffic survey data is provided in Appendix A.

Analysis of the survey data identified the following peak hour periods:

- Weekday AM peak hour: 6:45 am to 7:45 am
- Weekday PM peak hour: 5:30 pm to 6:30 pm
- Saturday peak hour: 12:15 pm to 1:15 pm.

The above peak hour periods were adopted for the assessment of the surrounding road network. Table 2-10 summarises the average peak hour traffic volumes along roads in the vicinity of the site.

Table 2-10 Intersection survey traffic volumes (each direction): New South Head Road / Dover Road

Location	Direction	AM Peak Hour (veh/h)*	PM Peak Hour (veh/h)*
New South Head Road^	Northbound	914	1,171
	Southbound	1,029	821
	Total	***1,943***	***1,992***
Dover Road	Eastbound	206	381
	Westbound	269	205
	Total	***475***	***586***

Notes:
(*) veh/h = vehicles per hour
(^) volume obtained on the south arm

Automatic seven-day tube count survey

GHD engaged Matrix Traffic and Transport Data Pty Ltd to undertake seven-day automatic tube count surveys between Wednesday 11 December 2019 and Tuesday 17 December 2019.

The automatic tube count surveys were undertaken at the following intersection:

- ATC 1: Oceanview Avenue (east of Military Road)
- ATC 2: Eastern Avenue (east of Military Road)
- ATC 3: Kimberley Street (east of Military Road)
- ATC 4: Chamberlain Avenue (north of Fernleigh Avenue)
- ATC 5: Carlisle Street (south of Conway Avenue)
- ATC 6: Dover Road (between Carlisle Street and Spencer Lane
- ATC 7: Horler Avenue (access road to Parley Bay car park).

A summary of the key data extracted from the surveys is outlined in the following sections.

ATC 1: Oceanview Avenue (east of Military Road)

The surveyed traffic volumes (per day and direction) for Oceanview Avenue are shown in Figure 2-12. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-13 and a list of the key traffic data summary outlined in Table 2-11.

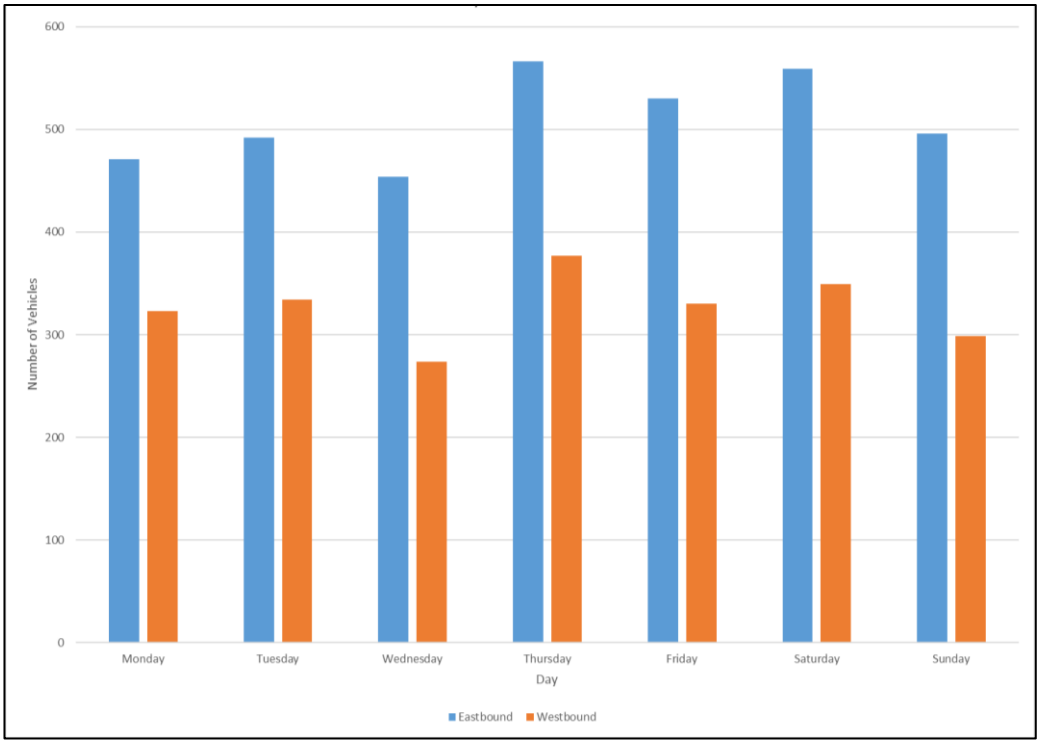


Figure 2-12 Daily traffic volumes on Oceanview Avenue (two-way)

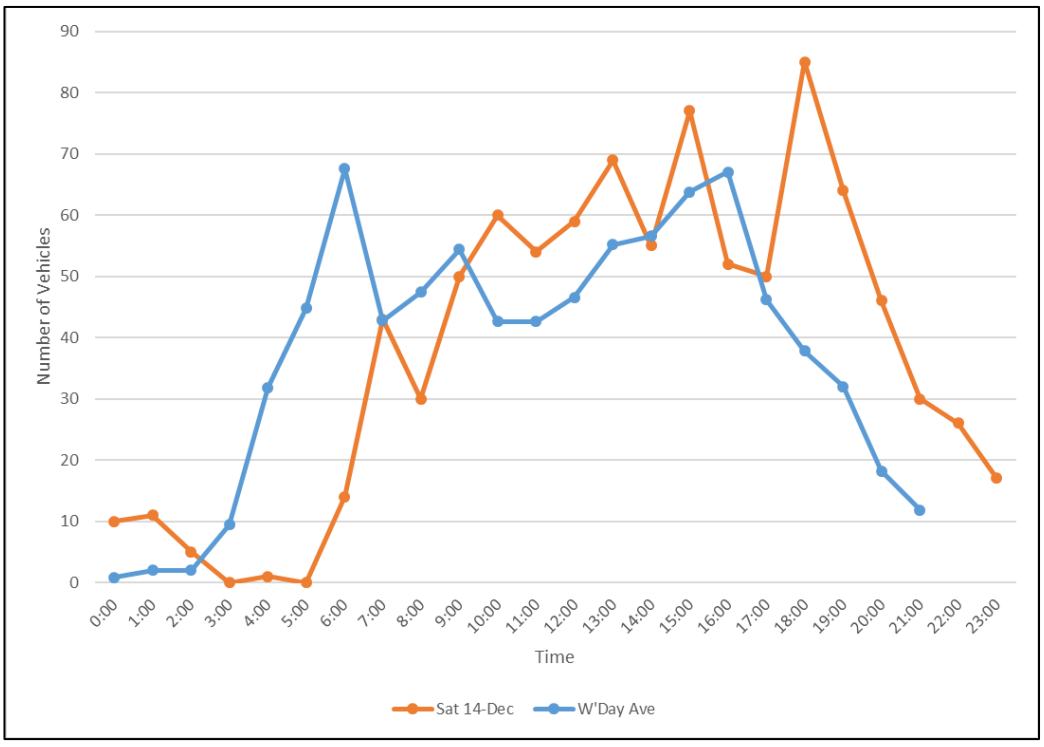


Figure 2-13 Five day (weekday) and weekend hourly traffic profile on Oceanview Avenue

Table 2-11 Oceanview Avenue key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	830 vehicles	
7 Day Average Volume (two-way)	836 vehicles	
Maximum Weekday AM Peak Hour (two-way)	75 vehicles	
Maximum Weekday PM Peak Hour (two-way)	87 vehicles	
Maximum Weekend Peak Hour (two-way)	85 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	98%	98%
Medium	2%	2%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 2: Eastern Avenue (east of Military Road)

The surveyed traffic volumes (per day and direction) for Eastern Avenue are shown in Figure 2-14. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-15 and a list of the key traffic data summary outlined in Table 2-12.

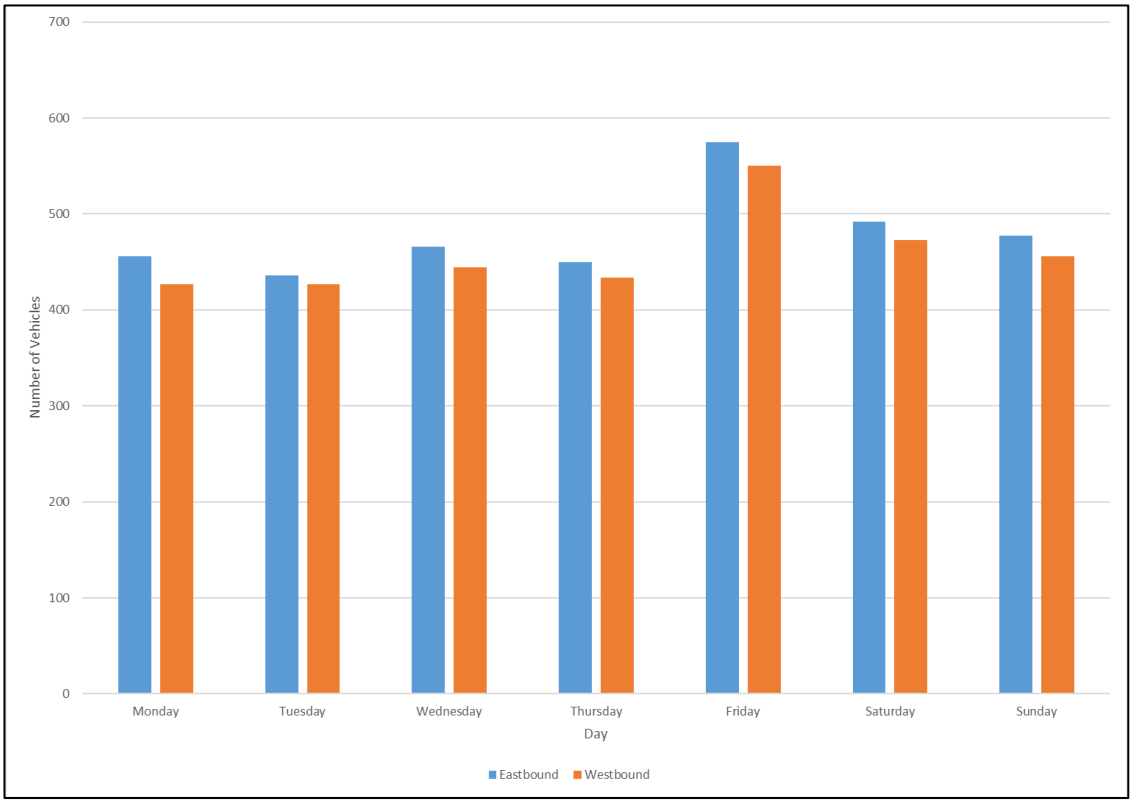


Figure 2-14 Daily traffic volumes on Eastern Avenue (two-way)

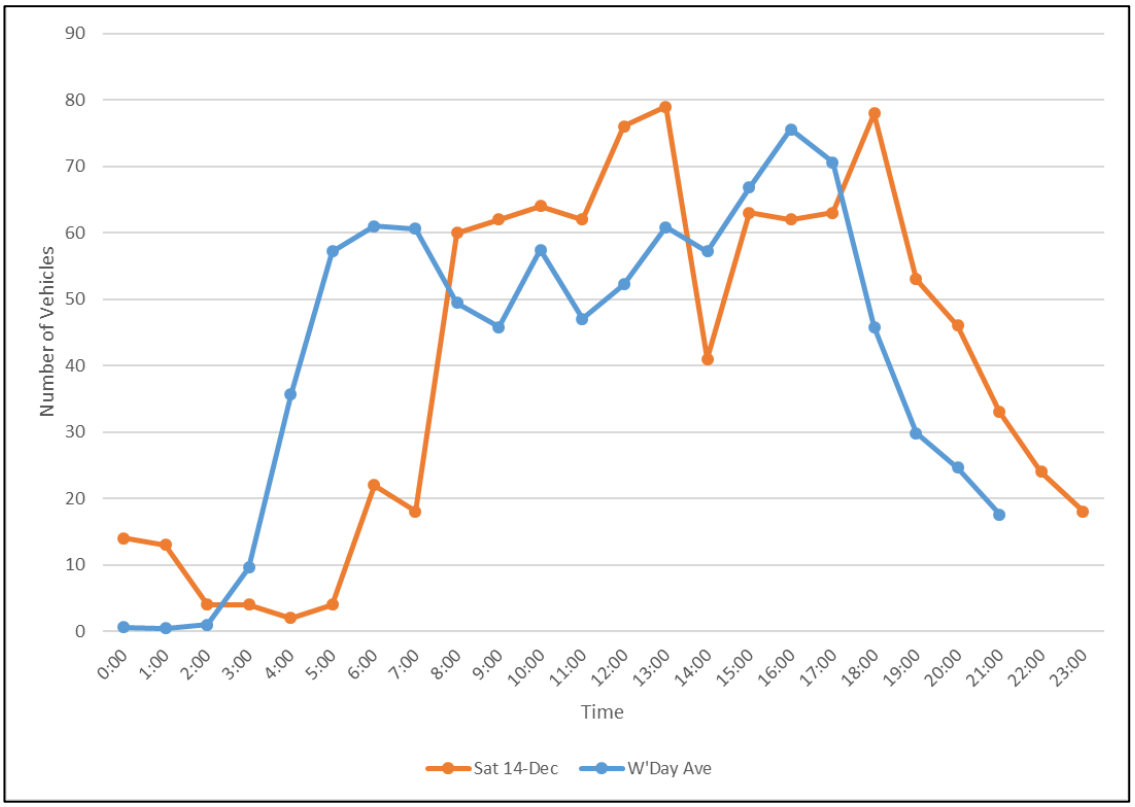


Figure 2-15 Five day (weekday) and weekend hourly traffic profile on Eastern Avenue

Table 2-12 Eastern Avenue key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	933 vehicles	
7 Day Average Volume (two-way)	938 vehicles	
Maximum Weekday AM Peak Hour (two-way)	73 vehicles	
Maximum Weekday PM Peak Hour (two-way)	93 vehicles	
Maximum Weekend Peak Hour (two-way)	82 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	90%	89%
Medium	10%	11%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 3: Kimberley Street (east of Military Road)

The surveyed traffic volumes (per day and direction) for Kimberley Street are shown in Figure 2-16. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-17 and a list of the key traffic data summary outlined in Table 2-13.

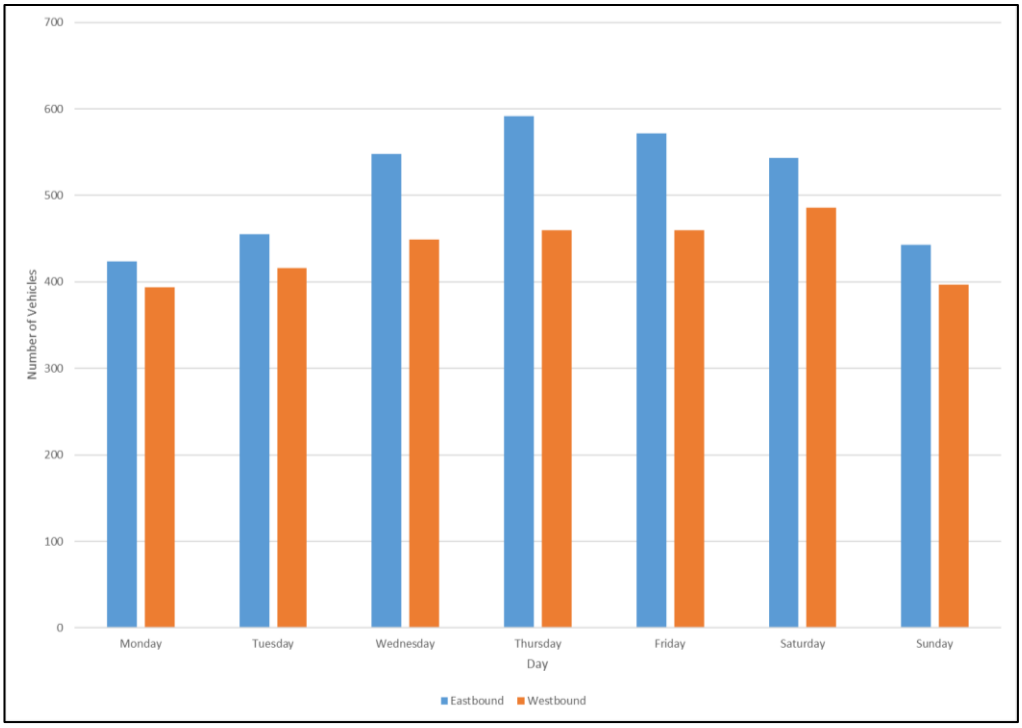


Figure 2-16 Daily traffic volumes on Kimberley Street (two-way)

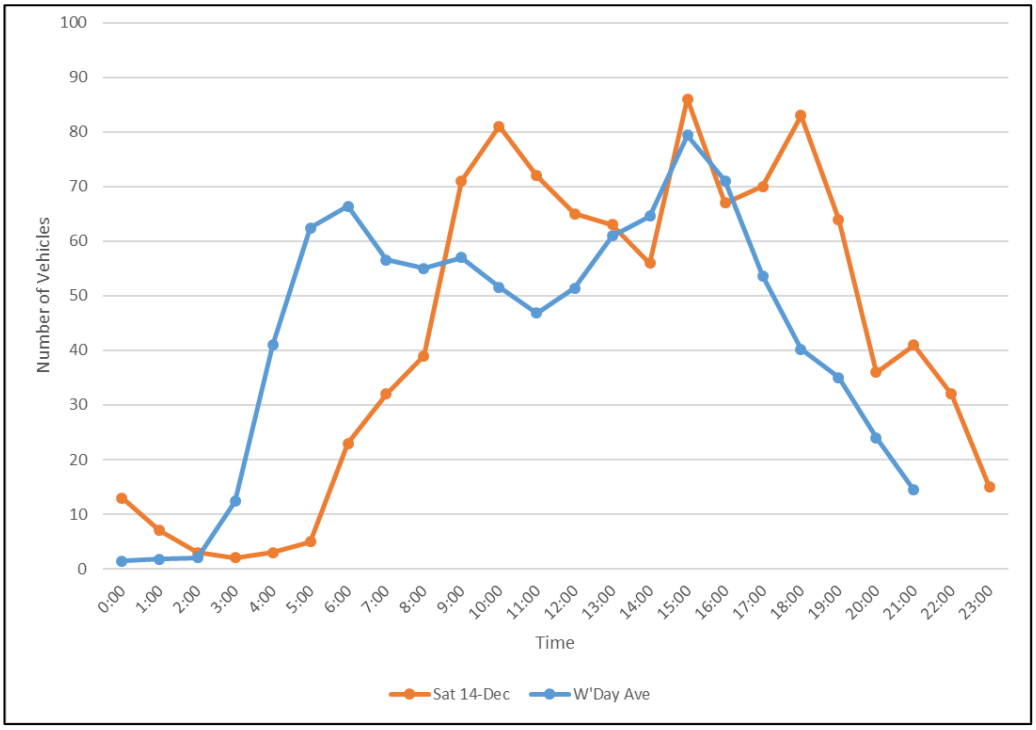


Figure 2-17 Five day (weekday) and weekend hourly traffic profile on Kimberley Street

Table 2-13 Kimberley Street key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	954 vehicles	
7 Day Average Volume (two-way)	948 vehicles	
Maximum Weekday AM Peak Hour (two-way)	80 vehicles	
Maximum Weekday PM Peak Hour (two-way)	94 vehicles	
Maximum Weekend Peak Hour (two-way)	88 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	91%	90%
Medium	9%	10%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 4: Chamberlain Avenue (north of Fernleigh Avenue)

The surveyed traffic volumes (per day and direction) for Chamberlain Avenue are shown in Figure 2-18. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-19 and a list of the key traffic data summary outlined in Table 2-14.

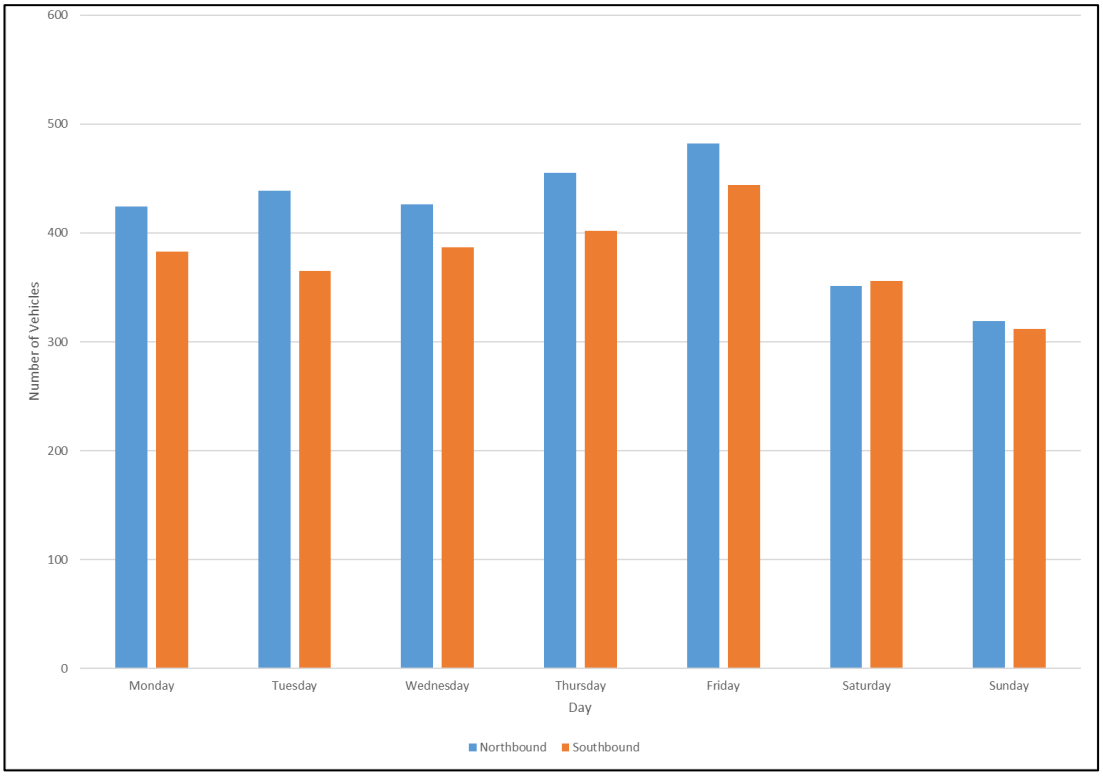


Figure 2-18 Daily traffic volumes on Chamberlain Street (two-way)

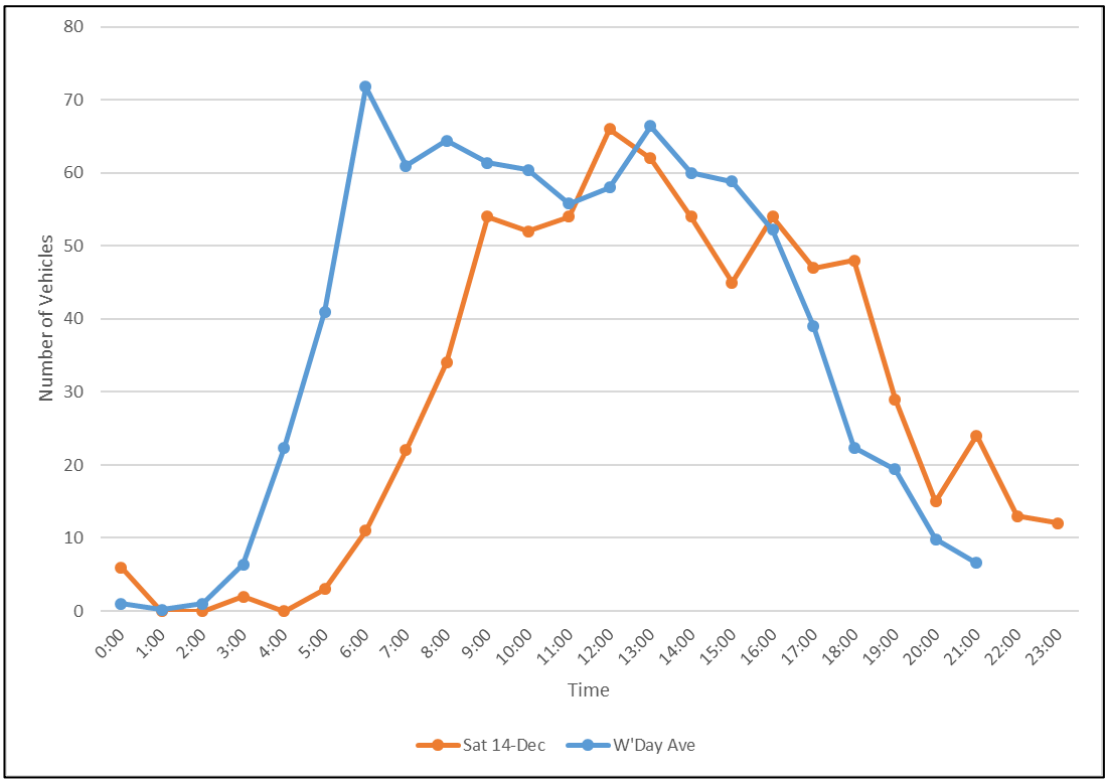


Figure 2-19 Five day (weekday) and weekend hourly traffic profile on Chamberlain Street

Table 2-14 Chamberlain Street key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	841 vehicles	
7 Day Average Volume (two-way)	792 vehicles	
Maximum Weekday AM Peak Hour (two-way)	84 vehicles	
Maximum Weekday PM Peak Hour (two-way)	74 vehicles	
Maximum Weekend Peak Hour (two-way)	66 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	97%	97%
Medium	3%	3%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 5: Carlisle Street (south of Conway Avenue)

The surveyed traffic volumes (per day and direction) for Carlisle Street are shown in Figure 2-20. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-21 and a list of the key traffic data summary outlined in Table 2-15.

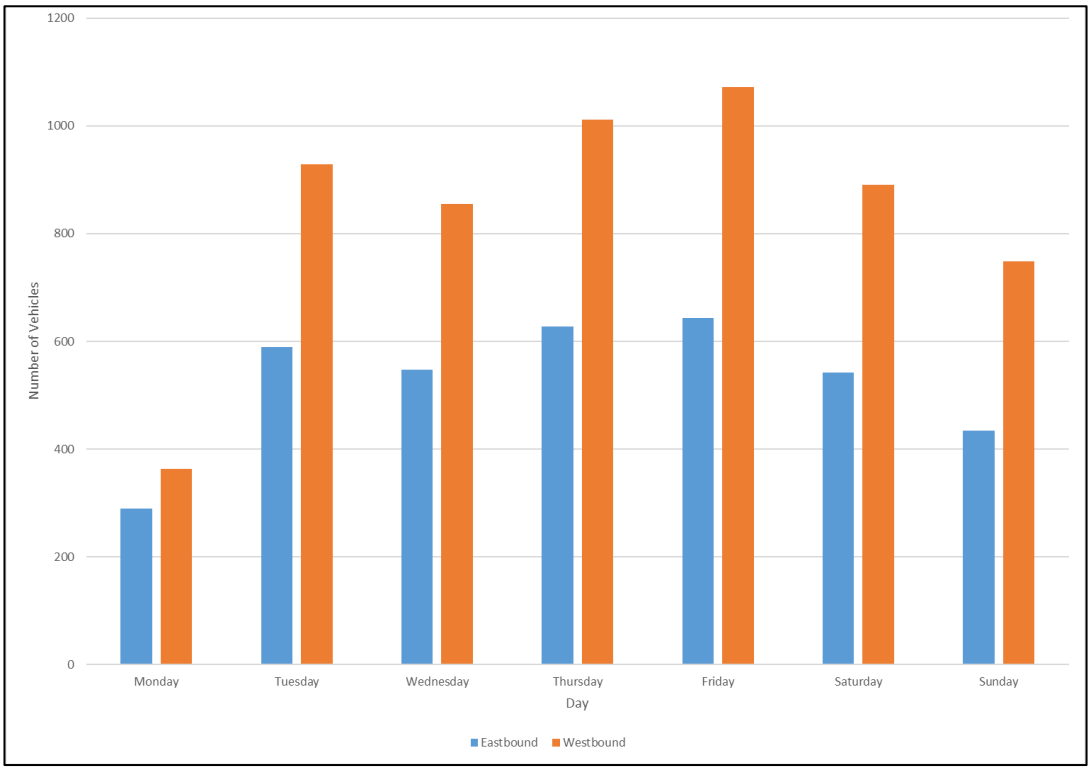


Figure 2-20 Daily traffic volumes on Carlisle Street (two-way)

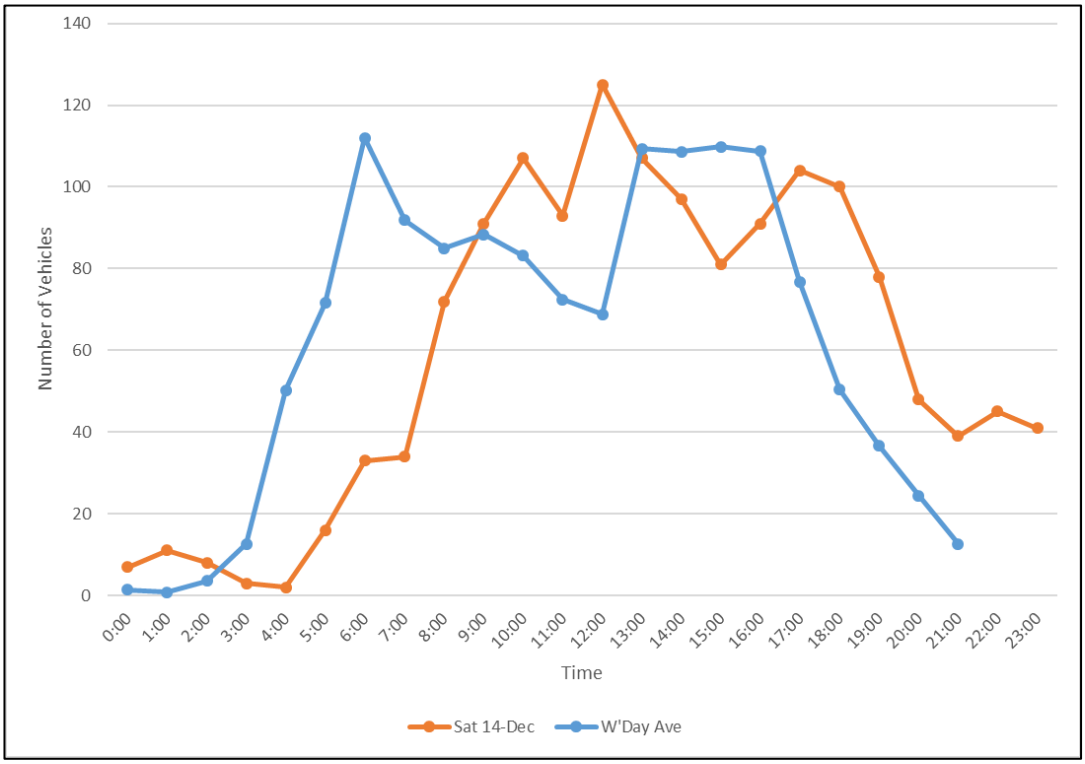


Figure 2-21 Five day (weekday) and weekend hourly traffic profile on Carlisle Street

Table 2-15 Carlisle Street key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	1,386 vehicles	
7 Day Average Volume (two-way)	1,364 vehicles	
Maximum Weekday AM Peak Hour (two-way)	147 vehicles	
Maximum Weekday PM Peak Hour (two-way)	139 vehicles	
Maximum Weekend Peak Hour (two-way)	125 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	95%	96%
Medium	5%	4%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 6: Dover Road (between Carlisle Street and Spencer Lane

The surveyed traffic volumes (per day and direction) for Dover Road are shown in Figure 2-20. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-23 and a list of the key traffic data summary outlined in Table 2-16.

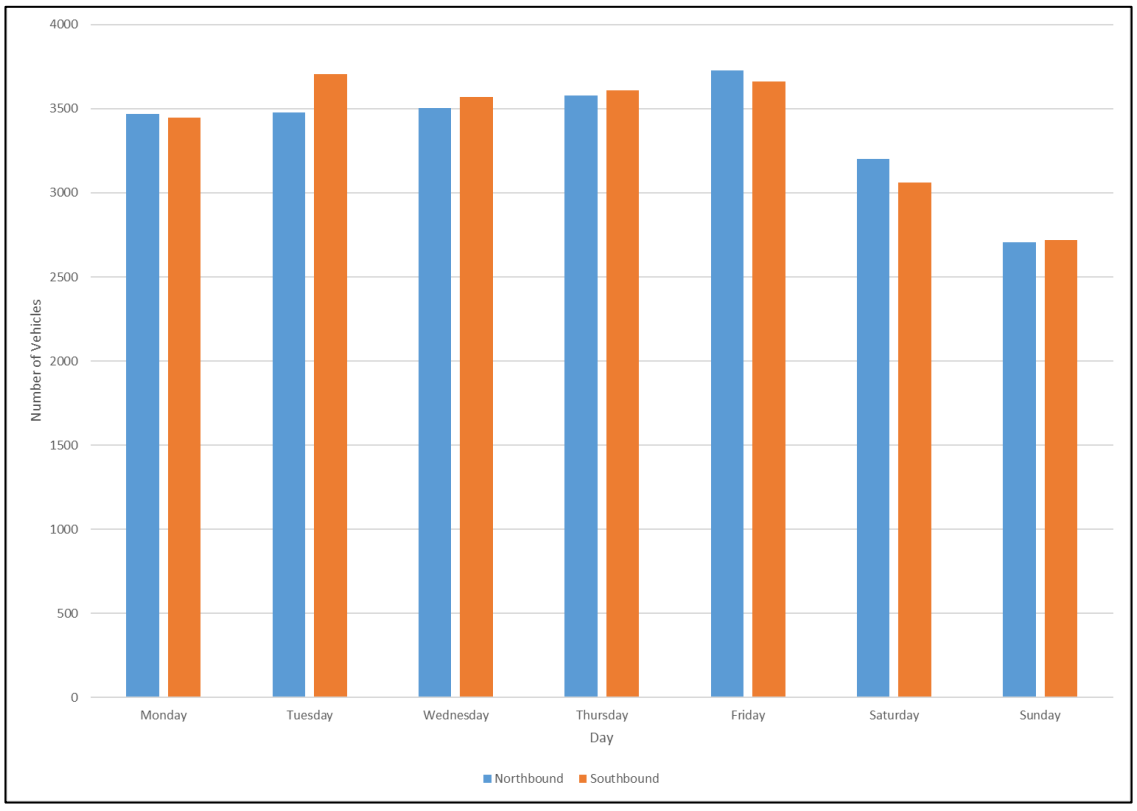


Figure 2-22 Daily traffic volumes on Dover Road (two-way)

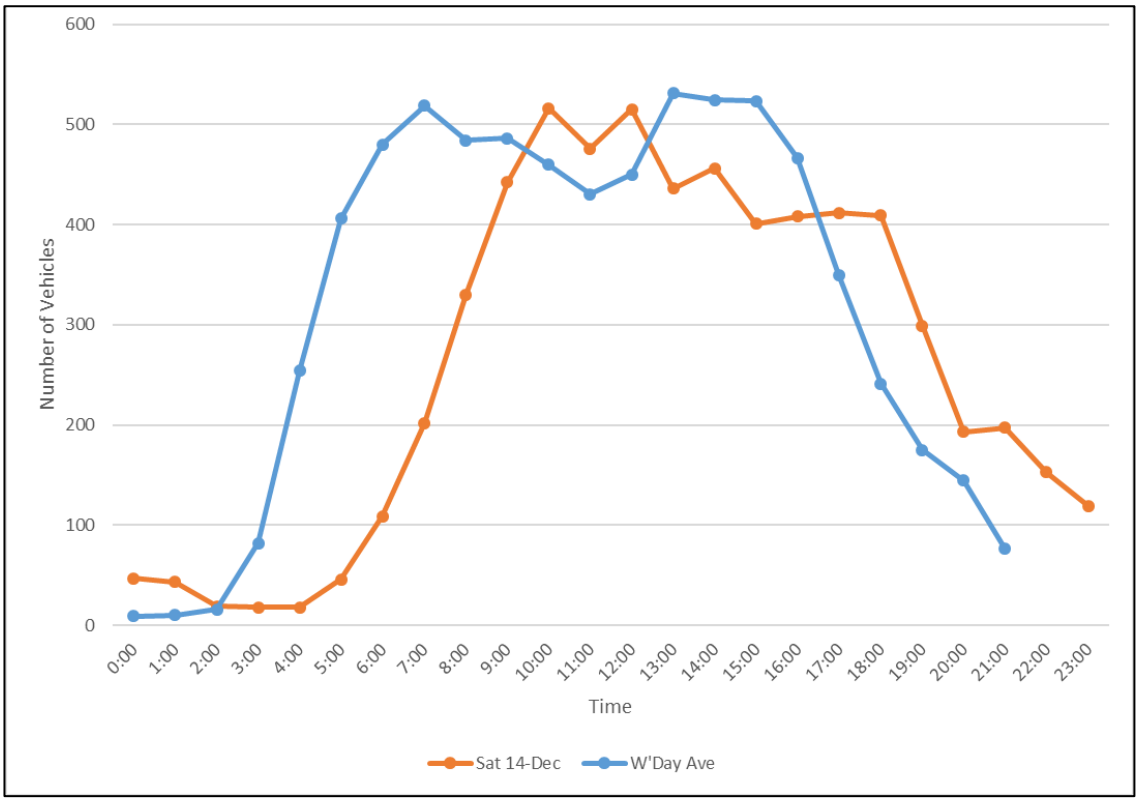


Figure 2-23 Five day (weekday) and weekend hourly traffic profile on Dover Road

Table 2-16 Dover Road key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	7,149 vehicles	
7 Day Average Volume (two-way)	6,766 vehicles	
Maximum Weekday AM Peak Hour (two-way)	550 vehicles	
Maximum Weekday PM Peak Hour (two-way)	540 vehicles	
Maximum Weekend Peak Hour (two-way)	516 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	94%	95%
Medium	6%	5%
Heavy	0%	0%
Unclassifiable	0%	0%

ATC 7: Horler Avenue (access road to Parley Bay car park)

The surveyed traffic volumes (per day and direction) for Horler Avenue are shown in Figure 2-24. Hourly (two-way) traffic volumes recorded for the five day (weekday) average and peak weekend (Saturday) are displayed in Figure 2-25 and a list of the key traffic data summary outlined in Table 2-17.

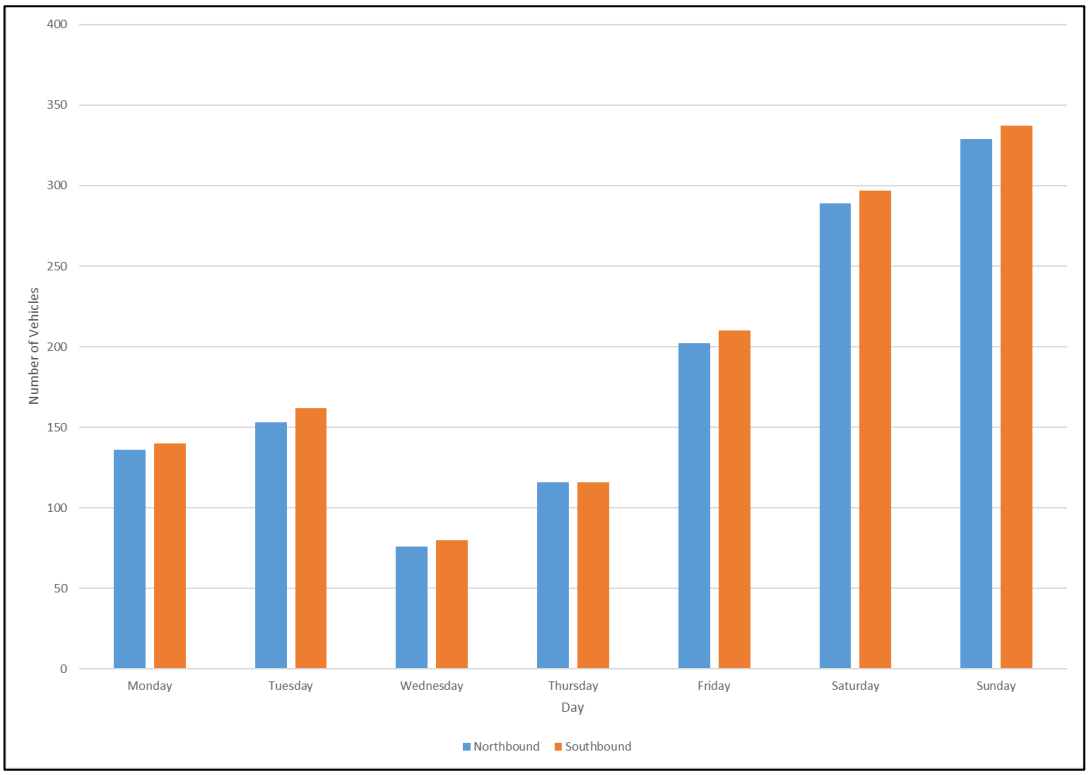


Figure 2-24 Daily traffic volumes on Horler Avenue (two-way)

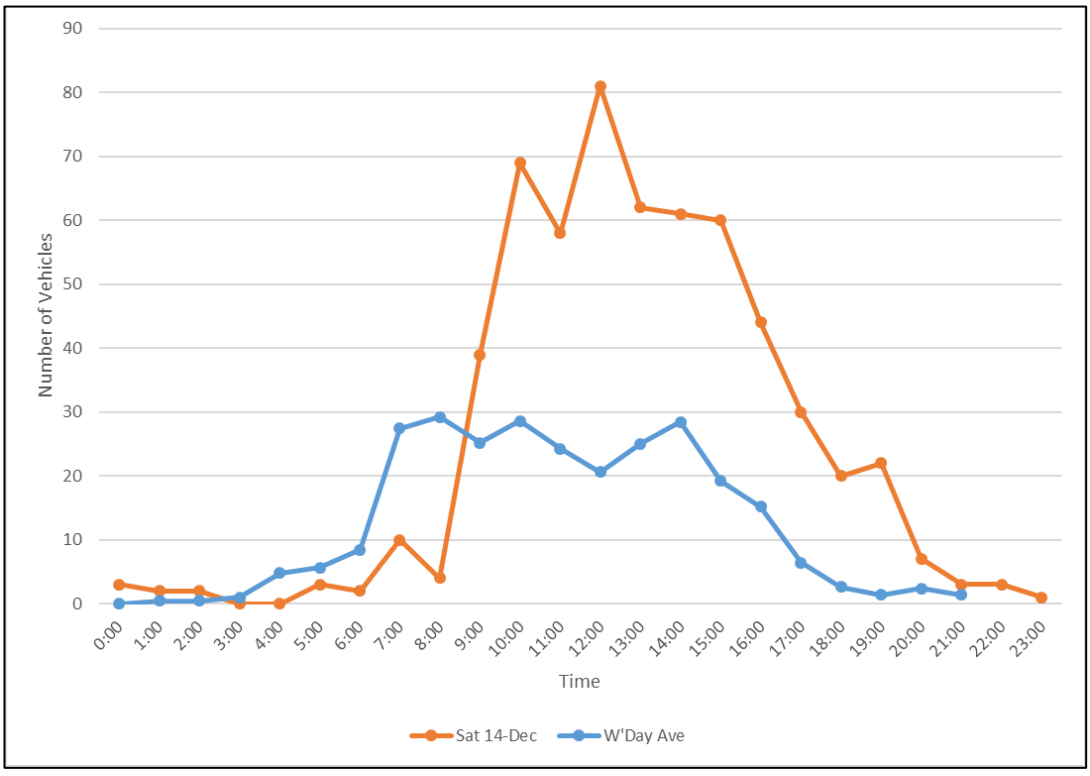


Figure 2-25 Five day (weekday) and weekend hourly traffic profile on Horler Avenue

Table 2-17 Horler Avenue key traffic data summary

Key Data Description	Amount	
Traffic volume		
5 Day (Weekday) Average Volume (two-way)	278 vehicles	
7 Day Average Volume (two-way)	378 vehicles	
Maximum Weekday AM Peak Hour (two-way)	62 vehicles	
Maximum Weekday PM Peak Hour (two-way)	42 vehicles	
Maximum Weekend Peak Hour (two-way)	116 vehicles	
Vehicle classification	Weekday Average	7-day Average
Light	79%	80%
Medium	20%	19%
Heavy	0%	0%
Unclassifiable	1%	1%

2.3.2 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. Transport Roads and Maritime Services has developed a set of road hierarchy classifications detailed in Table 2-18, which indicate typical nominal average annual daily traffic (AADT) volumes for various classes of roads.

Table 2-18 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 on the survey results outlined in in the above sections, the peak hour traffic volumes generally fall within the criteria provided in Table 2-18 for the relevant classification.

2.1 Existing road network performance

2.1.1 Existing intersection performance

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 2-19. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. Level of Service (LoS)), which is applied to each band of average vehicle delay.

Table 2-19 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)

Existing (base 2019) traffic models were developed using the AM / PM weekday and Saturday peak hour surveyed data results. Existing traffic flows at the key intersection was analysed using SIDRA 8 to obtain the current operating performance. A summary of the results is outlined in Table 2-20 and detailed in Appendix B.

Table 2-20 Existing intersection performance (2019 base)

Intersection	AM Peak				PM Peak			
	Average Delay (s)	LoS	Control Type	Degree of Saturation	Average Delay (s)	LoS	Control Type	Degree of Saturation
Site 1: New South Head Road / Dover Road	10.6	A	Signal	0.683	10.6	A	Signal	0.735

	Saturday Peak			
	Average Delay (s)	LoS	Control Type	Degree of Saturation
Site 1: New South Head Road / Dover Road	11.9	A	Signal	0.716

Notes:

- *The average delay for priority-controlled intersections is selected from the movement on the approach with the highest average delay.*
- *The level of service for priority-controlled intersections is based on the highest average delay per vehicle for the most critical movement.*
- *The degree of saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.*
- *Average delay is given in seconds per vehicle.*

Table 2-20 indicates that each of the analysed intersection currently operates with an acceptable and satisfactory LoS (i.e. better than LoS E) with spare capacity in both the weekday morning and evening peak periods.

2.1.2 Existing mid-block performance

The criteria for evaluating the operational performance of mid-block capacities is outlined from the *Roads and Maritime Guide to Traffic Generating Developments* which indicates the LoS mid-block capacities for urban roads as outlined in Table 2-21.

Table 2-21 Urban road mid-block capacities

Level of Service	One Lane (veh/h)	Two Lanes (veh/h)
A	280	900
B	380	1,400
C	600	1,800
D	900	2,200
E	1,400	2,800

Existing traffic mid-block review was developed using the AM and PM weekday, Saturday peak hour from the seven-day automatic tube count surveyed data results with reference to the above LoS Criteria and summarised in Table 2-22.

Table 2-22 Mid-block review of roads in key work areas

Road	Direction	Number of Lanes	Mid-block volume (AM Peak)	Mid-block volume (PM Peak)	Mid-block volume (Saturday Peak)	Level of Service
ATC 1: Oceanview Avenue	Eastbound	1	40	58	55	A
	Westbound	1	42	30	33	A
ATC 2: Eastern Avenue	Eastbound	1	31	57	43	A
	Westbound	1	47	41	43	A
ATC 3: Kimberley Street	Eastbound	1	39	62	57	A
	Westbound	1	48	37	42	A
ATC 4: Chamberlain Avenue	Northbound	1	47	41	34	A
	Southbound	1	40	36	32	A
ATC 5: Carlisle Street	Eastbound	1	48	61	51	A
	Westbound	1	110	94	82	A
ATC 6: Dover Road	Northbound	1	329	277	276	B
	Southbound	1	239	307	249	B
ATC 7: Horler Avenue	Northbound	1	30	23	39	A
	Southbound	1	32	28	42	A

The traffic survey outputs indicate that the roads in the vicinity of the project currently operate within the acceptable limits of their mid-block capacities with a LoS not greater than LoS D (desirable maximum).

2.2 Existing parking

The key works areas generally provide on-street parking provisions on the adjoining local road networks. An off-street parking area is available at Parsley Bay Reserve located at the northern end of Horler Avenue.

Parsley Bay Reserve car park consists of 27 designated car spaces with access available Monday to Sunday from 3.30 am to 6 pm with the parking area shown in Figure 2-26.

Source: Google Maps

Figure 2-26 Parsley Bay Reserve car park (viewed northbound)

GHD engaged Matrix Traffic and Transport Data Pty Ltd to undertake parking utilisation surveys of Parsley Bay Reserve car park on Wednesday 11 December 2019 and Saturday 14 December 2019 between 8 am and 6 pm. The survey consisted of a parking occupancy count at hourly intervals to ascertain parking demand during a peak weekend period. Details of the survey results can be found in Appendix C.

The following summarises the finding of the parking utilisation survey:

- Available spaces: 27 Spaces
- Weekday peak occupancy: 15 vehicles which occurred at 11 am
- Weekend (Saturday) Peak occupancy: 28 vehicles at 12 pm
  - Note: Vehicles were parked in No Parking restriction area
- Vehicle parking demand was higher and over a longer period time during the weekend when compared to weekday period
  - Weekday peak greater than 80 percent occupancy between 10 am to 12 pm
  - Weekday peak greater than 80 percent occupancy between 10 am to 5 pm.

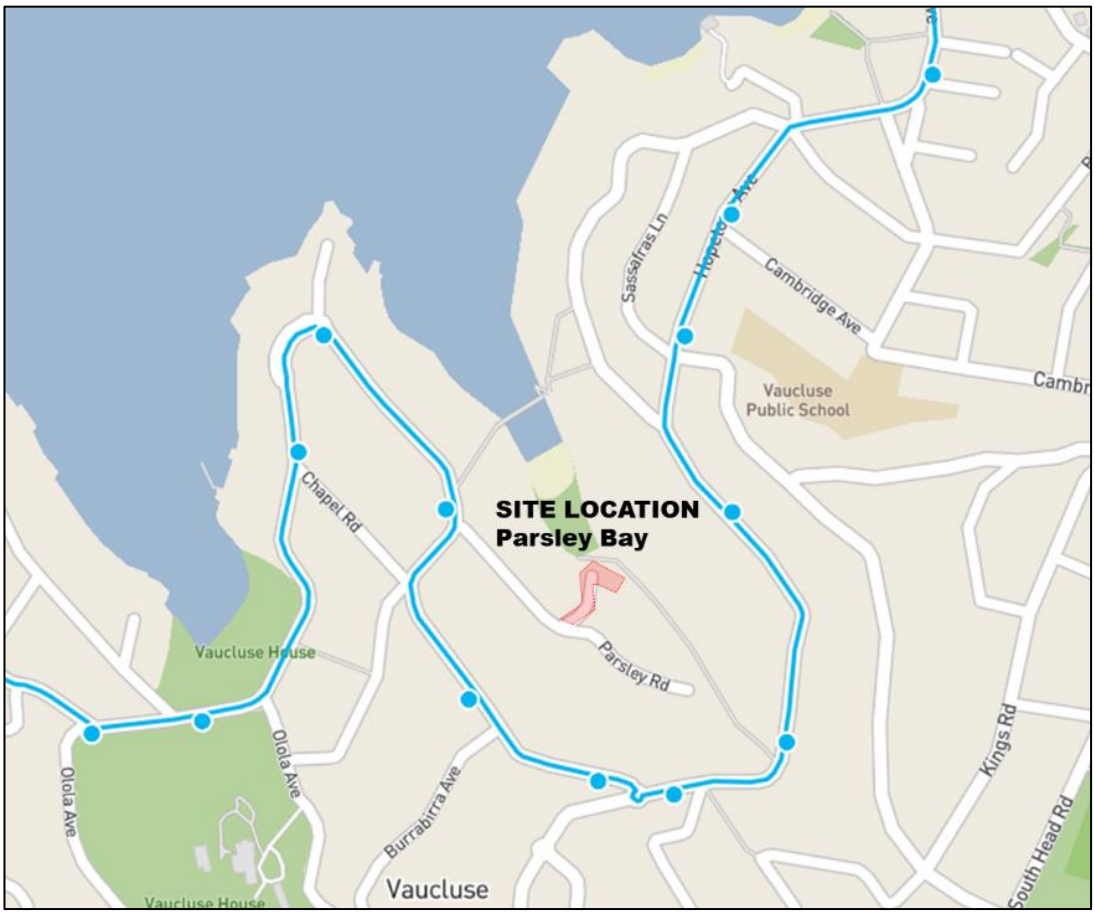
2.3 Public and active transport

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 sub-sections.

2.3.1 Bus services

The closest bus stops to the Parsley Bay Reserve construction site are located on each side of Fitzwilliam Road, situated north of the intersection of Parsley Road and Fitzwilliam Road. Pedestrians can access the bus stops from the Parsley Bay suspension bridge located north-east of Fitzwilliam Road.



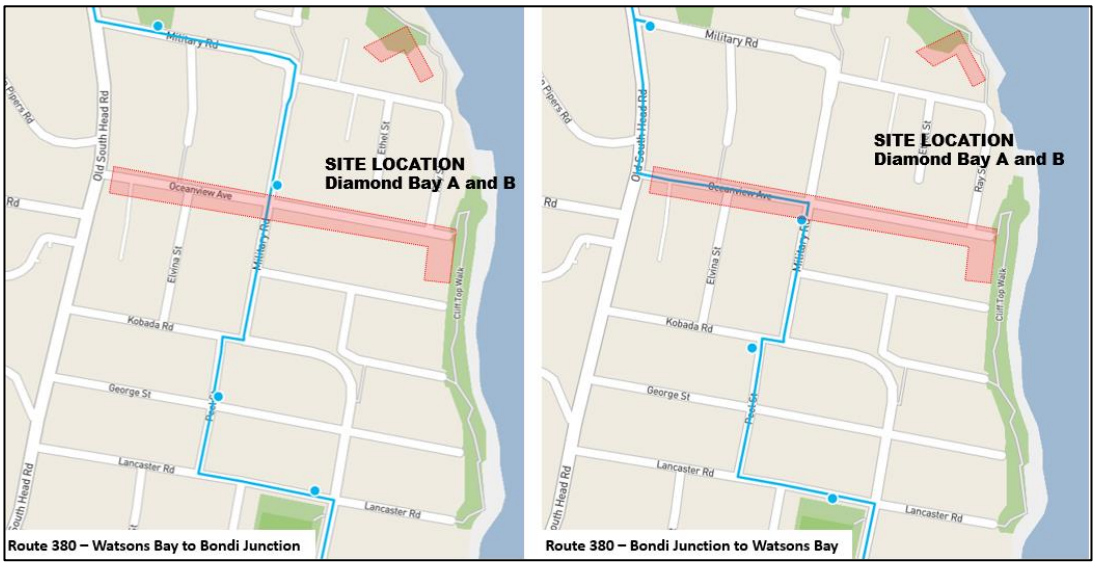
Source: Transport for NSW website – modified by GHD

Figure 2-27 Parsley Bay – Bus 325 Route

For the Oceanview Avenue and Kimberley Street construction sites (Diamond Bay Sites A and B) , there are two bus stops located on each side of Military Road, at its intersection with Oceanview Avenue. Furthermore, there are two bus stops on each side of Old South Head Road, north and south of the intersection with Oceanview Avenue, served by route 380, as shown in Figure 2-28.

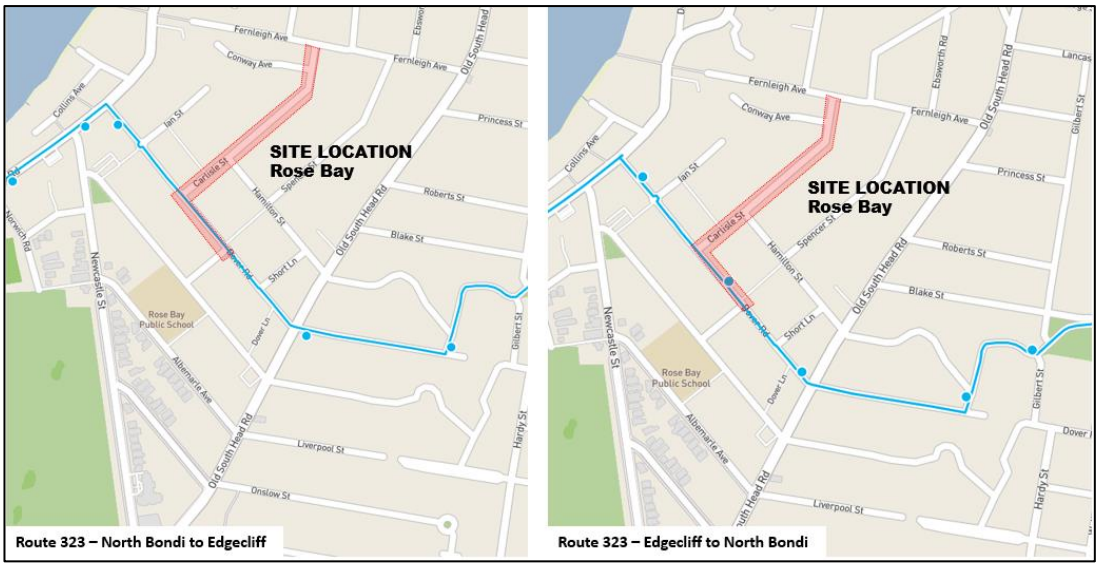
The two nearest bus stops to the Carlisle Street construction site (Rose Bay) are located on each side of Dover Road and served by route 323. One bus stop is at the north end before the intersection with New South Head road, and the other at the south end of Dover road approximately 35 m before Spencer Lane as shown in Figure 2-29.

The bus services in the vicinity of construction sites are listed in Table 2-23. The bus frequency was determined assuming that the weekday and weekend peak AM times are between 7.00 am and 9.00 am and the peak PM times are 4.00 pm to 7.00 pm.



Source: Transport for NSW website – modified by GHD

Figure 2-28 Diamond Bay Sites A and B – Bus 380 Route



Source: Transport for NSW website – modified by GHD

Figure 2-29 Rose Bay – Bus 323 Route

Table 2-23 Bus route summary

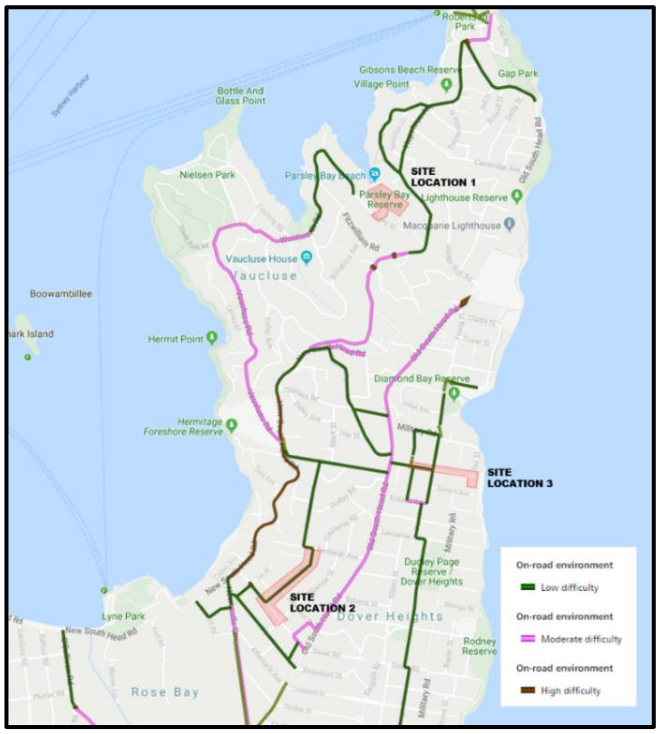
Route	Coverage	Frequency
Parsley Road		
325	Watsons Bay to City - Walsh Bay via Vaucluse Rd	**Weekday** AM Peak: 6 PM Peak: 6 **Weekend** Saturday AM peak: 4 Saturday PM peak: 10
Dover Road		
323	North Bondi to Edgecliff via New South Head Rd	**Weekday** AM Peak: 4 PM Peak: 7
386	Vaucluse to Bondi Junction via New South Head Rd and Old South Head Rd	**Weekday** AM Peak: 9 PM Peak: 6 **Weekend** Saturday AM peak: 4 Saturday PM peak: 6 Sunday & Public Holidays AM peak: 4 Sunday & Public Holidays PM peak: 6
Oceanview Avenue		
380	Watsons Bay to Bondi Junction via Bondi Beach	**Weekday** AM Peak: 8 PM Peak: 10 **Weekend** Saturday AM peak: 5 Saturday PM peak: 11 Sunday & Public Holidays AM peak: 5 Sunday & Public Holidays PM peak: 11
387	South Head Cemetery to Bondi Junction	**Weekday** AM Peak: 10 PM Peak: 6 **Weekend** Saturday AM peak: 4 Saturday PM peak: 6 Sunday & Public Holidays AM peak: 4 Sunday & Public Holidays PM peak: 6

2.3.2 Bicycle riding

The main bicycle routes in the areas pass through Rose Bay and Vaucluse and utilise a mix of high and low traffic streets. The route begins from Bondi Junction and covers the western coast of Vaucluse towards Watson's Bay. Most roads are sealed and wide enough to accommodate bicycles, and the footpaths are smooth with appropriate width to cater to children riders.

Source: Woollahra Council website – modified by GHD

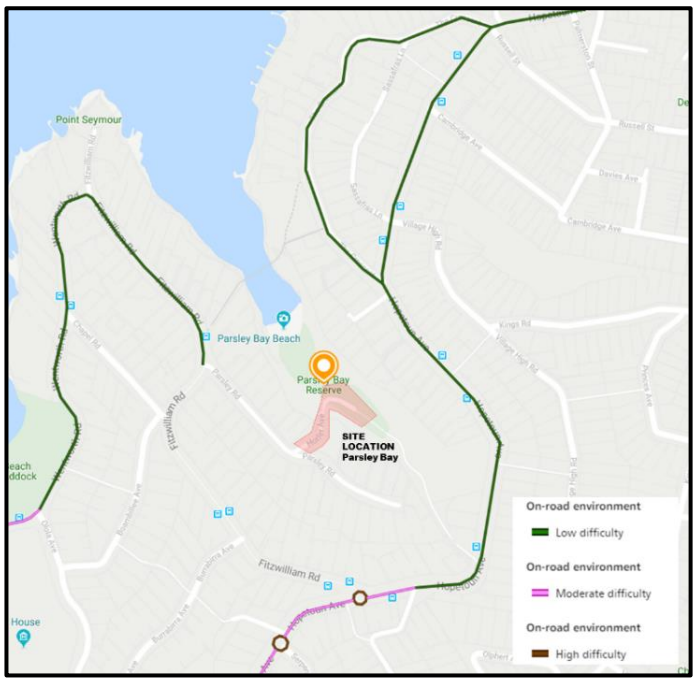
Figure 2-30 Woollahra cycle route map



Source: Transport Roads and Maritime Services Cycleway Finder website – modified by GHD

Figure 2-31 Existing cycle network

The bicycle path reaches Parsley Bay Reserve from Fitzwilliam Road, approximately 200 m away from the site, where cyclists cross the suspension bridge to Hopetoun Avenue to the north which is approximately 140 m away from the site as shown in Figure 2-32.

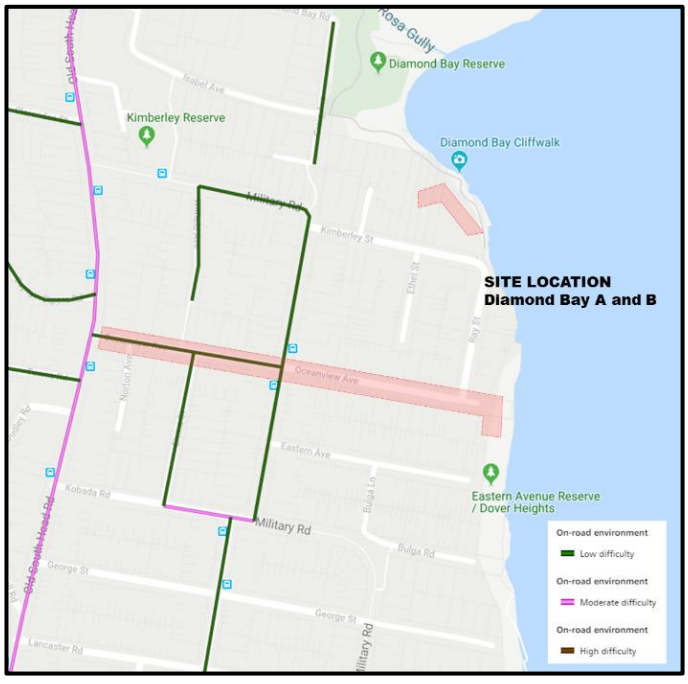


Source: Transport Roads and Maritime Services Cycleway Finder website – modified by GHD

Figure 2-32 Existing cycle network near Parsley Bay Reserve construction site

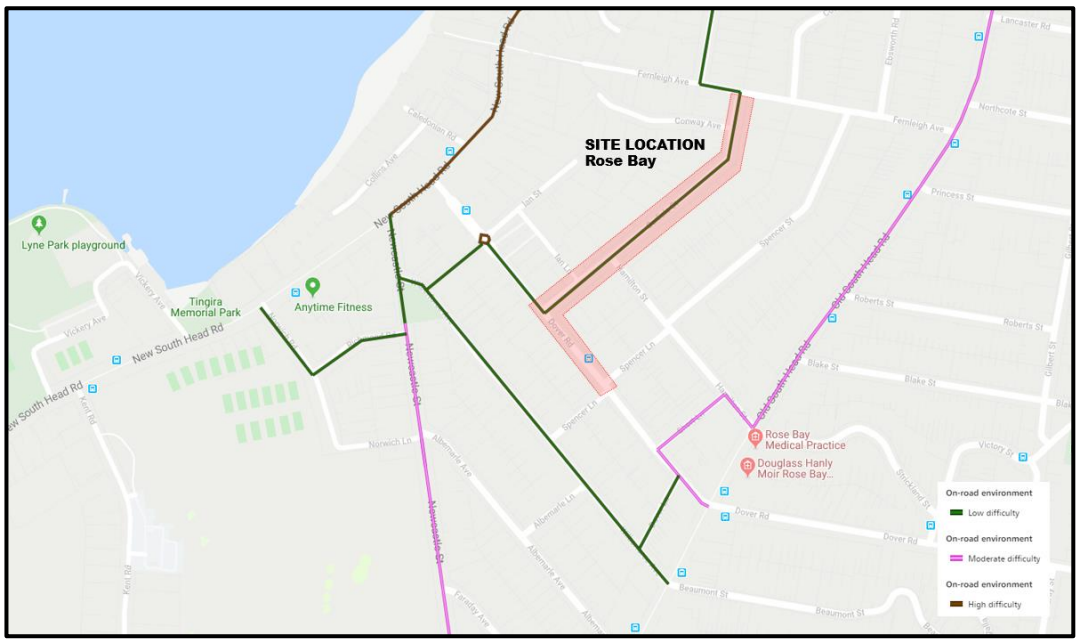
The circuit circles back to Bondi Junction, with Military Road being one of the easier paths to travel within the vicinity of the construction site on Oceanview Avenue. There are alternative routes such as along Old South Head Road, but the on-road environment is of moderate difficulty as shown in Figure 2-33.

Carlisle Street and Dover Road are other low-difficulty cyclist paths that can be used when travelling to and from Rose Bay. The alternatives to this are New South Head Road with a high difficulty environment and Old South Head Road as shown in Figure 2-34.



Source: Transport Roads and Maritime Services Cycleway Finder website – modified by GHD

Figure 2-33 Existing cycle network near Oceanview Avenue construction site



Source: Transport Roads and Maritime Services Cycleway Finder website – modified by GHD

Figure 2-34 Existing cycle network near Carlisle Street construction site

2.3.3 Walking

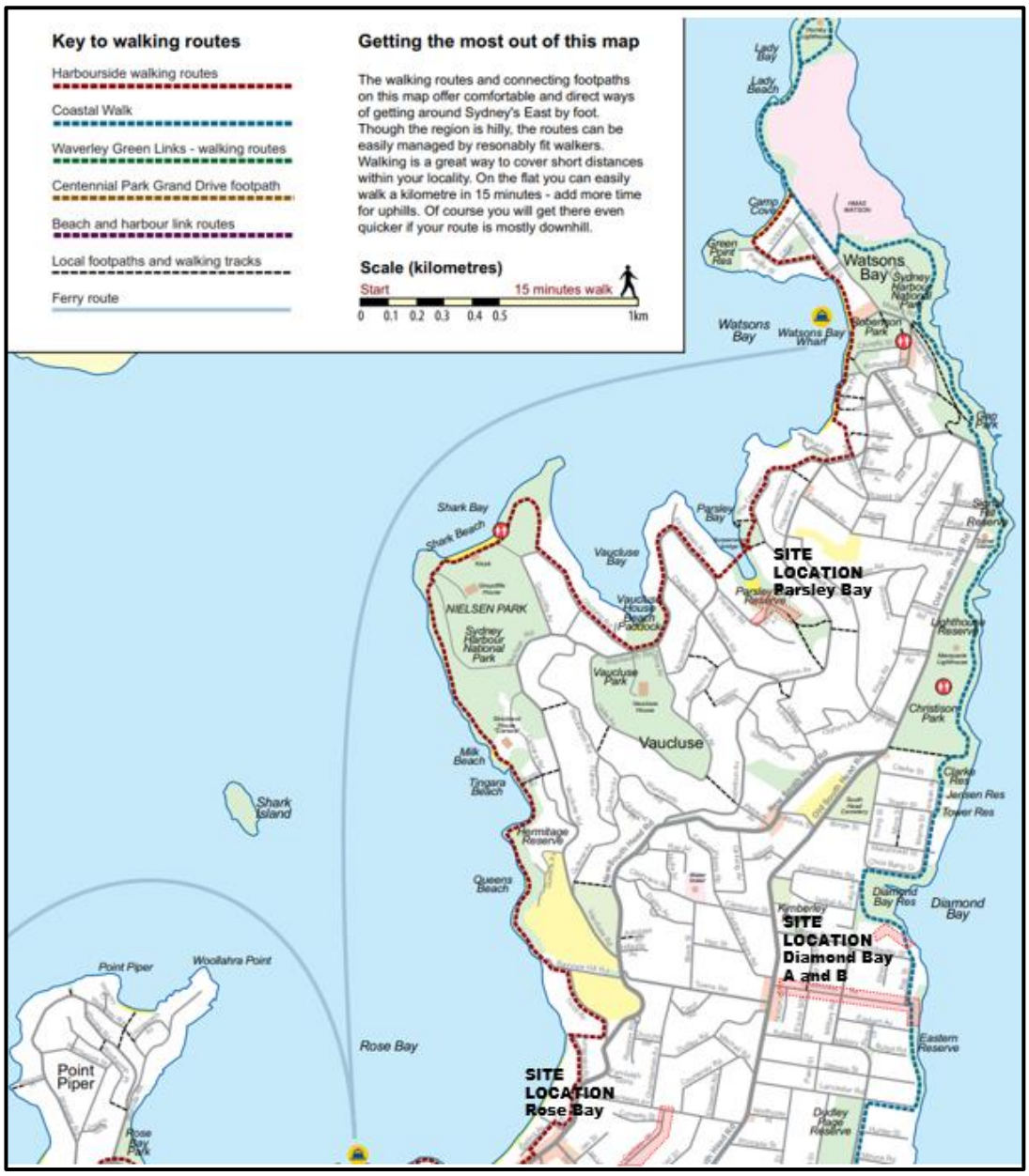
The coast of Vaucluse provides an extensive network of walking routes, due to most of the local roads having footpaths on both sides, making it a comfortable and accessible environment. The major walking routes which were identified using the Woollahra Walking Plans, as shown in Figure 2-35 including the 'Harbourside walking route' and 'Coastal walk'.

The Harbourside walking route starts at Camp Cove in Watsons Bay and crosses through Parsley Bay over the suspension bridge to Fitzwilliam Road where pedestrians can continue along the coast.

In addition, the Parsley Bay Café may be attracting pedestrians who are coming to and from the park on this route as well as from the surrounding residential areas. Thus, possible interactions with pedestrians at the construction site may occur. Other pedestrian friendly sites nearby the construction site include the Vaucluse War Memorial, DanceCircus and a childcare centre (Active Kids Group Vaucluse), which are all located north-west of the construction site. These pedestrian facilities could also be accessed from the Parsley Bay Reserve car park via Horler Avenue.

Similarly, the coastal walk begins from Watsons Bay and trails on the eastern coast, through the Diamond Bay Reserve and past the Diamond Bay Cliffwalk, which is in the vicinity of the site. Furthermore, the path continues through to the Eastern Reserve via Kimberley and Ray Street.

Eastern Avenue Reserve and Dover Heights Reserve is a cliffside park located at the eastern coastline of Dover Heights. It can be accessed directly from the east end of Eastern Avenue, as well as from Kimberley Street down Ray Street into Oceanview Avenue to the cul-de-sac which leads to the park.



Source: Walking in Waverley and Woollahra Map – modified by GHD

Figure 2-35 Existing walking routes

Carlisle Street is expected to accommodate significant pedestrian activity due to the presence of McAuley Catholic Primary School, St Andrews Scots Presbyterian Church and the Ballykin Rose Bay Early Learning Centre and nearby commercial area along New South Head Road.

Residents who live in Carlisle Street, Conway Avenue and Fernleigh Avenue would walk to and from the Dover Road bus stop on the northern or southern ends, the business district on New South Head Road and Rose Bay Beach which is approximately 345 m west of Carlisle Street. Carlisle Street provides pedestrian facilities such as the pedestrian crossings, the ramps, stairs and their guard rails at the nearby schools.

2.3.4 Higher mass limit vehicles

Short combination higher mass limit vehicles (standard six-axle semi-trailers) are authorised to travel on Old South Head Road as illustrated in Figure 2-36. The heavy vehicles using this route must be enrolled in the NSW Intelligent Access Program (IAP) in accordance with the Higher Mass Limits Declaration and comply with the conditions in Schedule 5 of the Heavy Vehicle (Mass, Dimension and Loading) National Regulation. The route is based on a maximum vehicle width of 2.5 m and the vehicles are subject to signposted restrictions. The vehicles may access the Carlisle Street construction site via Old South Head Road or by the state road (New South Head Road).

Source: RMS Interactive HML Restricted Access Vehicle route map – Modified by GHD

Figure 2-36 HML Access Routes

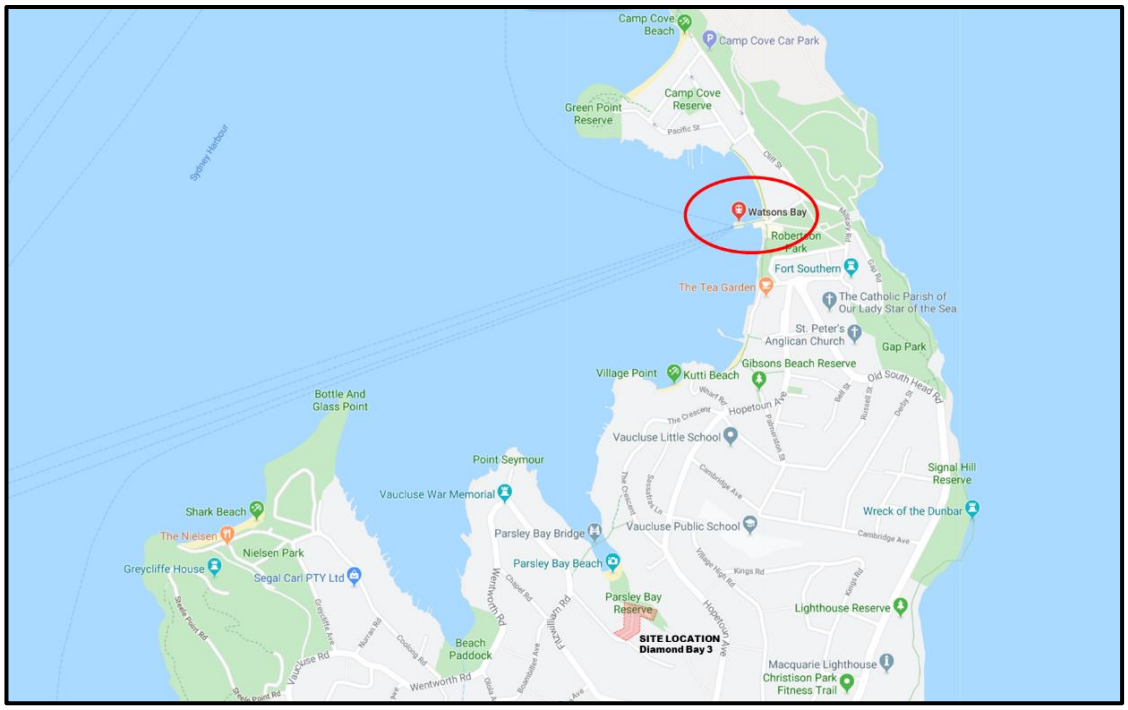
2.3.5 Emergency vehicle access

The carriageway must be wide enough (minimum desirable 3.2 m) to allow easy negotiating by emergency services such as a fire appliance and provide room around the vehicle to allow emergency services to exit and work with equipment or patients.

Temporary roadworks during construction should ensure such road widths are maintained.

2.3.6 Ferry activity

The Watsons Bay Ferry Terminal is located approximately one km north of Parsley Bay Beach, as shown in Figure 2-37. The Ferry passes directly across Parsley Bay Reserve and the wharf provides egress for passengers at Robertson Park. Pedestrians, whether tourists or locals, may come to and from the wharf and travel down the west coast via Hopetoun Avenue towards the Parsley Bay Reserve site as part of the 'Harbourside walking route'.

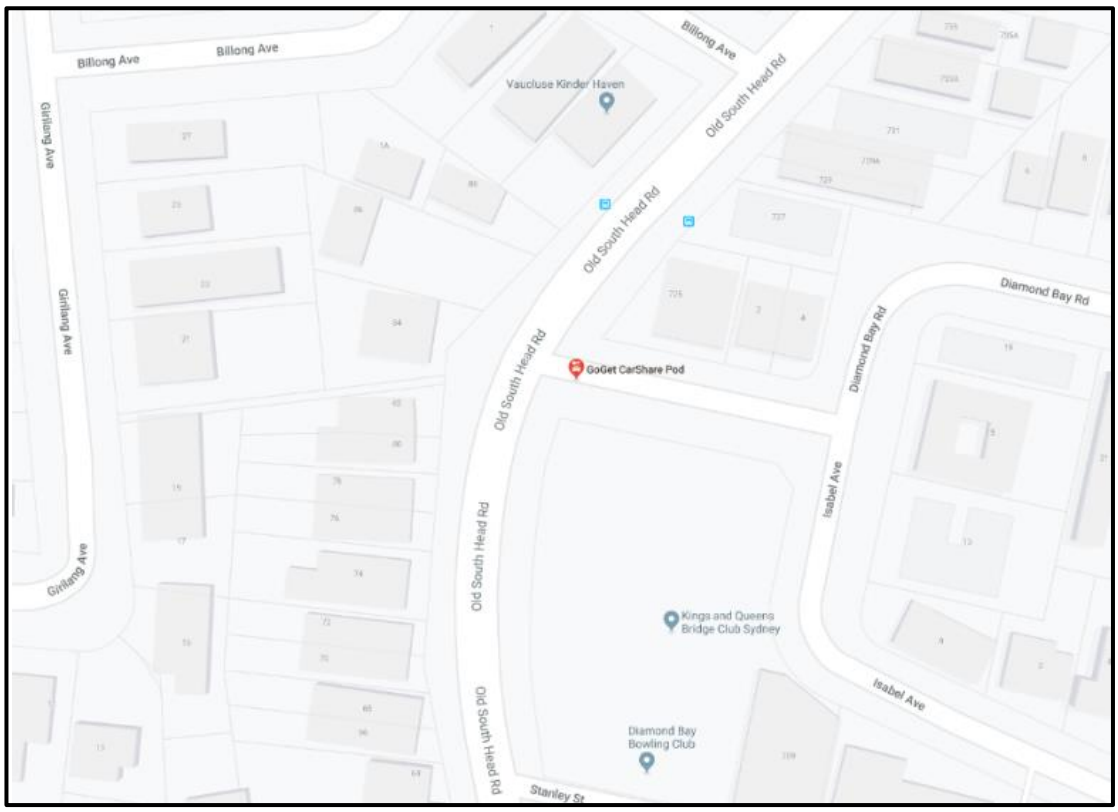


Source: Google Maps – Modified by GHD

Figure 2-37 Ferry wharf

2.3.7 Car share

A GoGet Car Share Pod is situated beside the Kings and Queens Bridge Club Sydney and Diamond Bay Bowling Club on Diamond Bay Road, between Old South Head Road and Isabel Avenue. It is approximately 480 m west of the Kimberley Street construction site as depicted in Figure 2-38 and Figure 2-39.



Source: Google Maps

Figure 2-38 GoGet CarShare Pod location

Source: Google Maps

Figure 2-39 GoGet CarShare Pod street view

3. Construction traffic impact assessment

3.1 Potential construction traffic generation

The main traffic impact for the proposal would be generated by construction vehicles, namely workers and heavy vehicles, accessing and egressing the sites.

3.2 Work activities

In constructing the sewerage infrastructure at Vaucluse and Diamond Bay, the project will include the following key work activities at the three sites:

- Soil sampling, testing and classification, and characteristics of soil types are analysed
- Construction of sewage pump station components at Parsley Bay car park and Eastern Bay Reserve – including transportation of materials and equipment
- Pipeline construction by a mix of open trenching and trenchless methods such as horizontal directional drilling or microtunneling – including transportation of materials and equipment.

3.2.1 Construction timeframe

It is estimated that the total works program will take eight to nine months.

3.2.2 Proposed work hours

The working hours for the construction sites would be as follows:

- Monday to Friday (7.00 am to 6.00 pm)
- Saturday (8.00 am to 1.00 pm)
- Sunday and public holidays (no work)
- Limited night time works for tunnelling but would involve minimal vehicle movements.

3.3 Construction activity traffic generation

3.3.1 Staff Movements

During the proposed works, it is expected that there would be a total construction workforce of up to 40 personnel with 15 at Parsley Bay, 15 at Eastern Avenue Reserve and 10 at Carlisle Street accessing the sites daily.

3.3.2 Light vehicle traffic generation

In the order of 30 daily light vehicle movements across the sites in and out are estimated to occur as it is assumed that there will be some level of car sharing.

Construction workers would be expected to access the sites in the morning and exit them in the afternoon/evening, as outlined in section 3.2.2

These volumes equate to, on average less than one vehicle every minute over peak hour arrival and departure periods.

The expected volume of construction worker trips are low and would fall within typical daily fluctuations with no expected adverse impacts to the operation of the adjoining road network.

3.3.3 Heavy vehicle traffic generation

The traffic generation associated with heavy vehicles has been based off the preliminary design and construction programming and indicates that it is estimated that heavy vehicle truck movements are in the order of five to ten vehicles per day at each site providing access/agrees at each construction site. It has been conservatively assumed that excavated material would be transported from each construction site by truck. Trucks are expected to be associated with the following activities:

- Installation of pipe sections
- Equipment to remove spoil
- Drilling rig and associated construction equipment
- Drilling at Parsley Bay and Carlisle Avenue
- Spoil removal and transportation
- Ground water and drilling fluid transportation
- Transport of pipe materials and construction materials
- Concrete trucks.

Mechanical and electrical items. These increases in traffic movements are low and would fall within typical daily fluctuations with no expected adverse impacts to the operation of the adjoining road network.

3.4 Construction traffic access and trip distribution

The construction traffic movements are expected to occur:

- To/from the pump station at Parsley Bay: New South Head Road, Vaucluse Road, Parsley Road, Horler Avenue
- To/from the pump station at Eastern Avenue Reserve: New South Head Road, Dover Road, Old South Head Road, Oceanview Avenue, Military Road, Eastern Avenue
- To/from drill site at Carlisle Street: New South Head Road, Dover Road, Carlisle Street.

Horlier Avenue is considered the main road network constraint for construction vehicular access to the construction sites, due to its existing narrow and winding road layout.

A tuning path review has been undertaken with medium rigid vehicle of 8.8 m in length (refer to Appendix D) The review indicated a vehicle of this size would overhang the existing kerb and gutter and be constrained by the existing property retaining walls adjacent to the kerb. For this reason, small rigid vehicle (up to 6.4 m in length) should be utilised to convey materials and/or equipment via the road network to Parsley Bay Reserve, with the contractor responsible for assessing the maximum vehicle type and suitability of access for the desired vehicle type.

4. Mitigation measures

4.1 Objectives

The Preliminary Construction Traffic Management Plan (CTMP) aims to facilitate the safety of all workers and road users within the vicinity of the construction site. The following outlines the primary objectives:

- To minimise the impact of the construction vehicle traffic on the operation of the adjoining road network
- To facilitate the continuous, safe and efficient movement of traffic for both the general public and construction workers
- To identify appropriate advance warning signs to inform users of changed traffic conditions
- To facilitate the establishment of a safe pedestrian environment in the vicinity of the sites
- To provide a description of the types of vehicles and estimated vehicle volumes during each stage of construction
- To provide information regarding the access arrangement and a description of the proposed routes for vehicles accessing and egressing the construction sites.

4.2 Construction vehicle access route

The construction traffic movements is expected to occur:

- To/from the pump station at Parsley Bay car park site: New South Head Road, Vaucluse Road, Parsley Road, Horler Avenue
- To/from the pump station at Eastern Avenue Reserve: New South Head Road, Dover Road, Old South Head Road, Oceanview Avenue, Military Road, Eastern Avenue
- To/from drill site at Carlisle Street: New South Head Road, Dover Road, Carlisle Street.

Key consideration needs to be given to vehicle types expected to access Parsley Bay. Horler Road is narrow with a suitable width for one way traffic flow and the provision of passing.

The horizontal alignment will also prevent larger vehicles from accessing the site via this road. The contractor will be responsible for assessing the maximum vehicle type. However an initial desktop review indicates, such vehicle type would be limited to Small Ridge Vehicle (SRV) of up to 6.4 m in length.

4.3 Construction car parking

4.3.1 Heavy Vehicles

Arrival of heavy vehicles for construction work will require coordination to minimise queuing of vehicles, notably during peak truck movement, such as the main works. Vehicles are not to double park or queue to adversely impact traffic and pedestrian thoroughfare and property access.

Although not anticipated to be required for the proposed construction works and is not proposed due to the low volume of construction vehicles, application of a Works Zone can minimise the likelihood of impacts to traffic movement on the surrounding road network in the designated queue areas.

Such traffic management should be considered if road network operation becomes restricted during constructions works.

4.3.2 Light vehicles

During the proposed works, it is expected that there would be a total construction workforce of up to 40 personnel with 15 at Parsley Bay, 15 at Eastern Avenue Reserve and 10 at Carlisle Street accessing the site daily.

Due to the constraints of the sites, it is anticipated primarily the worker vehicle parking will be within the surrounding road network, with the exception of Parsley Bay, where some parking could be made available within/adjacent to the worksite.

The designated area will need to be addressed in greater detail between the Contractor, Transport Roads and Maritime Services and the Council, prior to commencement of construction and incorporated within the detailed CTMP.

It is recommended that workers be made aware of alternative transport options and where possible encouraged to use alternate transport options such as public transport to access the site or carpool with fellow workers. Detailing the available transport and carpooling options should form part of the site induction process.

4.3.3 Parsley Bay Reserve parking area

As noted above, works within the Parsley Bay Reserve will be required to utilise some of the parking areas. Details of specific site area are not available at the time of this review, however, the extent of occupancy (land area) of the parking area should be minimised where possible. For the duration of works, the car park will be unavailable and not available for public usage for a period of approximately eight months.

4.4 Traffic Management

Public access to the sites is expected to be maintained on the surrounding road network. Vehicles will be permitted to travel past the worksite with traffic signage in accordance with a Traffic Control Plan (TCP) to be developed in accordance with Roads and Maritime *Traffic Control at Works Sites* manual (2018) and AS1742.3 – T*raffic Control for Works on Roads*..

TCPs will need to be developed as part of the detailed CTMP before the commencing of construction activity on the site.

4.5 Road closures

4.5.1 Lane closures

Lane closure (partial road closure) will be required in the following locations to allow the open trench works:

- Carlisle Street
- Oceanview Avenue.

A bi-directional operation can be maintained via the implementation of traffic controllers with two-way communication. Such implementation of traffic controllers can react to traffic demand and minimise potential queuing within the road network and provide access to/through the work areas.

Lane closure to be kept in short sections, where possible, to minimise longer travel times past the worksite

Property access must be maintained during closures.

TCPs are to be developed in accordance with Roads and Maritime *Traffic Control at Works Sites* manual (2018) and AS1742.3 – T*raffic Control for Works on Roads*.

Residential and business in the local area shall be notified on any lane closures (refer to section 4.14).

4.5.2 Full road closures

Although details of full road closure are not available at this stage, it is possible that Carlisle Street near the intersection of Fernleigh Avenue may require to be closed to provide suitable site are for plant and equipment and a safe work environment with appropriate clearances. At the end of the trenchless section at Carlisle Street there will be a pit that may impact access to adjacent residences.

It is noted that Fernleigh Avenue is one way westbound (east of Carlisle Street). Should road closure be required, residential properties along Fernleigh Avenue and Chamberlain Street, that require to travel south (typically along Carlisle Street), will temporarily be required to travel north along Chamberlain Avenue to Towns Road, before travelling along either Old or New South Head Roads.

As far as practical, works should be limited to one lane and in short sections (particularly with open trench works) in order to maintain access for residents, with traffic control in place to manage vehicle movements in one lane sections.

TCPs are to be developed in accordance with Roads and Maritime *Traffic Control at Works Sites* manual (2018) and AS1742.3 – T*raffic Control for Works on Roads*.

Residential and business in the local area shall be notified on any road closures (refer to section 4.14).

4.6 Oversize Vehicles

Section 4.2 outlines the proposed access routes for heavy vehicles. Location of key vehicle constraints include:

Horler Avenue with narrow width that is only suitable for one-way traffic flow and provision of passing.

While a desktop assessment has been carried out of the vehicle turn path (refer to Appendix D), the Constructor is to review the suitability of the maximum size vehicle that can negotiate the road network. It is anticipated that vehicle size will be limited to 6.4 m small rigid vehicle, or smaller (subject to Contractor review). Larger or oversized vehicles for the delivery of plant / equipment such as drill rig (should it be required), will need to be reviewed on an individual basis by the contractor to ensure the vehicle suitability to provide access. It should be noted (refer to section 3.4) that existing infrastructure (including property retaining wall) limits the vehicle size to traverse Horler Avenue with limited opportunities for road widening.

4.7 Pedestrian and bicycle management

This section outlines the management of impacts on pedestrians, cyclists and paths and the maximisation of their safety. The prime objectives of a pedestrian and cyclist management framework are strategical to:

- Ensure the safety and protection of pedestrians and cyclists
- Minimise disruption to pedestrian and cycle movements
- Management of pedestrian and cycle flows around the construction sites and haulage routes. This addresses all traffic control actions such as traffic control personnel, redirection of pedestrians, cyclists, signposting, line-marking, Variable Message Sign (VMS), lane closures etc.

- Identify mitigation measures to improve the efficiency for pedestrian utilisation of pathways and movements.

Site access will be restricted to authorised personnel only. It is anticipated that the pedestrian, and to a lesser extent, cyclist activity, within proximity to the site will be low due to the residential nature of the site locations.

Potential interactions between construction traffic and pedestrians and bicycle riders include:

- Impact to pedestrian and bicycle rider movements due to the movement of material to and from the site
- Increased vehicle movements may reduce safety.

Pedestrians are to be clearly directed to utilise formed paths where possible or temporary paths as a short term measure.

Clear visibility at the site egress along the road network and the pedestrian pathway is to be maintained. This can be achieved by the removal of vegetation, where required or convex mirrors upon site egress.

4.8 Works zone

Works Zone are not anticipated on the road network for the duration of works. However, such traffic management should be considered if road network operation becomes restricted during constructions works.

Works Zones, if required, are to be positioned near the worksites and can assist in short term parking of heavy vehicles during loading and unloading activity or parking for site workers.

Should a Work Zone be required, the contractor is to apply through the council for approval.

4.9 Roadwork speed zone

Temporary roadwork speed limits are one of many traffic controls that can be implemented to manage the speed of traffic approaching and passing through work sites. However, they can, over long distances, have a significant impact on road user delay.

Roadwork speed zones must be logical and credible, as well as enforceable. When considering the use of roadwork speed zones, they will:

- Only be used where they are self-enforcing or will be enforced
- Not be used alone but with other traffic control signs and devices
- Not be used in place of more effective traffic controls
- Only be used while road works are in progress or the lower speed road conditions exist.

Where works are anticipated to be contained within the boundary of the sites, with vehicle access via local roads (Horler Avenue, Dover Road) where vehicle speeds are relatively low due to the existing urban environment, no Roadwork Speed Zones are proposed adjacent to the sites.

4.10 Access to adjoining properties

Access to all adjoining properties and lots will be maintained for the duration of works. Notification and communication to affected properties during lane or road closures are to be provided as outlined in section 4.14.

4.11 Storage of materials

All construction storage containment is to be located within the designated site area. The road networks is not to be used for storage of material and equipment. Storage of materials is not to impede access on the road network with prior approval for the relevant authority. At the end of the trenchless section at Carlisle Street there will be a pit that may impact access to adjacent residences. Alternative access would need to be arranged through the construction method with communication to property owners and authorities.

4.12 Road hazards

The proposed works adjacent to the road network brings hazards to workers and the public and can impact the surrounding facilities. The CTMP should identify specific road hazards associated with the works area including but not limited to:

- Environmental:
  - fog
  - wet weather
  - frost
- Transport infrastructure:
  - bus infrastructure: Dover Rd, Intersection of Fitzwilliam Road and Parsley Road, Intersection of Military Road and Oceanview Avenue
  - bicycle facilities: Generally on-road environment
  - general traffic
  - pedestrian activity & infrastructure: Parsley Bay Reserve play equipment
- Public facilities
  - Parsley Bay Café: Horler Avenue
  - McAuley Catholic Primary School: Carlisle St
  - Ballykin Early Learning Centre – Rose Bay: Carlisle St
  - The Scots College Early Years Centre: Carlisle St
  - St Andrews Scots Presbyterian Church: Intersection of Carlisle Street and Dover Road
  - Eastern Avenue Reserve / Dover Heights: Eastern end of Eastern Avenue.

4.13 Environmental control

Notwithstanding the environmental requirements specified in other project documents, the following environmental requirements are to be adhered to:

- All vehicles transporting loose materials will have the entire load covered and / or secured to prevent any large items, excess dust or debris depositing onto the roadway during travel to and from the site with additional dust tracking control implemented, including, but not limited to, construction rumble strips / wheels wash at the site egress location.
- The lead contractors will monitor the roads leading to and from the site and take all necessary steps to rectify any road deposits caused by site vehicles, to maintain the safety of all road users.
- Vehicles operating to, from and within the site shall do so in a manner, which does not create unreasonable or unnecessary noise or vibration.
- Metal-tracked vehicles will not be permitted on paved roads.

- Public roads and access points will not be obstructed by any materials, vehicles, refuse skips or the like, under any circumstances.
- All subcontractors must be inducted by the lead contractor to encourage that all the relevant procedures are met.

4.14 Method of communicating traffic changes

Advance notification of upcoming works is paramount to safety and efficient delivery of the proposal. The following outlines communication measure to be considered in the detailed CTMP.

4.14.1 On-road communication

TCPs are to be developed in accordance with Australian Standards (AS 1742.3 – Traffic Control Devices for Works on Roads) and Roads and Maritime Traffic Control at Worksites manual to identify appropriate signage (and location) to advise motorists of upcoming changes in the road network.

Signs and Devices

Signs and other safety devices such as safety barriers, containment fences, temporary kerbing and longitudinal channelizing barricades should be provided in accordance to the Australian Standards (AS 1743.2 – Traffic Control Devices for Works on Roads) to:

- Warn, guide and instruct road users, workers and pedestrians
- Control the speed or passage of traffic within and adjacent to work areas
- Indicate the direction of alternate travel.

Other alternatives to consider include vehicle-mounted warning devices, illuminating arrow signs, and painting vehicles and machinery distinctive colours. Installations and operations of the traffic control devices must abide by the regulations in section 4 of AS 1743.2.

Variable Message Signs

The use of VMS provides benefit to the local community and visitors to convey messages of upcoming impacts to the road network as the result of construction activity. Although not anticipated for this proposal, VMS should be installed in locations and used in accordance with relevant guidelines and Australian Standard practices (AS 4852.1 and/or AS4852.2) with the necessary approvals from governing authorities

Night Works

Due to limited night work being conducted, temporary traffic route lighting through a worksite may be required to supplement existing lighting particularly on areas where the path through the site could be difficult to follow. This could include the park area in Parsley Bay Reserve.

4.14.2 Advance notification of works

Prior to the commencement of works on site, neighbouring properties must be informed by the contractor of the impacts and site contact information. Notification can be provided by various means including, but not limited to:

- Letterbox distribution
- Local newspaper
- Council website.

4.15 Monitoring of Traffic Control Plans (TCP)

During construction the contractor shall each morning, prior to commencing work, ensure all signage is erected in accordance with the TCP and is clearly visible to motorists. Each evening, upon completion of work, the contractor is to ensure signage is either covered or removed as required.

A review of the TCPs can be undertaken as required in order to determine any potential need for future amendments. Any variation to the layout of the TCP on site is to be recorded and certified by accredited Transport for NSW (TfNSW) / Roads and Maritime Services (RMS) personnel.

4.16 Work health and safety

Any workers required to undertake works or traffic control shall be suitably trained and hold the required accreditation to carry out works on-site and will also be site inducted. All traffic control personnel will be required to hold TfNSW / RMS accreditation in accordance with Section 2.4 of the Roads and Maritimes Traffic Control at Worksites manual.

4.17 Certificates and approvals

Approval is to be obtained from TfNSW / RMS, Woollahra and Waverly Councils and other relevant authorities as required. Approvals that may need to be obtained for items such as but not limited to:

- Council Road opening permits
- Road occupancy approvals/licences
- Hoarding/fencing approvals.

4.18 Staff induction

All staff and subcontractors engaged on-site will be required to undergo a site induction. The induction will outline the requirements on the CTMP including site access routes, environmental and occupational health and safety responsibilities, emergency procedures, potential carpooling opportunities, etc. Additionally, the Site Manager will discuss CTMP requirements regularly as a part of toolbox talks.

4.19 Contact for emergency services

In the event of an emergency related construction traffic incident on the public road network, it will be the responsibility of the Site Manager to ensure that emergency services are notified. The emergency services include but are not limited to:

- Fire
- Ambulance
- Police.

Phone “000” in cases of emergency. Furthermore, it is the responsibility of the Site Manager to advise the emergency services of any restriction of vehicular access to the public and private areas one week prior to its implementation.

5. Conclusion

This Construction TIA has been prepared by GHD on behalf of Sydney Water Corporation. The assessment has been undertaken to outline the potential traffic, transport and parking impacts associated with the proposed construction activity during the works on the surrounding road network.

5.1 Key findings

The key findings of this study are outlined as follows:

5.1.1 Existing conditions

- The weekday AM peak hour was observed between 6:45 am to 7:45 am
- The weekday PM peak hour was observed between 5:30 pm to 6:30 pm
- The Saturday peak hour was observed between 12:15 pm to 1:15 pm
- The SIDRA Intersection analysis indicates that the intersection of New South Head Road / Dover Road currently operates at a good level of service
- The mid-block of the road networks reviewed are currently within acceptable capacity limits
- Parking demand within Parsley Bay reserve is moderate during the weekday and high on the weekend.

5.1.2 Construction impacts

- During the proposed works, it is expected that there would be a total construction workforce of up to 40 personnel with 15 at Parsley Bay, 15 at Eastern Avenue Reserve and 10 at Carlisle Street accessing the site daily.
- The traffic generation associated with heavy vehicles has been estimated in the order of five to ten vehicles per day providing access across each construction site. Ten vehicles per day is deemed to be conservative and would provide additional coverage for other heavy vehicle movements. The vehicle movements would have the following access routes:
  - To/from the pump station at Parsley Bay: New South Head Road, Vaucluse Road, Parsley Road, Horler Avenue.
  - To/from the pump station at Eastern Avenue Reserve: New South Head Road, Dover Road, Old South Head Road, Oceanview Avenue, Military Road, Eastern Avenue.
  - To/from drill site at Carlisle Street: New South Head Road, Dover Road, Carlisle Street.
- Horler Avenue currently services low local traffic volumes as such the increase in traffic movements from the construction activity would be accommodated. Access to residents to adjoining properties would need to be maintained during the construction phase.
- Overall, such increase in traffic movements to the road network is low and would fall within typical daily fluctuations of the road network with no expected adverse impact to the operation of the road network.
- Details of site area are not available at the time of this review, however, the extent of occupancy (land area) of the parking area should be minimised where possible, including minimisation of occupancy during weekend periods.

5.1.3 Mitigation measures

- The contractor is to develop, in consultation with TfNSW / RMS and Councils, a Detailed Construction Traffic Management Plan prior to construction.
- The aim of the CTMP is to maintain the safety of all workers and road users within the vicinity site and outline mitigation measures of construction traffic impacts.
- Any adverse impact on the road network and pedestrian access during construction can be minimised with the implementation of the CTMP.
- The foreseeable impacts and site contact information will be communicated to local residents via various mediums including letterbox distribution, Council website and local newspaper.

5.2 Conclusion

Based on the assumptions and investigations undertaken by GHD and the conclusions drawn in this report, it is considered that the construction activities would not create an adverse impact on the road network. Adverse impact on the road system and pedestrian access during construction would be minimised, with the implementation of the CTMP prior to construction by the contractor.

Appendices

Appendix A – Project Extent


Scope of Works at Parsley Bay
VILLAGE HIGH ROAD
THE CRESCENT
HOPETOUN AVENUE
PARSLEY BAY BRACE
FITZWILLIAM ROAD
HORLER AVENUE
PARSLEY ROAD
Legend
Indicative construction footprint
Parsley Bay proposed pump station indicative footprint
Proposed underground wastewater pipeline (open trench construction)
Proposed underground wastewater pipeline (trenchless construction)
Cadastre
CLIFTON GARDENS
WATSONS BAY
VAUCLUSE
DIAMOND BAY
POINT PIPER
NORTH BONDI
Sydney WATER
Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase
DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020
A4
1:1,800

Legend

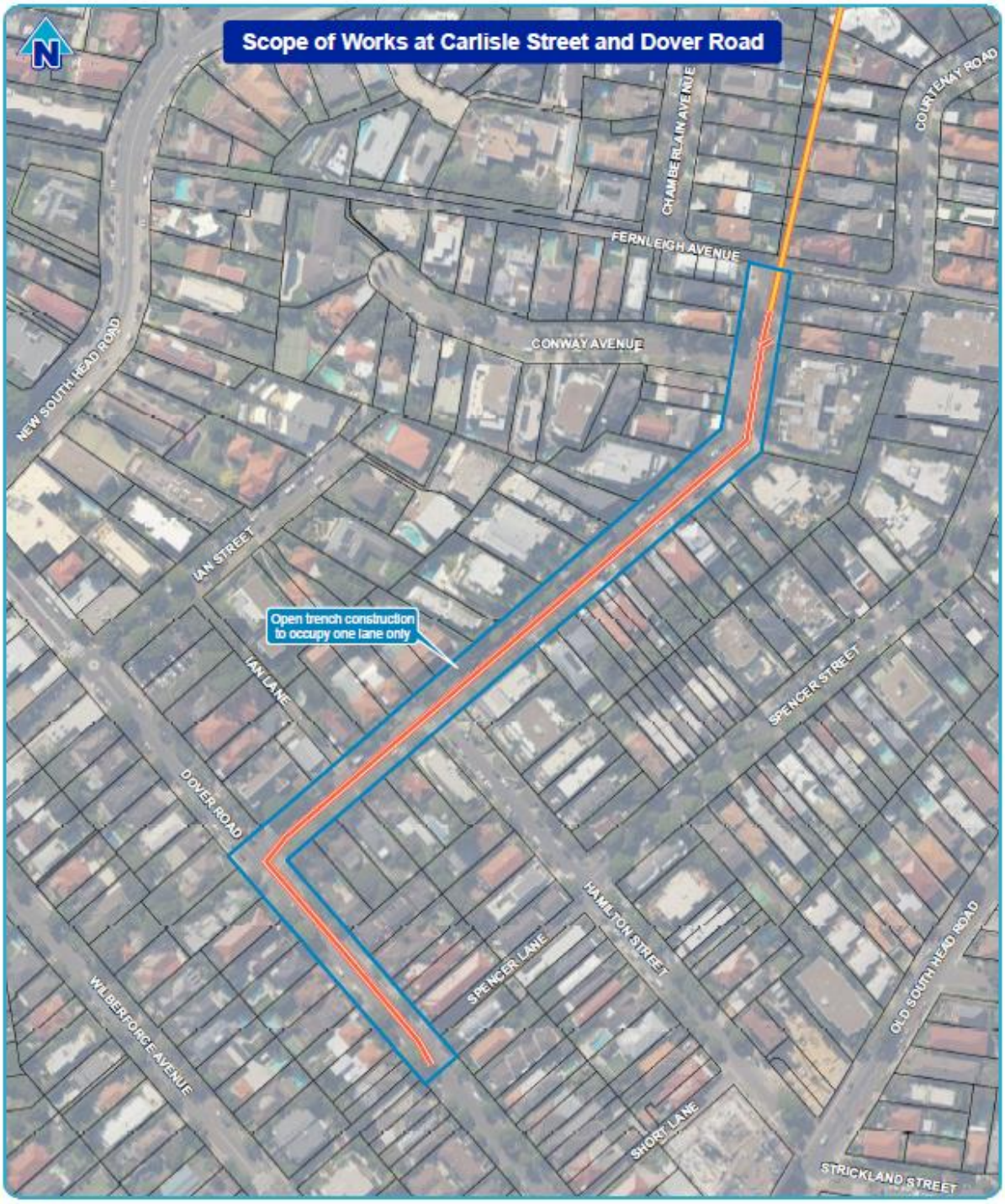
- Indicative construction footprint
- Diamond Bay proposed pump station indicative footprint
- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)
- Cadastre

Sydney WATER

Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020

A4
1:2,800



Legend

- Indicative construction footprint
- Proposed underground wastewater pipeline (open trench construction)
- Proposed underground wastewater pipeline (trenchless construction)
- Cadastre

Sydney WATER

Map is indicative and not to scale – proposed locations are subject to change during the detailed design phase

DATA SOURCES:
NSW LPI DTDB/DCDC 2018
SIXMAPS 2020
SYDNEY WATER 2020

A4
1:2,500

Appendix B – SIDRA Results

MOVEMENT SUMMARY

Site: TCS0619 [2019_AM_BASE_NEW SOUTH HEAD RD & DOVER RD]

New Site
Site Category: BASE_AM
Signals - Fixed Time Coordinated Cycle Time = 50 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Dover Rd												
1	L2	247	6.8	0.281	15.9	LOS B	3.5	25.8	0.71	0.73	0.71	15.6
3	R2	36	14.7	0.281	27.0	LOS B	1.5	11.6	0.93	0.74	0.93	30.9
Approach		283	7.8	0.281	17.3	LOS B	3.5	25.8	0.73	0.74	0.73	18.9
NorthEast: New South Head Road												
4	L2	40	10.5	0.137	19.9	LOS B	1.3	9.6	0.76	0.67	0.76	37.2
5	T1	771	4.4	0.683	18.0	LOS B	8.9	63.8	0.92	0.83	1.00	38.1
Approach		811	4.7	0.683	18.1	LOS B	8.9	63.8	0.92	0.82	0.98	38.1
SouthWest: New South Head Road												
11	T1	772	9.7	0.481	0.9	LOS A	2.3	17.1	0.12	0.13	0.12	57.7
12	R2	176	9.6	0.481	8.3	LOS A	2.3	17.1	0.56	0.62	0.56	28.6
Approach		947	9.7	0.481	2.3	LOS A	2.3	17.1	0.20	0.22	0.20	54.4
All Vehicles		2041	7.4	0.683	10.6	LOS A	8.9	63.8	0.56	0.53	0.59	41.3

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.
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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P2	NorthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P4	SouthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		158	19.4	LOS B			0.88	0.88

MOVEMENT SUMMARY

Site: TCS0619 [2019_PM_BASE_NEW SOUTH HEAD RD & DOVER RD]

New Site
Site Category: BASE_AM
Signals - Fixed Time Coordinated Cycle Time = 50 seconds (Site Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: Dover Rd												
1	L2	214	0.5	0.231	12.3	LOS A	3.0	21.0	0.60	0.71	0.60	21.5
3	R2	57	9.3	0.330	29.5	LOS C	1.4	10.7	0.97	0.74	0.97	30.2
Approach		271	2.3	0.330	15.9	LOS B	3.0	21.0	0.68	0.72	0.68	25.1
NorthEast: New South Head Road												
4	L2	86	2.4	0.220	23.6	LOS B	1.8	12.9	0.86	0.75	0.86	33.3
5	T1	645	2.8	0.735	21.7	LOS B	8.4	59.6	0.97	0.90	1.14	35.5
Approach		732	2.7	0.735	21.9	LOS B	8.4	59.6	0.96	0.88	1.11	35.2
SouthWest: New South Head Road												
11	T1	914	1.3	0.578	0.7	LOS A	3.4	24.0	0.10	0.10	0.10	58.2
12	R2	313	1.3	0.578	8.5	LOS A	3.4	24.0	0.61	0.69	0.61	27.6
Approach		1226	1.3	0.578	2.7	LOS A	3.4	24.0	0.23	0.25	0.23	53.0
All Vehicles		2228	1.9	0.735	10.6	LOS A	8.4	59.6	0.52	0.52	0.57	41.7

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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	SouthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P2	NorthEast Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
P4	SouthWest Full Crossing	53	19.4	LOS B	0.1	0.1	0.88	0.88
All Pedestrians		158	19.4	LOS B			0.88	0.88

MOVEMENT SUMMARY

Site: TCS0619 [2019_SAT_BASE_NEW SOUTH HEAD RD & DOVER RD]

New Site
Site Category: BASE_AM
Signals - Fixed Time Coordinated Cycle Time = 60 seconds (Site Practical 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: Dover Rd												
1	L2	264	1.6	0.308	15.4	LOS B	4.9	34.5	0.66	0.74	0.66	19.0
3	R2	65	3.2	0.363	34.0	LOS C	1.9	13.9	0.97	0.75	0.97	28.2
Approach		329	1.9	0.363	19.1	LOS B	4.9	34.5	0.72	0.74	0.72	22.5
NorthEast: New South Head Road												
4	L2	106	2.0	0.209	23.7	LOS B	2.4	17.3	0.80	0.75	0.80	33.3
5	T1	802	3.0	0.716	21.2	LOS B	11.9	84.4	0.93	0.84	1.01	35.9
Approach		908	2.9	0.716	21.5	LOS B	11.9	84.4	0.91	0.83	0.98	35.5
SouthWest: New South Head Road												
11	T1	964	1.7	0.537	1.1	LOS A	3.1	21.9	0.13	0.14	0.13	57.3
12	R2	199	1.1	0.537	8.7	LOS A	3.1	21.9	0.56	0.61	0.56	28.8
Approach		1163	1.6	0.537	2.4	LOS A	3.1	21.9	0.21	0.22	0.21	54.4
All Vehicles		2401	2.1	0.716	11.9	LOS A	11.9	84.4	0.54	0.52	0.57	40.9

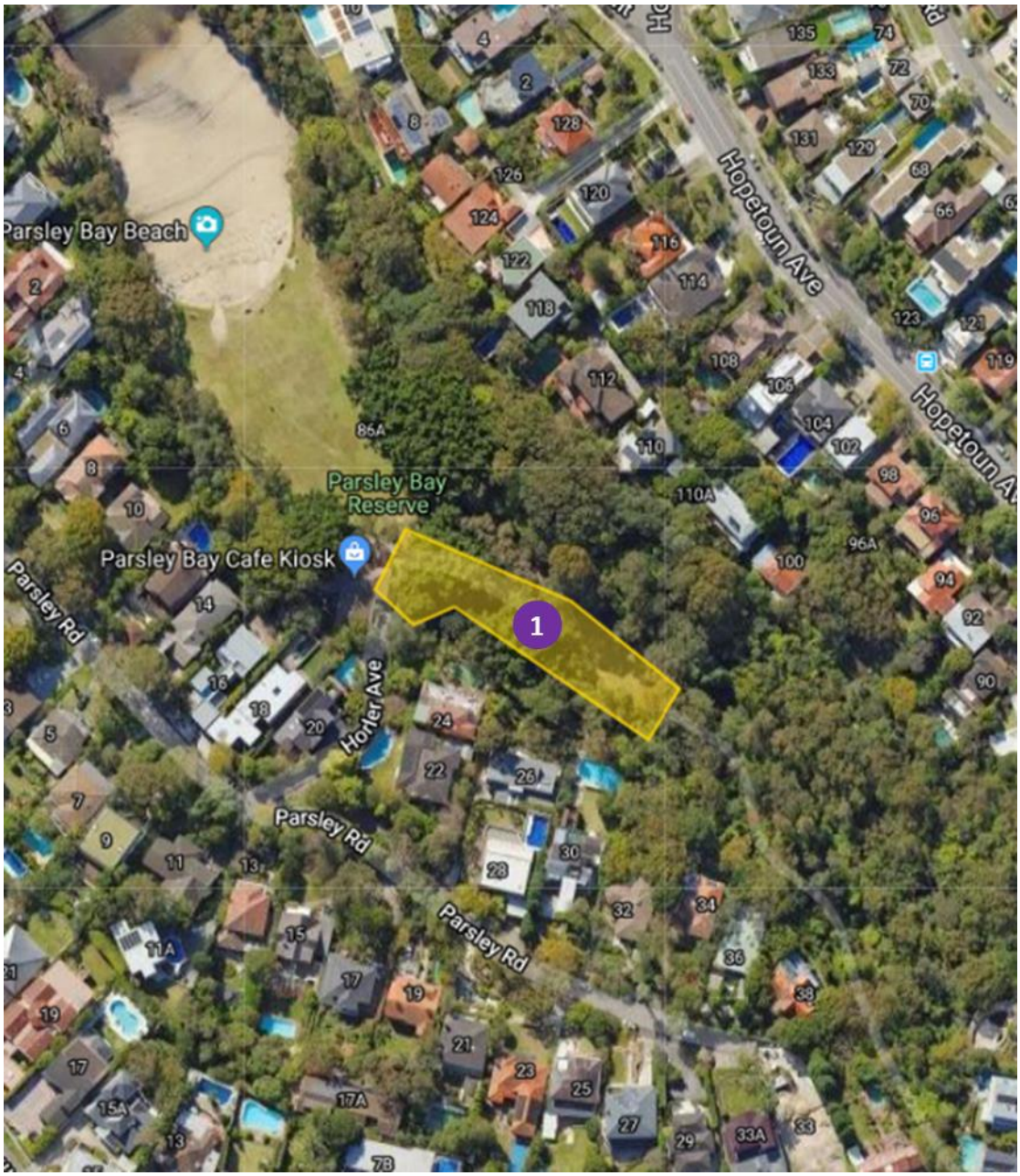
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard 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 Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	SouthEast Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P2	NorthEast Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
P4	SouthWest Full Crossing	53	24.4	LOS C	0.1	0.1	0.90	0.90
All Pedestrians		158	24.4	LOS C			0.90	0.90

Appendix C – Parking Survey Results

Survey Area: Parsley Bay Reserve



Client	GHD
Location	1. Paisley Bay Reserve
Date	Wed, 11th December 2019 (8:00-18:00)
Description	Eastern Suburbes Parking Survey

MATRIX Traffic and Transport Data

Side of the Street	Parking Restriction	Time Restrictions	Availble Spaces	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
1. Paisley Bay Reserve_North Side													
Horler Ave													
Darking area locked at 6pm 8pm day light saving time $50 late gate opening fee	No Parking												
	No Restriction	90' Angle Parking	6	3	5	6	6	6	5	5	3	6	4
	Disabled	90' Angle Parking	1	0	0	0	0	0	0	0	0	0	0
	No Restriction	90' Angle Parking	12	0	1	8	6	5	5	3	1	5	3
	No Parking												
Total			**19**	**3**	**6**	**14**	**12**	**11**	**10**	**8**	**4**	**11**	**7**
% Capacity				**16%**	**32%**	**74%**	**63%**	**58%**	**53%**	**42%**	**21%**	**58%**	**37%**

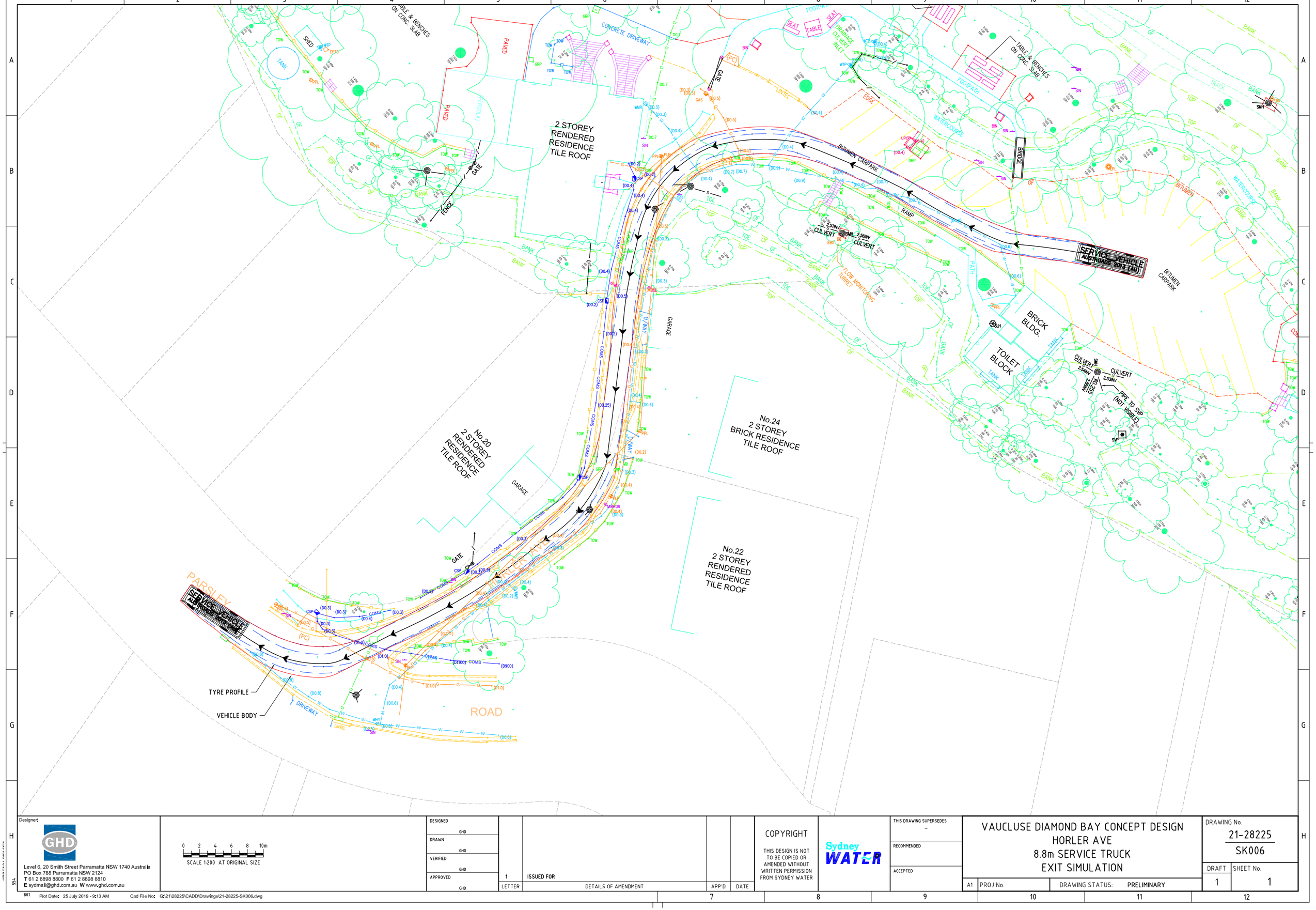
Side of the Street	Parking Restriction	Time Restrictions	Availble Spaces	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
1. Paisley Bay Reserve_South Side													
Horler Ave													
	No Restriction	90' Angle Parking	8	0	0	2	3	3	1	0	0	0	1
	No Parking												
Total			**8**	**0**	**0**	**2**	**3**	**3**	**1**	**0**	**0**	**0**	**1**
% Capacity				**0%**	**0%**	**25%**	**38%**	**38%**	**13%**	**0%**	**0%**	**0%**	**13%**

Client	GHD
Location	1. Paisley Bay Reserve
Date	Sat, 14th December 2019 (8:00-18:00)
Description	Eastern Suburbes Parking Survey

Side of the Street	Parking Restriction	Time Restrictions	Available Spaces	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
1. Paisley Bay Reserve_North Side													
Horler Ave													
Darking area locked at 6pm 8pm day light saving time $50 late gate opening fee	No Parking												
	No Restriction	90' Angle Parking	6	4	4	6	6	6	6	6	6	6	6
	Disabled	90' Angle Parking	1	0	0	0	0	1	0	1	1	1	1
	No Restriction	90' Angle Parking	12	1	3	12	12	12	12	12	12	12	12
	No Parking						2	2	2	2	2	2	2
Total			**19**	**5**	**7**	**18**	**20**	**21**	**20**	**21**	**21**	**21**	**21**
% Capacity				**26%**	**37%**	**95%**	**105%**	**111%**	**105%**	**111%**	**111%**	**111%**	**111%**

Side of the Street	Parking Restriction	Time Restrictions	Available Spaces	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00
1. Paisley Bay Reserve_South Side													
Horler Ave													
	No Restriction	90' Angle Parking	8	0	0	8	8	8	8	8	8	8	8
	No Parking												
Total			**8**	**0**	**0**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**8**
% Capacity				**0%**	**0%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Appendix D – Horler Avenue Turning Path Plan



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0 2 4 6 8 10m
SCALE 1:200 AT ORIGINAL SIZE

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DRAWN	GHD
VERIFIED	GHD
APPROVED	GHD

LETTER	DETAILS OF AMENDMENT	APP'D	DATE
1	ISSUED FOR		

Sydney WATER

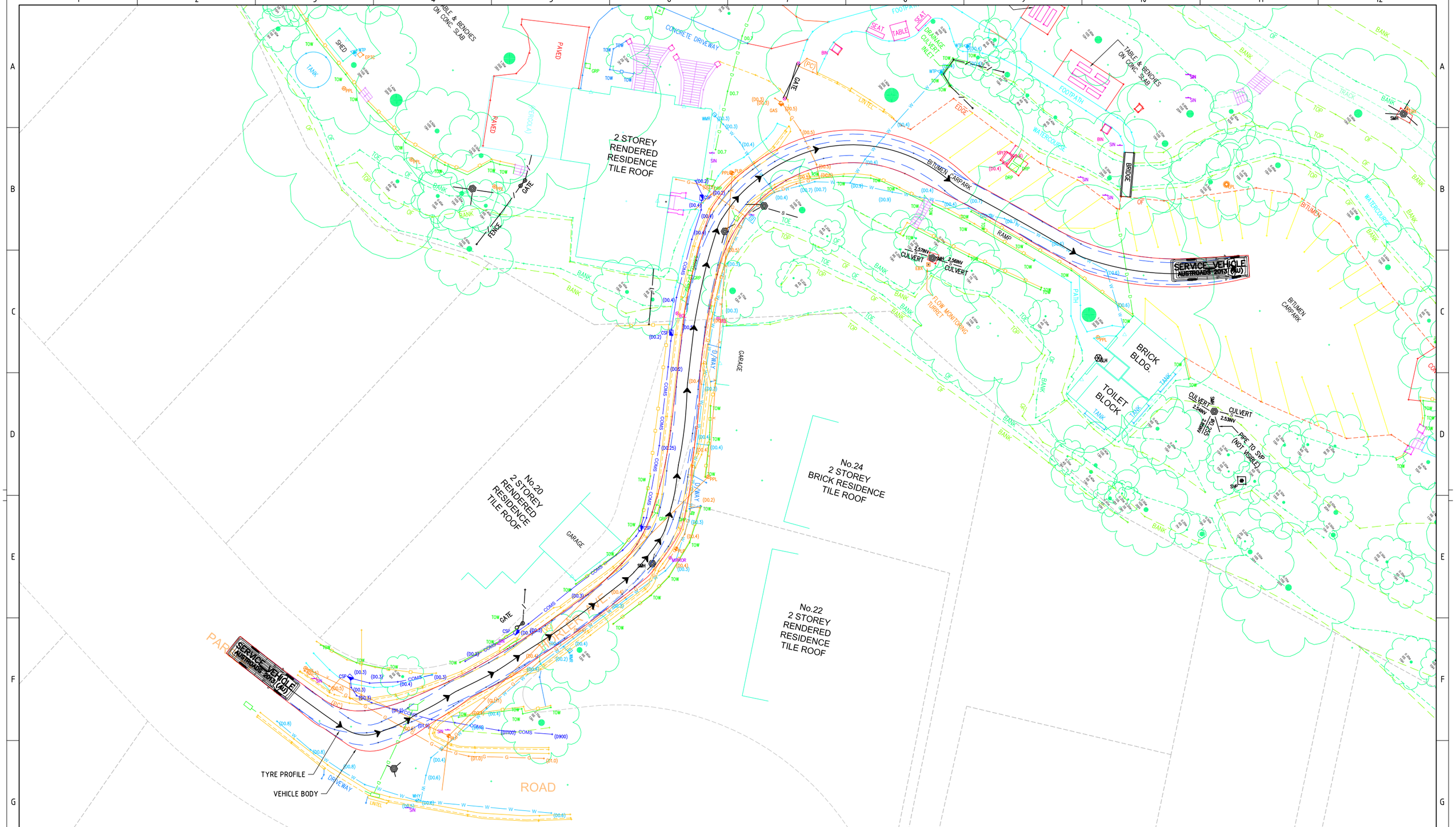
THIS DRAWING SUPERSEDES -
RECOMMENDED
ACCEPTED

VAUCLUSE DIAMOND BAY CONCEPT DESIGN
HORLER AVE
8.8m SERVICE TRUCK EXIT SIMULATION

A1 | PROJ No. | DRAWING STATUS: PRELIMINARY

DRAWING No. 21-28225 / SK006
DRAFT 1 | SHEET No. 1

801 Plot Date: 25 July 2019 - 9:13 AM Cad File No: G:\21\28225\CADD\Drawings\21-28225-SK006.dwg



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SCALE 1:200 AT ORIGINAL SIZE

DESIGNED	GHD
DRAWN	GHD
VERIFIED	GHD
APPROVED	GHD

LETTER	DETAILS OF AMENDMENT	APP'D	DATE
1	ISSUED FOR		

Sydney WATER

THIS DRAWING SUPERSEDES –

RECOMMENDED

ACCEPTED

VAUCLUSE DIAMOND BAY CONCEPT DESIGN
HORLER AVE
8.8m SERVICE TRUCK ENTRY SIMULATION

A1 | PROJ No. | DRAWING STATUS: PRELIMINARY

DRAWING No. 21-28225 / SK005

DRAFT 1 | SHEET No. 1

801 Plot Date: 25 July 2019 - 9:10 AM Cad File No: G:\21\28225\CADD\Drawings\21-28225-SK005.dwg

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2128225-91740/https://projects.ghd.com/oc/sydney2/vauclusediamonbaycon/Delivery/Documents/2128225_REP_Vaucluse Diamond Bay_Construction Traffic Impact Assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	M. Tran	S. Clarke	On file	A Chitty	On file	09/03/2020
1	M. Tran	S. Clarke		A. Chitty	On file	03/04/2020

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