



TRAFFIC & PARKING IMPACT ASSESSMENT

Construction of a new arm to an existing marina to create 40 additional berths

Quays Marina

1856 Pittwater Road



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1 INTRODUCTION

1.1 BACKGROUND

Quays Marina have engaged Traffic & Safety Solutions to prepare a Traffic and Parking Impact Assessment to accompany a development application to the Department of Planning Housing and Infrastructure (**DPHI**) for the proposed additions and alterations to the existing marina located at 1856 Pittwater Road, Church Point, NSW 2105.

The existing marina has a capacity of 110 wet berths and 69 swing moorings and also contains the following ancillary uses:

- Marina Cafe: 171 square metres and operates Monday to Sunday from 8am to 3pm and also on Friday & Saturday from 5pm to 9pm.
- Commercial Office 1 occupied by TfNSW: 32 square meters and operates Monday to Saturday from 8AM to 4PM.
- Commercial Office 2 occupied by Pacific Boating: 58 square metres and operates Monday to Sunday from 8am to 5pm.
- Commercial Office 3 occupied by Riviera: 42 square meters and operates with Monday to Saturday from 8am to 5pm.
- Commercial Office occupied by Eyachts: 80 square meters and operates Monday to Friday from 8am to 4pm.

The development proposes to increase the number of wet berths to 150 and reduce the number of swing moorings to 29 and therefore the overall capacity of the marina will remain the same. No changes are proposed to the existing ancillary uses.

1.2 REPORT PURPOSE

This report sets out an assessment of the traffic and parking impact of the proposed development, to address the key traffic and transport issues in the Planning Secretary's Environmental Assessment Requirements (**SEARS**):

- details of the existing and proposed parking arrangements (including bicycle and public transport access), in accordance with the relevant guidelines and/or Australian Standards,
- road traffic predictions for the development during construction and operation, including cumulative impacts, and
- details of road transport routes and access to the site.

In addition to the above the following Council assessment requirements relating to Traffic and transport are noted:

- Detailed parking analysis. Note that parking issues were a key concern in previous refusal of DA1987/0497 in previous development application to expand the marina.
- Parking management, including bicycle and public transport access.
- Details of road transport routes and access to the site
- Road traffic predictions for the development during construction and operation, including cumulative impacts.
- Pittwater road access safety and functionality for the additional traffic and patronage to the site.

To address the requirements of the SEARS and Northern Beaches Council this report provides:

- a description and analysis of the existing road network and traffic conditions.
- a description of the proposed development.
- an assessment of the on-site car parking supply.
- a parking survey conducted on:
 - Friday 30th August 2024,
 - Saturday 31st August 2024, and
 - Sunday 1st September.
- an assessment of the traffic generated by the proposed development including SIDRA traffic modelling.
- pedestrian and cyclist access.
- details regarding access to public transport.

1.3 REPORT REFERENCES

This report has been based upon the following reference sources:

- Proposed architectural plans prepared by Bellingham Marine,
- Australian Standard AS 3962:2020 (Marina Design),
- Pittwater Local Environmental Plan 2014 (LEP),
- Pittwater 21 Development Control Plan (DCP),
- RTA Guide to Traffic Generating Developments (2002), and
- Trip Generation, Parking Demand and Vessel Movement Surveys of Marinas (2020) prepared by TPP for TfNSW.

2 EXISTING CONDITIONS

2.1 SITE DESCRIPTION

The subject site is located at 1856 Pittwater Road, Church Point, NSW 2105 and is legally defined as Lot 329 in DP 46686.

The Quays Marina is located on this site as shown in figure 2.1 below.

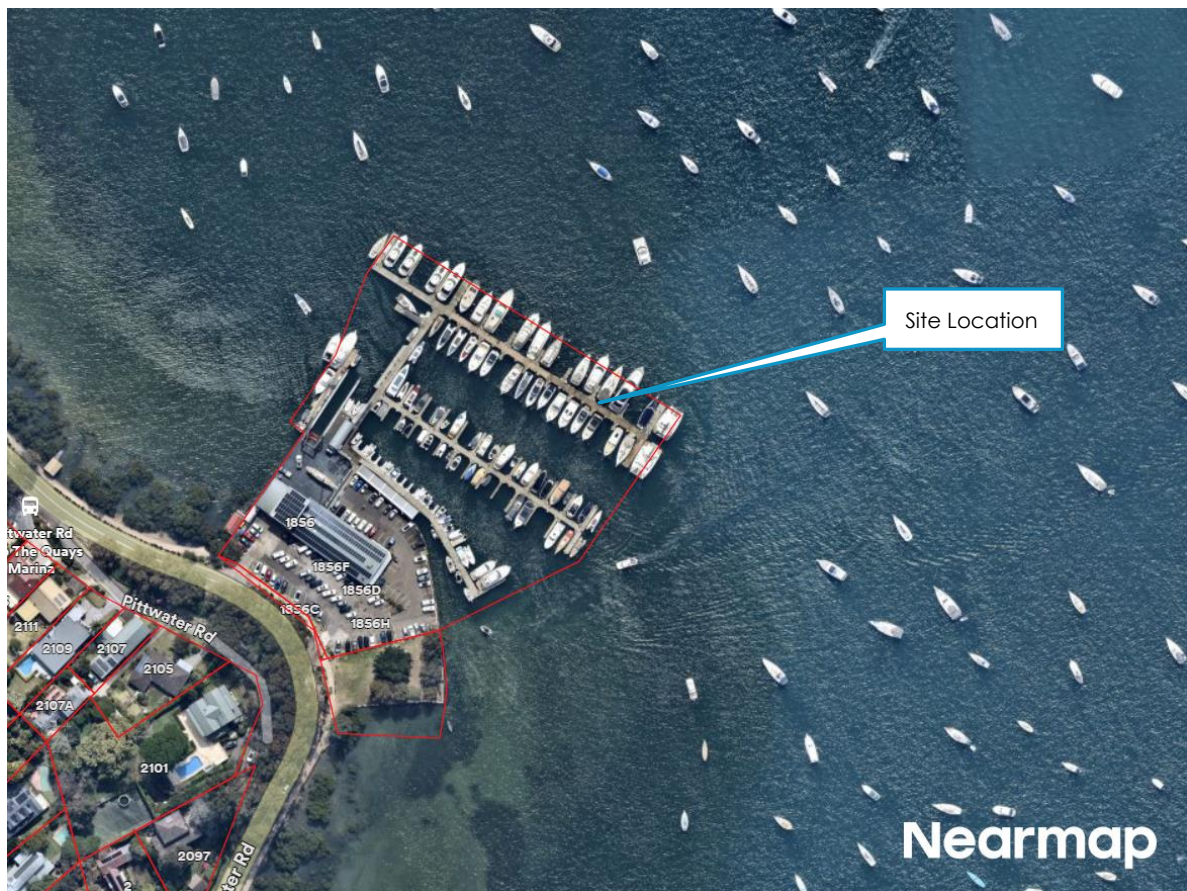


FIGURE 2.1: AERIAL PHOTOGRAPH 1856 PITTWATER ROAD, CHURCH POINT
SOURCE: NEARMAP PHOTOGRAPH DATE 22/9/2024

2.2 LAND USE

The site is zoned W2 Recreational Waterways and W4 Working Waterfront E1 Local Centre in the LEP and the surrounding land use includes:

- low density residential land uses to the west,
- recreational land uses immediately along the foreshore and
- working waterfront land uses along the foreshore.

The aerial photograph provided in figure 2.2 provides a view of the land uses surrounding the site.



FIGURE 2.2: SITE AERIAL MAP – 1856 PITTWATER ROAD, CHURCH POINT
SOURCE: NEARMAP PHOTOGRAPH DATE 22/9/2024

2.3 ROAD NETWORK

The locality map shown in figure 2.3 shows the site in relation to the surrounding road network.

The description of the road network in the immediate vicinity of the site is provided in table 2.1.

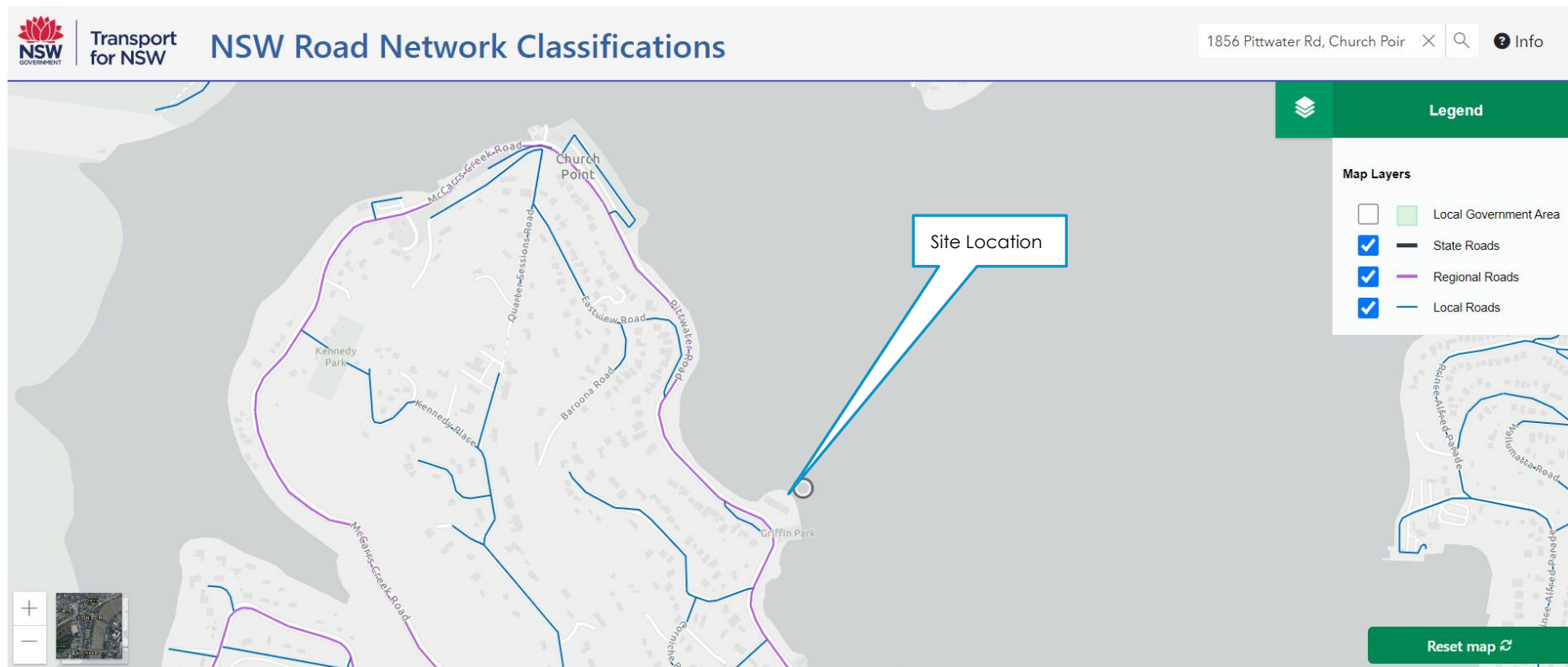


FIGURE 2.3: ROAD CLASSIFICATION MAP

SOURCE: [HTTPS://MAPS.TRANSPORT.NSW.GOV.AU/GEOMAPS/ROAD-NETWORK-CLASSIFICATION/](https://maps.transport.nsw.gov.au/geomaps/road-network-classification/)

Road Name	Road Classification	Roads Authority	Description	Kerbside restrictions	Intersections nearby	Speed Limit	Bus Route
Pittwater Road	Classified regional road – main road 2110	Northern Beaches Council	Approximately 6.5m wide undivided road for two-way traffic. Provides collector road function along the Pittwater foreshore between Barrenjoey Road in the south east and McCarrs Creek Road in the north west	No Stopping restrictions	Forms the major road with priority give way controls at T intersections with all intersecting roads in the immediate vicinity of the site.	60km/h	Yes
Barrenjoey Road	Classified state road	TfNSW	Approximately 27.5m wide divided road for two-way traffic. Major state road.	Parking permitted in some sections	Traffic signals with Pittwater Road.	60km/h	Yes
McCarrs Creek Road	Classified regional road	Northern Beaches Council	Approximately 6.5m wide undivided road for two-way traffic. Provides collector road	No Stopping restrictions	Continuation of main road 2110	60km/h	Yes

TABLE 2.1: ROAD NETWORK DESCRIPTION

2.4 CRASH HISTORY

The 5-year finalised crash data between 2019 and 2023 as shown in figure 2.4, has been reviewed and indicates that there have been no crashes in this section of Pittwater Road.

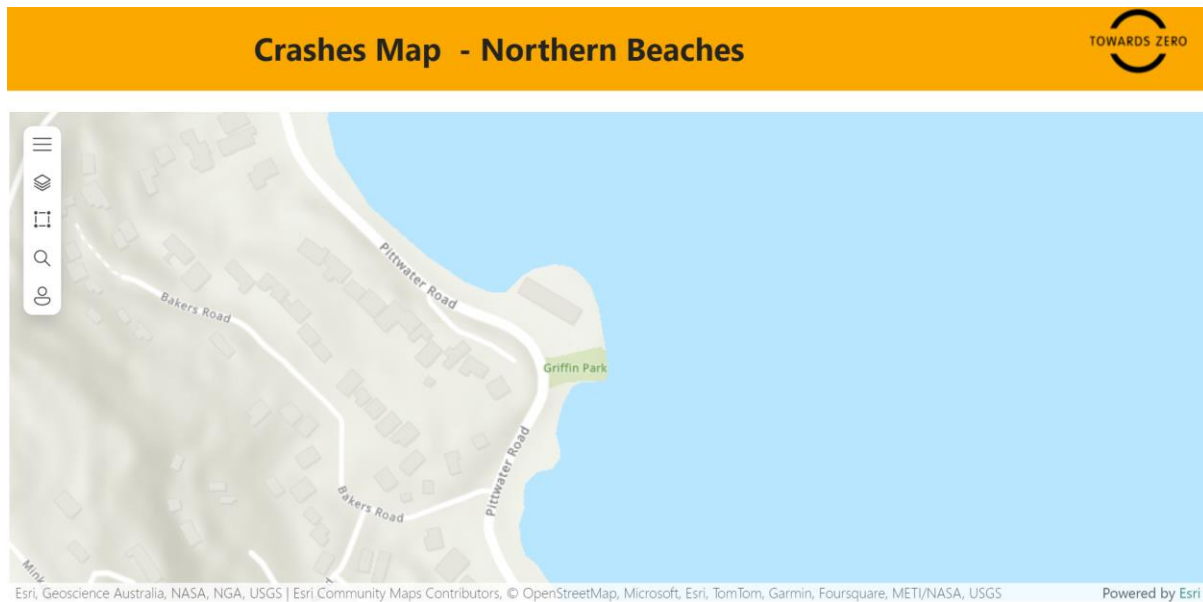


FIGURE 2.4: CRASH MAP IN THE VICINITY OF 1856 PITWATER ROAD, CHURCH POINT
SOURCE: TFNSW

2.5 VEHICULAR ACCESS

Vehicular access to the site and car park is provided via a separate entry driveway located on the north western side of the site and a separate exit driveway located in the south eastern side of the site as shown in figures 2.5 and 2.6.

The characteristics of the driveways are provided in table 2.2.

Driveway	Width	Comments
1	6.3m	Provides one-way entry to the at grade car park.
2	4.5m	Provides one-way exit from the at grade car park.

TABLE 2.2: VEHICULAR ACCESS DRIVEWAYS



FIGURE 2.5: DRIVEWAY 1 – ENTRY TO CAR PARK
SOURCE: TSS SITE INSPECTION PHOTOGRAPH DATE 13 AUGUST 2024



FIGURE 2.6: DRIVEWAY 2 – EXIT FROM CAR PARK
SOURCE: TSS SITE INSPECTION PHOTOGRAPH DATE 13 AUGUST 2024

2.6 PEDESTRIANS AND CYCLISTS

Pedestrian access to the site is provided via the existing footpath along the Pittwater foreshore and is not impacted by the development. During the parking survey it was observed that the footpath is popular and regularly used by all ages and used by locals accessing the existing Marina café.

Pittwater Road is a very popular on road cycle route. Although dedicated bicycle lanes are not provided, bicycle pavement markings are provided in the centre of the traffic lanes to alert drivers to the presence of cyclists.

During the traffic counts undertaken, a large volume of cyclists was observed to be cycling along Pittwater Road on Saturday and Sunday.

2.7 PUBLIC TRANSPORT

The site is serviced by the 156-bus route that operates between Mona Vale and McCarrs Creek. The bus route map is provided in figure 2.7.

Bus stops are located 100m of the site for inbound services (bus stop ID 210512) and 270m for outbound services (bus stop ID 210538).

Whilst it is acknowledged that most people that have boats moored at the marina would use private vehicles to access the marina, the close proximity of bus stops does provide options for employees of the marina and for construction workers when construction commences.

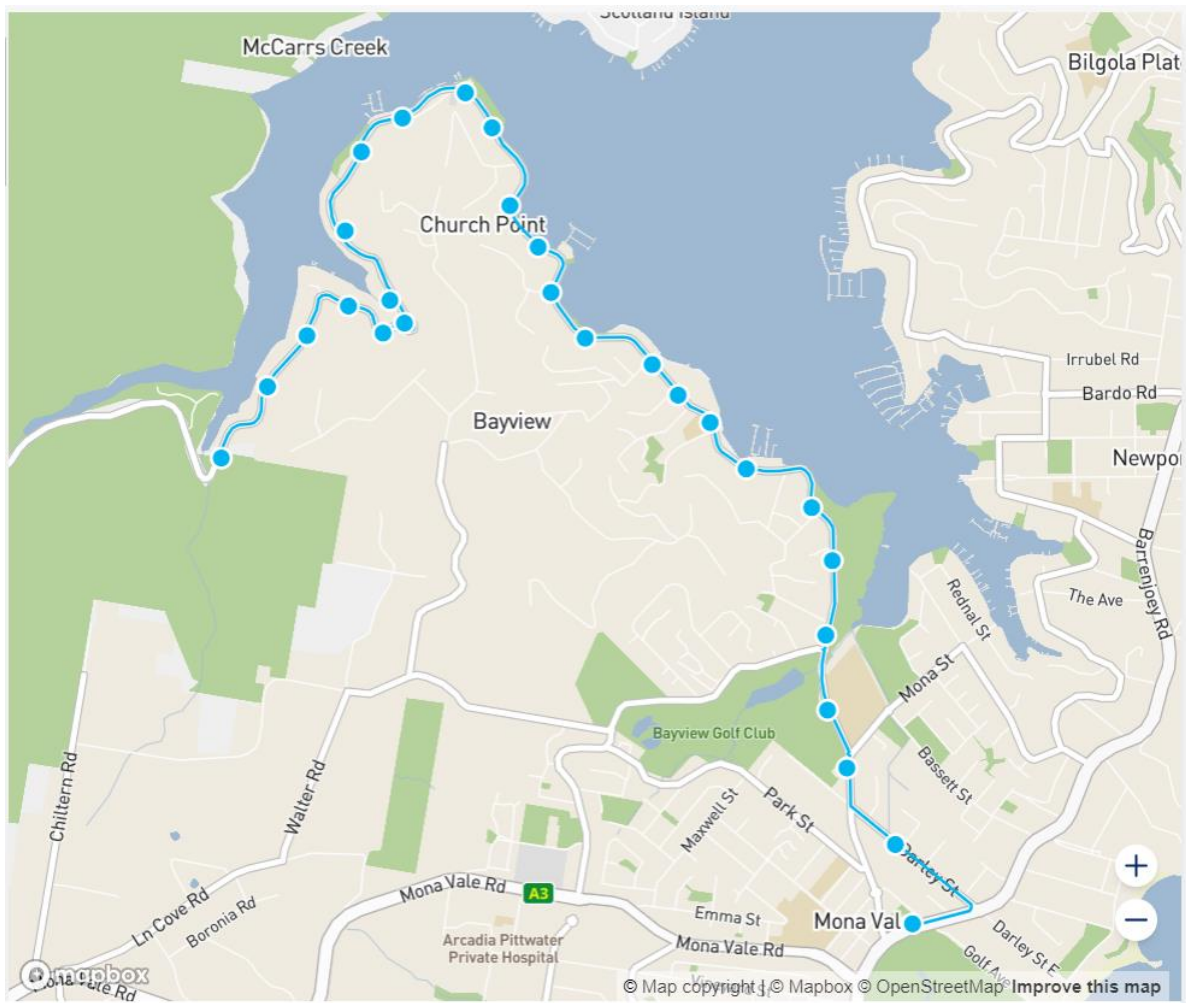


FIGURE 2.7: 156 BUS ROUTE MAP

SOURCE: [HTTPS://TRANSPORTNSW.INFO/ROUTES/DETAILS/SYDNEY-BUSES-NETWORK/156/29156?DATE=2024-10-13](https://TRANSPORTNSW.INFO/ROUTES/DETAILS/SYDNEY-BUSES-NETWORK/156/29156?DATE=2024-10-13)

3 PROPOSED DEVELOPMENT

3.1 DEVELOPMENT DESCRIPTION

The development proposes to increase the number of wet berths to 150 and reduce the number of swing moorings to 29 and therefore the overall capacity of the marina will remain the same.

No changes are proposed to the existing ancillary uses

An extract from the architectural plans showing the proposed development is shown in figure 3.1 below.

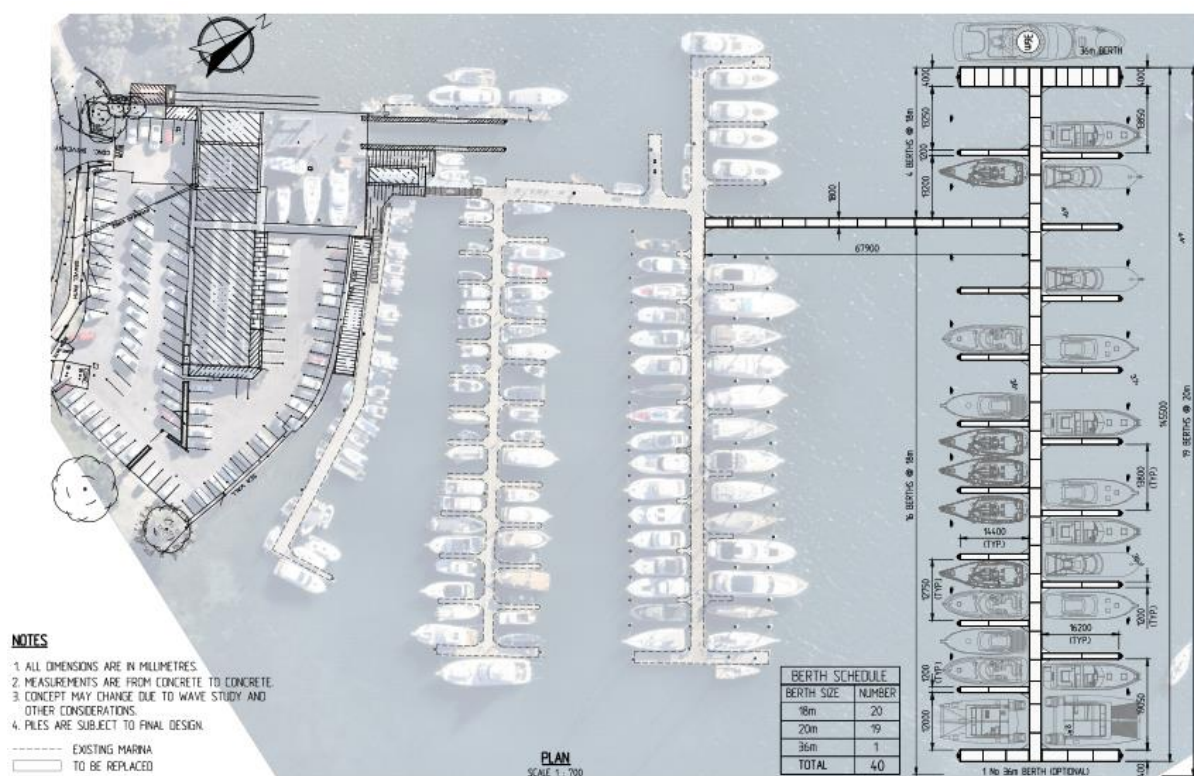


FIGURE 3.1: PROPOSED DEVELOPMENT
SOURCE: BELLINGHAM MARINE

3.2 VEHICULAR ACCESS

The existing separate one-way entry driveway and one-way exit driveway that provides access to the at grade car park will not be changed as part the proposed development.

3.3 CAR PARKING

The existing car parking arrangement and quantum that was approved through a previous DA, N1182/99 will not be changed with the proposed development. The car park was approved for 107 car parking spaces.

On site inspections show that the existing car park provides a total of 107 parking spaces on site in total including 4 car parking spaces that provide access to electric vehicle charging facilities.

4 TRAFFIC & PARKING IMPACT ASSESSMENT

4.1 TRAFFIC GENERATION

Whilst the RTA *Guide to Traffic Generating Developments* provides daily trip rates for marina developments, AM and PM peak trips rates are not provided.

To determine the AM and PM peak hour traffic generation of the site, traffic counts were undertaken at the entry and exit driveways on:

- Friday 30th August 2024,
- Saturday 31st August 2024, and
- Sunday 1st September.

The AM and PM peak hour periods for each of the surveyed days are provided in table 4.1. Traffic count data is provided in Appendix B.

Date	AM Peak Hour	PM Peak Hour
30/8/2024	9:15 to 10:15	14:30 to 15:30
31/8/2024	9:45 to 10:45	15:45 to 16:45
1/9/2024	9:45 to 10:45	15:15 to 16:15

TABLE 4.1: EXISTING DEVELOPMENT PEAK HOURS

The peak hour traffic generation for each of the survey days is summarised in table 4.2.

Date	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
30/8/2024	35	26	61	14	30	44
31/8/2024	38	22	60	11	21	32
1/9/2024	34	31	65	11	39	50

TABLE 4.2: EXISTING DEVELOPMENT PEAK HOUR TRAFFIC GENERATION

The traffic generation shown in table 4.2 represents the total traffic generation for the existing development which includes the existing wet berth and swing moorings, and the ancillary uses such as the café and commercial offices. A summary of each land use component for the existing marina and is provided in table 4.3.

Marina Land Use Component	Total or Area	Staff Number
Wet berths	110	
Swing Moorings	69	
Marina Cafe	171m ²	
Commercial Office 1 occupied by TfNSW	32m ²	2
Commercial Office 2 occupied by Pacific Boating	58m ²	2
Commercial Office 3 occupied by Riviera	42m ²	2
Commercial Office 4 occupied by Eyachts	80m ²	4

TABLE 4.3: EXISTING MARINA LAND USE COMPONENTS

To determine the traffic generation for each land use component, the following assumptions have been considered:

- Trip rates published in the *RTA Guide to Traffic Generating Developments (2002)* for the café component based on the gross floor area,
- A first principles approach to calculating the traffic generation of the commercial offices based on the number of staff per office on each day. The reason for this is that if the traffic generation is calculated on the gross floor area, it would result in a lower traffic generation for the commercial component than actually occurs.
- The operating hours of the café and commercial office are as follows:
- Marina Cafe: Monday to Sunday 8am to 3pm and Friday & Saturday 5pm to 9pm.
- TfNSW: Monday to Sunday 8am to 4pm.
- Pacific Boating: Monday to Sunday 8am to 5pm.
- Riviera: Monday to Saturday 8am to 5pm.
- Eyachts: Monday to Friday 8am to 4pm.

Using the assumptions above and the peak hour survey results the traffic generation of the existing marina, the AM and PM peak trip rates per vessel has been calculated for each of the surveyed days.

Friday Traffic Generation								
Marina Land Use Component	Number or Staff	GFA (m2)	AM Trip Rate	PM Trip Rate	Existing Marina			
					AM Peak		PM Peak	
					In	Out	In	Out
Number of Vessels	179		0.24	0.23	26	17	14	28
Marina Café		171	5 trips per 100m2	5 trips per 100m2	9	9	0	0
Commercial Office 1	2	32	Staff numbers	Staff numbers	0	0	0	2
Commercial Office 2	2	58	Staff numbers	Staff numbers	0	0	0	0
Commercial Office 3	2	42	Staff numbers	Staff numbers	0	0	0	0
Commercial Office 4	4	80	Staff numbers	Staff numbers	0	0	0	0
Total					35	26	14	30

TABLE 4.4: FRIDAY TRIP GENERATION

Saturday Traffic Generation								
Marina Land Use Component	Number or Staff	GFA (m2)	AM Trip Rate	PM Trip Rate	Existing Marina			
					AM Peak		PM Peak	
					In	Out	In	Out
Number of Vessels	179		0.23	0.17	29	13	11	19
Marina Café		171	5 trips per 100m2	5 trips per 100m2	9	9	0	0
Commercial Office 1	2	32	Staff numbers	Staff numbers	0	0	0	2
Commercial Office 2	2	58	Staff numbers	Staff numbers	0	0	0	0
Commercial Office 3	2	42	Staff numbers	Staff numbers	0	0	0	0
Commercial Office 4	4	80	Staff numbers	Staff numbers	0	0	0	0
Total					38	22	11	21

TABLE 4.5: SATURDAY TRIP GENERATION

Sunday Traffic Generation								
Marina Land Use Component	Number or Staff	GFA (m2)	AM Trip Rate	PM Trip Rate	Existing Marina			
					AM Peak		PM Peak	
					In	Out	In	Out
Number of Vessels	179		0.26	0.26	25	22	11	35
Marina Café		171	5 trips per 100m2	5 trips per 100m2	9	9	0	0
Commercial Office 1	2	32	Staff numbers	Staff numbers	0	0	0	2
Commercial Office 2	2	58	Staff numbers	Staff numbers	0	0	0	2
Commercial Office 3	2	42	Staff numbers	Staff numbers	0	0	0	0
Commercial Office 4	4	80	Staff numbers	Staff numbers	0	0	0	0
Total					34	31	11	39

TABLE 4.6: SUNDAY TRIP GENERATION

The calculated trip rates per vessel are slightly higher but align with the trip rates published in the *Trip Generation, Parking Demand and Vessel Movement Surveys of Marinas (2020)*.

As the proposed development does not increase the total number of vessels the traffic generation of the site pre and post development will remain the same.

4.2 TRAFFIC IMPACT ASSESSMENT

SIDRA 9.1 is a traffic modelling program that is used to determine intersection performance and provides a number of performance measures. The most useful measure provided is average delay per vehicle expressed in seconds per vehicle. Based on average delay per vehicle, SIDRA estimates the levels of service (LOS) and degree of saturation (DOS) for an intersection.

For priority-controlled intersections the average delay per vehicle in seconds is selected for the movement with the highest average delay per vehicle. Table 4.7 describes the LOS outputs and DOS intersections.

Delay (Seconds)	LOS	DOS	Description
<10	A	<0.6	Excellent with spare capacity
10-15	B	0.6 to 0.7	Very good with minimal delays and spare capacity
15-25	C	0.7 to 0.8	Good with some spare capacity
25-35	D	0.8 to 0.9	Satisfactory but operating near capacity
35-50	E	0.9 to 1.0	Poor with intersection operating at capacity and incidents will cause excessive delays
>50	F	>1.0	Exceeds capacity with long delays

TABLE 4.7: SIDRA LEVEL OF SERVICE DEFINITIONS

To determine the network performance of Pittwater Road at the development site, SIDRA intersection models have been prepared for the AM and PM peak hour for each of the surveyed days intersection.

The SIDRA intersection models prepared have been developed using the following inputs:

1. Intersection Geometry – Georeferenced Nearmap aerial imagery has been used to obtain lane widths and lane lengths.
2. Traffic volume data – AM and PM peak hour traffic count data from the surveys described in section 4.1.

The SIDRA Modelling results are summarised in tables 4.8 and 4.9.

Day and time	Pittwater Road NW		Pittwater Road SE		Access Driveway	
	DOS	LOS	DOS	LOS	DOS	LOS
Friday 9:15 to 10:15	0.075	A	0.087	A	0.020	A
Saturday 9:45 to 10:45	0.104	A	0.115	A	0.019	A
Sunday 9:45 to 10:45	0.097	A	0.103	A	0.028	A

TABLE 4.8: AM PEAK HOUR NETWORK PERFORMANCE SUMMARY

Day and time	Pittwater Road NW		Pittwater Road SE		Access Driveway	
	DOS	LOS	DOS	LOS	DOS	LOS
Friday 14:30 to 15:30	0.098	A	0.090	A	0.024	A
Saturday 15:45 to 16:45	0.076	A	0.083	A	0.016	A
Sunday 15:15 to 16:15	0.104	A	0.085	A	0.032	A

TABLE 4.9: PM PEAK HOUR NETWORK PERFORMANCE SUMMARY

It can therefore be concluded that the traffic generated by the development:

- does not have any adverse impact on the traffic flows in Pittwater Road or any unsatisfactory traffic safety or capacity issues on the surrounding road network.
- allows vehicles to enter and leave the site without delay.

4.3 VEHICLE ACCESS ASSESSMENT

An assessment has been undertaken on the existing vehicular access arrangements provided in table 2.2 of section 2.4.

Table 3.2 of AS2890.1 states that the minimum driveway widths for a Category 1 driveway can range from 3.0m to 5.5m in width and therefore the existing driveway widths shown previously in table 3.1 which are 6.3m for entry driveway and 4.5m comply with the requirements of AS2890.1.

Sight distance criteria for driveways are provided in Figure 3.2 of AS 2890.1. Table 4.10 provides a summary of the stopping sight distance assessment in for a road with a speed limit of 60km/h.

Driveway	Desirable Sight Distance (5s gap)	Minimum Sight Distance required	Measured sight distance to the west	Measured sight distance to the east
Entry Driveway	83m	65m	100m	n/a
Exit Driveway	83m	65m	130m	54m

TABLE 4.10: SIGHT DISTANCE ASSESSMENT (AS2890.1) 60KM/H FRONTAGE ROAD SPEED
SOURCE: SITE INSPECTION 13/08/2024

As shown above the entry driveway is compliant with the width and sight distance requirements of AS2890 however for the exit driveway the sight distance to the east which is for the right turn movement from the exit driveway is deficient by 9m.

As indicated in section 2.4, the 5-year finalised crash data between 2019 and 2023 has been reviewed and indicates that there have been no crashes in this section of Pittwater Road.

On site observations showed driver's slowing down to travel around the bend and the speed was more likely to be 50km/h. Considering this and the low volume of traffic that turn rights from the exit driveway (as shown in the traffic count data), no further action is required to prohibit the right movement from the exit driveway.

For the reasons indicated above although is not deemed to be necessary, a W2-206n(A) – Caution driveways sign could be installed to alert oncoming traffic to the potential for right turning vehicles.



FIGURE 4.1: W2-206N(A) – CAUTION DRIVEWAYS SIGN
SOURCE: TfNSW

4.4 CAR PARKING ASSESSMENT

The *Australian Standard AS 3962:2020 (Marina Design)* provides the most recent parking rates for marina developments:

- 0.25 spaces per wet berth,
- 0.25 spaces per dry berth,
- 0.25 spaces per swing mooring, and
- 0.25 spaces per employee.

In addition to these rates the *Pittwater 21 Development Control Plan* provides parking rates for the restaurants/cafés and commercial offices.

Using these parking rates, the number of parking spaces required for the marina development is summarised in table 4.11.

Parking calculation component	Number or Staff	GFA (m2)	GLA (m2)	Parking Rate	Parking spaces required
Wet Berth	150	-	-	0.25	37.5
Dry Berth	0	-	-	0.25	0
Swing Mooring	29	-	-	0.25	7.25
Marine Staff Weekday	10	-	-		2.5
Marine Staff Weekend	3				0.75
Marina Café	-	171	128.25	1 space per 30m ²	4.28
Commercial Office 1	-	32	24	2.5 spaces per 100m ²	0.6
Commercial Office 2	-	58	43.5	2.5 spaces per 100m ²	1.09
Commercial Office 3	-	42	31.5	2.5 spaces per 100m ²	0.79
Commercial Office 4	-	80	60	2.5 spaces per 100m ²	1.5
Total parking spaces required on weekdays					56
Total parking spaces required on weekends					54

TABLE 4.11: CAR PARKING ASSESSMENT FOR PROPOSED DEVELOPMENT

As previously mentioned, the proposed development does not propose to increase the number of vessels on site and the development simply proposes to replace swing moorings with wet berths.

The existing car park provides 107 approved parking spaces. There is an internal boom gate to separate the marina parking from the parking for the ancillary uses of the café and commercial offices. This ensures that the parking spaces for the marina component is not used by patrons of the café or commercial offices. Considering this the number of existing parking spaces provided on site will be able to cater for the parking demand of the development including all existing ancillary uses.

4.5 PARKING SURVEY

To understand the parking demands of the existing marina and ancillary uses and justify that the existing parking can adequately cater for the parking demand of the proposed development, a parking occupancy survey was undertaken between the hours of 9AM and 5PM on:

- Friday 30th August 2024,
- Saturday 31st August 2024, and
- Sunday 1st September

The parking survey data is provided in Appendix C, and summarised in figures 4.2, 4.3 and 4.4.

It was observed that Sunday 1st September 2024 was Father's Day, and the café was seen to be quite busy throughout the day. For assessment purposes the increase in parking demand for the café on the Sunday would be similar to a very busy summer weekend for the marina. It was also observed that many customers walked to the café walked on all survey days.

The results show that:

1. On the Friday between 9AM and 5PM:
 - there was a surplus of parking available within the marina carpark with:
 - an average occupancy of 54.1%,
 - a maximum occupancy of 68.2% with a minimum of 34 parking spaces vacant during the busiest 15-minute period.
2. On the Saturday between 9AM and 5PM:
 - there was a surplus of parking available within the marina carpark with:
 - an average occupancy of 58.9%,
 - a maximum occupancy of 72% with a minimum of 30 parking spaces vacant during the busiest 15-minute period.
3. On the Sunday between 9AM and 5PM:
 - there was a surplus of parking available within the marina carpark with:
 - an average occupancy of 66%,
 - a maximum occupancy of 78.5% with a minimum of 23 parking spaces vacant during the busiest 15-minute period.

The parking survey results demonstrate that parking demand of proposed development can be accommodated by the existing carpark without reliance on additional parking.

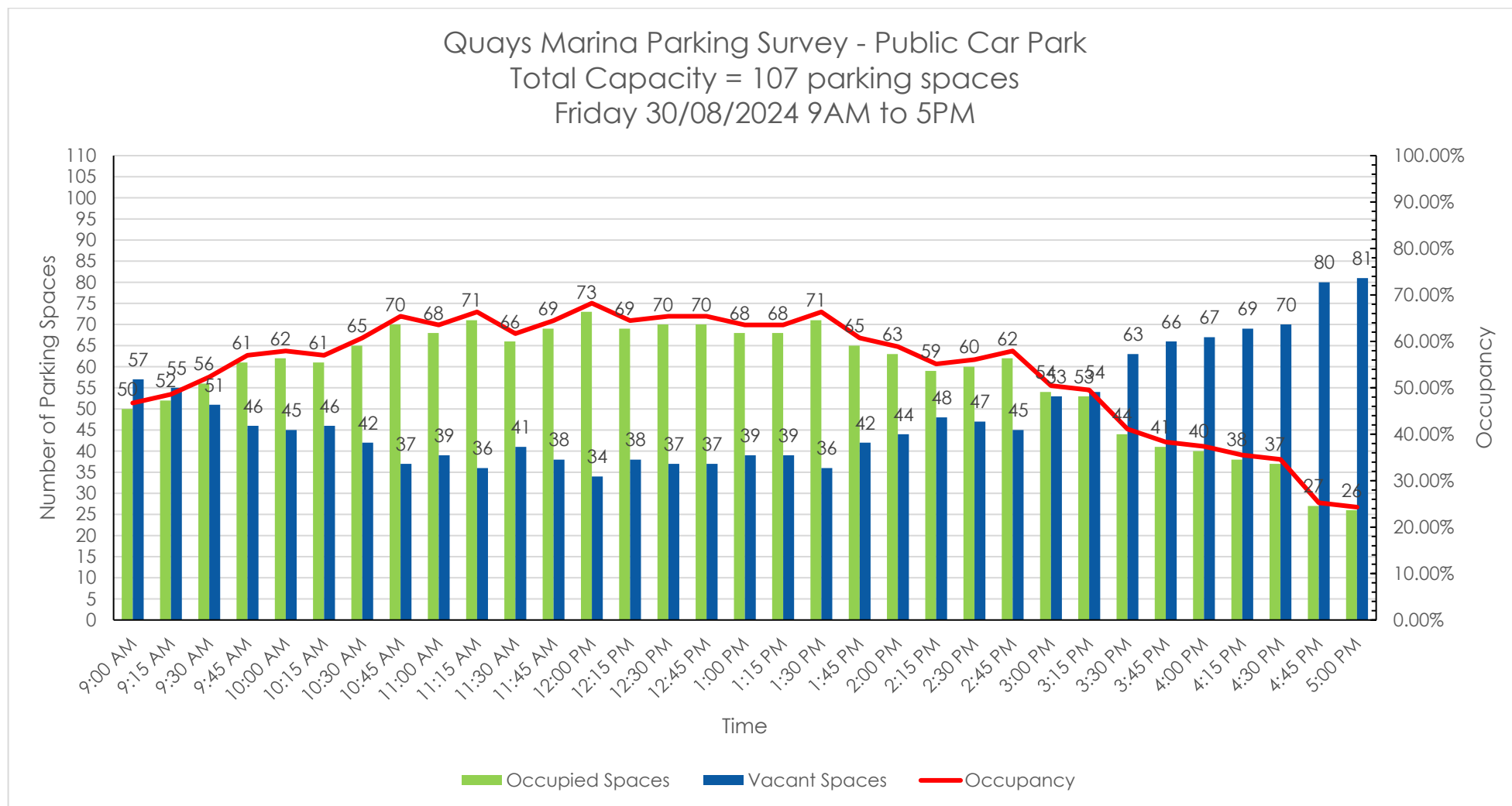


FIGURE 4.2: QUAYS MARINA CAR PARK PARKING SURVEY RESULTS – FRIDAY 9AM TO 5PM
SOURCE: T&SS PARKING SURVEY 30/08/2024

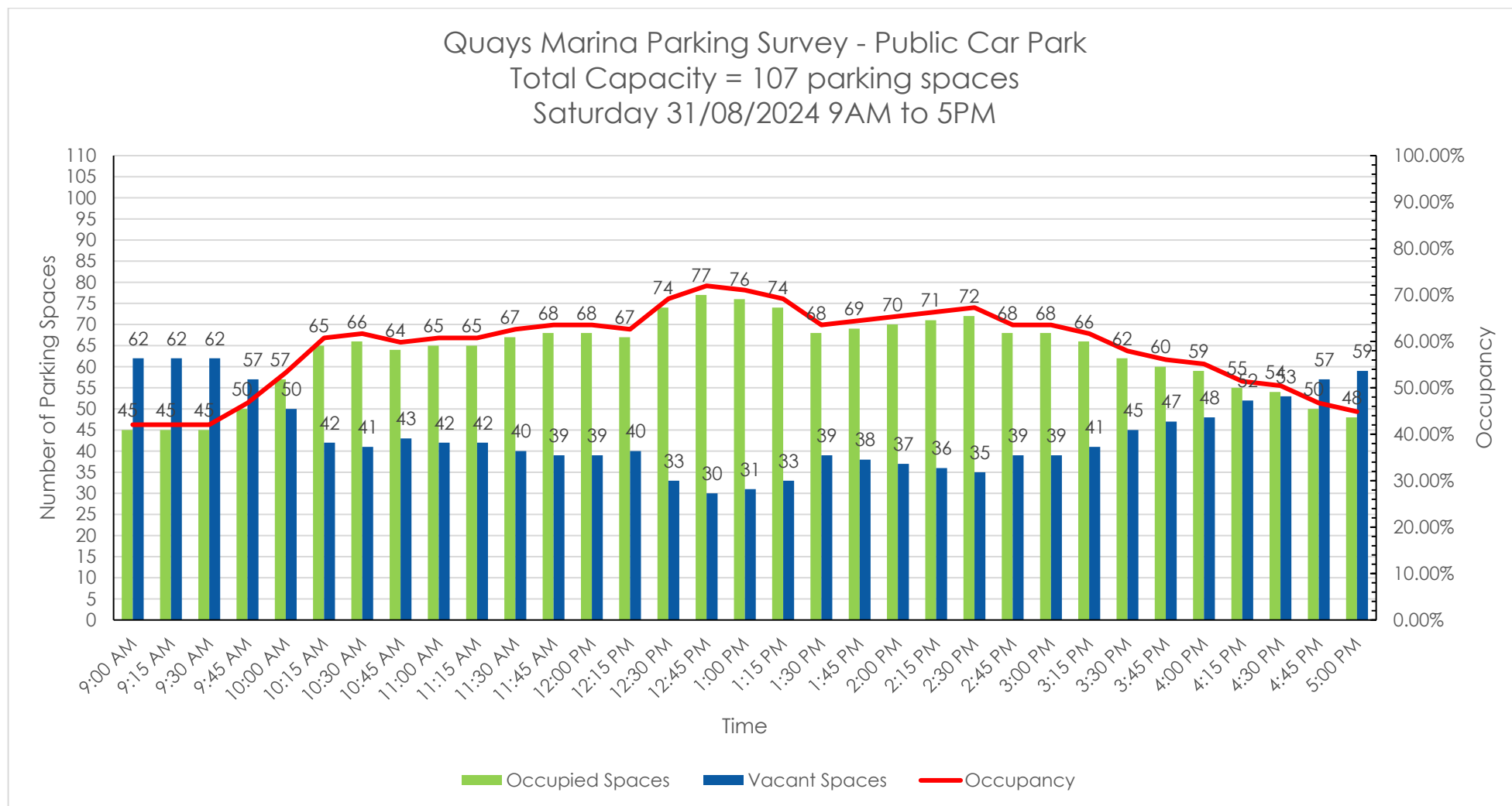


FIGURE 4.3: QUAYS MARINA CAR PARK PARKING SURVEY RESULTS – SATUURDAY 9AM TO 5PM
SOURCE: T&SS PARKING SURVEY 31/08/2024

Quays Marina Parking Survey - Public Car Park
Total Capacity = 107 parking spaces
Sunday 1/09/2024 9AM to 5PM

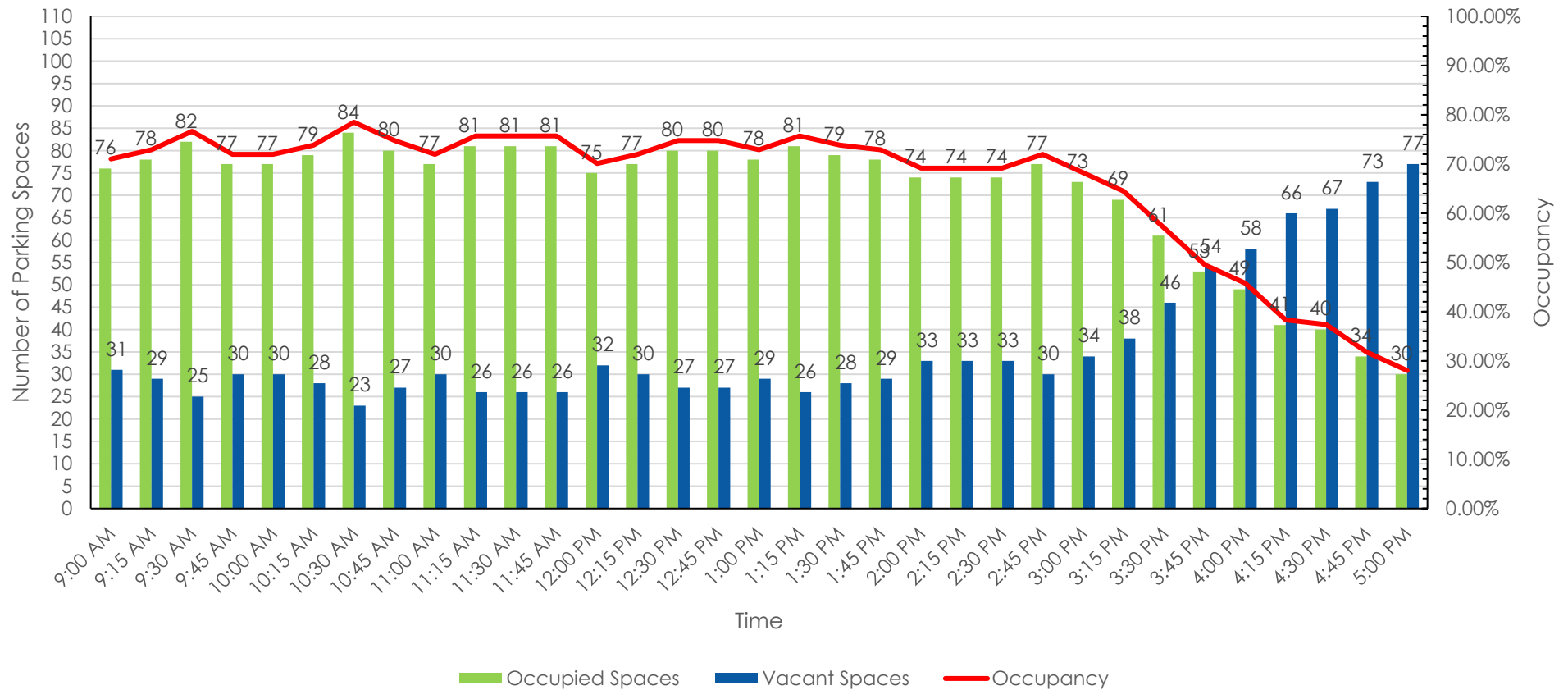


FIGURE 4.4: QUAYS MARINA CAR PARK PARKING SURVEY RESULTS – SUNDAY 9AM TO 5PM
SOURCE: T&SS PARKING SURVEY 01/09/2024

5 PRELIMINARY CONSTRUCTION TRAFFIC MANAGEMENT PLAN

The following sections provides details of a preliminary construction traffic management plans. It should be noted that whilst this assessment is based on high level strategic assessment, a detailed construction traffic management plan would be prepared to obtain a construction certificate once the development is approved and construction methodology is provided by the building contractor. Although subject to consent conditions, primarily this section aims to provide an assessment of the:

- site access and construction traffic routes,
- construction traffic volumes including the type and size of the construction vehicle,
- construction work hours,
- construction staff parking,
- traffic management that may be required,
- road network impacts,
- pedestrian and cyclist impacts, and
- public transport impacts.

5.1 SITE ACCESS AND CONSTRUCTION TRAFFIC ROUTES

The site is easily accessed from the classified state and regional road networks. A description of the road network is provided in section 2.3 of this report.

An assessment of the access into the site indicates the following:

- The site provides a separate ingress and egress driveway which allows all traffic movements to enter and leave the site in a forward direction.
- To remove the need for vehicles to negotiate through the existing car park it is recommended that the existing exit driveway is used for construction vehicle access into the site.
- The site is large enough to allow vehicles to enter the site in a forward direction, turn around within the site and exit in a forward direction.
- For oversize materials and equipment such as piling rigs and piles, it is likely that they may be brought to site via a barge.

Construction vehicles would use the routes shown in figure 5.1.

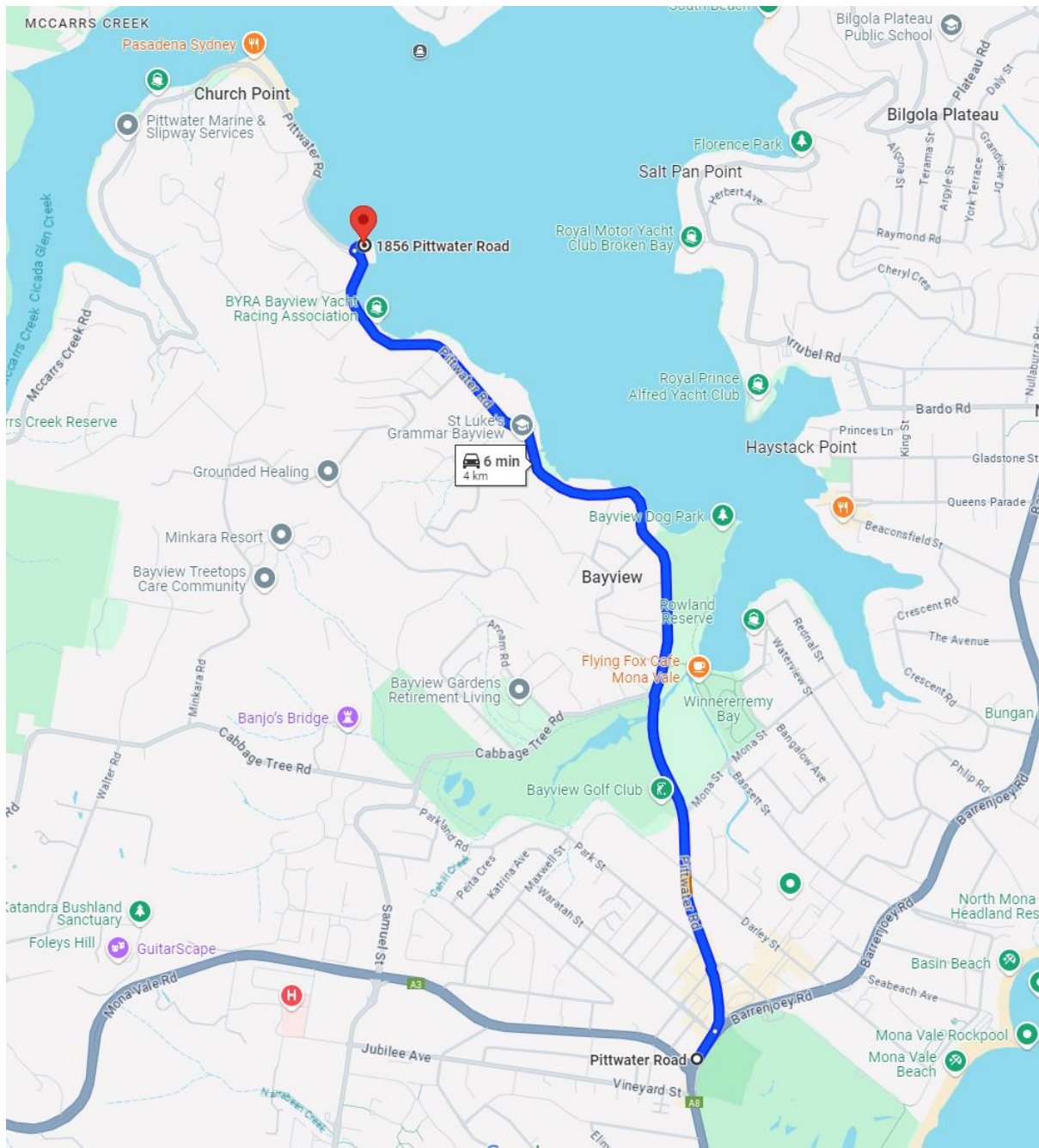


FIGURE 5.1: CONSTRUCTION VEHICLE TRAFFIC ROUTE
SOURCE: GOOGLE MAPS

5.2 CONSTRUCTION TRAFFIC VOLUMES

As the construction is associated with the construction of the new arm of the marina, it is likely that the size of construction vehicle that would typically access the site via the road network would be:

- Light commercial vehicles up to 4.5T GVM,

- 12.5T GVM HRV Skip bin truck for building waste removal,
- 12.5m HRV flatbed crane trucks for construction material delivery, and
- Concrete trucks and a concrete pump truck for concrete works.

Any piling rigs and pier delivery is likely to be floated to the site using a barge from an accessible boat ramp to be determined.

The estimated construction traffic volumes and a breakdown of the construction traffic using the road network to access the worksite is detailed in table 5.1.

Construction Activity	Vehicle Type	Volume
Site Establishment, plant, and material delivery	12.5m HRV crane truck	2 per day
	Light commercial vehicle	4 per day
Demolition	12.5m HRV Skip Bin Truck	2 per week
	Light commercial vehicle	4 per day
Pile Construction	12.5m HRV crane truck	2 per day
	Concrete Truck	4 per day
	Concrete Pump Truck	1 per day
	Light commercial vehicle	4 per day
Pontoon construction	12.5m HRV crane truck	2 per day
	Concrete Truck	4 per day
	Concrete Pump Truck	1 per day
	Light commercial vehicle	4 per day
Finishing works	12.5m HRV crane truck	2 per day
	Light commercial vehicle	4 per day

TABLE 5.1: CONSTRUCTION TRAFFIC VOLUMES

5.3 CONSTRUCTION WORK HOURS

The existing marina including the Marina café is busiest on weekends and to minimise the impacts on the existing operation of the marina and café it is proposed that construction is limited to weekdays only between 7AM and 5PM.

It is noted that there are school zones located in Pittwater Road and therefore it is recommended that any construction deliveries or heavy vehicle movements be limited to outside of the school zone times.

5.4 CONSTRUCTION TRAFFIC PARKING

The site currently contains a carpark that is separated via an internal boom gate to access the parking spaces along the waterfront. To minimise the impact of construction traffic parking on the existing marina café a section of the rear carpark containing up to 15 parking spaces will be allocated for construction vehicle parking and provide an area for a site compound. The building contractor will confirm the exact number of parking spaces required for the site compound once construction methodology is known.

Given the results of the parking survey detailed in section 4.5 of this report, 34 parking spaces are vacant at the busiest time of the day on weekdays and therefore the allocation of 15 parking spaces for construction vehicle parking and materials storage should not impact on the existing parking requirements of the marina.

5.5 PEDESTRIANS & CYCLISTS

The existing footpath, driveways and traffic lanes are not affected by the construction works and traffic control is not proposed.

As the construction is limited to the waterway and construction volumes are low, it is unlikely that pedestrian and cyclist movement will be impacted by the construction works.

Similar to the existing access arrangements vehicles would be required to give way to pedestrians on the footpath before entering or exiting the site.

5.6 RESIDENTS & BUSINESSES

As the construction is limited to the waterway and construction volumes are low, it is unlikely that that residents will be impacted by the construction works.

As discussed previously, to minimise the impact on the Marina Café it is recommended that the work hours be limited to weekdays only. This will also provide respite from construction activities for residents.

Notification will be provided to the residents prior to the start of works. The notice will include date and time of works and a description of the works being conducted and will be hand delivered at-least 14 days before commencement.

5.7 PUBLIC TRANSPORT

Although Pittwater Road is a bus route, as there is no traffic control of Pittwater Road required and all construction traffic volumes are low it is unlikely that bus services will be impacted.

5.8 EMERGENCY VEHICLE ACCESS

As there is no traffic control of Pittwater Road, it is unlikely that emergency services will be impacted. The existing 5.8m wide parking aisle will maintain emergency vehicle access within the site.

5.9 OTHER CONSTRUCTION ACTIVITY

On site inspections of the area surrounding the site and access routes that construction traffic would use indicate that there is one other construction site in the immediate vicinity. The site is located 1.3km to the east at 1955 Pittwater Rd, Bayview and known as the Quartet Bayview development.

It is unlikely that the construction activities of the marina development would impact on the Quartet Bayview development or impact on the operation of Pittwater Road and therefore a cumulative impact assessment is deemed unnecessary at this time.

Further inspections would be undertaken before construction commences to determine if the cumulative impact needs to be assessed.

6 CONCLUSIONS

The traffic and parking impact of the proposed development that proposes to increase the number of wet berths to 150 and reduce the number of swing moorings to 29 at the existing marina located at 1856 Pittwater Road, Church Point, NSW 2105 has been assessed to determine the likely traffic impacts and address the SEARS. The assessment undertaken in this report indicates that in relation to:

6.1.1 PARKING

The parking survey indicates that there is a surplus of parking on all surveyed days.

The existing provision of 107 on-site car parking spaces exceeds the parking requirements of the *Australian Standard AS 3962:2020 (Marina Design)* and *Pittwater 21 Development Control Plan (DCP)* and no additional parking spaces are required to cater for the parking demand of the development.

6.1.2 TRAFFIC IMPACT

The SIDRA modelling undertaken demonstrates that there are no existing network performance issues in Pittwater Road and as the overall number of vessels that the marina can accommodate, remains the same there will be no increase in traffic generation of the site and therefore there will be no traffic impact as a result of the development once completed.

6.1.3 CONSTRUCTION TRAFFIC

As Pittwater Road is a classified regional road and an existing bus route, heavy vehicles up to 12.5m in length will be able to access the site easily from the state road network. Any large deliveries or equipment may be floated to the site using a barge. Once a building contractor has been appointed a detailed CTMP should be provided based on the builder's construction methodology.

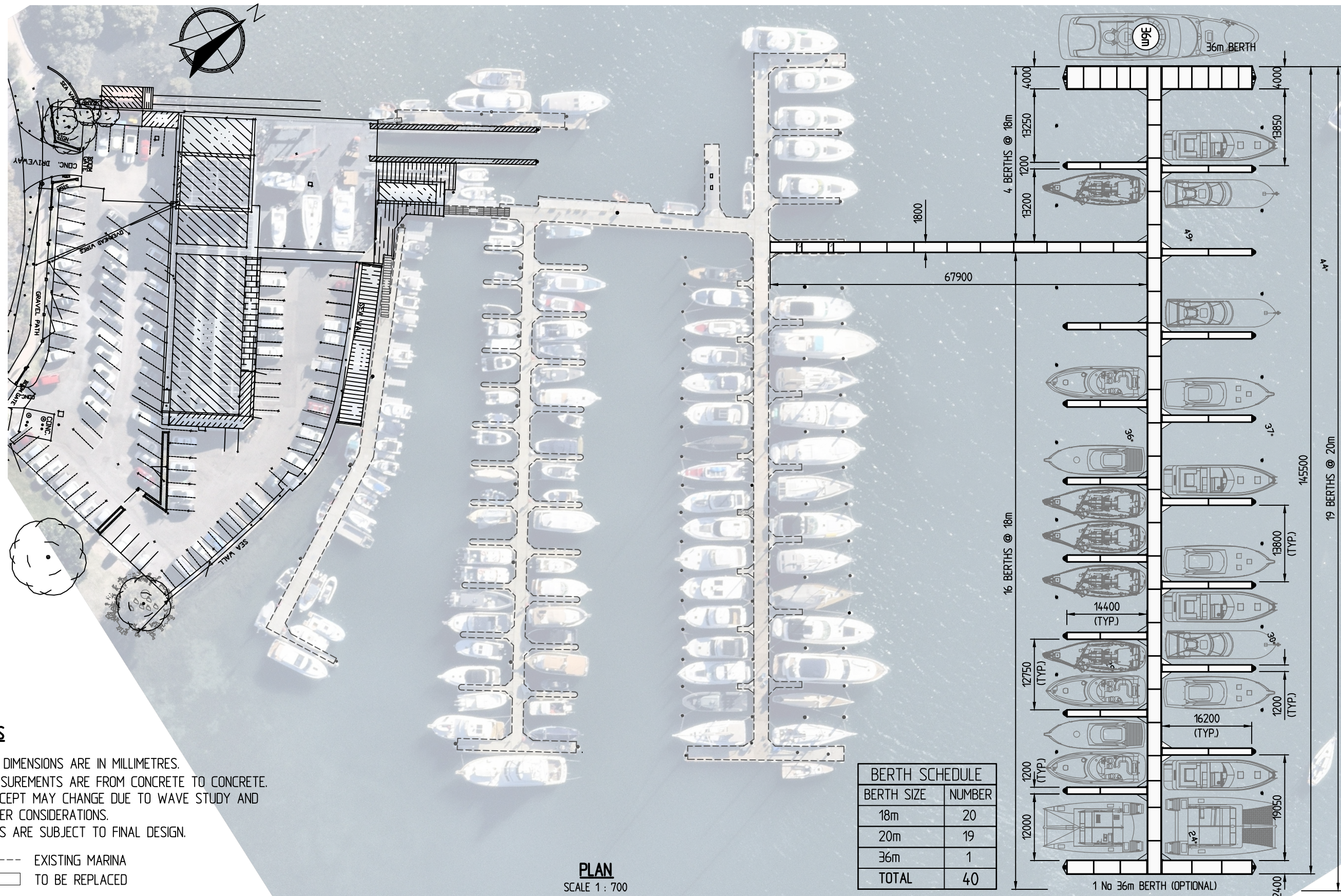
The SIDRA modelling undertaken demonstrates that there is spare capacity in Pittwater Road and the increase in traffic due to construction is unlikely to adversely impact the operation of Pittwater Road.

This assessment concludes that the traffic and parking impacts of the proposed development will be minimal and unlikely to create any adverse impacts on the surrounding network.



Navin Prasad (Bachelor of Engineering Technology – Civil Engineering)
Director
Traffic & Safety Solutions PTY LTD

APPENDIX A – ARCHITECTURAL PLANS



NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. MEASUREMENTS ARE FROM CONCRETE TO CONCRETE.
3. CONCEPT MAY CHANGE DUE TO WAVE STUDY AND OTHER CONSIDERATIONS.
4. PILES ARE SUBJECT TO FINAL DESIGN.

----- EXISTING MARINA
TO BE REPLACED

BERTH SCHEDULE	
BERTH SIZE	NUMBER
18m	20
20m	19
36m	1
TOTAL	40

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REVISION:

ASSOCIATED WITH DWG: -

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THE WRITTEN PERMISSION OF BELLINGHAM MARINE AUSTRALIA PTY. LTD.

PROJECT:

THE QUAYS MARINA

CLIENT:

LOCATION:

DWG. TITLE:

GENERAL ARRANGEMENT

ALL DIMENSIONS IN MM - DO NOT SCALE - IF IN DOUBT INQUIRE

DRG #: 23-P2-SK8

DATE: 12/04/24 SHT: 1 of 1

SCALE: AS SHOWN SIZE: A3L

DRN: IN REV:

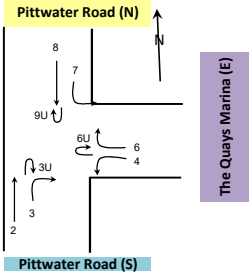
CHK: -

APP:

APPENDIX B – TRAFFIC COUNT DATA

Job No. Traffic Count - Quays Marina
Client :Quays Marina
Suburb :
Location : The Quays Marina

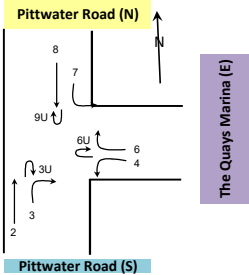
Day/Date : Friday 30th August 2024
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data



Classifications	Class 1		Class 2		Class 3																																					
	Cars		Heavies		Buses		Cyclists																																			
Approach	Pittwater Road (S)															The Quays Marina (E)																										
Direction	Direction 1 (Left Turn)					Direction 2 (Through)					Direction 3 (Right Turn)					Direction 3U (U Turn)					Direction 4 (Left Turn)					Direction 5 (Through)					Direction 6 (Right Turn)					Direction 6U (U Turn)						
Time Period	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total		
9:00 to 9:15					0	17	0	1	4	22	4	0	0	0	4	0	0	0	0	0	3	0	0	0	0	3					0	0	0	0	0	0	0	0	0	0	0	0
9:15 to 9:30					0	27	1	1	1	30	11	0	0	0	11	0	0	0	0	0	7	0	0	0	0	7					0	1	0	0	0	0	1	0	0	0	0	0
9:30 to 9:45					0	17	1	1	1	20	9	0	0	0	9	0	0	0	0	0	5	0	0	0	0	5					0	1	0	0	0	0	1	0	0	0	0	0
9:45 to 10:00					0	18	0	0	3	21	4	0	0	0	4	0	0	0	0	0	3	0	0	0	0	3					0	1	0	0	0	0	1	0	0	0	0	0
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15:30 to 15:45					0	29	1	1	0	31	2	0	0	0	2	0	0	0	0	0	4	0	0	0	0	4					0	1	0	0	0	0	1	0	0	0	0	0
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Peaks Total	0	0	0	0	0	1,005	33	27	31	1,096	135	4	0	1	140	0	0	0	0	0	167	2	0	1	170	0	0	0	0	0	25	2	0	0	0	27	12	0	0	0	12	

Job No. Traffic Count - Quays Marina
Client : Quays Marina
Suburb :
Location : The Quays Marina

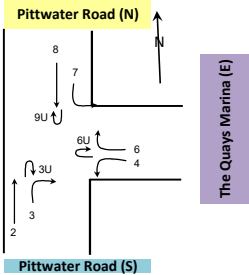
Day/Date : Saturday 31st August 2024
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data



Classifications	Class 1		Class 2		Class 3																																								
	Cars		Heavies		Buses		Cyclists																																						
Approach	Pittwater Road (S)																		The Quays Marina (E)																										
Direction	Direction 1 (Left Turn)					Direction 2 (Through)					Direction 3 (Right Turn)					Direction 3U (U Turn)					Direction 4 (Left Turn)					Direction 5 (Through)					Direction 6 (Right Turn)					Direction 6U (U Turn)									
Time Period	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total										
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9:30 to 9:45					0	33	0	1	4	38	6	0	0	0	6	0	0	0	0	0	0	2	0	0	0	0	2					0	0	0	0	0	0	0	0	0	0	0	0		
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10:15 to 10:30					0	34	2	0	4	40	3	0	0	0	3	0	0	0	0	0	0	2	0	0	0	0	2					0	0	0	0	0	0	0	0	0	0	0	0	0	
10:30 to 10:45					0	45	0	0	0	45	6	0	0	0	6	0	0	0	0	0	0	8	0	0	0	0	8					0	0	0	0	0	0	0	0	0	0	0	0	0	
10:45 to 11:00					0	36	1	0	4	41	9	0	0	0	9	0	0	0	0	0	0	9	0	0	0	0	9					0	0	0	0	0	0	0	0	0	0	0	0	0	
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14:15 to 14:30					0	26	0	0	0	26	3	0	0	0	3	0	0	0	0	0	0	1	0	0	0	1					0	2	0	0	0	2	0	0	0	0	0	0	0	0	
14:30 to 14:45					0	30	0	1	0	31	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5					0	0	0	0	0	0	0	0	0	0	0	0	0	0	
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15:00 to 15:15					0	30	0	2	0	32	6	0	0	2	8	0	0	0	0	0	0	6	0	0	0	0	6					0	2	0	0	0	2	0	0	0	0	0	0	0	0
15:15 to 15:30					0	26	0	0	0	26	2	0	0	1	3	0	0	0	0	0	0	4	0	0	0	0	4					0	2	0	0	0	2	0	0	0	0	0	0	0	0
15:30 to 15:45					0	31	0	1	0	32	2	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	4					0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45 to 16:00					0	32	0	0	1	33	2	0	0	0	2	0	0	0	0	0	0	3	0	0	0	0	3					0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00 to 16:15					0	38	0	1	1	40	2	0	0	0	2	0	0	0	0	0	0	6	0	0	0	0	6					0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15 to 16:30					0	32	0	0	0	32	3	0	0	0	3	0	0	0	0	0	0	5	0	0	0	0	5					0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30 to 16:45					0	33	0	1	0	34	3	0	0	0	3	0	0	0	0	0	0	7	0	0	0	0	7					0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45 to 17:00					0	30	0	0	1	31	1	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	3					0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peaks Total	0	0	0	0	0	1,168	9	16	68	1,261	141	1	0	6	148	0	0	0	0	0	140	1	0	1	142	0	0	0	0	0	17	0	0	12	29	0	0	0	0	0	0	0	0	0	

Job No. Traffic Count - Quays Marina
Client : Quays Marina
Suburb :
Location : The Quays Marina

Day/Date : Sunday 01st September 2024
Weather : Fine
Description : Classified Intersection Count
: 15 mins Data



Classifications	Class 1		Class 2		Class 3																																				
	Cars		Heavies		Buses		Cyclists																																		
Approach	Pittwater Road (S)																		The Quays Marina (E)																						
Direction	Direction 1 (Left Turn)					Direction 2 (Through)					Direction 3 (Right Turn)					Direction 3U (U Turn)					Direction 4 (Left Turn)					Direction 5 (Through)					Direction 6 (Right Turn)					Direction 6U (U Turn)					
Time Period	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	Cars	Heavies	Buses	Cyclists	Total	
9:00 to 9:15					0	35	0	1	11	47	6	0	0	0	6	0	0	0	0	0	3	0	0	0	3					0	1	0	0	0	1	0	0	0	0	0	
9:15 to 9:30					0	44	0	1	11	56	11	0	0	0	11	0	0	0	0	0	7	0	0	0	2	9					0	0	0	0	0	0	0	0	0	0	
9:30 to 9:45					0	34	2	1	2	39	3	0	0	0	3	0	0	0	0	0	9	0	0	0	0	9					0	1	0	0	0	1	1	0	0	0	1
9:45 to 10:00					0	26	0	0	3	29	4	0	0	0	4	0	0	0	0	0	7	0	0	0	0	7					0	0	0	0	0	0	0	0	0	0	
10:00 to 10:15					0	36	0	2	8	46	9	0	0	0	9	1	0	0	0	1	7	0	0	0	5	12					0	1	0	0	0	1	3	0	0	0	3
10:15 to 10:30					0	36	0	0	4	40	8	0	0	0	8	0	0	0	0	0	4	0	0	0	0	4					0	0	0	0	0	0	1	0	0	0	1
10:30 to 10:45					0	43	1	1	2	47	5	0	0	0	5	0	0	0	0	0	10	0	0	0	0	10					0	2	0	0	0	2	0	0	0	0	0
10:45 to 11:00					0	38	0	0	3	41	5	0	0	0	5	0	0	0	0	0	9	0	0	0	0	9					0	0	0	0	0	0	1	0	0	0	1
11:00 to 11:15					0	60	0	1	0	61	7	0	0	0	7	0	0	0	0	0	3	0	0	0	0	3					0	1	0	0	0	1	0	0	0	0	0
11:15 to 11:30					0	51	2	0	3	56	4	0	0	0	4	0	0	0	0	0	3	0	0	0	0	3					0	1	0	0	0	1	0	0	0	0	0
11:30 to 11:45					0	60	0	1	2	63	3	0	0	0	3	0	0	0	0	0	5	0	0	0	0	5					0	0	0	0	0	0	0	0	0	0	
11:45 to 12:00					0	56	1	0	1	58	4	0	0	0	4	0	0	0	0	0	10	0	0	0	0	10					0	1	0	0	0	1	0	0	0	0	0
12:00 to 12:15					0	42	0	0	3	45	3	0	0	0	3	0	0	0	0	0	4	0	0	0	0	4					0	0	0	0	0	0	0	0	0	0	
12:15 to 12:30					0	51	0	1	7	59	8	0	0	0	8	0	0	0	0	0	5	0	0	0	0	5					0	1	0	0	0	1	0	0	0	0	0
12:30 to 12:45					0	36	1	1	1	39	2	0	0	0	2	0	0	0	0	0	2	0	0	0	0	2					0	0	0	0	0	0	0	0	0	0	
12:45 to 13:00					0	33	0	0	0	33	7	0	0	0	7	0	0	0	0	0	6	0	0	0	0	6					0	3	0	0	0	3	0	0	0	0	0
13:00 to 13:15					0	52	0	1	2	55	5	0	0	0	5	0	0	0	0	0	3	0	0	0	0	3					0	2	0	0	0	2	0	0	0	0	0
13:15 to 13:30					0	45	0	0	0	45	2	0	0	0	2	0	0	0	0	0	6	0	0	0	0	6					0	0	0	0	0	0	2	0	0	0	2
13:30 to 13:45					0	63	0	1	3	67	2	0	0	0	2	0	0	0	0	0	5	0	0	0	0	5					0	0	0	0	0	0	0	0	0	0	
13:45 to 14:00					0	52	0	0	1	53	1	0	0	0	1	0	0	0	0	0	5	0	0	0	0	5					0	1	0	0	0	1	1	0	0	0	1
14:00 to 14:15					0	55	0	2	2	59	3	0	0	0	3	0	0	0	0	0	3	0	0	0	0	3					0	2	0	0	0	2	0	0	0	0	0
14:15 to 14:30					0	40	0	0	0	40	1	0	0	0	1	0	0	0	0	0	2	0	0	0	0	2					0	1	0	0	0	1	0	0	0	0	0
14:30 to 14:45					0	43	1	1	1	46	4	0	0	0	4	0	0	0	0	0	2	0	0	0	0	2					0	2	0	0	0	2	0	0	0	0	0
14:45 to 15:00					0	32	0	0	0	32	1	0	0	0	1	0	0	0	0	0	7	0	0	0	0	7					0	0	0	0	0	0	0	0	0	0	
15:00 to 15:15					0	26	0	1	1	28	1	0	0	0	1	0	0	0	0	0	7	0	0	0	0	7					0	0	0	0	0	0	0	0	0	0	
15:15 to 15:30					0	29	0	0	2	31	3	0	0	0	3	0	0	0	0	0	11	0	0	0	0	11					0	1	0	0	0	1	0	0	0	0	0
15:30 to 15:45					0	33	1	1	0	35	2	0	0	0	2	0	0	0	0	0	7	0	0	0	0	7					0	3	0	0	0	3	0	0	0	0	0
15:45 to 16:00					0	39	0	1	2	42	4	0	0	0	4	0	0	0	0	0	7	0	0	0	0	7					0	1	0	0	0	1	0	0	0	0	0
16:00 to 16:15					0	33	0	1	0	34	1	0	0	0	1	0	0	0	0	0	8	0	0	0	0	8					0	1	0	0	0	1	0	0	0	0	0
16:15 to 16:30					0	52	0	0	1	53	4	0	0	0	4	0	0	0	0	0	4	0	0	0	2	6					0	1	0	0	0	1	0	0	0	0	0
16:30 to 16:45					0	29	0	2	1	32	2	0	0	0	2	0	0	0	0	0	7	0	0	0	0	7					0	1	0	0	0	1	0	0	0	0	0
16:45 to 17:00					0	31	0	0	0	31	2	0	0	0	2	0	0	0	0	0	6	0	0	0	0	6					0	0	0	0	0	0	0	0	0	0	
Peaks Total	0	0	0	0	0	1,335	9	21	77	1,442	127	0	0	0	127	1	0	0	0	1	184	0	0	9	193	0	0	0	0	0	28	0	0	0	0	28	9	0	0	0	9

APPENDIX C – PARKING SURVEY DATA

Quays Marina Parking Survey			
Date:	Friday, 30 August 2024		
Total Number of Car Spaces			107
Time Start	Occupied Spaces	Vacant Spaces	Occupancy
9:00 AM	50	57	46.73%
9:15 AM	52	55	48.60%
9:30 AM	56	51	52.34%
9:45 AM	61	46	57.01%
10:00 AM	62	45	57.94%
10:15 AM	61	46	57.01%
10:30 AM	65	42	60.75%
10:45 AM	70	37	65.42%
11:00 AM	68	39	63.55%
11:15 AM	71	36	66.36%
11:30 AM	66	41	61.68%
11:45 AM	69	38	64.49%
12:00 PM	73	34	68.22%
12:15 PM	69	38	64.49%
12:30 PM	70	37	65.42%
12:45 PM	70	37	65.42%
1:00 PM	68	39	63.55%
1:15 PM	68	39	63.55%
1:30 PM	71	36	66.36%
1:45 PM	65	42	60.75%
2:00 PM	63	44	58.88%
2:15 PM	59	48	55.14%
2:30 PM	60	47	56.07%
2:45 PM	62	45	57.94%
3:00 PM	54	53	50.47%
3:15 PM	53	54	49.53%
3:30 PM	44	63	41.12%
3:45 PM	41	66	38.32%
4:00 PM	40	67	37.38%
4:15 PM	38	69	35.51%
4:30 PM	37	70	34.58%
4:45 PM	27	80	25.23%
5:00 PM	26	81	24.30%
Average	58	49	54.1%
Minimum	26	34	24.3%
Maximum	73	81	68.2%

Quays Marina Parking Survey			
Date:	Saturday, 31 August 2024		
Total Number of Car Spaces			107
Time Start	Occupied Spaces	Vacant Spaces	Occupancy
9:00 AM	45	62	42.06%
9:15 AM	45	62	42.06%
9:30 AM	45	62	42.06%
9:45 AM	50	57	46.73%
10:00 AM	57	50	53.27%
10:15 AM	65	42	60.75%
10:30 AM	66	41	61.68%
10:45 AM	64	43	59.81%
11:00 AM	65	42	60.75%
11:15 AM	65	42	60.75%
11:30 AM	67	40	62.62%
11:45 AM	68	39	63.55%
12:00 PM	68	39	63.55%
12:15 PM	67	40	62.62%
12:30 PM	74	33	69.16%
12:45 PM	77	30	71.96%
1:00 PM	76	31	71.03%
1:15 PM	74	33	69.16%
1:30 PM	68	39	63.55%
1:45 PM	69	38	64.49%
2:00 PM	70	37	65.42%
2:15 PM	71	36	66.36%
2:30 PM	72	35	67.29%
2:45 PM	68	39	63.55%
3:00 PM	68	39	63.55%
3:15 PM	66	41	61.68%
3:30 PM	62	45	57.94%
3:45 PM	60	47	56.07%
4:00 PM	59	48	55.14%
4:15 PM	55	52	51.40%
4:30 PM	54	53	50.47%
4:45 PM	50	57	46.73%
5:00 PM	48	59	44.86%
Average	63	44	58.9%
Minimum	45	30	42.1%
Maximum	77	62	72.0%

Quays Marina Parking Survey			
Date:	Sunday, 1 September 2024		
Total Number of Car Spaces			107
Time Start	Occupied Spaces	Vacant Spaces	Occupancy
9:00 AM	76	31	71.03%
9:15 AM	78	29	72.90%
9:30 AM	82	25	76.64%
9:45 AM	77	30	71.96%
10:00 AM	77	30	71.96%
10:15 AM	79	28	73.83%
10:30 AM	84	23	78.50%
10:45 AM	80	27	74.77%
11:00 AM	77	30	71.96%
11:15 AM	81	26	75.70%
11:30 AM	81	26	75.70%
11:45 AM	81	26	75.70%
12:00 PM	75	32	70.09%
12:15 PM	77	30	71.96%
12:30 PM	80	27	74.77%
12:45 PM	80	27	74.77%
1:00 PM	78	29	72.90%
1:15 PM	81	26	75.70%
1:30 PM	79	28	73.83%
1:45 PM	78	29	72.90%
2:00 PM	74	33	69.16%
2:15 PM	74	33	69.16%
2:30 PM	74	33	69.16%
2:45 PM	77	30	71.96%
3:00 PM	73	34	68.22%
3:15 PM	69	38	64.49%
3:30 PM	61	46	57.01%
3:45 PM	53	54	49.53%
4:00 PM	49	58	45.79%
4:15 PM	41	66	38.32%
4:30 PM	40	67	37.38%
4:45 PM	34	73	31.78%
5:00 PM	30	77	28.04%
Average	71	36	66.0%
Minimum	30	23	28.0%
Maximum	84	77	78.5%

APPENDIX D – SIDRA MODELLING OUTPUTS

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

Template: Default Site User
Report

 **Site: 101 [Site Access AM Peak 9:15 to 10:15 (Site Folder: Friday Site Driveway)]**

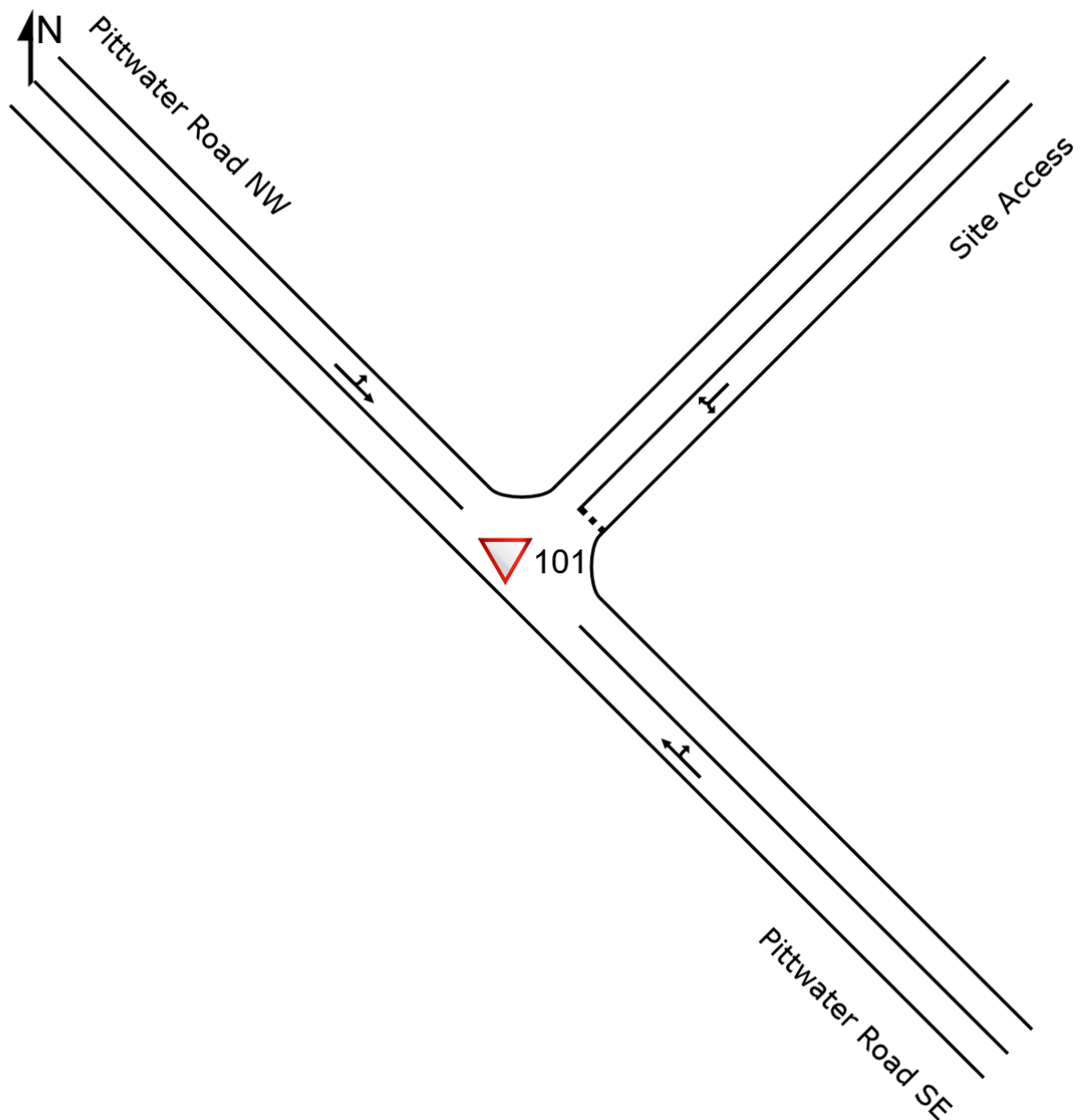
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	55.5	55.6 km/h
Travel Distance (Total)	veh-km/h	334.0	580.7 pers-km/h
Travel Time (Total)	veh-h/h	6.0	10.4 pers-h/h
Desired Speed	km/h	56.7	
Speed Efficiency		0.98	
Travel Time Index		9.75	
Congestion Coefficient		1.02	
Demand Flows (Total)	veh/h	331	575 pers/h
Arrival Flows (Total)	veh/h	331	
Percent Heavy Vehicles (Demand)	%	6.1	
Percent Heavy Vehicles (Arrivals)	%	6.1	
Degree of Saturation		0.087	
Practical Spare Capacity	%	1030.8	
Effective Intersection Capacity	veh/h	3814	
Control Delay (Total)	veh-h/h	0.12	0.15 pers-h/h
Control Delay (Average)	sec	1.3	0.9 sec
Control Delay (Worst Lane by MC)	sec	6.0	
Control Delay (Worst Movement by MC)	sec	6.6	6.6 sec
Geometric Delay (Average)	sec	1.1	
Stop-Line Delay (Average)	sec	0.2	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.2	
95% Back of Queue - Dist (Worst Lane)	m	1.6	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	45	72 pers/h
Effective Stop Rate		0.14	0.13
Proportion Queued		0.08	0.07
Performance Index		6.8	6.8
Cost (Total)	\$/h	362.49	362.49 \$/h
Fuel Consumption (Total)	L/h	24.3	
Carbon Dioxide (Total)	kg/h	55.2	
Hydrocarbons (Total)	kg/h	0.005	
Carbon Monoxide (Total)	kg/h	0.06	
NOx (Total)	kg/h	0.098	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 24.7% 4.1% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	121	9.6	121	9.6	0.087	0.2	LOS A	0.2	1.6	0.13	0.18	0.13	57.0
23	R2	All MCs	34	3.1	34	3.1	0.087	6.0	LOS A	0.2	1.6	0.13	0.18	0.13	54.9
Approach			155	8.2	155	8.2	0.087	1.5	NA	0.2	1.6	0.13	0.18	0.13	56.5
NorthEast: Site Access															
24	L2	All MCs	24	0.0	24	0.0	0.020	5.9	LOS A	0.1	0.5	0.24	0.55	0.24	52.2
26	R2	All MCs	3	0.0	3	0.0	0.020	6.6	LOS A	0.1	0.5	0.24	0.55	0.24	51.9
Approach			27	0.0	27	0.0	0.020	6.0	LOS A	0.1	0.5	0.24	0.55	0.24	52.1
NorthWest: Pittwater Road NW															
27	L2	All MCs	4	0.0	4	0.0	0.075	5.1	LOS A	0.0	0.0	0.00	0.02	0.00	53.3
28	T1	All MCs	144	5.1	144	5.1	0.075	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	55.1
Approach			148	5.0	148	5.0	0.075	0.2	NA	0.0	0.0	0.00	0.02	0.00	55.1
All Vehicles			331	6.1	331	6.1	0.087	1.3	NA	0.2	1.6	0.08	0.14	0.08	55.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

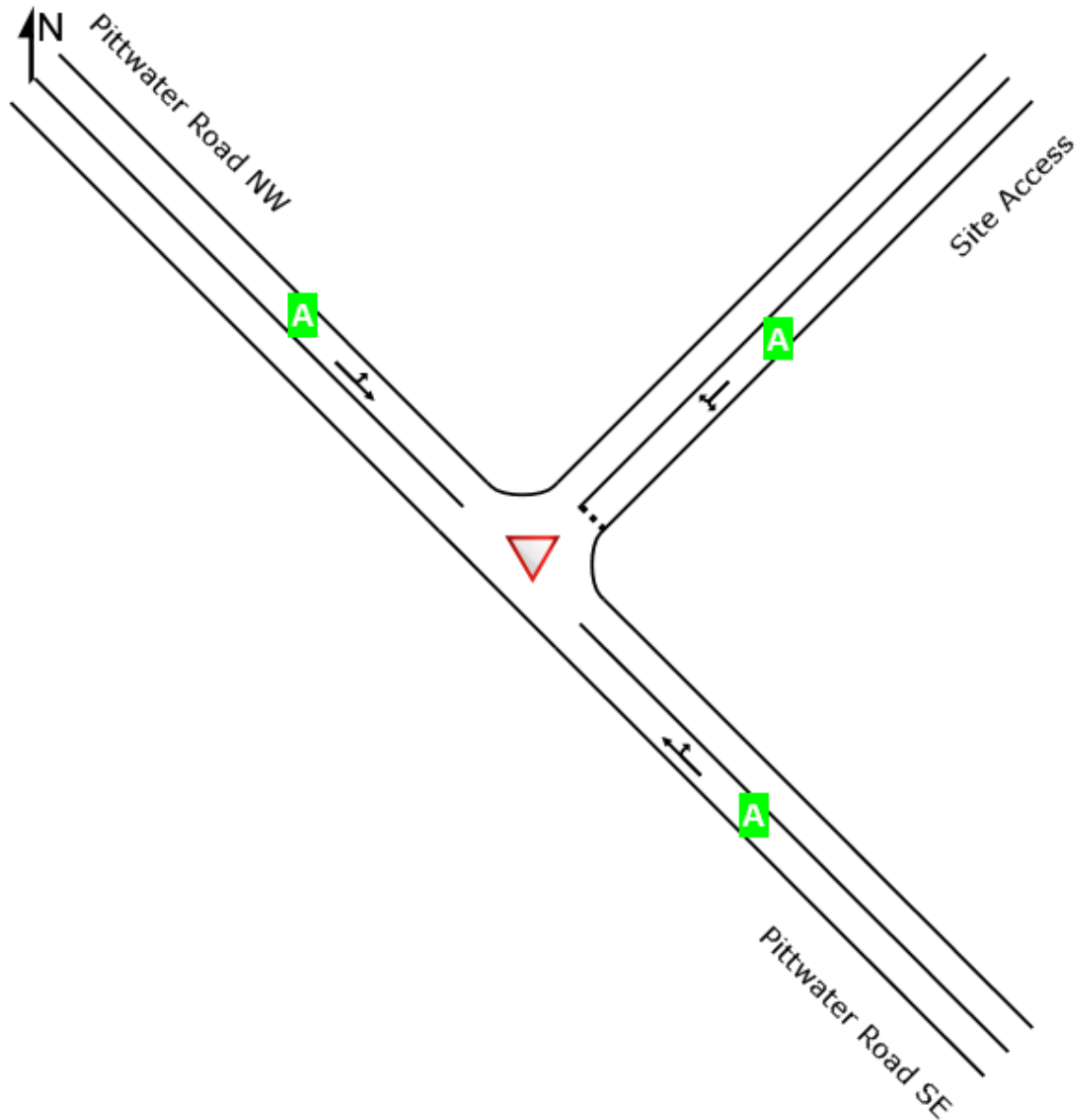
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

**Template: Default Site User
Report**

 **Site: 101 [Site Access PM Peak 14:30 to 15:30 (Site Folder: Friday Site Driveway)]**

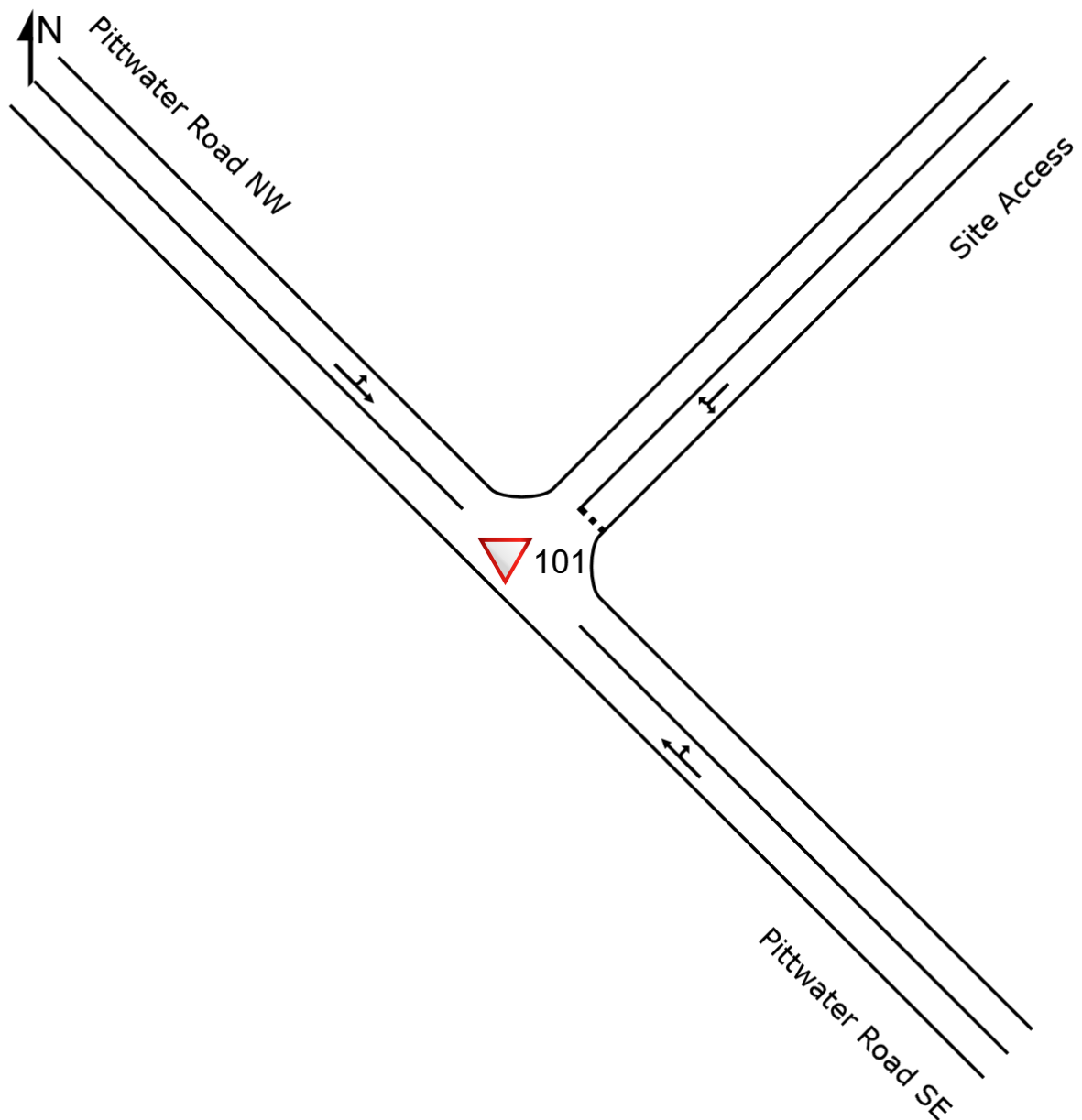
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	58.5	58.8 km/h
Travel Distance (Total)	veh-km/h	384.0	766.3 pers-km/h
Travel Time (Total)	veh-h/h	6.6	13.0 pers-h/h
Desired Speed	km/h	59.5	
Speed Efficiency		0.98	
Travel Time Index		9.82	
Congestion Coefficient		1.02	
Demand Flows (Total)	veh/h	380	759 pers/h
Arrival Flows (Total)	veh/h	380	
Percent Heavy Vehicles (Demand)	%	4.4	
Percent Heavy Vehicles (Arrivals)	%	4.4	
Degree of Saturation		0.098	
Practical Spare Capacity	%	904.2	
Effective Intersection Capacity	veh/h	3894	
Control Delay (Total)	veh-h/h	0.08	0.10 pers-h/h
Control Delay (Average)	sec	0.8	0.5 sec
Control Delay (Worst Lane by MC)	sec	6.2	
Control Delay (Worst Movement by MC)	sec	6.8	6.8 sec
Geometric Delay (Average)	sec	0.7	
Stop-Line Delay (Average)	sec	0.1	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.1	
95% Back of Queue - Dist (Worst Lane)	m	0.7	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	31	49 pers/h
Effective Stop Rate		0.08	0.06
Proportion Queued		0.05	0.04
Performance Index		7.0	7.0
Cost (Total)	\$/h	444.68	444.68 \$/h
Fuel Consumption (Total)	L/h	26.0	
Carbon Dioxide (Total)	kg/h	61.4	
Hydrocarbons (Total)	kg/h	0.005	
Carbon Monoxide (Total)	kg/h	0.07	
NOx (Total)	kg/h	0.062	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 28.4% 2.0% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	153	4.8	153	4.8	0.090	0.1	LOS A	0.1	0.7	0.06	0.08	0.06	58.7
23	R2	All MCs	14	0.0	14	0.0	0.090	6.1	LOS A	0.1	0.7	0.06	0.08	0.06	56.2
Approach			166	4.4	166	4.4	0.090	0.6	NA	0.1	0.7	0.06	0.08	0.06	58.5
NorthEast: Site Access															
24	L2	All MCs	27	0.0	27	0.0	0.024	6.1	LOS A	0.1	0.6	0.28	0.56	0.28	52.1
26	R2	All MCs	4	0.0	4	0.0	0.024	6.8	LOS A	0.1	0.6	0.28	0.56	0.28	51.7
Approach			32	0.0	32	0.0	0.024	6.2	LOS A	0.1	0.6	0.28	0.56	0.28	52.0
NorthWest: Pittwater Road NW															
27	L2	All MCs	1	0.0	1	0.0	0.098	5.6	LOS A	0.0	0.0	0.00	0.00	0.00	57.4
28	T1	All MCs	181	5.2	181	5.2	0.098	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach			182	5.2	182	5.2	0.098	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
All Vehicles			380	4.4	380	4.4	0.098	0.8	NA	0.1	0.7	0.05	0.08	0.05	58.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

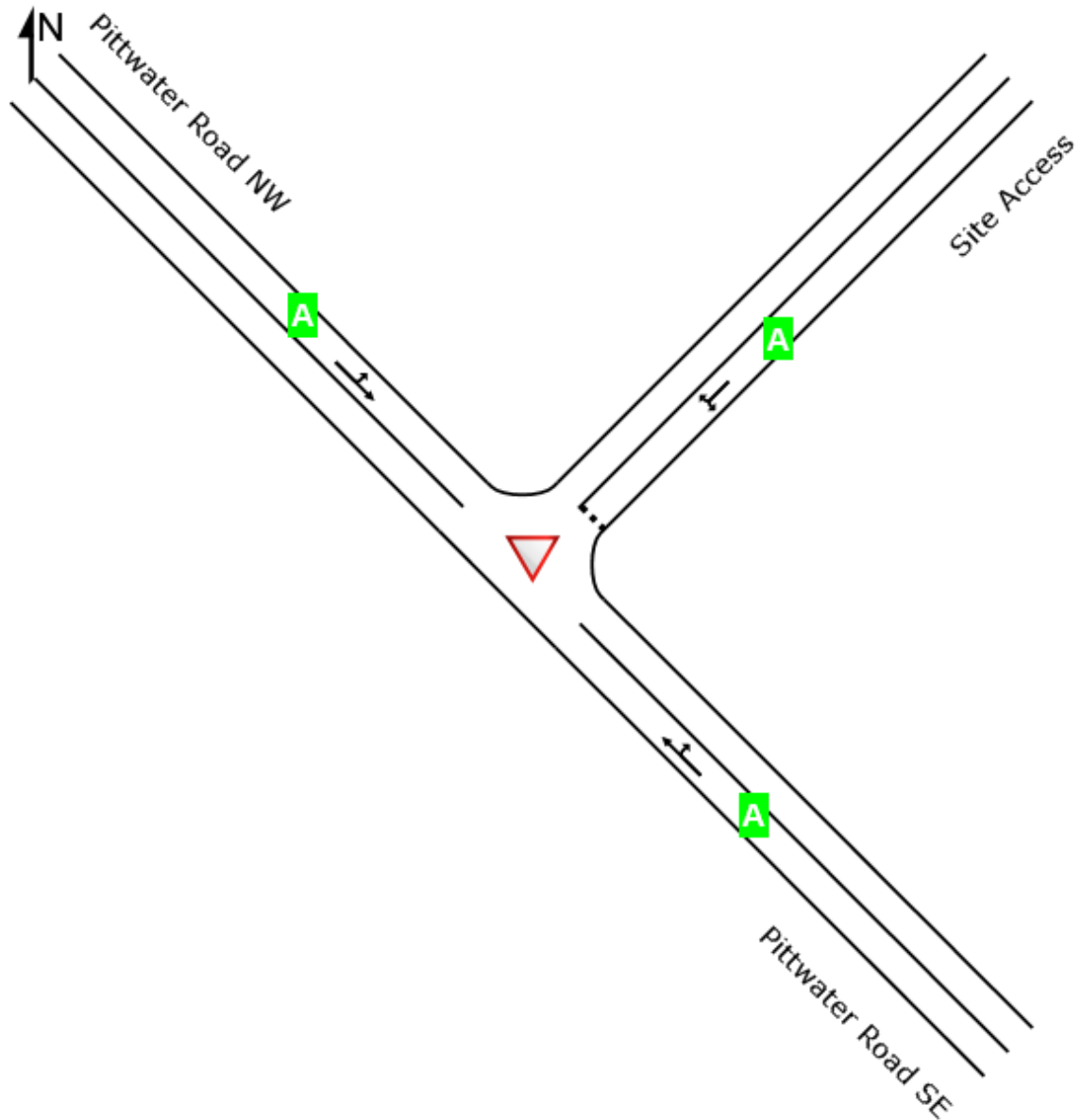
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

**Template: Default Site User
Report**

 **Site: 101 [Site Access AM Peak 9:45 to 10:45 (Site Folder: Saturday Site Driveway)]**

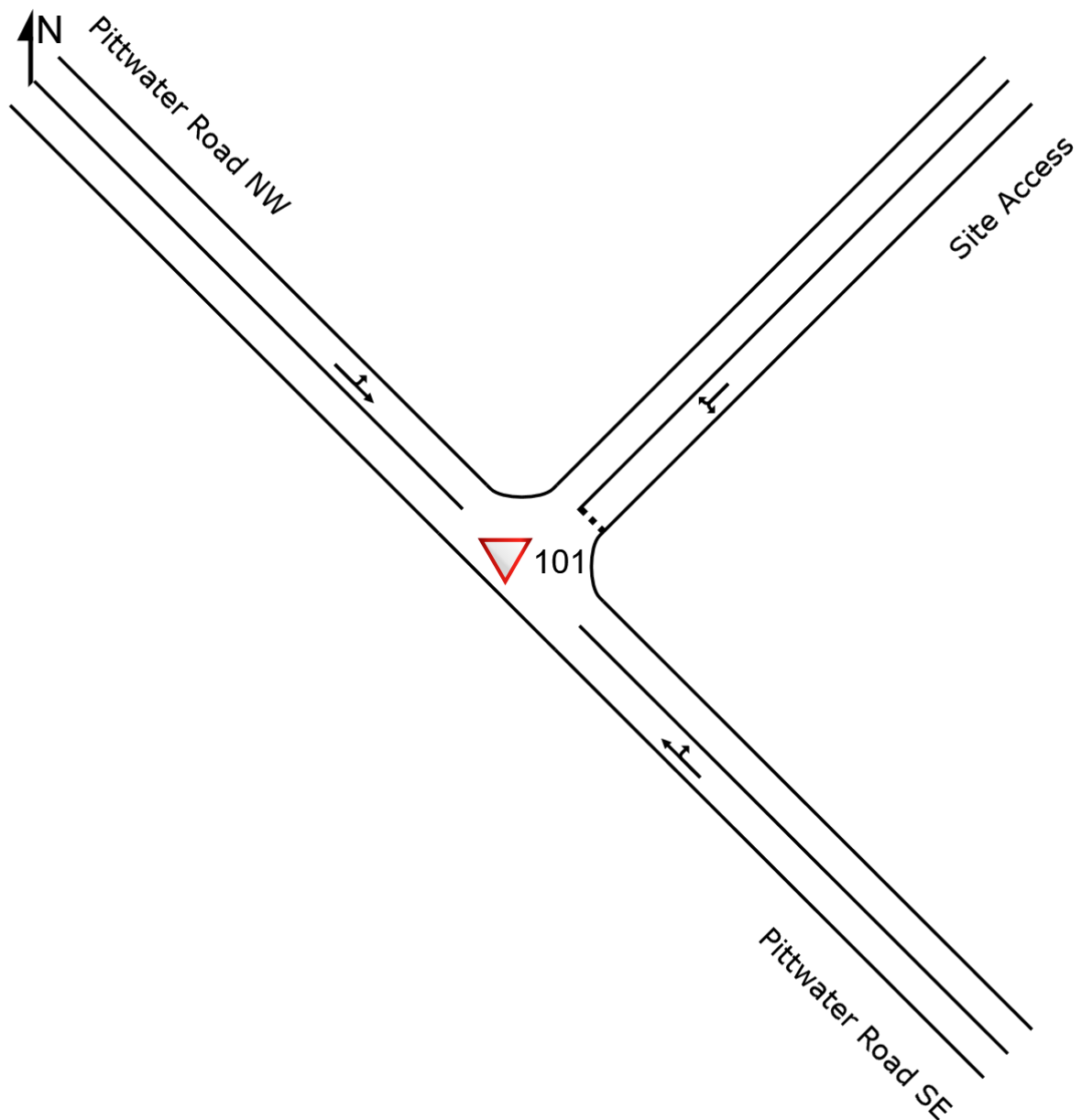
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	54.2	54.1 km/h
Travel Distance (Total)	veh-km/h	460.5	635.7 pers-km/h
Travel Time (Total)	veh-h/h	8.5	11.7 pers-h/h
Desired Speed	km/h	54.8	
Speed Efficiency		0.99	
Travel Time Index		9.87	
Congestion Coefficient		1.01	
Demand Flows (Total)	veh/h	456	629 pers/h
Arrival Flows (Total)	veh/h	456	
Percent Heavy Vehicles (Demand)	%	2.5	
Percent Heavy Vehicles (Arrivals)	%	2.5	
Degree of Saturation		0.115	
Practical Spare Capacity	%	754.9	
Effective Intersection Capacity	veh/h	3976	
Control Delay (Total)	veh-h/h	0.12	0.14 pers-h/h
Control Delay (Average)	sec	0.9	0.8 sec
Control Delay (Worst Lane by MC)	sec	6.0	
Control Delay (Worst Movement by MC)	sec	6.2	6.2 sec
Geometric Delay (Average)	sec	0.8	
Stop-Line Delay (Average)	sec	0.2	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.3	
95% Back of Queue - Dist (Worst Lane)	m	1.8	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	48	63 pers/h
Effective Stop Rate		0.11	0.10
Proportion Queued		0.08	0.07
Performance Index		9.4	9.4
Cost (Total)	\$/h	406.74	406.74 \$/h
Fuel Consumption (Total)	L/h	28.0	
Carbon Dioxide (Total)	kg/h	60.6	
Hydrocarbons (Total)	kg/h	0.005	
Carbon Monoxide (Total)	kg/h	0.07	
NOx (Total)	kg/h	0.062	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 32.5% 4.9% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	177	3.0	177	3.0	0.115	0.2	LOS A	0.3	1.8	0.13	0.16	0.13	57.0
23	R2	All MCs	36	0.0	36	0.0	0.115	6.2	LOS A	0.3	1.8	0.13	0.16	0.13	55.1
Approach			213	2.5	213	2.5	0.115	1.2	NA	0.3	1.8	0.13	0.16	0.13	56.7
NorthEast: Site Access															
24	L2	All MCs	23	0.0	23	0.0	0.019	6.1	LOS A	0.1	0.5	0.29	0.54	0.29	50.4
26	R2	All MCs	2	0.0	2	0.0	0.019	4.0	LOS A	0.1	0.5	0.29	0.54	0.29	36.3
Approach			25	0.0	25	0.0	0.019	6.0	LOS A	0.1	0.5	0.29	0.54	0.29	48.8
NorthWest: Pittwater Road NW															
27	L2	All MCs	2	0.0	2	0.0	0.104	4.9	LOS A	0.0	0.0	0.00	0.01	0.00	51.0
28	T1	All MCs	216	2.9	216	2.9	0.104	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	52.6
Approach			218	2.9	218	2.9	0.104	0.1	NA	0.0	0.0	0.00	0.01	0.00	52.5
All Vehicles			456	2.5	456	2.5	0.115	0.9	NA	0.3	1.8	0.08	0.11	0.08	54.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

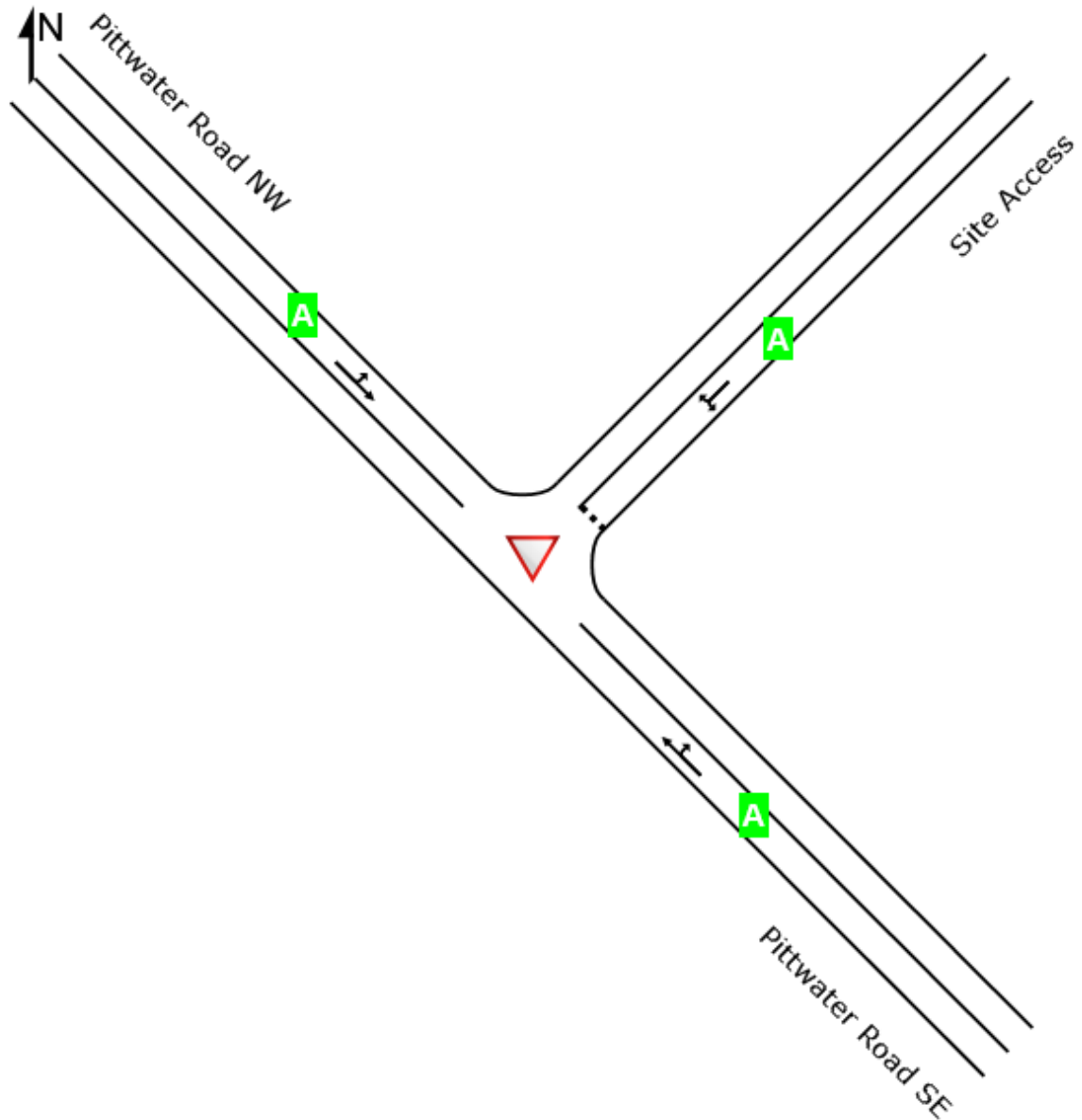
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

**Template: Default Site User
Report**

 **Site: 101 [Site Access PM Peak 15:45 to 16:45 (Site Folder: Saturday Site Driveway)]**

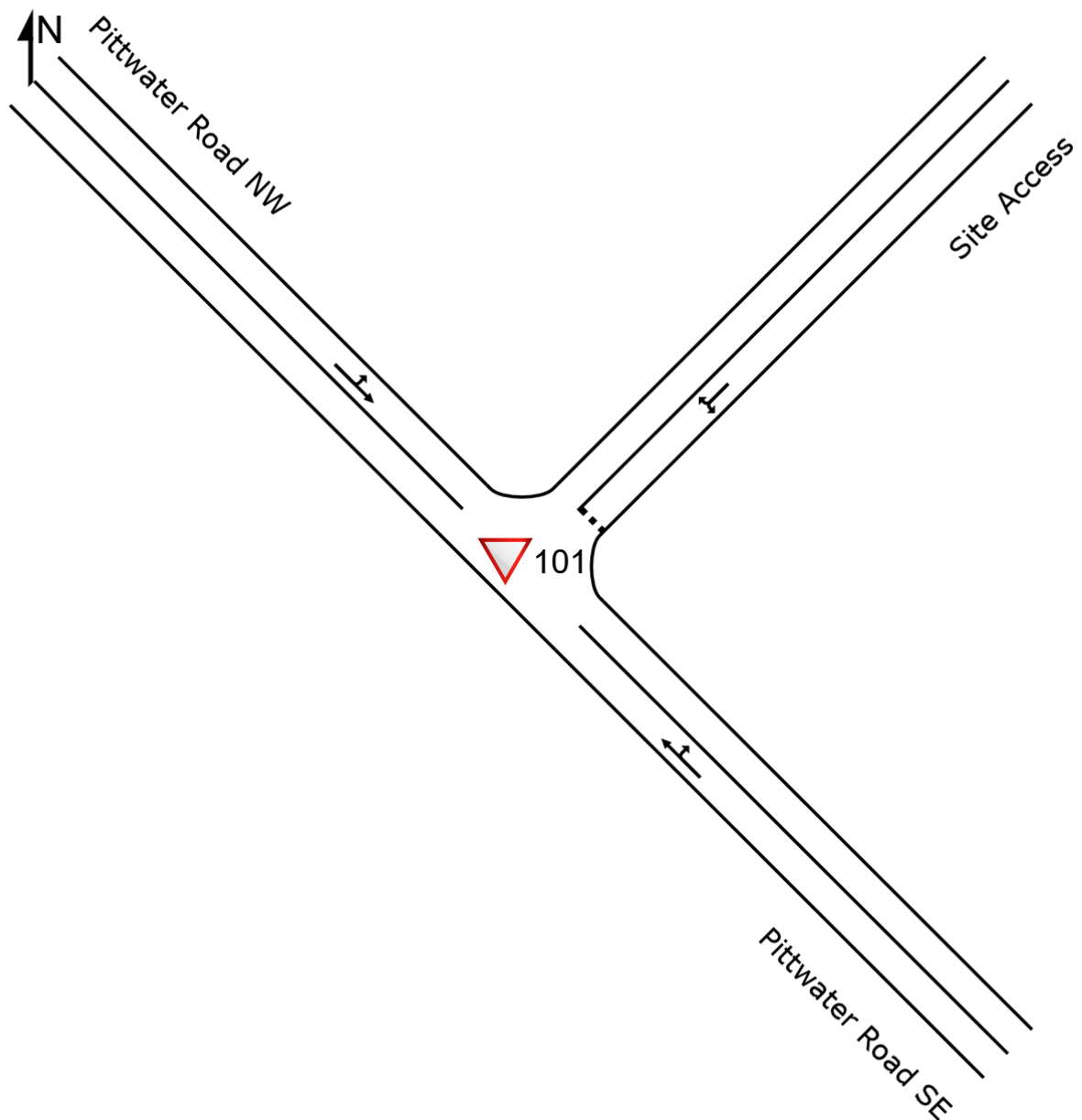
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	58.4	58.6 km/h
Travel Distance (Total)	veh-km/h	330.8	518.6 pers-km/h
Travel Time (Total)	veh-h/h	5.7	8.9 pers-h/h
Desired Speed	km/h	59.2	
Speed Efficiency		0.99	
Travel Time Index		9.85	
Congestion Coefficient		1.01	
Demand Flows (Total)	veh/h	327	513 pers/h
Arrival Flows (Total)	veh/h	327	
Percent Heavy Vehicles (Demand)	%	1.3	
Percent Heavy Vehicles (Arrivals)	%	1.3	
Degree of Saturation		0.083	
Practical Spare Capacity	%	1085.2	
Effective Intersection Capacity	veh/h	3959	
Control Delay (Total)	veh-h/h	0.06	0.07 pers-h/h
Control Delay (Average)	sec	0.7	0.5 sec
Control Delay (Worst Lane by MC)	sec	6.0	
Control Delay (Worst Movement by MC)	sec	6.6	6.6 sec
Geometric Delay (Average)	sec	0.6	
Stop-Line Delay (Average)	sec	0.1	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.1	
95% Back of Queue - Dist (Worst Lane)	m	0.5	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	22	30 pers/h
Effective Stop Rate		0.07	0.06
Proportion Queued		0.04	0.03
Performance Index		5.9	5.9
Cost (Total)	\$/h	308.66	308.66 \$/h
Fuel Consumption (Total)	L/h	20.1	
Carbon Dioxide (Total)	kg/h	46.9	
Hydrocarbons (Total)	kg/h	0.004	
Carbon Monoxide (Total)	kg/h	0.06	
NOx (Total)	kg/h	0.018	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 22.6% 1.4% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	146	1.4	146	1.4	0.083	0.0	LOS A	0.1	0.5	0.04	0.06	0.04	59.0
23	R2	All MCs	11	0.0	11	0.0	0.083	5.9	LOS A	0.1	0.5	0.04	0.06	0.04	56.4
Approach			157	1.3	157	1.3	0.083	0.4	NA	0.1	0.5	0.04	0.06	0.04	58.9
NorthEast: Site Access															
24	L2	All MCs	22	0.0	22	0.0	0.016	6.0	LOS A	0.1	0.4	0.24	0.54	0.24	52.2
26	R2	All MCs	1	0.0	1	0.0	0.016	6.6	LOS A	0.1	0.4	0.24	0.54	0.24	51.9
Approach			23	0.0	23	0.0	0.016	6.0	LOS A	0.1	0.4	0.24	0.54	0.24	52.2
NorthWest: Pittwater Road NW															
27	L2	All MCs	1	0.0	1	0.0	0.076	5.5	LOS A	0.0	0.0	0.00	0.00	0.00	56.7
28	T1	All MCs	146	1.4	146	1.4	0.076	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.1
Approach			147	1.4	147	1.4	0.076	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.1
All Vehicles			327	1.3	327	1.3	0.083	0.7	NA	0.1	0.5	0.04	0.07	0.04	58.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

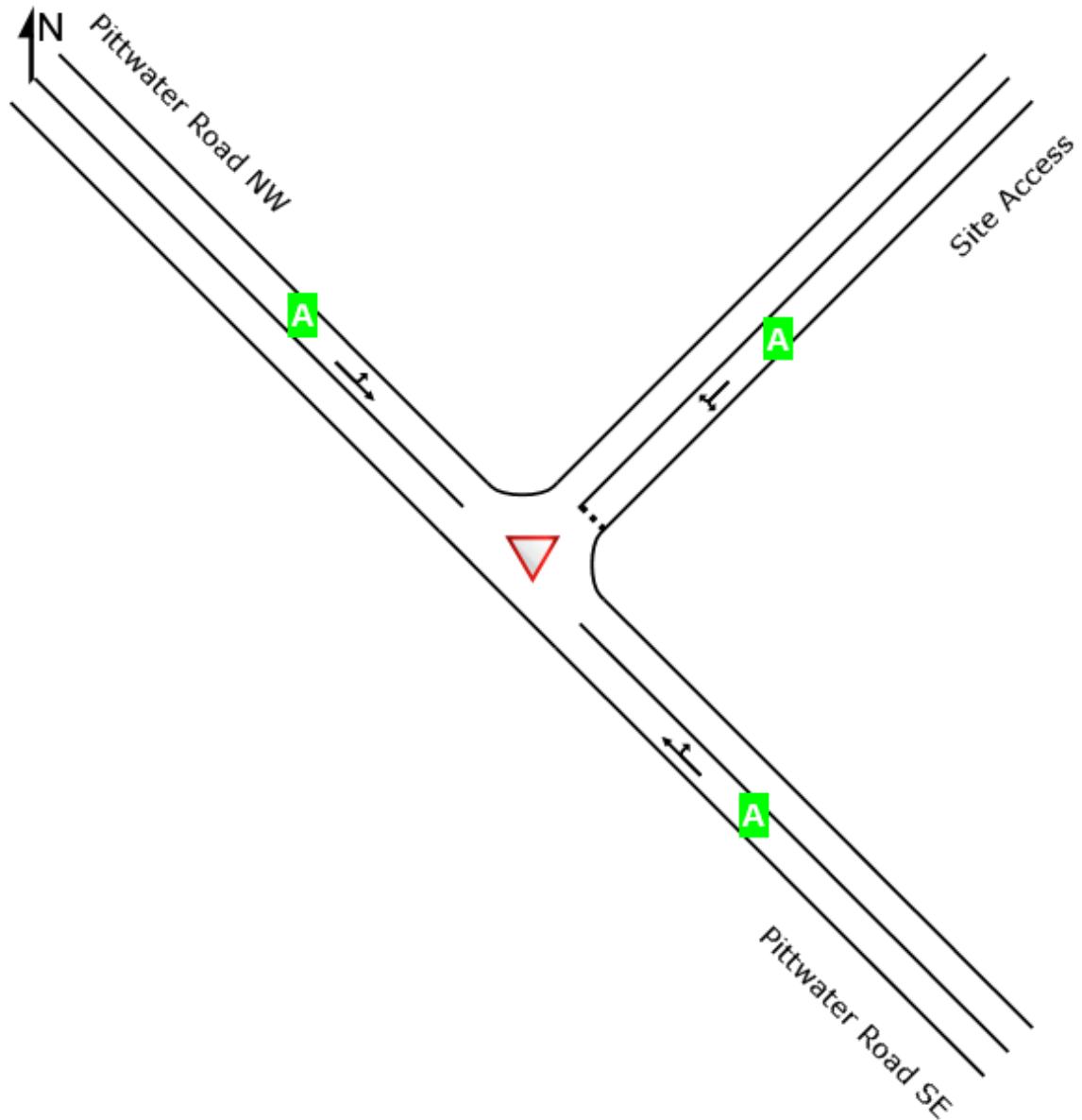
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

**Template: Default Site User
Report**

 **Site: 101 [Site Access AM Peak 9:45 to 10:45 (Site Folder: Sunday Site Driveway)]**

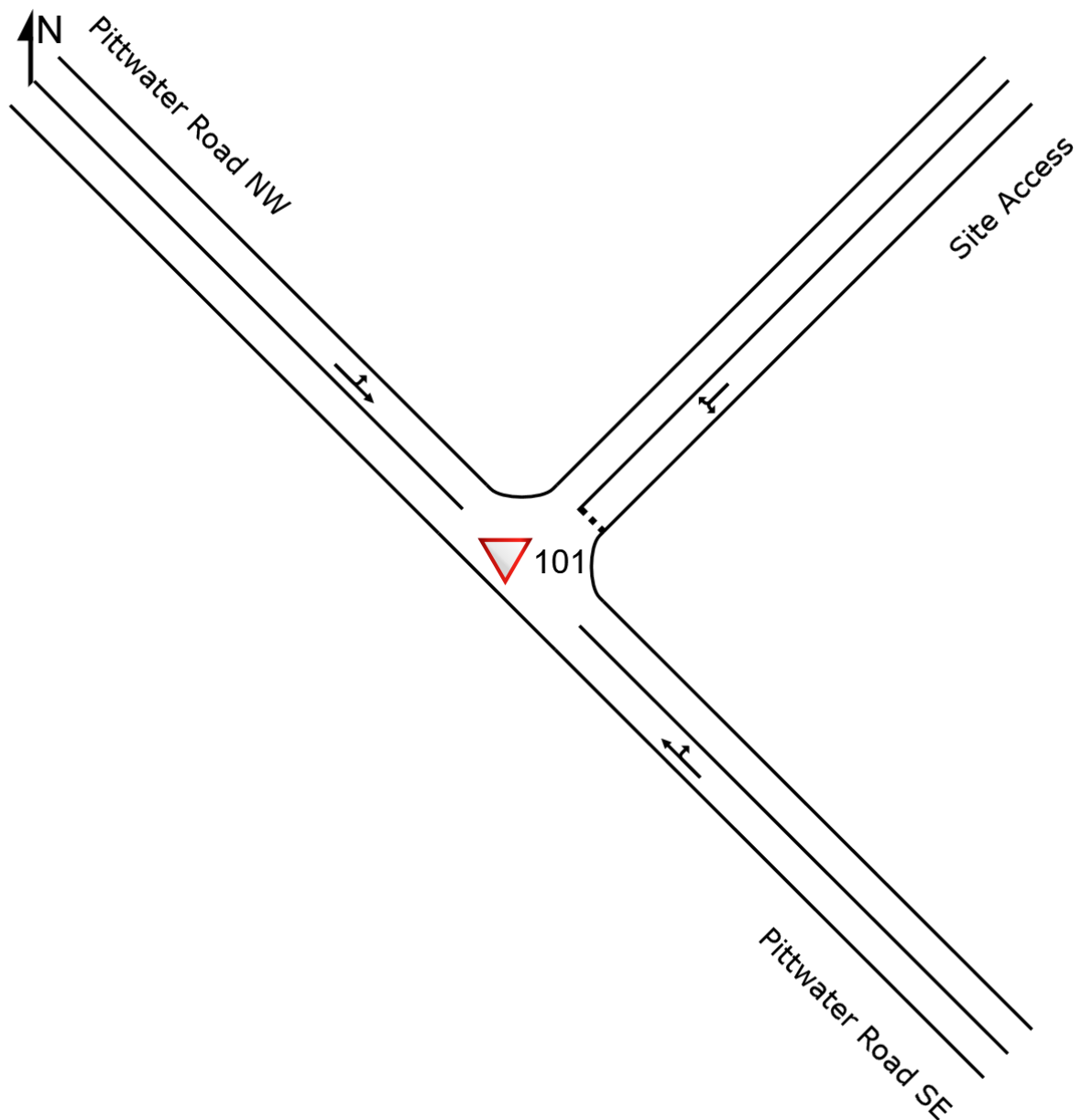
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	52.5	52.6 km/h
Travel Distance (Total)	veh-km/h	452.1	713.5 pers-km/h
Travel Time (Total)	veh-h/h	8.6	13.6 pers-h/h
Desired Speed	km/h	52.6	
Speed Efficiency		1.00	
Travel Time Index		9.98	
Congestion Coefficient		1.00	
Demand Flows (Total)	veh/h	447	706 pers/h
Arrival Flows (Total)	veh/h	447	
Percent Heavy Vehicles (Demand)	%	1.9	
Percent Heavy Vehicles (Arrivals)	%	1.9	
Degree of Saturation		0.103	
Practical Spare Capacity	%	854.3	
Effective Intersection Capacity	veh/h	4356	
Control Delay (Total)	veh-h/h	0.13	0.16 pers-h/h
Control Delay (Average)	sec	1.0	0.8 sec
Control Delay (Worst Lane by MC)	sec	5.8	
Control Delay (Worst Movement by MC)	sec	6.9	6.9 sec
Geometric Delay (Average)	sec	0.9	
Stop-Line Delay (Average)	sec	0.2	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.2	
95% Back of Queue - Dist (Worst Lane)	m	1.3	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	51	74 pers/h
Effective Stop Rate		0.11	0.10
Proportion Queued		0.07	0.06
Performance Index		9.5	9.5
Cost (Total)	\$/h	448.76	448.76 \$/h
Fuel Consumption (Total)	L/h	25.0	
Carbon Dioxide (Total)	kg/h	51.4	
Hydrocarbons (Total)	kg/h	0.004	
Carbon Monoxide (Total)	kg/h	0.06	
NOx (Total)	kg/h	0.034	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 34.0% 4.4% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	171	2.5	171	2.5	0.103	0.2	LOS A	0.2	1.3	0.10	0.13	0.10	56.0
23	R2	All MCs	27	0.0	27	0.0	0.103	6.1	LOS A	0.2	1.3	0.10	0.13	0.10	54.8
Approach			198	2.1	198	2.1	0.103	1.0	NA	0.2	1.3	0.10	0.13	0.10	55.8
NorthEast: Site Access															
24	L2	All MCs	35	0.0	35	0.0	0.028	5.7	LOS A	0.1	0.7	0.28	0.54	0.28	49.2
26	R2	All MCs	3	0.0	3	0.0	0.028	6.9	LOS A	0.1	0.7	0.28	0.54	0.28	50.4
Approach			38	0.0	38	0.0	0.028	5.8	LOS A	0.1	0.7	0.28	0.54	0.28	49.3
NorthWest: Pittwater Road NW															
27	L2	All MCs	8	0.0	8	0.0	0.097	4.6	LOS A	0.0	0.0	0.00	0.02	0.00	49.0
28	T1	All MCs	203	2.1	203	2.1	0.097	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	50.3
Approach			212	2.0	212	2.0	0.097	0.2	NA	0.0	0.0	0.00	0.02	0.00	50.2
All Vehicles			447	1.9	447	1.9	0.103	1.0	NA	0.2	1.3	0.07	0.11	0.07	52.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

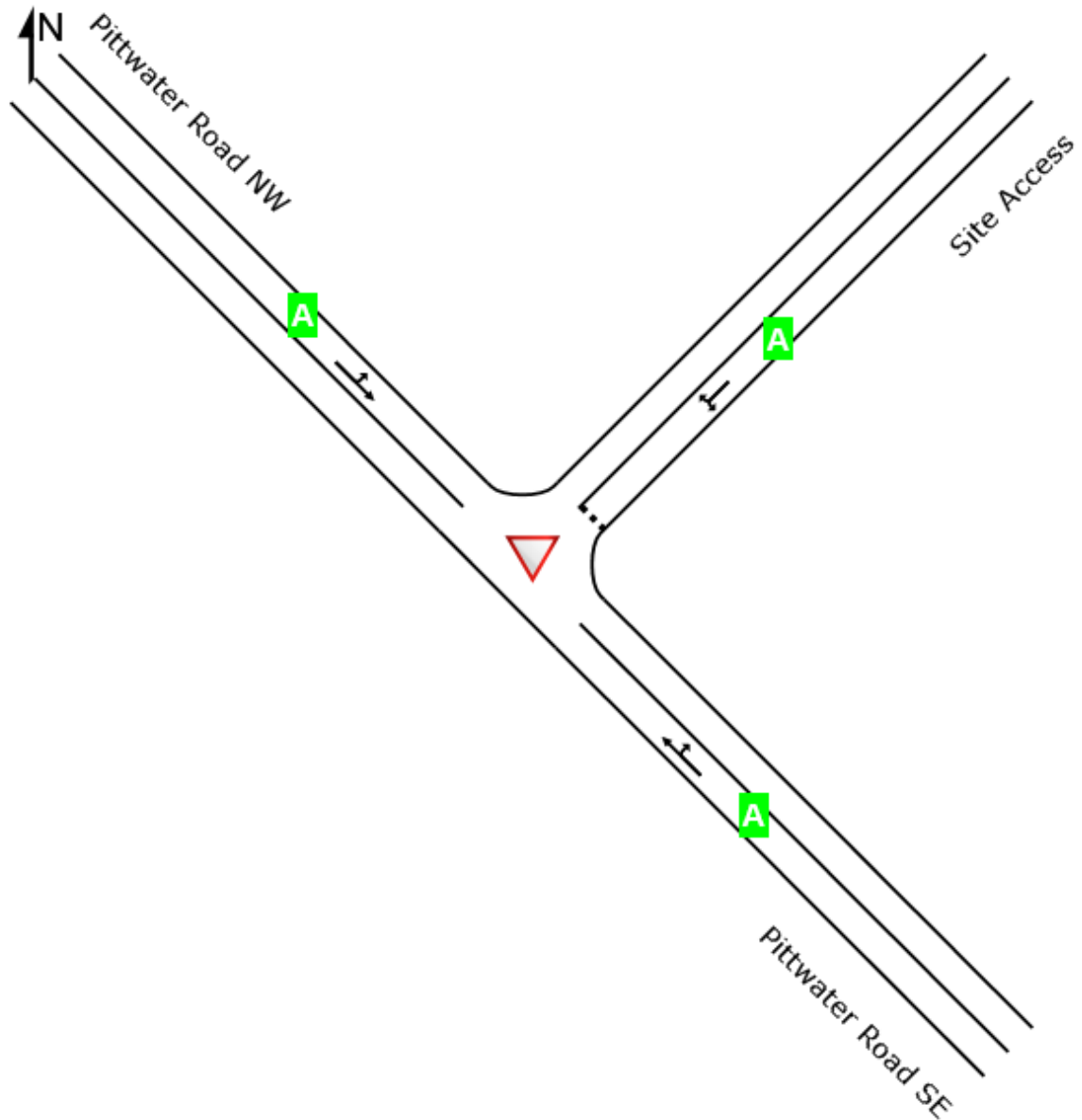
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

USER REPORT FOR SITE

 **Project:** Project1

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

**Template: Default Site User
Report**

 **Site: 101 [Site Access PM Peak 15:15 to 16:15 (Site Folder: Sunday Site Driveway)]**

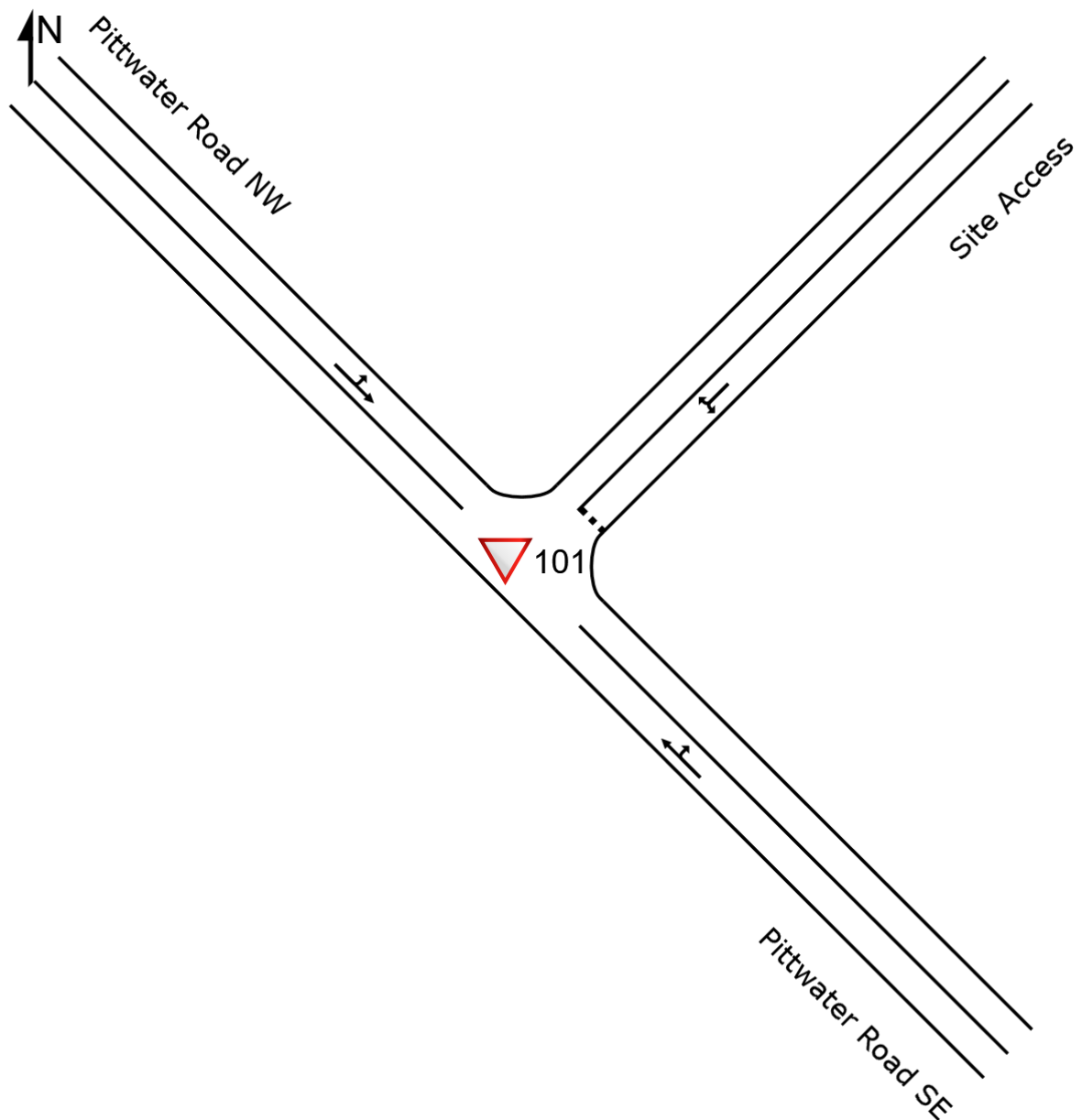
New Site

Site Category: (None)

Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Intersection Performance - Hourly Values			
Performance Measure	Vehicles:	All MCs	Persons
Travel Speed (Average)	km/h	57.5	57.8 km/h
Travel Distance (Total)	veh-km/h	407.4	701.1 pers-km/h
Travel Time (Total)	veh-h/h	7.1	12.1 pers-h/h
Desired Speed	km/h	58.5	
Speed Efficiency		0.98	
Travel Time Index		9.82	
Congestion Coefficient		1.02	
Demand Flows (Total)	veh/h	403	694 pers/h
Arrival Flows (Total)	veh/h	403	
Percent Heavy Vehicles (Demand)	%	2.3	
Percent Heavy Vehicles (Arrivals)	%	2.3	
Degree of Saturation		0.104	
Practical Spare Capacity	%	840.1	
Effective Intersection Capacity	veh/h	3868	
Control Delay (Total)	veh-h/h	0.09	0.12 pers-h/h
Control Delay (Average)	sec	0.8	0.6 sec
Control Delay (Worst Lane by MC)	sec	6.3	
Control Delay (Worst Movement by MC)	sec	6.9	6.9 sec
Geometric Delay (Average)	sec	0.7	
Stop-Line Delay (Average)	sec	0.1	
Idling Time (Average)	sec	0.0	
Intersection Level of Service (LOS)		NA	
95% Back of Queue - Veh (Worst Lane)	veh	0.1	
95% Back of Queue - Dist (Worst Lane)	m	0.8	
Ave. Que Storage Ratio (Worst Lane)		0.00	
Effective Stops (Total)	veh/h	34	47 pers/h
Effective Stop Rate		0.08	0.07
Proportion Queued		0.05	0.04
Performance Index		7.5	7.5
Cost (Total)	\$/h	416.67	416.67 \$/h
Fuel Consumption (Total)	L/h	25.5	
Carbon Dioxide (Total)	kg/h	58.9	
Hydrocarbons (Total)	kg/h	0.005	
Carbon Monoxide (Total)	kg/h	0.07	
NOx (Total)	kg/h	0.037	

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.

In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.

Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %

Number of Iterations: 3 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 30.0% 1.8% 0.0%

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist] m				km/h
SouthEast: Pittwater Road SE															
22	T1	All MCs	149	2.8	149	2.8	0.085	0.1	LOS A	0.1	0.5	0.05	0.06	0.05	58.6
23	R2	All MCs	11	0.0	11	0.0	0.085	6.1	LOS A	0.1	0.5	0.05	0.06	0.05	56.2
Approach			160	2.6	160	2.6	0.085	0.5	NA	0.1	0.5	0.05	0.06	0.05	58.5
NorthEast: Site Access															
24	L2	All MCs	35	0.0	35	0.0	0.032	6.1	LOS A	0.1	0.8	0.29	0.57	0.29	52.0
26	R2	All MCs	6	0.0	6	0.0	0.032	6.9	LOS A	0.1	0.8	0.29	0.57	0.29	51.7
Approach			41	0.0	41	0.0	0.032	6.3	LOS A	0.1	0.8	0.29	0.57	0.29	52.0
NorthWest: Pittwater Road NW															
27	L2	All MCs	1	0.0	1	0.0	0.104	5.4	LOS A	0.0	0.0	0.00	0.00	0.00	55.9
28	T1	All MCs	201	2.6	201	2.6	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	58.1
Approach			202	2.6	202	2.6	0.104	0.1	NA	0.0	0.0	0.00	0.00	0.00	58.1
All Vehicles			403	2.3	403	2.3	0.104	0.8	NA	0.1	0.8	0.05	0.08	0.05	57.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Two-Way Sign Control Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).

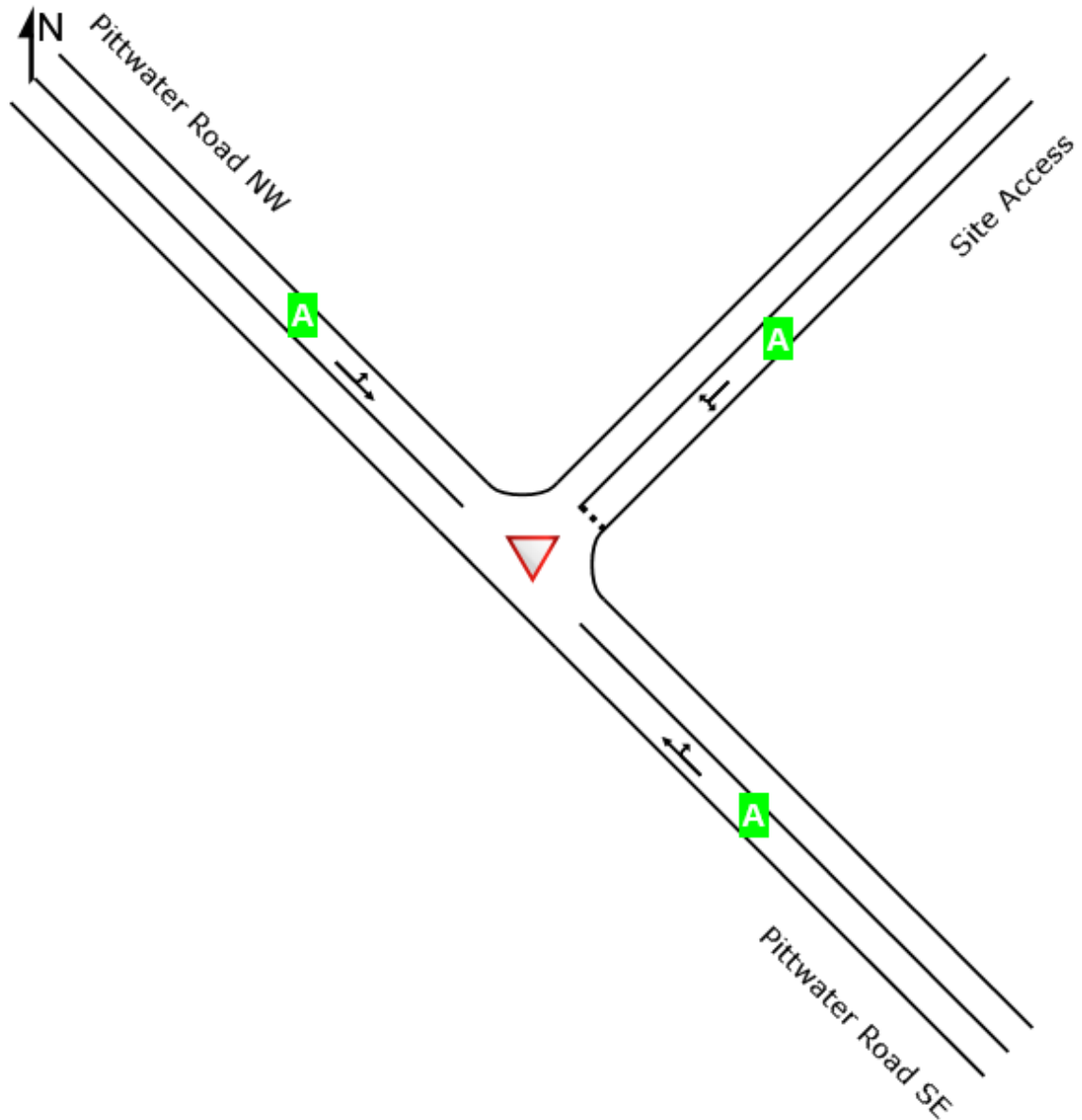
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Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

LOS Summary



Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).