

APPENDIX E

TRANSPORT ASSESSMENT

Meriton Properties
Little Bay Cove
Transport Assessment

Rev A | 24 June 2019

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 267648

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1 Introduction

1.1 Background

Meriton Properties (Meriton) commissioned Arup to undertake traffic and transport analysis for the proposed Little Bay Cove site in Sydney's south-east. The intended outcome of the Gateway application is to amend the *Randwick Local Environmental Plan 2012* (RLEP 2013) as follows:

- Increase the maximum floor space ratio (FSR) from 0.5:1 to 2:1.
- Increase the maximum height of buildings

A concept plan illustrating the type of development facilitated by the Planning Proposal has been prepared by SJB. The concept plan contemplates a high-density residential development with buildings of 2-22 storeys oriented around a network of internal roads and public open space. The development is proposed to accommodate approximately 1,909 dwellings and allowance has been made for 5,900m² retail floor space and provision for a 100-place childcare centre.

The site has approval for up to 617 dwellings including 28 house lots and 10 super lots containing 135 townhouses and 288 apartments (Case number 10672 of 2009). Of these, there has been:

- Approval and construction of one 5-storey building with 45 apartments, with 47 parking spaces on Lot 5
- Approval and construction of three 5-storey buildings, with 179 apartments, with 226 parking spaces on Lot 11
- Approval and construction of two house dwellings

This report references the previously prepared documentation for the whole site including the Colston Budd Hunt and Kafes report prepared for the original approval dated February 2009.

The subject site is located within a broader site previously known as UNSW sporting fields and associated facilities and the former UNSW Biological Resources Centre.

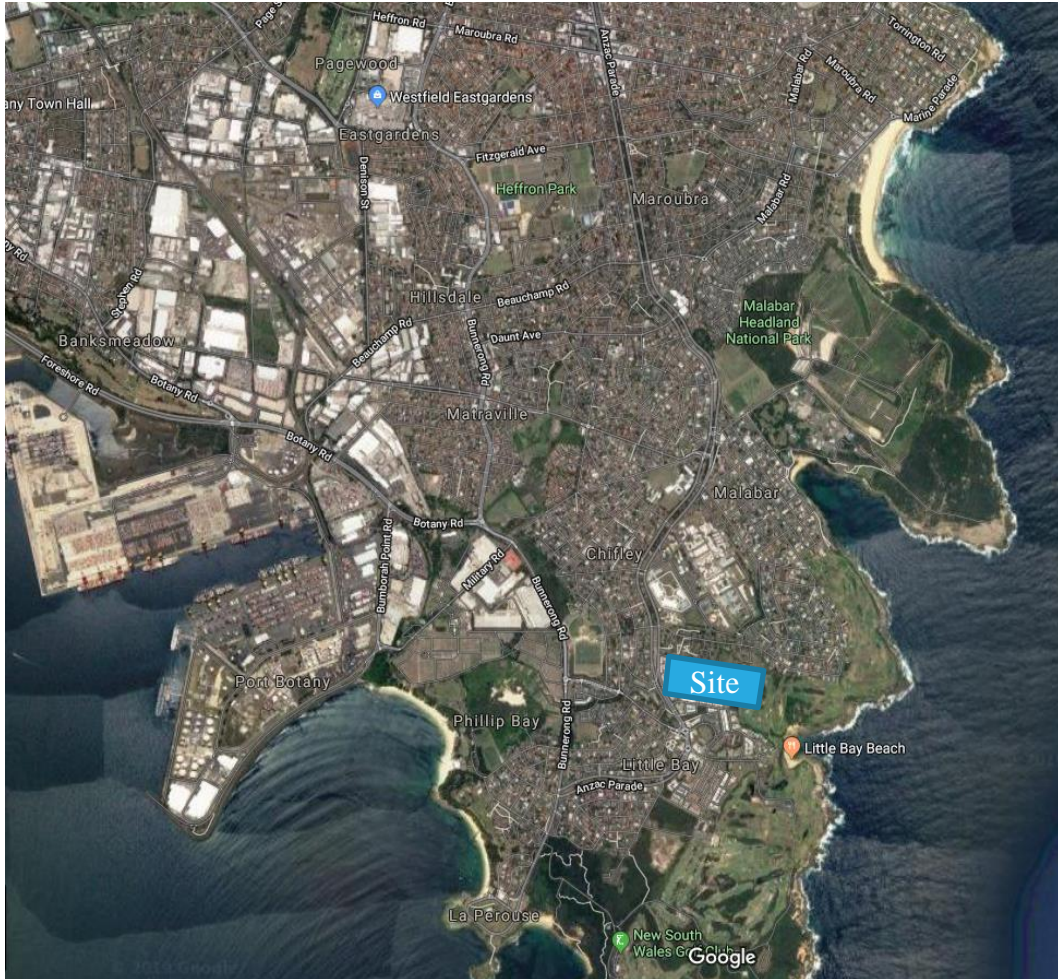


Figure 1: Site location

1.2 Report scope

This transport report supports the rezoning application related to Little Bay Cove site and will outline the following:

- Existing transport conditions
- Forecast traffic generation
- Road network impacts
- Parking provision
- Access arrangements
- Public transport availability
- Pedestrian and cycle linkages

2 Planning context

2.1 Sydney Light Rail / High Frequency Buses

The current Sydney Light Rail is proposed to terminate at Kingsford, which is approximately 6km from the proposed development site. However, Infrastructure NSW noted that the light rail may be extended to La Perouse via Maroubra Junction in the State Infrastructure Strategy Update. This would place a light rail stop within 10 minutes' walk of the proposed site.

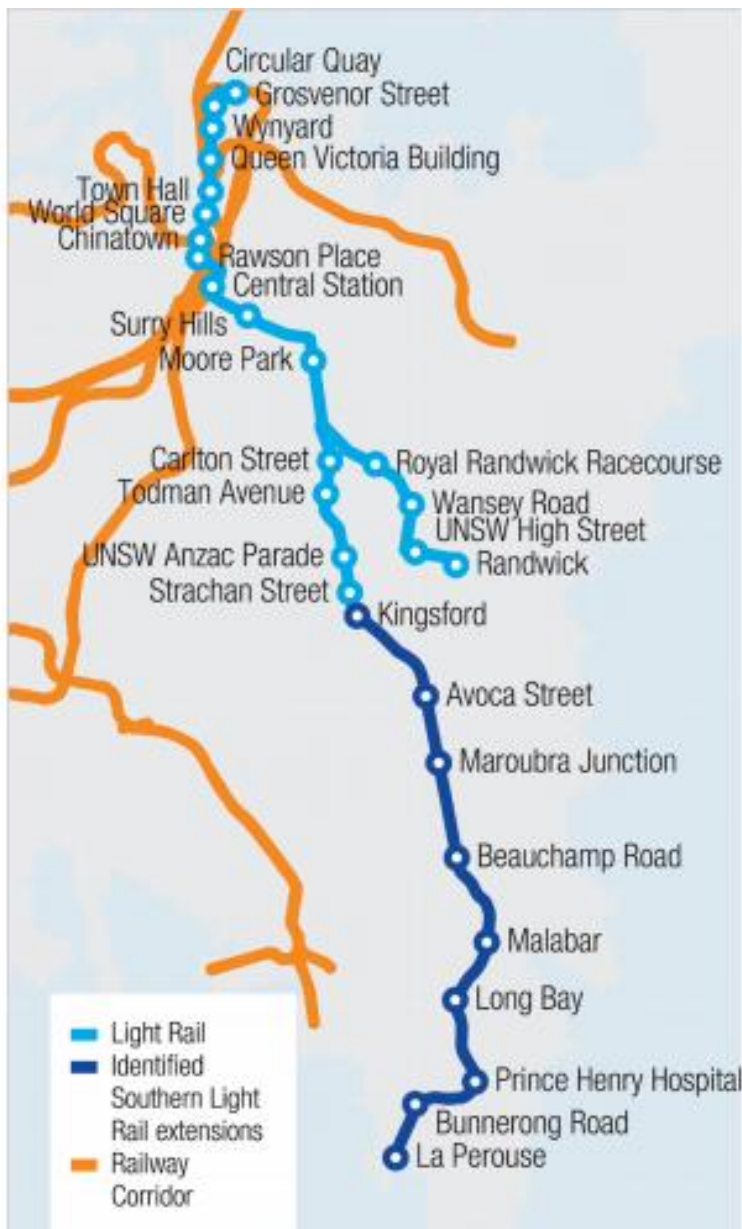


Figure 2: Potential Light Rail extension

Source: Infrastructure NSW (originally from Transport for NSW)

Meriton in liaison with the former Botany Bay Council and Randwick Council, has also approached the NSW State Government to consider extending the current

CBD and South East Light Rail to Maroubra Junction and on to the site. This could service the suburbs of Maroubra, Pagewood, Matraville, Eastgardens and the broader South-East Sydney area. There would also be further opportunities to expand this service beyond the site to the south and west, expanding the potential for cross district transport connections.

Given the complexities of this transport mode and the availability of transport corridors such as Anzac Parade, a high frequency bus service is much more cost effective.

2.2 Sydney Metro West

The NSW Government has announced a new underground metro railway line linking the Parramatta and Sydney CBDs, and communities along the way. The Sydney Metro West project addresses Sydney's rapid growth, with the city's population to increase above 6 million in the next 20 years. The new railway is expected to be built largely underground and operational in the second half of the 2020s. The final number of potential stations will be identified following community and industry consultation. Four key precincts to be serviced have initially been identified at:

- Parramatta, where the number of jobs is expected to double over the next 20 years to 100,000.
- Sydney Olympic Park, where 34,000 jobs and more than 23,000 residents will be located by 2030.
- The Bays Precinct, Sydney's new innovation hub where 95 hectares of land is being regenerated.
- The Sydney CBD, allowing easy access to the existing public transport network and Stages 1 and 2 of Sydney Metro, which is currently under construction.

Following the announcement, a consortium proposed value-capture for the project, including connections further west to Western Sydney Airport via Westmead and further east to La Perouse via Maroubra and Alexandria. The potential alignments proposed by the consortium are noted in Figure 3 and could have a connection as close as Maroubra to the proposed site.

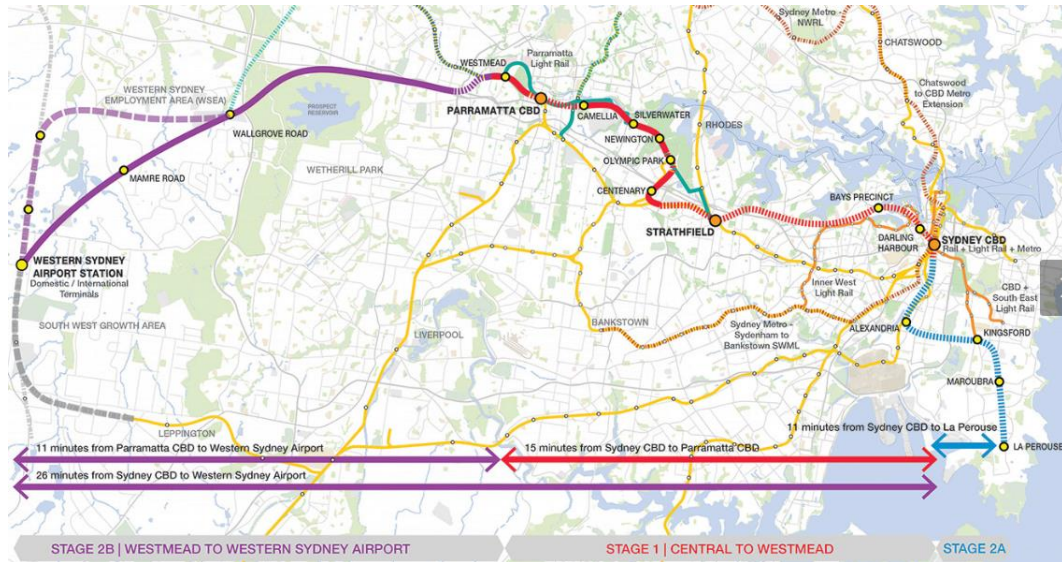


Figure 3: Potential Metro West alignments (Source CM+)

2.3 Future transport

Future transport Strategy 2056 notes the corridor via Maroubra Junction and Eastgardens towards the Harbour CBD as a city-shaping corridor. Eastgardens is a strategic centre with Malabar nominated as a centre to be served by this corridor.

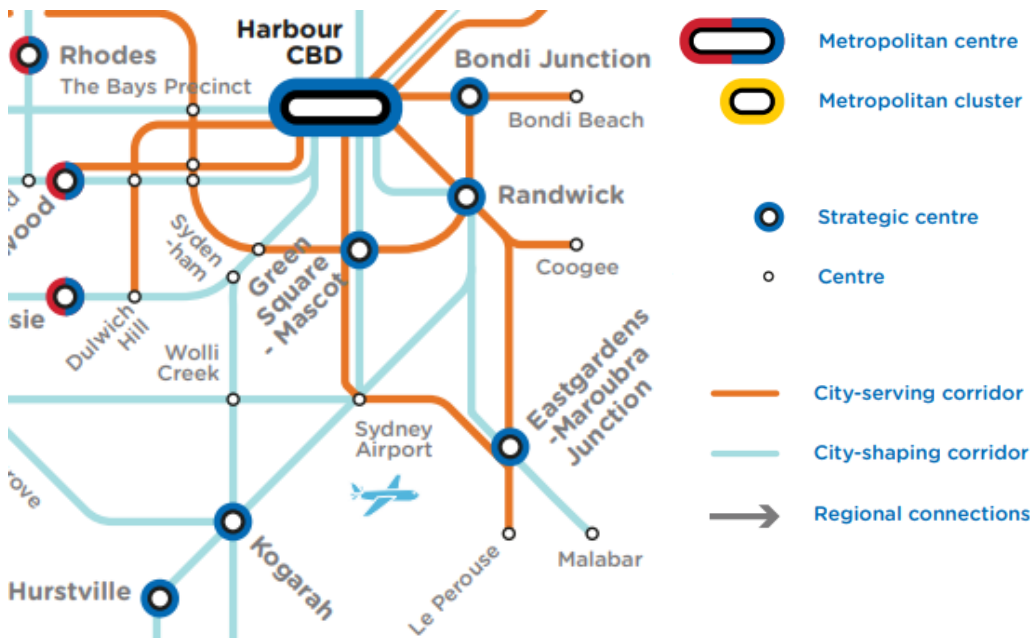


Figure 4: Greater Sydney Intermediate Transit Network 2056

The key project to be investigated within 0-10 years is the Green Square to La Perouse Rapid Bus Link, which is Item 1 in Figure 5. The Light Rail Extension to Maroubra Junction and Mass transit / train link to South East are also key initiatives to be investigated within 10-20 years as shown in Figure 6.



Figure 5: Future transport initiatives for investigation in 0-10 years



Figure 6: Future transport initiatives for investigation in 10-20 years

The centre-serving network connects local areas with strategic centres. It enables customers living in typically lower density areas across Greater Sydney to access jobs, education and services in strategic centres and to access city-shaping corridors, such as train, metro and high frequency bus services.

2.4 Eastern City District Plan

The Greater Sydney Commission released the Eastern City District Plan in 2018 that discusses the strategic importance throughout the area surrounding Little Bay. One of the key points is the investigation of transport to the south east, servicing Malabar via Randwick and Eastgardens/Maroubra Junction.

Urban renewal opportunities that leverage potential future mass transit to Malabar, Maroubra, La Perouse and Port Botany were identified as future opportunities to align growth with infrastructure investment.

Another key Green Grid project important to the district is The Great Coastal Walk which would complete missing links around Malabar Headland towards South Head. The site could capitalise of this link for recreation and connections to the north.



Figure 7: Eastern City District Plan

2.5 Previous studies and works

A Traffic and Transport Study (CBH&K) was prepared in February 2009 for the existing overall site to accompany the proposed residential subdivision by CHOF5 Little Bay Pty Limited.

The site has approval for up to 451 residential dwellings including 28 house lots and 10 super lots containing 135 townhouses and 288 apartments (Case number 10672 of 2009). Of these, there has been:

- Approval and construction of one 5-storey building with 45 apartments, with 47 parking spaces on Lot 5
- Approval and construction of three 5-storey buildings, with 179 apartments, with 226 parking spaces on Lot 11
- Approval and construction of two house dwellings

The traffic assessment was undertaken using INTANAL software, and found that:

- Intersections surrounding site operated at level of service A both before and after development. Sites assessed included:

- Anzac Parade / Little Bay Road / Jenner Street
- Anzac Parade / Gubbuteh Road
- Anzac Parade / Nyan Street
- Anzac Parade / Bilga Crescent / Kenny Avenue
- Parking was provided at full Randwick DCP rates
- The assessment included forecast traffic flows from the adjoining Prince Henry development (which was not yet built). This included up to 325 trips during the AM peak hour and 440 trips during the PM peak hour.
- It was proposed that the northern east-west road (Cawood Avenue) will connect to the northbound carriageway of Anzac Parade to accommodate all movements. The southern east-west road (Solarch Avenue) would be left-in / left-out only.

3 Existing site context

3.1 Site description

The proposed development site relates to Little Bay Cove which consists of a series of super lots as shown in Figure 9. The overall site includes the undeveloped and built lots as described in Table 1.

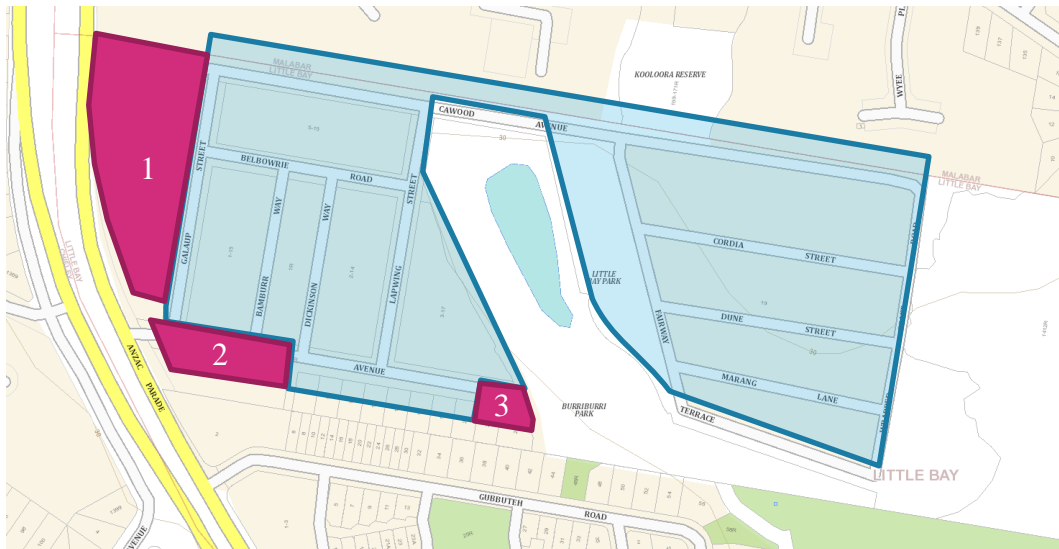


Figure 8: Site lots

Table 1: Lot descriptions

Sites undeveloped	Sites developed
1-15 Galaup Stree	1. 2 Galaup Street
1R Belbowrie Road (streets)	2. 1-5 Solarch Avenue
1R Solarch Avenue (park)	3. 23 & 25 Solarch Avenue
5-15 Cawood Avenue	
2-14 Lapwing Street	
3-17 Lapwing Street	
19 Cawood Avenue (including a park and streets)	

The site is located within the Randwick Council local government area. The overall site is bound by Malabar residential to the north, Prince Henry development to the south, The Coast Golf Course to the east and Anzac Parade to the west. The site is located some 12.5kms southeast of the Sydney CBD and approximately 4km south of Maroubra Junction. Adjacent land uses include:

- Existing low-density residential development to the north and west of the site; and
- The Coast Golf Course to the west of the site across Banks Avenue.

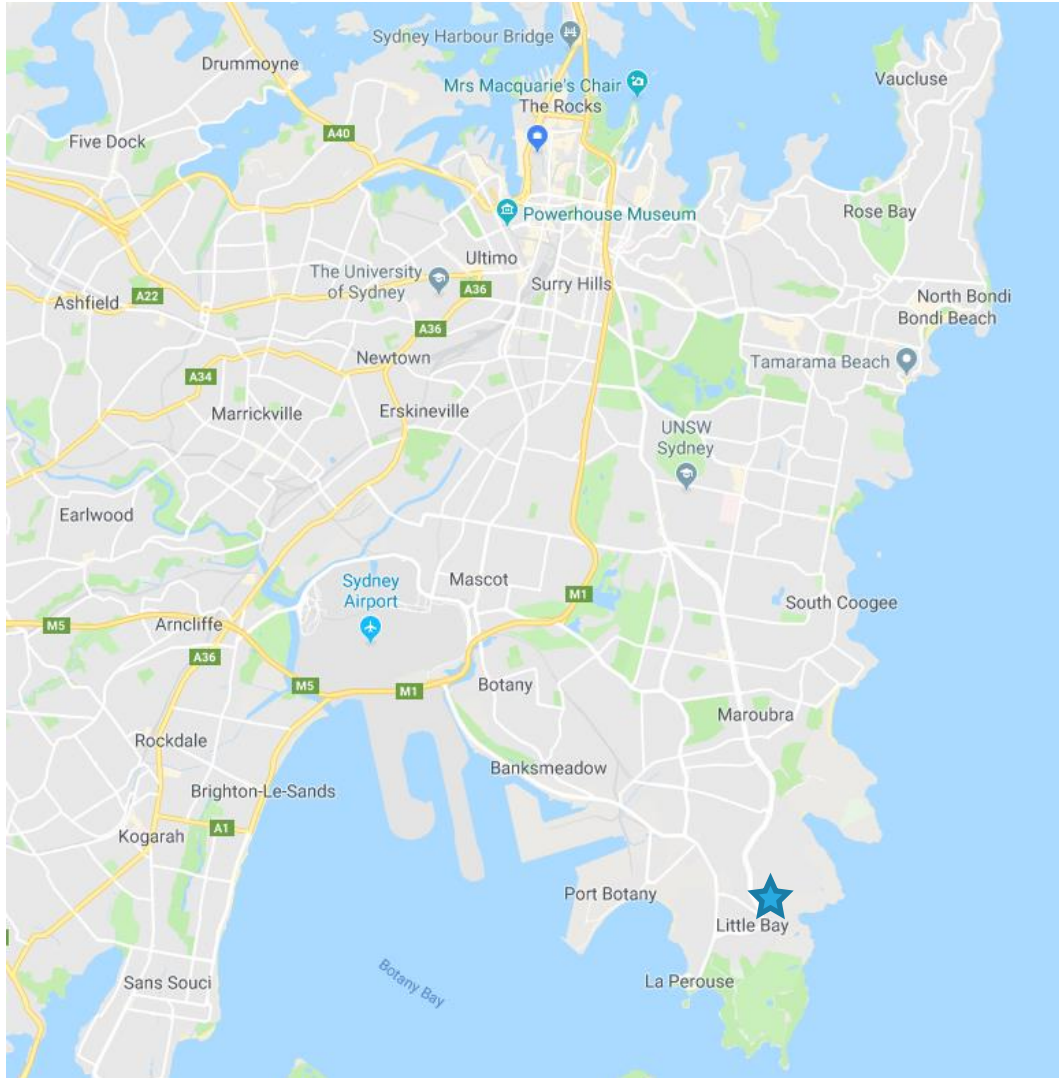


Figure 9: Site location plan

3.2 Road network

The main state roads connecting the site are Anzac Parade, Botany Road and Bunnerong Road.

Anzac Parade, is a state road with two traffic lanes in each direction and a wide central median. It becomes a regional road south of Malabar Road / Beauchamp Road. It serves as a major connection between Little Bay and Kingsford and beyond towards the City directly. Anzac Parade has a speed limit of 60km/h.

Botany Road (located further west to the site) is an east-west state road connecting La Perouse to Sydney CBD. It also provides connections via Foreshore Road further west towards General Holmes Drive.

Bunnerong Road (located further west to the site) is a north-south state road connecting La Perouse to Kingsford Nine Ways. It also provides a connection to Botany Road further west. It generally has three traffic lanes in each direction and a speed limit of 60km/h. Bunnerong Road is a major bus corridor with buses connecting to the Sydney CBD, La Perouse and Matraville.

There is also a network of internal roads being constructed as part of the approved masterplan site. The main local roads include Cawood Avenue and Solarch Avenue which runs east-west through the site connecting to Anzac Parade.

3.3 Public transport

The site has good access to existing public transport. The main public transport servicing the site are buses operated by Sydney Buses. A number of major bus routes operate on Anzac Parade as shown in Table 2. Bus stops are located directly in front of the site near Nyan Street Road (northeast of the site).

Table 2: Bus services

Bus route	Frequency (citybound)
393 Railway Square	Every half hour off-peak Every 15 minutes during peak
394 City Circular Quay	Once in morning Every half hour during afternoon only
399 City Circular Quay	Every half hour off-peak Every 20 minutes peak
L94 City Martin Place	Every half hour off-peak Every 15 minutes during peak
X93 Railway Square	Every 15 minutes during peak only
X94 City Museum	Every 15 minutes during peak only
X99 City Museum via Bilga Cres	Every half hour peak only
658E Brigidine College	Once in morning
620E Matraville via Bunnerong Road	Twice in afternoon only

3.4 Active transport

3.4.1 Cycling

There are a number of cycle facilities surrounding the development site, consisting mainly of on-road facilities or shoulders. These include an off-road facility along Wentworth Avenue and on-road marked cycle lanes on Heffron Road / Page Street and Banks Avenue. A map of surrounding cycleways is shown in Figure 10.

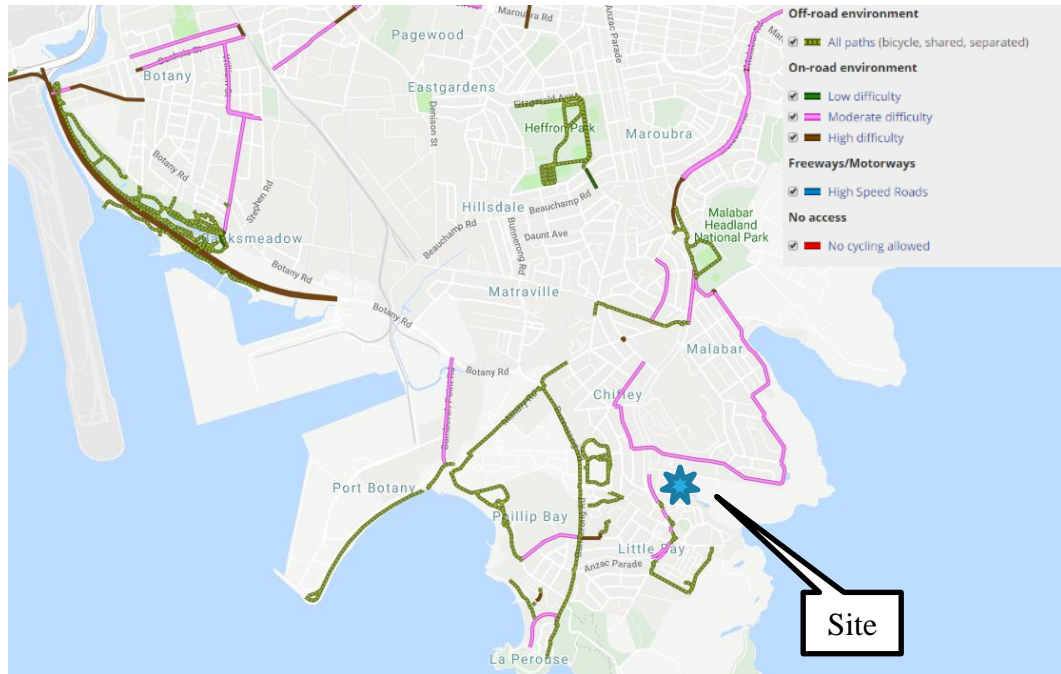


Figure 10: Cycling routes (Source: Roads and Maritime Cycleway Finder)

3.4.2 Walking

Due to the site's close proximity to public transport and local amenities, there is a good network of local footpaths. Footpaths and kerb ramps are provided on both sides of the road on Anzac Parade and the network of local streets.

Anzac Parade provides a refuge given the wide median and allows people to cross to bus facilities citybound and the Chifley Sports Reserve via Nyan Street. La Perouse Public School is accessible via Woomera Road / Yarra Road via the same crossing point.

3.5 Travel patterns

Mode share patterns at the site were analysed using 2016 Travel to Work Census data. The census data for the SA1 zones surrounding the site (see Figure 11) were used to assess the likely mode of peak hour trips departing the site. The mode share results of the analysis are presented in Figure 11.

The data reveals that outbound trips by residents rely more heavily on car trip modes (64%), followed by bus (18%). A large number did not travel either (13%).

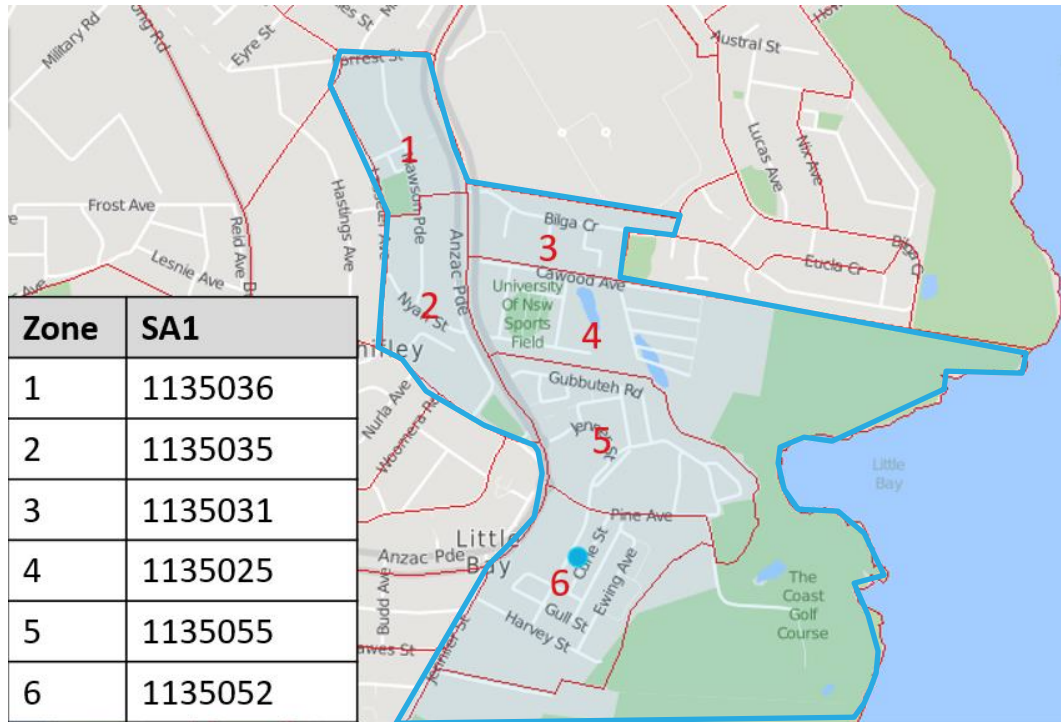


Figure 11: Travel to work area

Table 3: 2016 travel to work travel patterns

Mode	Outbound trips to work
Public transport	18%
Vehicle	64%
Active transport	4%
Other modes	1%
Did not travel	13%
Total %	100%
Total Trips	1,418

Source: Census POW dataset, 2016

The travel destinations are concentrated towards the City and Eastern Suburbs, taking the bulk (75.4%) of all trips as outlined in Table 4.

Table 4: Travel destinations

Destination	Little Bay Apartments Only	All Malabar, La Perouse, Chifley
Sydney - Baulkham Hills and Hawkesbury	0.4%	0.5%
Sydney - Blacktown	0.4%	0.6%
Sydney - City and Inner South	42.9%	40.3%
Sydney - Eastern Suburbs	32.5%	39.2%
Sydney - Inner South West	4.8%	4.7%
Sydney - Inner West	3.8%	2.6%
Sydney - North Sydney and Hornsby	5.1%	3.8%
Sydney - Northern Beaches	0.0%	0.6%
Sydney - Outer South West	1.1%	0.6%
Sydney - Outer West and Blue Mountains	0.0%	0.1%
Sydney - Parramatta	3.5%	2.4%
Sydney - Ryde	1.7%	1.5%
Sydney - South West	2.4%	1.3%
Sydney - Sutherland	1.1%	1.5%
Illawarra	0.8%	0.1%
Other	0.0%	0.2%
Total	100.0%	100.0%

3.6 Data collection

Fully classified turning movement surveys were carried out at key surrounding intersections providing access to the site at the following times:

- Tuesday, 9 April, 2019 7am to 10am & 3pm to 6pm
- Saturday, 6 April, 2019 10am to 2pm

These surveys identified the following network-wide peak hours:

- AM peak hour 8am to 9am
- PM peak hour 5pm to 6pm
- Weekend (WE) peak hour 11am to 12pm

The existing traffic generation rate for residential was calculated using the surveys at the two intersections that currently provide access to the precinct:

- Cawood Avenue/ Anzac Parade
- Solarch Avenue/ Anzac Parade

The peak hour which generated the most in/out movements from these two roads was considered as the peak hour for determining the existing traffic generation rate. A breakdown of these surveys is shown below in Table 5.

4 Development proposal

The proposed development site incorporates the super lot areas of the previously approved subdivision. This includes:

- 1-15 Galaup Street
- 1R Belbowrie Road (i.e. streets)
- 1R Solarch Avenue (i.e. park)
- 5-15 Cawood Avenue
- 2-14 Lapwing Street
- 3-17 Lapwing Street
- 19 Cawood Avenue (including a park and streets)

Meriton proposes to increase the residential density already permitted on the site with a floor space ratio of 2:1, which will provide up to 1,909 residential units, 5,900m² retail GFA on the site, one 100-child childcare centre.

The proposed development will utilise the general approved subdivision and internal road network, with some adjustments to accommodate the additional area for the urban blocks. The internal road network will provide separation and access to up to the urban blocks and parklands within the site. This adjustment results in the removal of Cordia Street, Marang Lane, Bamburr Way and Dickinson Way. The external connections will remain the same as per the previous approval to Anzac Parade.

The proposed internal road networks are shown in Figure 12.

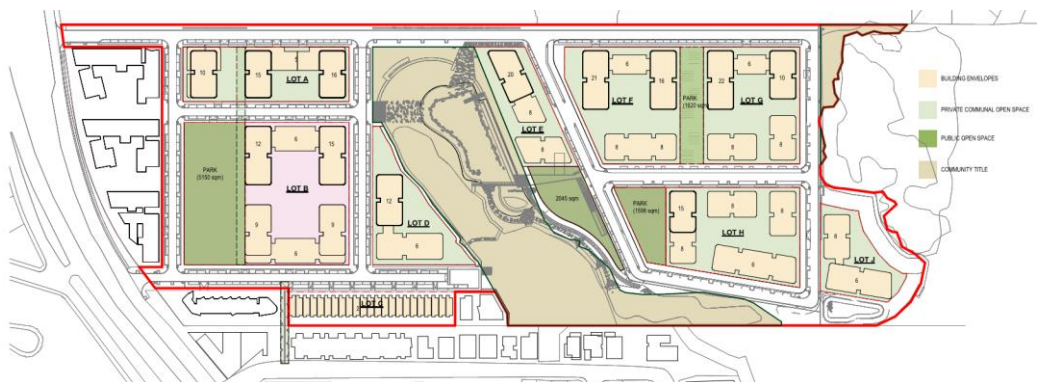


Figure 12: Meriton proposed option (SJB)

5 Transport Strategy

5.1 Future mode splits of residents

The Roads and Maritime Technical Direction (TDT 2013/04a) and Census travel to work data was utilised to determine the person trips and forecast mode split for the development. It should be acknowledged that demographics will likely be different for the proposed development in comparison to the current travel to work dataset, which is focused mostly on a low density established residential area context.

The person peak hour trip generation rates that have been adopted for the proposed development are as follows, which are based on the average rates for high density residential developments as outlined in TDT 2013/04a:

- AM peak hour: 0.66 trips / dwelling
- PM peak hour: 0.56 trips / dwelling
- Weekend peak hour: 0.66 trips / dwelling

5.1.1 Current context (unamended)

For the existing, with similar public transport connectivity assumed, the surveyed rates based on trips per dwelling are as follows:

- AM Peak Hour 0.38 trips/ dwelling
- PM Peak Hour 0.42 trips/ dwelling
- WE Peak Hour 0.40 trips/ dwelling

As a result of the current traffic generation and person trip generation, the current mode splits (Section 3.5) have been analysed and illustrated in Table 7. This does not include the currently constructed sites at Lot 5 and 11.

Table 7: Future mode split – existing context

Mode	AM Peak Hour		PM Peak Hour		Weekend Peak Hour	
	%	Number	%	Number	%	Number
Public transport	37%	471	21%	224	35%	445
Private vehicle	58%	725	75%	801	61%	763
Active transport	4%	50	4%	43	4%	50
Other	1%	12	0%	0	0%	0
Total	100%	1259	100%	1068	100%	1259

This represents a much higher mode share for private vehicles which is based on the maximum parking rates and current public transportation available.

5.1.2 Approved traffic generation

The 2009 Colston Budd Hunt & Kafes report, which was approved for development, allowed a total residential site traffic generation of 300 vehicles per hour (two-way peak hour flow). This included 210 outgoing vehicles and 90 incoming vehicles in the AM peak hour, with this flow reversed in the PM peak hour.

5.1.3 Sydney Metro or Bus Rapid Transit Scenario

Arup has developed a scenario where it is assumed that public transportation will be improved (see Section 5.4), and car parking limited across the site (see Section 5.2).

In this scenario, the site will have a convenient connection to high-capacity, high-frequency public transport (eg Sydney Metro or bus rapid transit link), the rate has been revised to be based on the Sydney average for buildings satisfying the following criteria: (i) close to public transport, (ii) greater than six storeys and (iii) has amenity from the mixed land uses within the site.

- AM Peak Hour 0.22 trips/ dwelling
- PM Peak Hour 0.22 trips/ dwelling
- WE Peak Hour 0.22 trips/ dwelling

5.1.4 Full Developments Scenario

As a result of the revised traffic generation above and person trip generation, the forecast mode splits of future residents (Section 3.5) have been analysed and illustrated in Table 7.

Table 8: Future mode split – potential context

Mode	AM Peak Hour		PM Peak Hour		Weekend Peak Hour	
	%	Number	%	Number	%	Number
Public transport	68%	859	57%	612	70%	881
Private vehicle	29%	362	39%	420	27%	340
Active transport	2%	25	2%	25	2%	25
Other	1%	13	1%	11	1%	13
Total	100%	1259	100%	1068	100%	1259

The number represent a significant shift to bus modes, which is further discussed in Section 5.4.

5.2 Parking provisions

The number of off-street parking spaces are specified by Randwick City Council in the Development Control Plan (DCP) 2012. Meriton have proposed parking rates which have been compared to the relevant LGAs in the area, and the approved Stage 1 concept masterplan rates (summarised below in Table 9.)

Table 9: Minimum car parking rates

Development type	Randwick DCP 2012	Proposed rates
Residential		
1 bedroom apartments	1 space per apartment	0.6 space per apartment
2 bedroom apartments	1.2 spaces per apartment	0.9 space per apartment
3 bedroom apartments	1.5 spaces per apartment	1.4 space per apartment
Visitor parking	1 space per 5 apartments	1 space per 10 apartments
Townhouses	1 space per dwelling up to 2-bedrooms 2 spaces per dwelling above 2-bedroom	1.0 space per dwelling
Other uses		
Shops	1 space per 40m ²	1 space per 40m ²
Childcare	1 space per 2 employees	1 space per 2 employees
	1 space per 8 children	1 space per 8 children
Hotel	1 space per 4 rooms	1 space per 4 rooms
	1 space per 2 employees	1 space per 2 employees

It is considered appropriate to reduce residential car parking to reduce car mode share from the development. Car parking is a major contributor to car usage and the reduced rates are expected to result in reduced traffic generation. The rates proposed are more aligned to the recommended RTA Guide to Traffic Generating Developments rates which indicate:

- 0.6 spaces for 1-bedroom apartments
- 0.9 spaces for 2-bedroom apartments
- 1.4 spaces for 3+ bedroom apartments

Visitor parking will be provided on-street only and be time limited so that residents will not be able to use these spaces.

Surrounding Councils (Sydney, Waverley and Woollahra LGAs) all have maximum parking rates and rates consistent with that proposed:

- 0.5 spaces for 1-bedroom apartments
- 1 space for 2-bedroom apartments
- 1.5 spaces for 3+ bedroom apartments

The total car parking rates are comparable with the proposed unit mix, which are less than a 1 parking space per 1-unit ratio overall as shown in Table 10.

Table 10: Meriton unit mix

Meriton proposed	Indicative unit mix	Car spaces
One bedroom/studio	560	280
Two bedroom	906	815
Three bedroom +	420	588
Visitors	-	191
Townhouses	23	23
Total	1,909	1,897

The reduced parking rates below the DCP rates are supported by the planned public transport network. This is a shortfall of some 1,000 spaces that would normally be required by the DCP. With a bus rapid transit, light rail extension or Metro, this will encourage less car mode share by the site and hence lower requirements for car parking.

5.3 Walk and cycle access

High quality pedestrian and cycling facilities will be inherent to the project. Within the development, footpaths, shared paths and cycle lanes would be provided along with public bicycle parking facilities. Individual development parcels would be required to provide facilities for cyclists including lockers, visitor bike racks and shower/change facilities.

5.4 Public transport

The following sections outline the current, proposed and potential public transport servicing the site.

5.4.1 Bus infrastructure

Using the mode splits for buses established in Section 5.1.3, this equates to between 612 to 881 people using the bus during peak hours. From site observations, buses were generally empty leaving the Anzac Parade bus stops, but were not as frequent to accommodate this number of people (i.e. some 25 standard buses with capacity for 50 people departed during the peak hour). This is not likely to encourage the mode shift required given the current uptake of bus modes.

It is proposed that a bus rapid transit option would provide a better express connection between Little Bay, Maroubra and Kingsford (i.e. the CBD and South East Light Rail terminus). Either double-decker or articulated buses have an approximate capacity of 100 people per bus and based on the projected patronage, at least nine large buses would be required during peak hours to accommodate the bus mode share. This could be either double deck or articulated buses.

At a headway of up to 6 minutes, a bus fleet of nine vehicles could provide sufficient capacity to handle a light rail connection and the mode shift towards public transport. Further options could be considered such as connections to Green Square or direct into the City to supplement light rail services. The proponent has allowed a provision for a State Infrastructure Contribution which could be used to facilitate the outcome so that these services are provided prior to the first residents moving in.

5.4.2 Sydney Light Rail

The current Sydney Light Rail stop under construction at Kingsford terminus is located approximately 6km to the north. This stop is anticipated to have a light rail vehicle leave every 8 minutes during the peak, equating to a throughput capacity of 3,375 people each way (based on the 450 people per vehicle).

5.4.3 Potential Light Rail extension

The government has indicated that Light Rail may be extended to Malabar in the future, which is within 10 minutes' walk of the proposed site. If Light Rail is extended to the site as discussed, patronage of bus is likely to be less and the need for additional services could potentially be mitigated given there will be a mode shift in the surrounding area to Light Rail.

5.4.4 West Metro

As stated in Section 2.2, there are also plans to be considered for a West Metro rail line linking the proposed Western Sydney Airport to Central and possible extension to the south eastern suburbs. The potential extension is planned to terminate near the site at Malabar and have the potential to attract patronage from the proposed development. If built in the near future, this will further encourage less car trips from the development if the station is located within 800m of the site. However, given the long-term nature of the project, buses will provide the mode split to public transport.

5.5 Transport measures

5.5.1 Travel Plans

One of the objectives to reduce the level of private car usage is to favour more sustainable modes of travel such as walking, cycling and public transport. A method of achieving this is personalised marketing strategies to assist in modifying travel behaviour through communicating relevant travel choice information to the community. Marketing would begin through information to be produced by the developer, including:

- Travel information kits for residents (including Travel Access Guides)
- Travel Plans for employees and residents.

5.5.2 Wayfinding

Wayfinding signage would be installed at entry points to allow people to navigate their way around the precinct. Maps would also be installed to allow people to know about the nearby pedestrian and cycle connections.

5.5.3 Car share schemes and unbundled parking

There is an opportunity for car share schemes and/or unbundled car parking to provide a flexible option for people who only require occasional car use and choose not to own a vehicle. These schemes provide access to a vehicle when it is the most suitable mode choice, while avoiding the need and expense of owning a vehicle. They would potentially lower parking rates even further than proposed in Section 5.2 to provide sufficient incentive for residents and businesses to reconsider purchasing a first or second vehicle in favour of using car share or unbundled parking spaces. Without a vehicle sitting in a garage, private car is not the first mode considered, increasing the likelihood that other mode sustainable modes will be chosen.

Successful car share operations are based in metropolitan areas with high-density and mixed-use development, good levels of pedestrian access and constrained parking (fewer car parks or parking that is more expensive). When used in conjunction with public transport, walking, and cycling, car sharing has the ability to be an integral part of the sustainable transport network for urban areas.

Car sharing and/or unbundled parking also has the ability to reduce the total fleet vehicles for a development and reduce the use of private vehicles for commuting. This trend is supported by current research, such as the Transportation Research Board report that estimated that ‘at least five private vehicles are replaced by each shared car’ in 2005. Sydney’s Go-Get club advertises that its research shows that each car in the scheme removes seven others off the roads.

6 Traffic assessment

6.1 Existing road network assessment

6.1.1 Existing mid-block capacities

The mid-block capacities of key roads have been assessed. This mid-block assessment uses Passenger Car Units (PCUs) based on the RMS Modelling Guidelines. This unit of measure standardises all vehicle types into passenger car equivalent units. The PCUs are as follows:

- Passenger Cars/ Light Commercial Vehicles 1
- Rigid Heavy Vehicles/ Buses 2
- Articulated Heavy Vehicles 4

The locations of the mid-block assessments are shown in Figure 13.

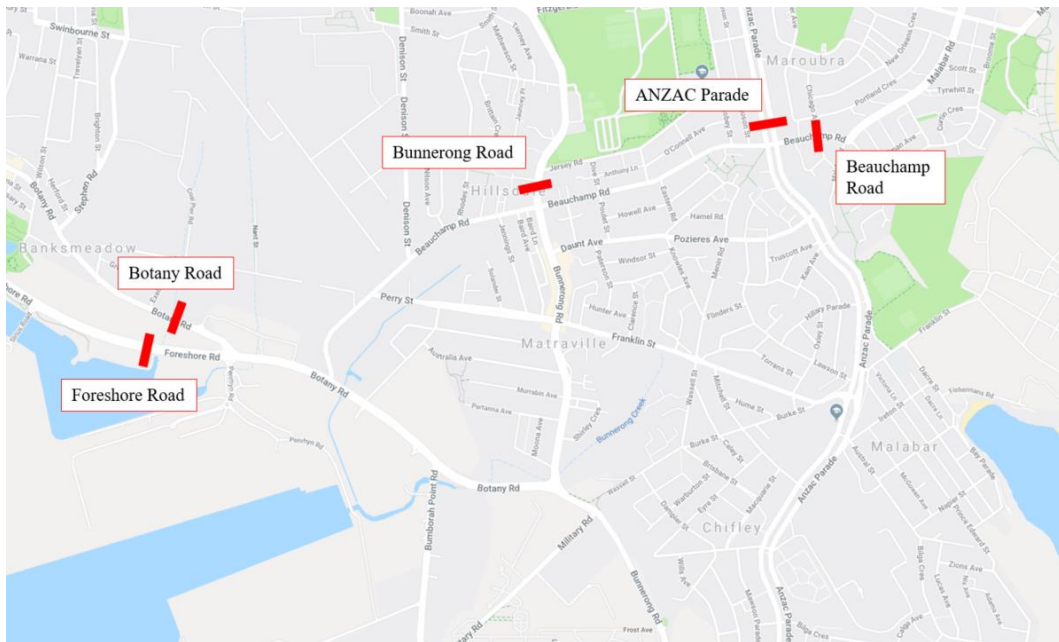


Figure 13: Mid-block assessment locations

The mid-block assessment is shown in Table 11. The mid-block assessment shows that the mid-block capacities of the roadways are not currently exceeded, however roads further away from the proposed development are approaching or close to exceeding capacity further north of the site:

- ANZAC Parade, north of Beauchamp Road in northbound direction, WE Peak
- Beauchamp Road/ Malabar Road, east of ANZAC Parade in eastbound direction, PM Peak

This means that most of the roads can sustain greater volumes from an operational perspective, while treatments to increase the capacity of Anzac Parade and Beauchamp Road/ Malabar Road could ensure that the roads operate under

capacity. On ANZAC Parade, clearway restrictions do not currently apply on weekends, thus extending clearways to weekend peak hours could help improve the mid-block performance. Beauchamp Road/ Malabar Road, east of Anzac Parade, currently has one lane of traffic in each direction with unrestricted parking generally provided on both sides. Addition of clearway restrictions in the weekday AM and PM peak hours could help to improve mid-block performance by allowing two lanes of traffic in the critical direction.

Table 11: Mid-block Assessment Results - Existing

Location	Capacity	Direction	Time Period	Volume (Current)	V/C (Current)
ANZAC Pde, north of Beauchamp Rd To CBD & Eastern Suburbs	1900	Northbound	AM	1,273	0.67
	900	Southbound	AM	664	0.74
	900	Northbound	PM	718	0.80
	1900	Southbound	PM	975	0.51
	900	Northbound	WE	827	0.92
	900	Southbound	WE	758	0.84
Beauchamp/Malabar Road, East of ANZAC Pde To Eastern Suburbs	900	Eastbound	AM	739	0.82
	900	Westbound	AM	794	0.88
	900	Eastbound	PM	874	0.97
	900	Westbound	PM	627	0.70
	900	Eastbound	WE	759	0.84
	900	Westbound	WE	713	0.79
Bunnerong Rd, north of Beauchamp Rd To CBD, North Sydney and Inner West	1900	Northbound	AM	967	0.51
	1900	Southbound	AM	611	0.32
	1900	Northbound	PM	756	0.40
	1900	Southbound	PM	1,107	0.58
	1900	Northbound	WE	972	0.51
	1900	Southbound	WE	1,082	0.57
Botany Rd, west of Foreshore Rd To Inner West	900	Eastbound	AM	638	0.71
	900	Westbound	AM	757	0.84
	900	Eastbound	PM	686	0.76
	900	Westbound	PM	564	0.63
	900	Eastbound	WE	350	0.39
	900	Westbound	WE	445	0.49
Foreshore Rd, west of Botany Rd To Southern and Western Suburbs	2400	Eastbound	AM	2,108	0.88
	2400	Westbound	AM	1,410	0.59
	2400	Eastbound	PM	1,171	0.49

Location	Capacity	Direction	Time Period	Volume (Current)	V/C (Current)
	2400	Westbound	PM	1,628	0.68
	2400	Eastbound	WE	1,085	0.45
	2400	Westbound	WE	1,137	0.47

6.1.2 Existing intersection results

The surveyed intersection locations noted in Section 3.6 were modelled to determine the performance of the existing intersections as illustrated in Figure 14. This diagram indicates the Beauchamp Road / Anzac Parade sites is nearing capacity.

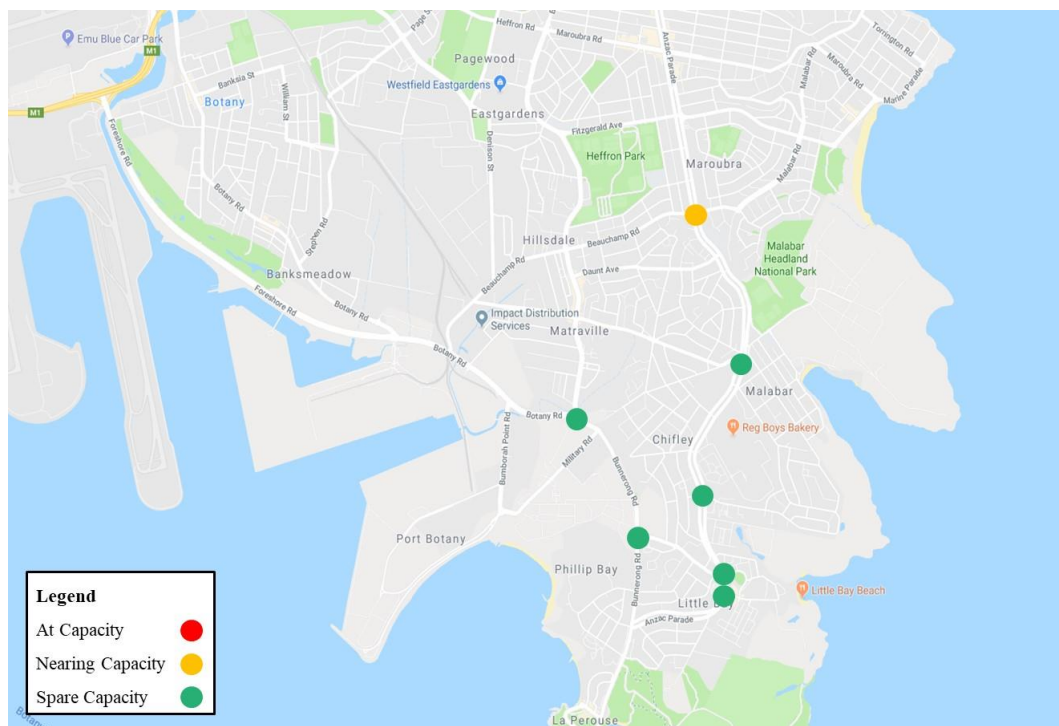


Figure 14: Intersection sites counted

The intersection performance is assessed in this report in terms of the following three factors for each intersection:

- Degree of Saturation
- Average Delay (Seconds per vehicle)
- Level of Service

In urban areas, the traffic capacity of the major road network is generally a function of the performance of key intersections. This performance is quantified in terms of Level of Service (LoS), is based on the average delay per vehicle. LoS ranges from A = very good to F = unsatisfactory (see Table 12).

Table 12: Level of service criteria for intersections

Level of Service	Average delay (s)	Description
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At Capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode
F	Greater than 71	Unsatisfactory with excessive queuing

Another common measure of intersection performance is the degree of saturation (DoS), which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DoS of 1.0 indicates that an intersection is operating at capacity.

The modelling results of the existing scenario are shown in Table 13. The modelling shows that the majority of intersections in the area operate with plenty of spare capacity with the exception of the following intersections:

- Anzac Parade/ Beauchamp Road: Approaches capacity in WE peak period
- Beauchamp Road/ Bunnerong Road: Exceeds capacity in WE peak period

Table 13: SIDRA Results – Existing

Intersection	Peak	DoS	Avg. Delay	LoS
1.2 Cawood/ ANZAC	AM peak	0.14	6	LOS A
	PM peak	0.22	6	LOS A
	WE peak	0.23	6	LOS A
2 Solarch/ ANZAC	AM peak	0.09	6	LOS A
	PM peak	0.12	6	LOS A
	WE peak	0.13	6	LOS A
3.1 Bilga/ Anzac/ Kenny (west intersection)	AM peak	0.25	9	LOS A
	PM peak	0.40	10	LOS A
	WE peak	0.43	10	LOS A
3.2 Bilga/ Anzac/ Kenny (east intersection)	AM peak	0.51	10	LOS A
	PM peak	0.30	8	LOS A
	WE peak	0.44	10	LOS A
4 Anzac/ Little Bay/ Jenner	AM peak	0.17	12	LOS A
	PM peak	0.20	12	LOS A
	WE peak	0.23	13	LOS A
5 Anzac/ Pine	AM peak	0.16	12	LOS A
	PM peak	0.16	12	LOS A
	WE peak	0.16	12	LOS A

Intersection	Peak	DoS	Avg. Delay	LoS
6.1 Anzac/ Franklin (Signalised)	AM peak	0.91	19	LOS B
	PM peak	0.53	12	LOS A
	WE peak	0.62	13	LOS A
6.2 Anzac/ Franklin (West, stop sign)	AM peak	0.40	13	LOS A
	PM peak	0.26	10	LOS A
	WE peak	0.23	11	LOS A
6.3 Anzac/ Franklin (East, stop sign)	AM peak	0.20	9	LOS A
	PM peak	0.32	12	LOS A
	WE peak	0.22	10	LOS A
7.1 Anzac/ Beauchamp (west intersection)	AM peak	1.02	54	LOS D
	PM peak	0.98	33	LOS C
	WE peak	1.1	58	LOS E
7.2 Anzac/ Beauchamp (east intersection)	AM peak	0.93	26	LOS B
	PM peak	0.97	27	LOS B
	WE peak	0.99	29	LOS C
8 Beauchamp/ Bunnerong	AM peak	0.93	47	LOS D
	PM peak	0.94	48	LOS D
	WE peak	0.97	77	LOS F
9 Bunnerong/ Little Bay	AM peak	0.24	10	LOS A
	PM peak	0.44	10	LOS A
	WE peak	0.49	13	LOS A
10 Botany/ Bunnerong	AM peak	0.69	15	LOS B
	PM peak	0.75	13	LOS A
	WE peak	0.77	16	LOS B

6.1.3 Future intersection operation with background growth

As a point of comparison, it is expected that the area will have background growth over the 10-year period that it will take for the development to construct and occupy. The intersection modelling results of the year 2029, with 1% per annum traffic growth across all movements, are shown in Table 14. It should be noted that the approved level of traffic has not been modelled in this scenario, only the currently built dwellings. The results indicate that there are capacity constraints at Anzac Parade / Beauchamp Road and the broader area irrespective of development.

Table 14: SIDRA Modelling Results – 2029 base

Intersection	Peak	DoS	Avg. Delay	LoS
1.2 Cawood/ Anzac (east intersection)	AM Peak	0.15	5	LOS A
	PM Peak	0.24	5	LOS A

Intersection	Peak	DoS	Avg. Delay	LoS
	SAT Peak	0.25	5	LOS A
2 Solarch/ Anzac	AM Peak	0.09	6	LOS A
	PM Peak	0.13	6	LOS A
	SAT Peak	0.14	6	LOS A
3.1 Bilga/ Anzac/ Kenny (west intersection)	AM Peak	0.27	18	LOS A
	PM Peak	0.43	10	LOS A
	SAT Peak	0.46	11	LOS A
3.2 Bilga/ Anzac/ Kenny (east intersection)	AM Peak	0.56	11	LOS A
	PM Peak	0.33	9	LOS A
	SAT Peak	0.48	10	LOS A
4 Anzac/ Little Bay/ Jenner	AM Peak	0.19	13	LOS A
	PM Peak	0.22	12	LOS A
	SAT Peak	0.25	13	LOS A
5 Anzac/ Pine	AM Peak	0.18	12	LOS A
	PM Peak	0.17	12	LOS A
	SAT Peak	0.18	12	LOS A
6.1 Anzac/ Franklin (Signalised)	AM Peak	0.90	21	LOS B
	PM Peak	0.59	12	LOS A
	SAT Peak	0.72	13	LOS B
6.2 Anzac/ Franklin (West, stop sign)	AM Peak	0.50	15	LOS A
	PM Peak	0.30	11	LOS A
	SAT Peak	0.25	12	LOS A
6.3 Anzac/ Franklin (East, stop sign)	AM Peak	0.24	10	LOS A
	PM Peak	0.39	14	LOS A
	SAT Peak	0.25	10	LOS A
7.1 Anzac/ Beauchamp (west intersection)	AM Peak	1.23	191	LOS F
	PM Peak	1.11	57	LOS E
	SAT Peak	1.27	96	LOS F
7.2 Anzac/ Beauchamp (east intersection)	AM Peak	1.19	103	LOS F
	PM Peak	1.08	44	LOS D
	SAT Peak	1.10	49	LOS D
9 Bunnerong/ Little Bay	AM Peak	0.27	10	LOS A
	PM Peak	0.49	10	LOS A
	SAT Peak	0.54	13	LOS A
10 Botany/ Bunnerong	AM Peak	0.76	16	LOS B
	PM Peak	0.83	14	LOS A
	SAT Peak	0.87	38	LOS C

6.2 Traffic Generation

6.2.1 Retail

The purpose of the retail centre within the proposed site is to service the future 4,000+ residents of the area, and not to draw in traffic from the wider road network. The major retail centre of Maroubra Junction and Eastgardens will continue to act as the primary retail area for people driving into the area. Nonetheless it is acknowledged that the retail centre will generate some traffic from the external road network.

Given that Maroubra Junction and Eastgardens already contain larger retail centres, it is reasonable to assume that any retail traffic generated by the proposed site would be generally locally contained. It may also draw traffic away from the congested parts of the network, which are on the periphery as discussed in the previous sections. It is also likely that trips would be more contained within the site given the project population of the overall masterplan site.

For the retail rates, results from a recent traffic survey at the East Village Shopping Centre has been referenced. This survey was undertaken by Arup to determine the actual trip generation rate for centres of similar size located in a high density residential precinct. The surveyed data indicated that the shopping centre – which has about 13,500m² of floor area, more than 550 retail parking spaces and includes a full line Coles supermarket– generated 760 peak hour trips during the Thursday PM period. This equates to a rate of 5.84 trips per 100m² of GFA.

The data indicates that there is a significant lower reliance in cars for retail shopping when the retail component is part of a mixed use high density residential development.

It is accepted that the AM peak rates are generally significantly lower as limited shopping activities are expected to be occurring during the AM peak hours. Surveys at the East Village shopping centre indicated there were approximately 300 vehicle trips in the AM peak hour, equating to a rate of 2.31 trips / 100m² GFA.

6.2.2 Residential

Traffic generation forecasts for high density residential uses are generally derived from the Roads and Maritime Services Guide to Traffic Generating Developments – Updated Traffic Surveys (Roads and Maritime, August 2013), which stipulate that the quantum of traffic generated is solely based on the number of dwellings contained in the future development. Traffic generation rates are however typically influenced by a number of factors such as bulk and scale of the development, public transport availability, availability and cost of parking, mixed use and complementary nature of various land use components and peak traffic generation hours.

Therefore, for the purposes of this study, the traffic generation rates adopted for the residential component of the development are as follows:

- AM peak hour: 0.22 trips / dwelling
- PM peak hour: 0.22 trips / dwelling
- WE peak hour: 0.22 trips / dwelling

This rate is conservative as validated by surveys from sites that are located near bus only services. Pagewood sites that were fully occupied at Allium (UB5W) and Marigold (UB5E/UB4) were surveyed throughout the entire 24-hour period over a Tuesday and Wednesday. The results of recent surveys undertaken in June 2019 are displayed in Table 15. It should be noted that both sites have 100-child childcare centres operating which was also included within this traffic volume given each development had only one driveway.

Table 15: Traffic generation of Pagewood sites

Site	Number of units	AM peak hour		PM peak hour	
		Trips	Rate	Trips	Rate
UB5W	487 units	99	0.20	104	0.21
UB5E	205 units	62	0.17	85	0.23
UB4	166 units				

The traffic generation rates are also supportable from sites such as Gladesville (adjacent to Victoria Road) and Dee Why (adjacent to B-line). These sites obtained AM peak hour trip rates of 0.20 and 0.12 peak hour trips per apartment respectively.

6.2.3 Childcare

For the child care centre component of the development, standard Roads and Maritime rates have been adopted, which are as follows:

- AM peak hour: 0.72 trips / child
- PM peak hour: 0.45 trips / child

6.2.4 Trip containment

The precinct will be a mixed-use development with several supporting uses such as childcare and retail activities supporting the local residential population. The mixed-use nature of the development (instead of the almost exclusively residential in nature for the development surveyed by Roads and Maritime Services) will facilitate trip containment of up to 25%. This containment will reduce the overall impact of the project on the external road network as trips already generated on the road network will already be undertaken by linked residential car trips or walking.

Figure 15 below illustrates the range of different trip types by purpose, based on Household Travel Survey data for the Sydney region. This indicates a significant number of trips are made in the morning and afternoon peak periods for the purposes of shopping, education and recreation – all uses which are provided for in the precinct.

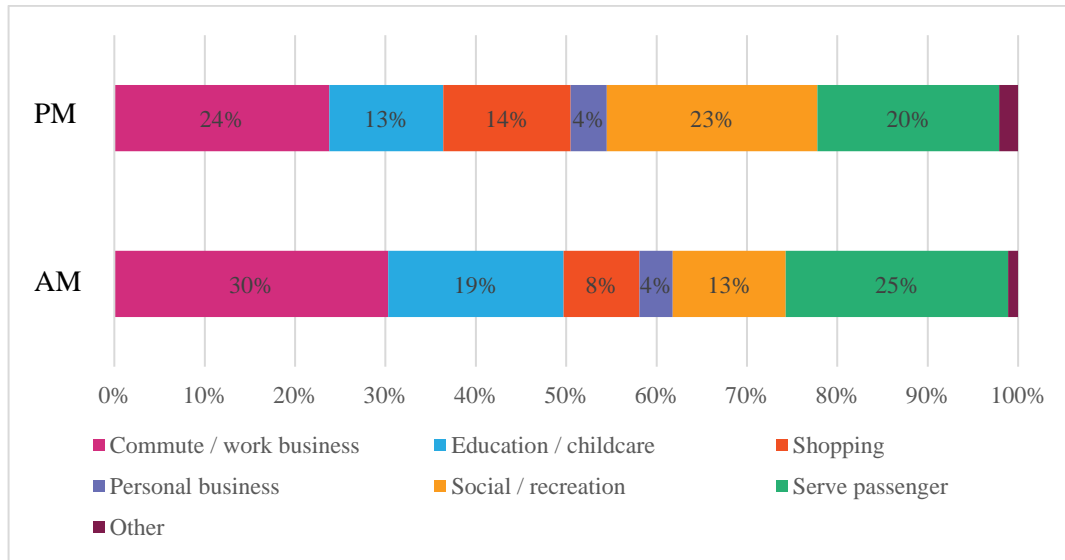


Figure 15 Trip type by purpose

Source: Household Travel Survey, Transport for NSW

6.2.5 Summary of traffic generation

Using the traffic generation developed from Section 5.1, the anticipated yield with a suitable public transport solution would yield the traffic generation rates are outlined in Table 16, utilising the residential traffic previously approved.

A 20/80 in/out split was assumed for the AM peak hour, in line with standard practice. This was reversed for the PM peak hour. These splits are like the in/out split surveyed at the site. For the Saturday peak hour, the surveyed 40/60 in/out split was adopted.

Table 16: Traffic generation rates

Land use	AM Peak Hour		PM Peak Hour		Weekend Peak Hour	
	In	Out	In	Out	In	Out
Residential	72	290	336	84	136	204
Childcare	27	27	17	17	0	0
Retail	51	51	129	129	129	129
Total	150	368	482	230	265	333

The full development scenario would result in the following traffic generation volumes:

- AM Peak Hour 518 trips
- PM Peak Hour 712 trips
- WE Peak Hour 598 trips

6.3 Traffic Distribution

Census 2016 information was analysed to calculate the following journey to work locations for people driving from the existing apartments in Little Bay:

- CBD, Inner South & North of Sydney Harbour 50%
- Eastern suburbs 30%
- Southern & Western Suburbs 10%
- Inner West 10%

Based on this, the following traffic distribution is assumed. This distribution assumes that a right-turn out of the site would be provided from Cawood Avenue.

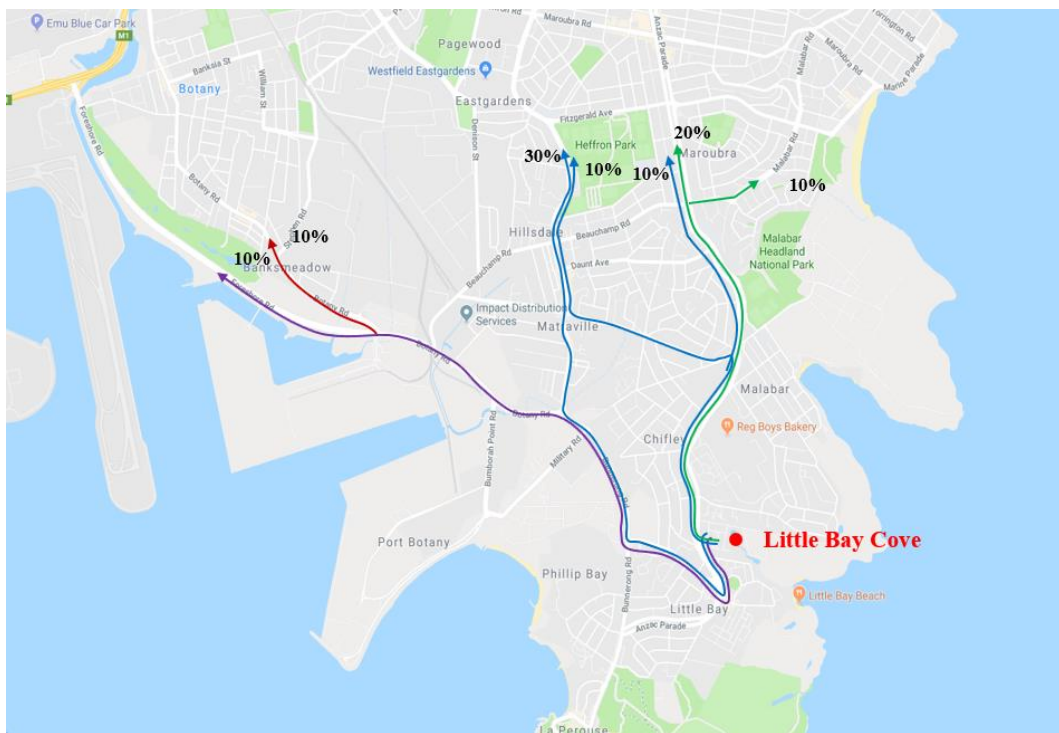


Figure 16: Traffic distribution

6.4 Intersection Analysis with Development

The road network has been assumed as per the existing, with the following opportunities identified:

- Anzac Parade, north of Beauchamp Road, would have clearways or parking removal at all AM, PM and WE peak hours. Thus, it would have two lanes of traffic in both directions. Clearways or parking removal should also be considered during the AM peak period on Beauchamp Road to facilitate more efficient east-west movement.
- Beauchamp Road/ Malabar Road would have clearways or parking removal at all AM, PM and WE peak hours. Thus, it would have two lanes of traffic in both directions. Approved Level of Traffic

- Cawood Avenue permits a right turn into and out of Anzac Parade with a new connection between the Anzac Parade northbound and southbound carriageways.

The intersection modelling results of the year 2029, with 1% per annum traffic growth, 1,909 dwellings, as well as associated retail and child care traffic, are shown in Table 17. This conservatively models all extra units generating traffic on top of the currently built dwellings and background growth.

Table 17: SIDRA Modelling Results – 2029 with development

Intersection	Peak	DoS	Avg. Delay	LoS
1.1 Cawood/ Anzac (west intersection)	AM Peak	0.35	7	LOS A
	PM Peak	0.35	6	LOS A
	SAT Peak	0.37	7	LOS A
1.2 Cawood/ Anzac (east intersection)	AM Peak	0.31	6	LOS A
	PM Peak	0.39	7	LOS A
	SAT Peak	0.37	8	LOS A
2 Solarch/ Anzac	AM Peak	0.14	6	LOS A
	PM Peak	0.18	6	LOS A
	SAT Peak	0.18	6	LOS A
3.1 Bilga/ Anzac/ Kenny (west intersection)	AM Peak	0.35	10	LOS A
	PM Peak	0.68	14	LOS A
	SAT Peak	0.62	13	LOS A
3.2 Bilga/ Anzac/ Kenny (east intersection)	AM Peak	0.78	16	LOS B
	PM Peak	0.47	10	LOS A
	SAT Peak	0.68	13	LOS A
4 Anzac/ Little Bay/ Jenner	AM Peak	0.29	12	LOS A
	PM Peak	0.28	13	LOS A
	SAT Peak	0.34	12	LOS A
5 Anzac/ Pine	AM Peak	0.18	12	LOS A
	PM Peak	0.18	12	LOS A
	SAT Peak	0.19	12	LOS A
6.1 Anzac/ Franklin (Signalised)	AM Peak	0.90	26	LOS B
	PM Peak	0.58	13	LOS A
	SAT Peak	0.84	17	LOS B
6.2 Anzac/ Franklin (West, stop sign)	AM Peak	0.65	22	LOS B
	PM Peak	0.45	13	LOS A
	SAT Peak	0.41	15	LOS B
6.3 Anzac/ Franklin (East, stop sign)	AM Peak	0.31	11	LOS A
	PM Peak	0.67	22	LOS B
	SAT Peak	0.38	13	LOS A

Intersection	Peak	DoS	Avg. Delay	LoS
7.1 Anzac/ Beauchamp (west intersection)	AM Peak	1.08	103	LOS F
	PM Peak	0.79	22	LOS B
	SAT Peak	0.96	36	LOS C
7.2 Anzac/ Beauchamp (east intersection)	AM Peak	1.08	72	LOS F
	PM Peak	0.98	41	LOS C
	SAT Peak	0.90	25	LOS B
9 Bunnerong/ Little Bay	AM Peak	0.39	12	LOS A
	PM Peak	0.59	11	LOS A
	SAT Peak	0.60	15	LOS B
10 Botany/ Bunnerong	AM Peak	0.77	18	LOS B
	PM Peak	0.80	19	LOS B
	SAT Peak	0.91	46	LOS D

The results indicate that capacity is relatively unconstrained except at the Anzac Parade / Beauchamp Road intersections during the AM peak period. This intersection may require some minor upgrades such as bus priority to reduce road network impacts given the current intersection combination operates poorly with background growth in 2029.

6.5 Summary of road network impacts

The traffic assessment has been based on the 2016 Census data, with a discussion of potential mode shift with intervention of public transport improvements and reduced parking rates. Residential traffic generation could be reduced to between 340 to 420 car trips in peak hours, which is accommodated within the local area. This is relatively close to the 300 vehicles per hour assessed in the previous 2009 Colston Budd Hunt & Kafes report.

It is acknowledged that there are challenges in accessing the wider traffic network, with traffic congestion on the state road network the further north and west of the site. This level of traffic is realistic given this congestion, reducing the likelihood that future residents will want to drive.

The improvement and priority of public transport with an improved public transport alternative will provide a suitable alternative link for people wishing to travel further abroad. This link could accommodate the identified 75% of people identified in Census data wanting to travel within the Eastern Suburbs and Sydney CBD.

The remaining non-residential car trips would be generated in the local area and contained within the local road network given competition from the larger retail centres at Maroubra and Eastgardens District Centre. Importantly, the assessment has shown that the local road network has sufficient capacity to handle the levels of traffic envisaged, which have been assessed in a conservative scenario with wide reaching distribution towards Matraville.

7 Summary

This strategic transport plan has been prepared to support a Planning Proposal which seeks to amend *Randwick Local Environmental Plan 2012 (RLEP 2012)* to rezone land known as Little Bay Cove. The Planning Proposal aims to facilitate the redevelopment of the Little Bay Cove into a new mixed use community incorporating a variety of uses including high density residential, retail, cafes and restaurants, recreation, and community facilities.

In summary, the local road network is functioning acceptably with the proposed development. The mode shift share is sufficiently addressed with an alternative public transport service, low parking rates and containment of uses.

Transport strategy

The transport strategy has been developed to provide for a coherent, legible transport network that supports movement both to, and within, Little Bay. The precinct has been planned to facilitate good access to all modes of transport, particularly public transport, walking and cycling. Given the road network approaches capacity during peak periods further away towards the north and west, the transport strategy focuses on reducing private vehicle dependency by providing an alternative transport option.

The mixed-use nature of the development will facilitate trip containment, which will reduce the overall impact of the project on the external road network.

Mode share

With the introduction of a new mixed-use precinct, reduced car parking and improved public transport, the project has the potential to achieve a mode share that minimises its impact on the road network and takes advantage of the other transport opportunities available. The forecast mode share for residents of the precinct (journey to work) is as follows:

- Private vehicle: 30%
- Active transport: 3%
- Public transport: 68%

Road Network

Arup has undertaken preliminary traffic modelling to understand the impacts of the potential development. This modelling has been based on a 2019 base year traffic model and added a background growth to year 2029 and the likely level of additional traffic associated with Little Bay Cove development site.

The modelling indicates that the addition of the traffic associated with the development does induce further delay at most intersections. However, in most cases this is acceptable, bearing in mind that intersection Levels of Service in the range of D to E are to be expected in congested urban environments. While Anzac Parade is approaching a Level of Service of F at Beauchamp Road, this is

demonstrated to occur with future growth and removal of parking will need to be facilitated to enable continued operations.

Importantly the local road network intersections including the proposed intersection at Cawood Avenue and Anzac Parade is modelled to operate satisfactorily. This is noteworthy given that there is no right turn access into the precinct currently and greater potential impacts locally if a right turn is not provided.

Parking

Parking rates have been proposed which are lower than the maximum rates for residential, commercial and other uses provided in the current Randwick DCP (2012). Parking has been generally been constrained to promote the use of alternative modes of transport and reduce the traffic impact of the development on the surrounding road network.

On-street parking is recommended to be time limited and allocated for visitors and people with special needs.

There is an opportunity to provide car share spaces and/or unbundled parking within the precinct to enable those without access to a car to travel via private vehicle when it is the most appropriate means of transport, whilst still relying on public transport, walking and cycling for the majority of their trips.

Bicycle parking will be provided both within individual development parcels, as well as the public domain, to increase travel by bicycle and reduce car dependence.

Public Transport

A strategy has been developed to provide good quality public transport to residents and visitors of Little Bay Cove. The strategy aims to maximise the availability of the Light Rail terminus at Kingsford by a bus link.

The addition of a minimum of nine buses is required to accommodate a mode shift share to public transport. The site will further benefit from the potential future bus rapid transit, CSELR extension and/or Metro to the site.

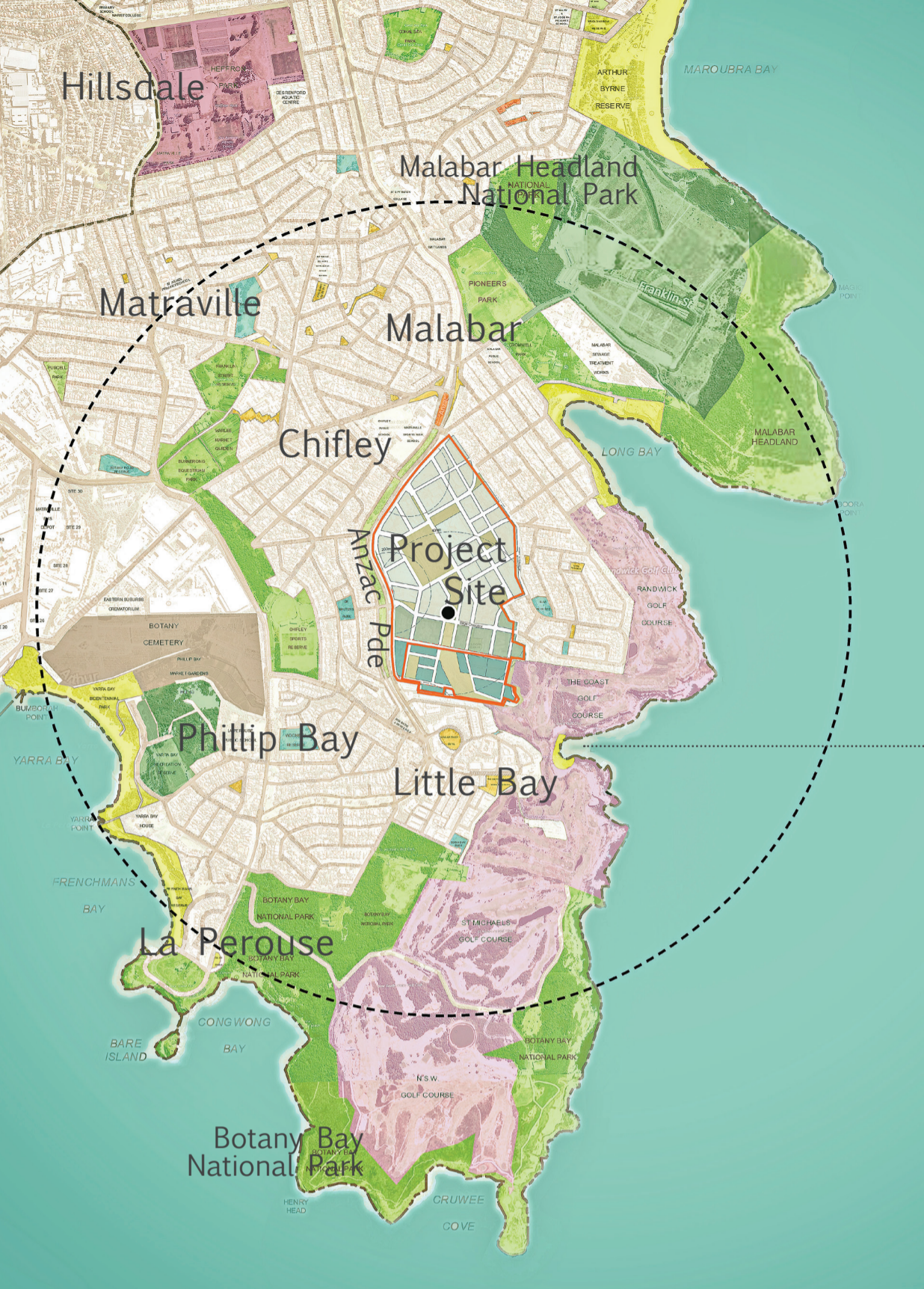
Roads within the site have been designed to accommodate the movement of public bus services by providing for a suitably wide carriageway.

Walking / Cycling

The proposed master plan places emphasis on improving connectivity and amenity for pedestrians and cyclists – both at a local and regional level. An enhanced pedestrian/cyclist connection on the southern side of the site will connect to the potential Green Grid project along the foreshore, which will facilitate a new coastal connection towards North Head.

The project also proposes a network of shared pedestrian/cycle paths to connect to the regional cycle network. This includes direct paths to Anzac Parade which links in to existing shared paths to the north and south of the site.

SOCIAL INFRASTRUCTURE AND OPEN NEEDS ANALYSIS Little Bay Precinct



Little Bay

