

Avenor Pty Limited

**East Walker Street Precinct, North
Sydney**

Traffic and Transport Assessment

Issue | 21 March 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 255880

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Executive Summary

The Planning Proposal seeks approval for an increase to the permitted building height and FSR in the Precinct, which would allow residential development comprising between 211 and 284 residential apartments (the Proposal).

The Site is located within the Local Government Area of North Sydney Council (the Council), and the Planning Proposal has been assessed against that Council's controls.

This report addresses the relevant traffic, transport and parking implications of the Proposal, including compliance with relevant State and Local Government controls and Australian Standards.

In preparing this report, Arup has referenced the following reports and key planning documents that are relevant to development at the Precinct:

- North Sydney Council Development Control Plan 2013 (DCP).
- North Sydney Council Local Environmental Plan 2013 (LEP).
- Chatswood to Sydenham – State Significant Infrastructure Application Report, prepared by
- Transport for NSW (TfNSW), dated November 2015 (Metro Report).
- Draft Ward Street Precinct Master Plan planning documents.
- This report also references general access, traffic and parking guidelines, including:
 - Roads & Maritime Services (RMS) Guide to Traffic Generating Developments, 2002 (RMS Guide).
 - RMS Technical Direction TDT 2013/04a, Guide to Traffic Generating Developments – Updated traffic surveys (RMS Guide Update).
 - Australian Standard 2890.1 (2004): Off-street car parking (AS2890.1).
 - Australian Standard 2890.2 (2002): Off-street commercial vehicle facilities (AS2890.2).
 - Australian Standard 2890.6 (2009): Off-street parking for people with disabilities (AS2890.6).

To inform this report and subsequent building design, Arup has consulted with RMS in a meeting on RMS on 18 December 2018 and with subsequent phone and email correspondence relating to parking, vehicle and pedestrian access, servicing and traffic. Details regarding the proposal including swept path analysis, parking provisions and servicing plans were provided. While this is not usual or required for a Planning Proposal, it has assisted in informing a design solution that RMS is comfortable with and will be engaged further on in the subsequent Development Application process.

This report also responds to feedback provided by North Sydney Council in its previous assessment of the Planning Proposal and incorporates amendments and requests of Council where appropriate.

Arup' recent experience with North Sydney Council in developing the Ward Street precinct masterplan, as well as other development sites in the North Sydney CBD, has been used to inform this report.

North Sydney Council's previous request for a Draft Travel Plan or a Draft Green Travel Plan to be produced has been noted and considered. This report also includes a Draft Travel Plan Summary identifying some key items to be addressed in the subsequent production of the Plan, however, it is too early for such a detailed plan to be produced. This would be completed in DA stage of planning.

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1 Introduction

1.1 Background

Avenor Pty Limited has engaged Arup to carry out a traffic and transport assessment for a new high density development at 173-179 Walker Street and 11-17 Hampden Street, North Sydney ('the site'). The Planning Proposal seeks to increase the height and FSR. The uplift will enable 211 - 284 dwellings to be delivered within the Precinct.

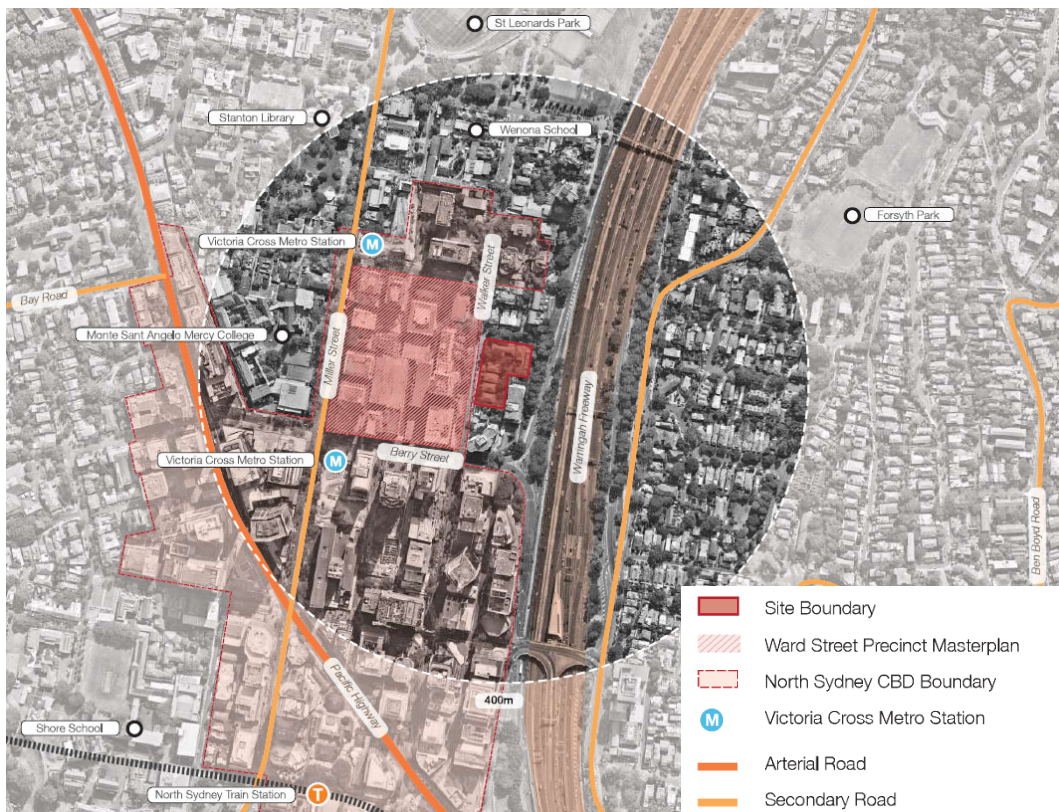


Figure 1 Precinct context

1.2 Report Structure

This traffic and transport report is structured as follows:

- Existing Conditions
- Planning Proposal Reference Designs
- Transport Assessment
- Summary

1.3 RMS Consultation

Consultation with RMS was identified as being a recommendation of the Sydney North Planning Panel in April 2018 following the decision of the Planning Proposal for 173-179 Walker Street. A teleconference was held with RMS on 18 December 2018 at 2.30pm, with the following people in attendance:

- Roads and Maritime Services:
 - Laura Van Putten – Strategic land use planning
 - Peter Carruthers - Network and safety services
 - Rachel Davis – Strategic land use planning
 - Nina Fard – Network and safety services
 - Victor Setiadi – Network integration
- Arup:
 - Josh Milston
- Avenor:
 - Peter Clemesha
 - Greg Gould

A summary of the key items discussed during the meeting are described below.

- RMS noted that justification for the driveway being positioned at the southern end of Walker Street would need to be provided in the transport assessment supporting the Planning Proposal.
- RMS commented that parking rates could be reduced due to the construction of the Victoria Cross Metro Station and the resulting reduction in car usage – although it was noted that North Sydney Council already has relatively low parking rates.
- RMS advised that as the site is being redeveloped, it provides the opportunity to provide residential parking on site, and remove on-street parking on Walker Street. RMS noted that due to the development of the Victoria Cross Metro Station, as well as the potential construction of the Northern Beaches Link Tunnel, and increased development activity in North Sydney, on street parking should be removed to improve vehicle circulation on Walker Street.

Following the conclusion meeting, Arup provided the following information at the request of RMS:

- Vehicle swept path analysis
- Details of existing waste servicing arrangements
- Transport study prepared as part of previous Planning Proposal for 173-179 Walker Street
- Proposed DCP & LEP amendments

2 Existing Conditions

2.1 Site Location

The East Walker Street Precinct is located in North Sydney and is bounded by Walker Street to the west and Hampden Street to the north.



Figure 2 Site location

2.2 Existing Road Network

The East Walker Street Precinct is conveniently located with respect to the arterial and local road network serving the region. It is therefore able to effectively distribute traffic onto the wider road network, minimising local traffic impacts. The key local roads influenced by the application include:

- Warringah Freeway – an RMS classified Freeway (F1) that generally runs in a north-south direction in the vicinity of the Site and forms a principal arterial link between the Sydney Harbour Bridge and Willoughby Road, Naremburn. The Warringah Freeway is subject to an 80 km/h speed zoning and generally carries at least 4 lanes of traffic in either direction within a divided carriageway. Traffic volumes along the Freeway are in the order of 100,000 vehicles per day (vpd).
- Pacific Highway – an RMS classified Highway (A1) that generally runs in a northwest-southeast direction in the vicinity of the Precinct and forms a major arterial link between the Sydney CBD and Hornsby to the north. The Pacific Highway carries about 60,000 vpd local to the Precinct. It is subject to a 60 km/h speed zoning and generally carries 3 lanes of traffic in either direction within an undivided carriageway.
- Miller Street – a local collector road that generally runs in a north-south direction to the west of the Precinct, providing a key link between Falcon Street (to the north) and the Pacific Highway (to the south). Miller Street is subject to a 50 km/h speed zoning and generally carries 1 lane of traffic in either direction with a parking lane on both sides of the street. Clearway restrictions apply along Miller Street, during peak periods, increasing the street's capacity to 2 southbound lanes in the morning peak and 2 northbound lanes in the evening peak.
- Walker Street – a local road that runs in a north-south direction to the west of the Precinct, carrying 1 lane of traffic in either direction with parking provided on both sides of the street. The road is generally subject to a 50 km/h speed zoning however, 40 km/h School Zone speed limits apply in the morning and afternoon for school drop-off and pick-up and drop-off at Wenona School.
- McLaren Street – a local road that runs in an east-west direction along the northern frontage of the Precinct, carrying 1 lane of traffic in either direction along an undivided carriageway. Parking is provided on both sides of McLaren Street with the road subject to a 50 km/h speed zoning. 40 km/h School Zone speed limits apply along McLaren Street between Miller Street and Walker Street.

The road network surrounding the precinct is illustrated in Figure 3.

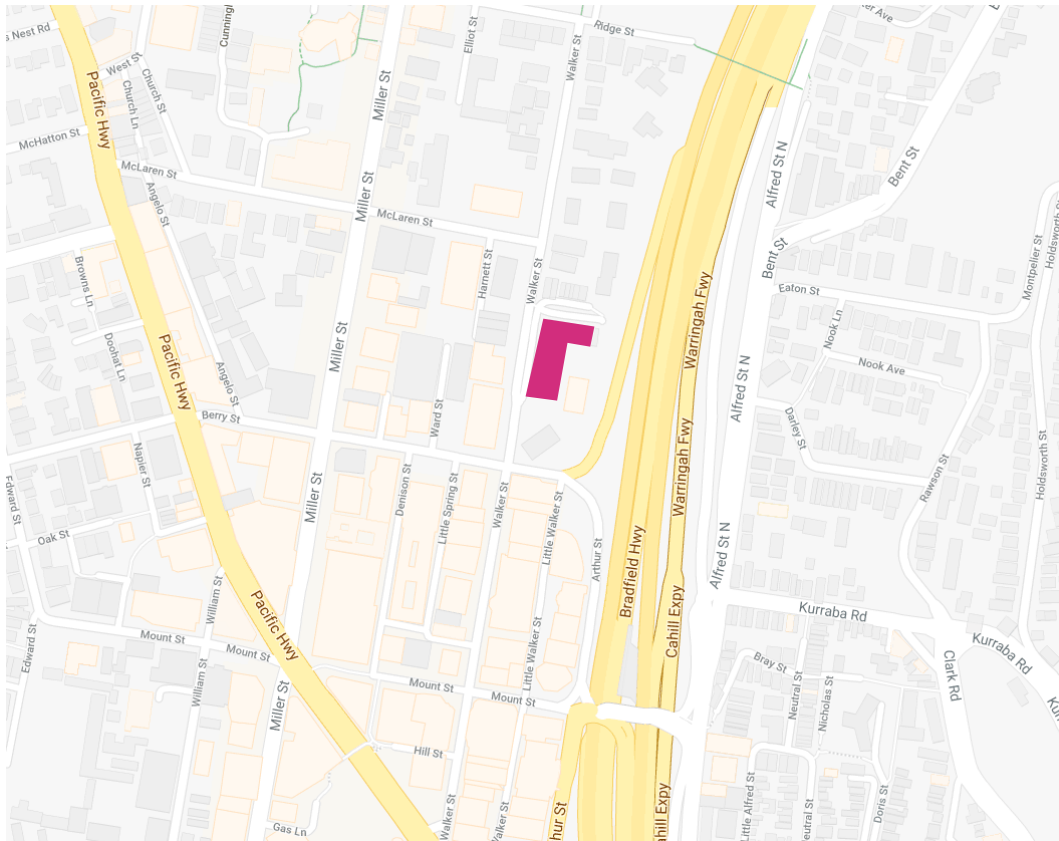


Figure 3 Road network surrounding East Walker Street precinct

2.3 Pedestrian and Cycle Network

The pedestrian network generally consists of the footpaths running along both sides of the roads along the surrounding road network. There is little permeability through the Ward Street Precinct at present. Pedestrian crossings are provided on three arms of the Berry Street/Walker Street intersection and on all arms of most other intersections.

There is adequate pedestrian accessibility to key local facilities and transport facilities to and from the Precinct. Pedestrian footpaths are provided on both sides of Walker Street and on Hampden Street providing access to destinations such as the North Sydney Commercial Core, North Sydney Station and North Sydney Oval and the future Sydney Metro Station.

North Sydney train station is within the 10 minute walking catchment of the development site, while the nearest bus stop is located on Miller Street, just over 5 minutes by foot from the development site.

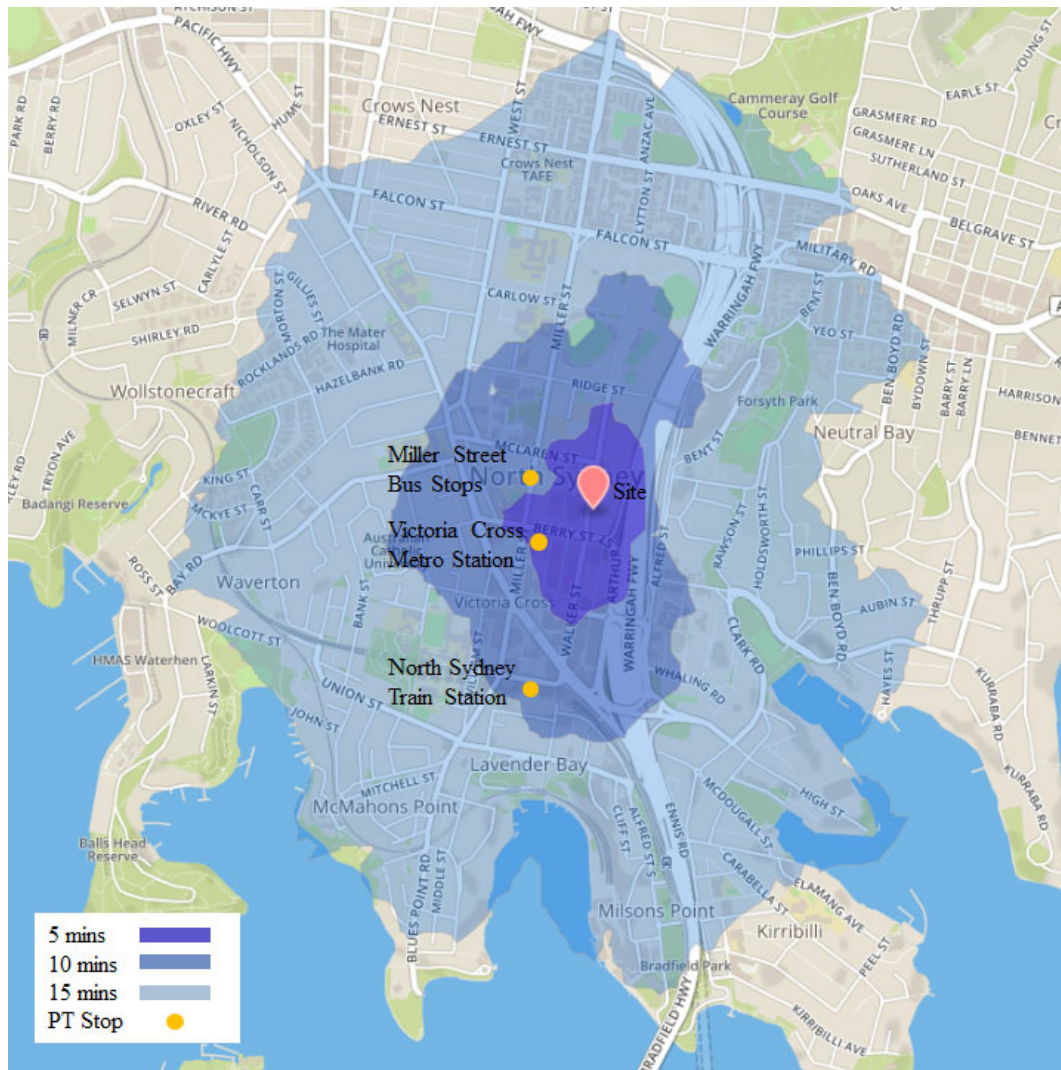


Figure 4 Walk catchment

North Sydney is served by a network of local and regional bicycle routes as shown in Figure 5 below. The Precinct has good access to the local bicycle network. The Precinct is located close to Off-road bike paths located along Miller Street to the south and Ridge Street to the north. These paths link to the wider cycling network providing a convenient route to Neutral Bay, Lane Cove and the Sydney CBD.”

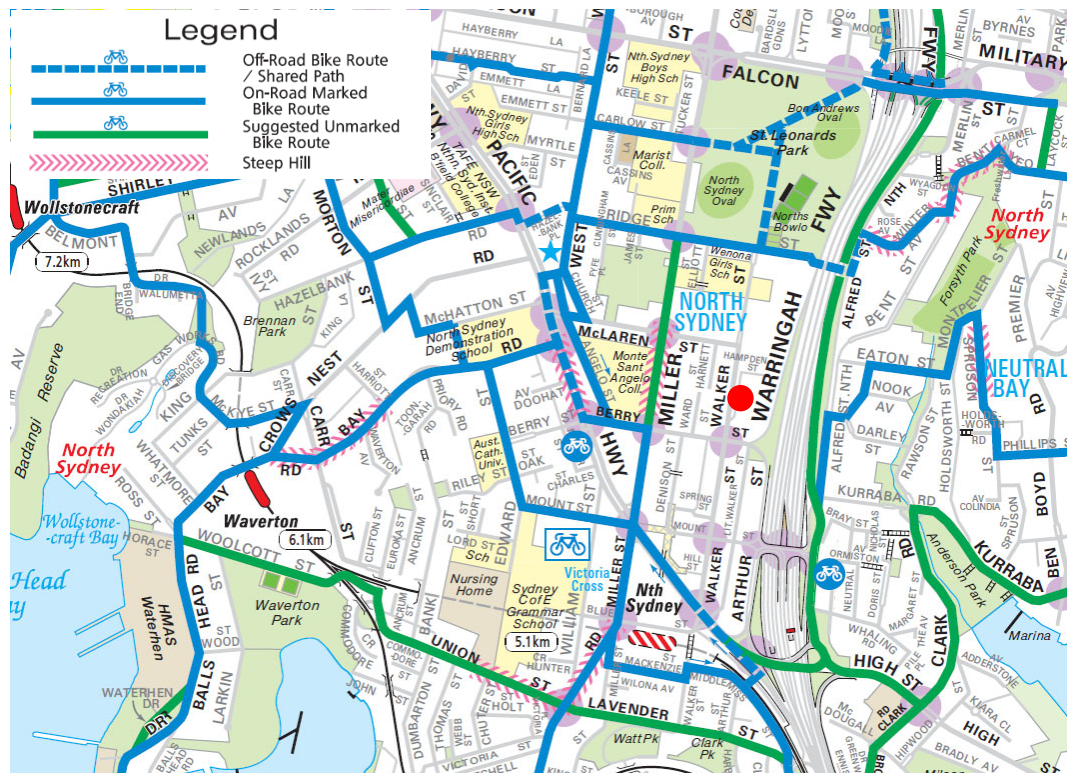


Figure 5 Existing bicycle network

2.4 Public Transport Network

The public transport network in the vicinity of the site consists of bus and rail services. A large number of bus routes within a 5 minute walk of the site (along Miller Street) with additional services available from the Pacific Highway while T1 northern line train services are available from North Sydney Train Station (10 minutes by foot). The 15, 30 and 45 minute journey time catchment of the site by public transport is presented in Figure 6.

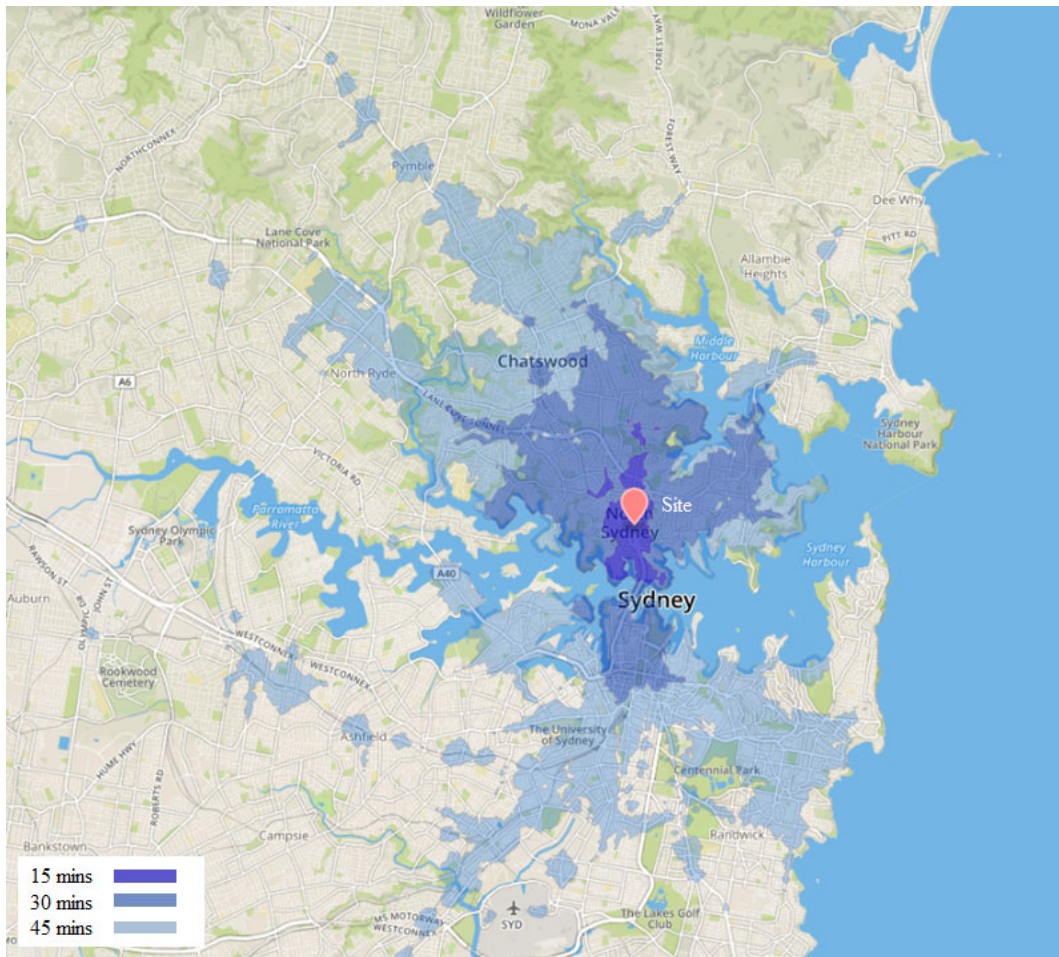


Figure 6 Public transport catchment

2.5 Mode split

The most recent 2016 Journey to Work Census data for residents living in the block surrounded by Berry Street, Walker Street, Hampden Street and Warringah Freeway (Statistical Area 1141730) is presented in Figure 7. The data shows that approximately 40% of residents travel to work by public transport (train and bus), with only 20% of residents choosing to drive to work. It is expected this proportion of people choosing to drive will only decrease further following the introduction of the Sydney Metro project.

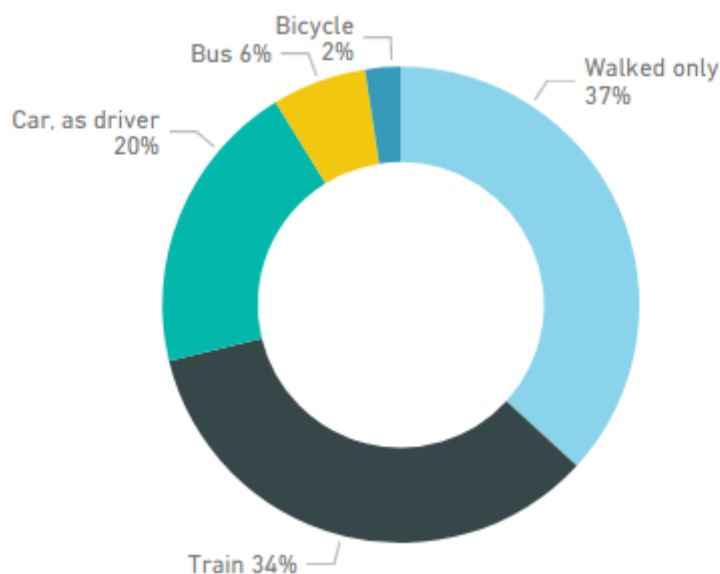


Figure 7 Journey to work mode split for residents of North Sydney

2.6 Traffic Flows

Arup previously conducted traffic counts in 2014 to understand the level of traffic movements in and around the local area. Current traffic volumes in the streets surrounding the development site are summarised in Table 1 below.

Table 1 Existing traffic volumes

Street	Traffic Volumes	
	AM Peak Hour	PM Peak Hour
Berry Street (eastbound)	1,553	1,221
Walker Street (northbound)	338	394
Walker Street (southbound)	376	387
McLaren St (eastbound)	218	102
McLaren St (westbound)	381	266

Traffic counts were not completed as part of this study due to the low level of traffic generated by the proposal (see section 5.1)

2.7 On-Street parking

On-street parking is presently located along the eastern side of Walker Street and southern side of Hampden Street as shown in Figure 8. These spaces are currently signposted as '2P Meter, 8.30am – 6pm Mon-Fri, permit holders excepted'.

The precinct currently accommodates 44 residential dwellings with limited off street parking available and has entitlement to approximately 44 on-street parking permits under the North Sydney Council policy which is based on RMS guidelines for resident parking.

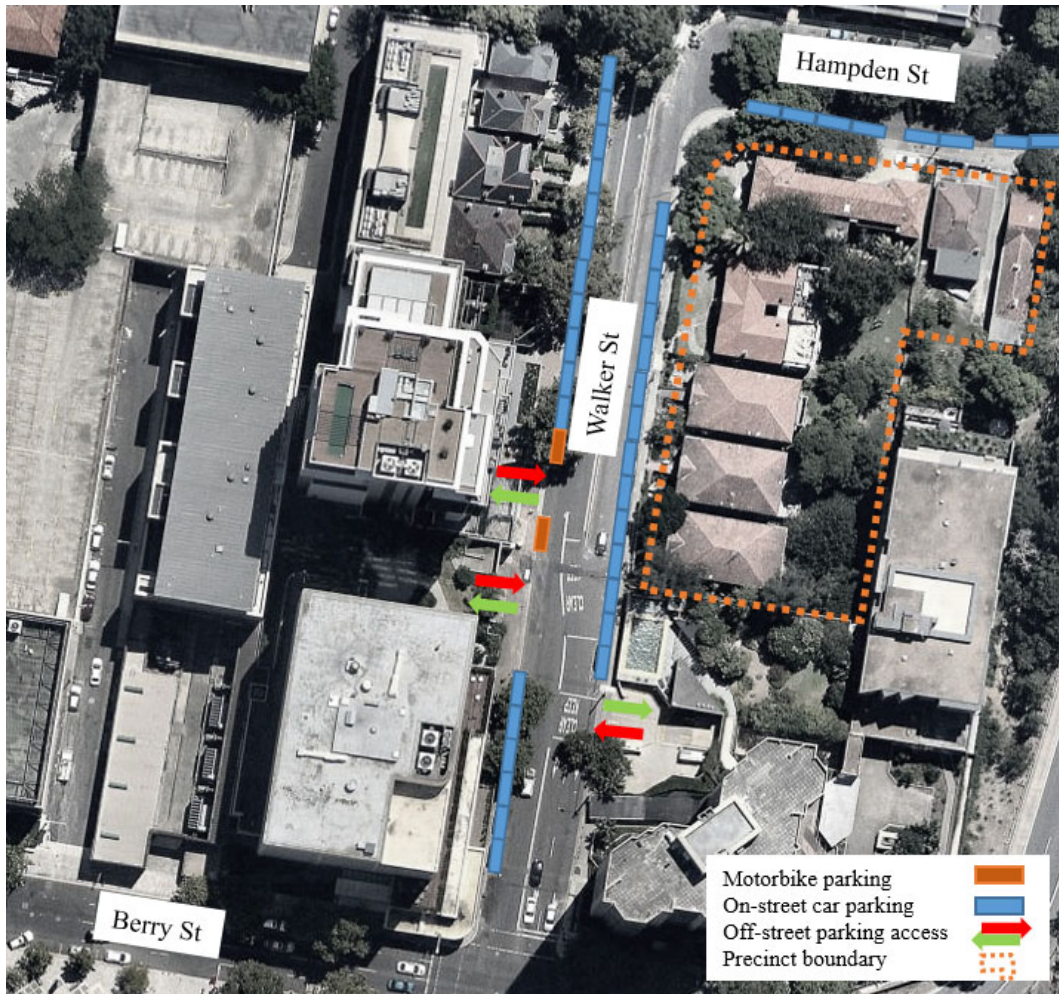


Figure 8 Existing on-street parking

3 Proposed Development

3.1 Development overview

Three development concepts have been prepared as part of the planning proposal documentation. These concepts are described below:

Table 2 Development overview

Development Scheme	Potential number of residential units	Non-Residential GFA	Notes
Reference design	237	80m ²	Consolidated development with two development parcels
Special Provisions Reference design	284	80m ²	Consolidated development with consistent podium across the site and single tower
Separate Landholdings Reference Design	211	80m ²	Consolidated development which does not require the amalgamation of 11, 15 and 17 Hampden Street.

For the purposes of the transport assessment, 'the special provisions reference design' has been considered as it details a 'higher demand' scenario in terms of transport demands.

3.2 Vehicular access

Vehicle entrance points within the Precinct are proposed at the southern end of Walker Street and the eastern end of Hampden Street. In the 'Special Provisions Reference Design' there will only be one vehicular access from the southern Walker Street driveway.

The swept path of a large (10.24m) vehicle accessing the precinct from the southern end of Walker Street is provided in Appendix A.

In contrast to the previous planning proposal, the revised planning proposal distributes density across the Walker and Hampden Street properties. In North Sydney Council's report on the previous planning proposal, it recommended that the proposal can achieve a better development outcome if density is distributed across the 'two sites' being the Walker Street site and the Hampden Street site and would "achieve better traffic and access outcomes for Walker Street". The Planning Proposal and Reference Design does this with density distributed across the two sites equally.

3.3 Public domain plan

The public domain plan (consistent with all development concepts) is illustrated in Figure 9. Key features of the plan include:

- Upgraded streetscape along both Hampden Street and Walker Street
- 5m wide landscaped setback with public seating areas on the Walker Street frontage
- New 2m wide landscaped setback on Hampden Street
- New pocket park on southern portion of Hampden Street east of basement entry
- Retention of existing on-street parking (outside of driveway access points)
- Vehicle access driveways at the southern end of Walker Street and eastern end of Hampden Street



Figure 9 Public domain plan

3.4 Car parking

The maximum residential car parking rate, as set out in Table B-10.2 of the North Sydney Development Control Plan 2013 (and as amended in 2015), permits the maximum parking rates as shown in Table 3 for residential development in zones other than B4 (development is located in Zone R4). Table 3 also summarises the parking rates recommended by RMS for metropolitan centres.

Table 3 Proposed parking rates

Apartment schedule	DCP Parking Rate (maximum rate)	RMS parking rates for metropolitan centres	Proposed parking rates for East Walker Street precinct
1 bedroom	1 / unit	0.4 / unit	0.5 / unit
2 bedroom	1 / unit	0.7 / unit	1 / unit
3+ bedroom	1.5 / unit	1.2 / unit	1 / unit
Visitor	1 space / 4 units	1 space / 7 units	0 / unit
Retail	1 / 400m ²	n / a	n/a

Parking rates to be adopted for the precinct are lower than those recommended by both North Sydney Council (for development in Zone R4) and RMS. This also aligns with the feedback received by RMS as part of consultation undertaken for this Planning Proposal.

The actual number of parking spaces to be provided would be detailed as part of a future development application for the precinct, following the finalisation of dwelling yield and mix.

Based on the current indicative dwelling mix, the potential number of parking spaces that could be achieved under the reference design and special provisions reference design is outlined in the table below.

Table 4 Potential parking provision

Apartment schedule	Number of apartments		Potential no. of parking spaces	
	Reference design	Special provisions reference design	Reference design	Special provisions reference design
1 bedroom	68	111	34	56
2 bedroom	83	102	83	102
3 bedroom	86	71	86	71
Total	237	284	203	229

The allocation of parking across the Walker Street and Hampden Street properties is summarised in Table 5 below.

Table 5 Parking allocation across Walker Street and Hampden Street properties

Part of precinct	Reference Design		Special Provisions Reference Design	
	Car parks in scheme	Allowable under R4 zoning	Car parks in scheme	Allowable under R4 zoning
Walker Street Properties	120	145	229	264
Hampden Street Properties	83	100		
Total Precinct	203	245	229	264
Note: under the Separate Landholdings Study, the car park numbers would be further reduced in line with the reduction in density across the Precinct				

Even though the Precinct is zoned R4 High Density Residential, North Sydney Council had identified in its response to the previous planning proposal for 173-179 Walker Street that it may be more appropriate for a B4 – Mixed Use: St Leonard’s Precincts 2 & 3 parking rates to be applied. The revised planning proposal has less than half the density of the previous proposal and approximately half the height. Council had suggested in response to the previous planning proposal 120 car spaces and 12 motorcycle spaces for a development that comprised 284 units would be appropriate. Under the Reference Design in the revised Planning Proposal, the maximum number of car parks on the 173-179 Walker Street component of the Precinct under the R4 controls would be 145 cars, but the Planning Proposal indicates that only 120 cars will be included, which means that due to the significant reduction in the overall scale of the development, there is no need to apply the B4 parking rates as the total number of cars is approximately in line with Council's original car park numbers response.

No parking for the retail component of the precinct is proposed given only 80m² of floor space is envisaged under the planning proposal, less than the rate of 1 space / 400m² outlined in the North Sydney DCP.

Clause 10.2.1, P6 of the North Sydney DCP-Part B stipulates that each adaptable residential apartment is required to be allocated an accessible car parking space. These spaces will be allocated as the design progresses towards a development application. Additionally, Clause 10.3.1, P2 of the North Sydney DCP-Part B stipulates that 1- 2% of all non-residential car parking is required to be provided as accessible parking. Given no parking associated with non-residential uses are proposed, no accessible car parking will be provided in this respect.

3.5 Service area

The North Sydney Development Control Plan 2013 requires that for developments with more than 60 dwellings, that at least two Medium Rigid Vehicle (MRV) bays be provided. Future development applications will provide these two MRV bays within the site. Vehicles will be able to enter/exit the site from street level in a forward direction.

3.6 Waste collection

Following discussions with North Sydney Council, it is understood that waste collection for residential developments is to be undertaken on-street and not within the development itself. In accordance with the DCP, a bin storage area will be provided within the site boundary which can be accessed via the street network. These arrangements will be further detailed in subsequent development applications for the site.

This waste collection process is already in place for the Walker Street and Hampden Street and is successful and it is reasonable to maintain the process for future development. RMS was consulted on the proposal and was generally comfortable with the capacity for future development to meet Waste Collection requirements

The existing waste collection arrangements for the precinct are shown in Figure 10. These arrangements would not change under the proposal.

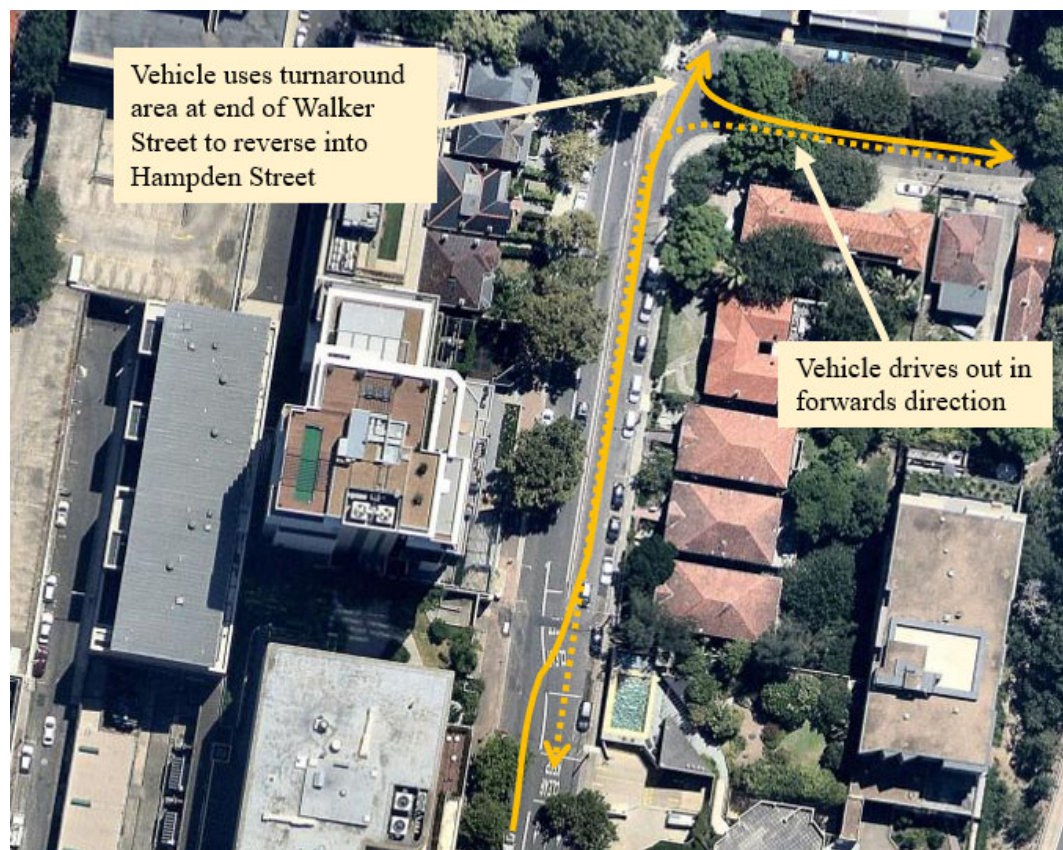


Figure 10 Existing waste collection arrangements

3.7 Bicycle parking

Clause 10.5.1, P1 of the North Sydney DCP-Part B requires bicycle parking to be provided at the following rates:

Residential Land Use:

- 1 bicycle space per dwelling, plus
- 1 bicycle space per 10 units for visitors

Application of the above rates to the Proposal results in a requirement for a total of 261 bicycle spaces comprising 237 residential spaces (for the reference design).

The development would provide a total of 261 bicycle spaces including 237 spaces within a designated bicycle parking area on Basement Level 1 and storage lockers that are large enough to accommodate a bicycle and hence, can be regarded as bicycle parking spaces in accordance with Clause 10.5.1, P1(a) of the North Sydney DCP-Part B. Compliance with Council's parking requirements will be further investigated at DA stage noting that it is likely this can be achieved.

3.8 Motorcycle parking

The North Sydney DCP requires the provision of motorcycle parking at the rate of 1 space per 10 car spaces, or part thereof. Future development applications for the precinct would comply with this requirement.

3.9 Car share

As the proposal moves towards development application stage, details around car share provision will be provided. Allowance has been made within the basement and/or on Walker Street to accommodate car share vehicles.

4 Future Context

4.1 Ward Street Precinct Masterplan

North Sydney Council has prepared a Masterplan for the Ward Street precinct which is adjacent to the site. The Precinct is bound by McLaren Street to the north, Berry Street to the south, Miller Street to the west and includes a number of properties on the eastern side of Walker Street, south of Hampden Street.

Within the precinct is a variety of commercial, mixed use and residential development. The precinct also contains the Ward Street car park, which is Council owned and privately operated under a long term lease. The upcoming expiry of the lease, in combination with the arrival of the Metro, brings the opportunity for Council to re-imagine how these facilities work for the community.

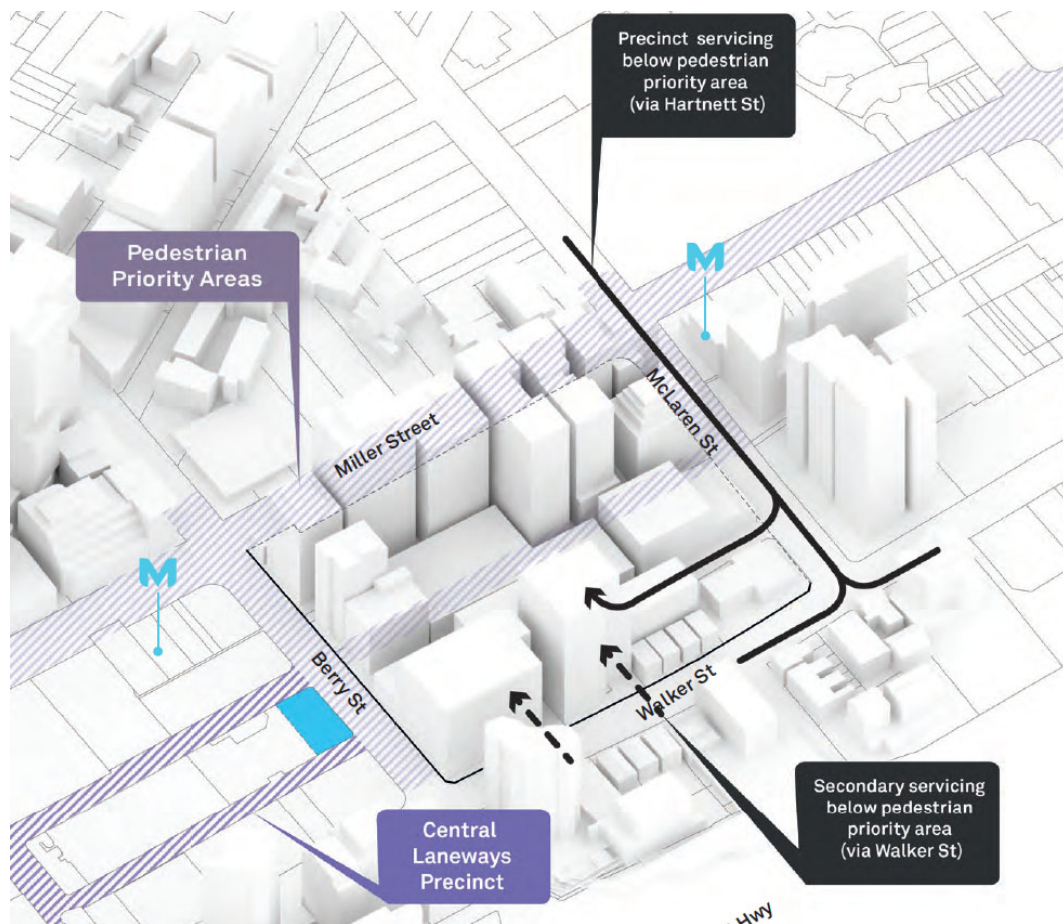


Figure 11 Ward Street Precinct Masterplan

The masterplan identifies Walker Street as being of a lower order in terms of pedestrian priority when compared with McLaren Street, Berry Street and Miller Street.

Of particular benefit to the East Walker Street Precinct will be the increased permeability of the precinct which will reduce walk times to bus services along Miller Street.

4.2 Sydney Metro & Victoria Cross Metro station

Sydney Metro is the next major rail project identified in Sydney's Rail Future. Sydney Metro scope has been developed to meet the Project objectives and deliver key elements of Stages 4 and 5 of Sydney's Rail Future.

In June 2014 the NSW Government announced the Sydney Metro concept, including the Sydney Harbour Crossing and Western Extension to Bankstown proposals. The project would extend rapid transit under Sydney Harbour, through the central business district (CBD) of Sydney and west to Bankstown, with capacity to run up to 30 trains per hour in each direction.

The Project represents a major increase in the capacity of Sydney's rail network, providing a 60 per cent increase in the number of trains in the peak periods and catering for an extra 100,000 customers per hour. Sydney Metro will significantly improve reliability across the rail network by addressing current and emerging constraints such as train crowding, platform and station crowding, and network complexity.

The NSW Government has commenced construction on a new station in North Sydney, known as Victoria Cross, as part of the Sydney Metro project. The station is located beneath Miller Street (to the north of the Pacific Highway) between McLaren Street and south of Berry Street. Station access and entry is via the pedestrian plaza opening to Miller, Denison and Berry streets. Residents of the proposed development will benefit from the future northern access point into Victoria Cross station located at the corner of Miller Street and McLaren Street.

Key employment centres will be easily accessible from Victoria Cross station, with 9 minutes travel time to Central Station and 5 minutes travel time to Martin Place metro station. Station access and entry is via the pedestrian plaza opening to Miller, Denison and Berry streets, and via the proposed northern services building on McLaren Street.

The station includes:

- New bike parking near the corner of Miller and Berry streets
- New kiss and ride bays on Berry Street
- Existing bus stops close to the station retained on Miller Street
- Wayfinding signage and Sydney Metro information within the North Sydney CBD
- A traction substation integrated into the station building (partially underground)
- Enhancement of pedestrian infrastructure around the station. This is being investigated further in consultation with Roads and Maritime Services and North Sydney Council.

The new metro station is located within a 5 minute walk (~200m) of the East Walker Street precinct, and will be operational from 2024, and is within equal distance of both North and South entrances to Victoria Cross Metro Station.

4.3 Western Harbour Tunnel and Beaches Link

In March 2017 the NSW Government announced the Western Harbour Tunnel and Beaches Link (WHTBL) motorway project. In July 2018, the NSW Government released project updates, including reference designs and supporting information. Council summarised these updates in a report on 29 October 2018 which provides a summary of impacts. The current tunnel design involves the construction of a north-bound tunnel opening north of Hampden Street, and an additional lane of road widening along the Warringah Freeway adjacent to East Walker Street. These works do not directly impact the subject property although they move the boundary of the Warringah Freeway. The WHTBL project was discussed with RMS who advised there is not major concern with the proposed development as it relates to the WHTBL.

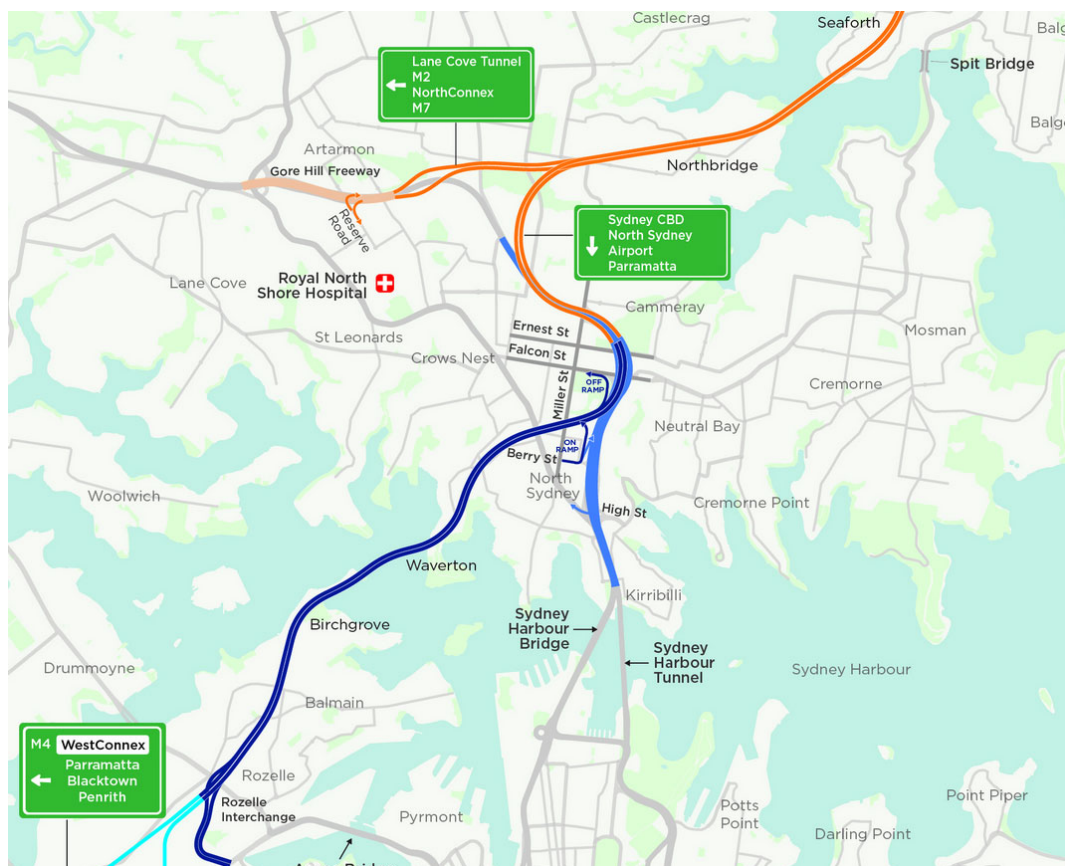


Figure 12 Western Harbour Tunnel and Beaches Link project

Source: RMS

4.4 Summary of future planning context

In regards to the planned transport and land use changes in the vicinity of the East Walker Street Precinct, specifically:

- Pedestrian improvements identified under the Ward Street masterplan;
- Provision of a new metro station within 200m walk of the precinct; and
- Enhanced road infrastructure through the Western Harbour Tunnel and Beaches Link project

the proposal is well suited to take advantage of the new infrastructure upon its completion in 2024. The improved access to transport services would ensure that future residents have a wide range of options, in addition to the numerous existing transport options, as alternatives to private vehicle use.

5 Transport Assessment

5.1 Trip generation

Recent surveys undertaken by the RMS of high density residential developments indicates a person trip generation rate of approximately 0.6 trips / dwelling. Applying this rate to the upper dwelling yield of 284 apartments possible under the planning proposal, 170 trips would be generated. For the reference design this number of peak hour trips reduces to 142. Using the existing mode splits previously noted in Section 2.5, and applying adjustments based on the site's proximity to the future metro station, the forecast number of trips by mode can be determined. This is outlined in Table 6 below.

Table 6 Mode share and peak period person trips

Mode Share		Reference Design		Special Provisions reference design	
		AM Peak Hour Trips	PM Peak Hour Trips	AM Peak Hour Trips	PM Peak Hour Trips
Car Driver	18%	26	26	31	31
Car Passenger	1%	1	1	2	2
Train / metro	36%	51	51	61	61
Bus	6%	9	9	10	10
Walk	37%	53	53	63	63
Cycling/Other	2%	3	3	3	3
Total	100%	142	142	170	170

5.2 Road network impacts

The analysis indicates that the site may generate up to 31 vehicle trips during peak hours. In this AM peak hour, this would equate to approximately 25 vehicle trips leaving the development in the morning (assuming an 80% of trip are egress), the majority of which would be directly accessing either the Warringah Freeway or the Pacific Highway. This is less than 1 vehicle every two minutes during the peak period and is considered to be of negligible impact.

Traffic generation of this magnitude would not impact access for people travelling to/from the nearby Victoria Cross metro station.

5.3 Vehicle access arrangements

In its response to the previous planning proposal, Council had requested the proponent consider whether a re-design or simplification of the junction at the driveway of the proposal and Walker Street would be required due to conflict or driver safety.

Notwithstanding the small number of vehicles generated by the proposal, Arup has undertaken an analysis to confirm the suitability of the existing road network

to accommodate traffic flows into the site. Specifically, the analysis has focused on the potential of the northbound lanes on Walker Street to queue back to Berry Street if a vehicle is waiting to turn right into the driveway of the proposed development.

A SIDRA model has been developed to understand the maximum queue that is likely to form behind vehicles waiting to turn right into the proposed driveway, based on historical traffic counts (2014) at the Berry Street / Walker Street intersection. The analysis considers up to 36 vehicles turning right into the Walker Street driveway during the PM peak hour, in line with the trip generation forecasts. It should be noted however that not all of these vehicles will necessarily use the access off Walker Street, given an access point off Hampden Street would also be provided.

The modelling demonstrates that the maximum queue length that is likely to form in the PM peak hour behind right turning traffic is no more than one vehicle. This is illustrated in Figure 13, and confirms the proposed development will not cause northbound lanes on Walker Street to queue back to Berry Street.

Traffic modelling outputs are provided in Appendix A.

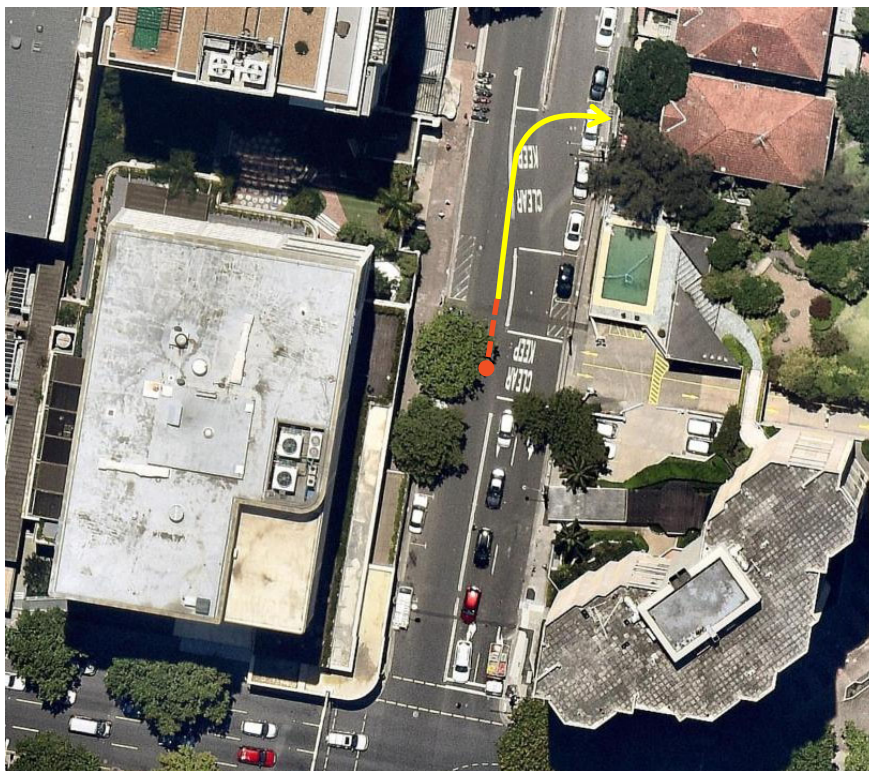


Figure 13 Forecast maximum queue length

Other locations for the driveway were considered in the study, however, it was determined that the location at the southern end of the Precinct was justified as being the optimum location for a number of further reasons:

- Given the constrained width of the lower side of Walker Street, it is preferable to have vehicles enter the precinct immediately as they enter Walker Street rather than travelling the full length of the road. Vehicles travelling north on

Walker Street may be required to wait a longer time for larger vehicles (e.g. waste collection vehicles, loading vehicles) to pass which would create localised congestion.

- If vehicles are waiting in traffic to exit the precinct from Hampden Street, vehicles seeking to enter would be able to pass between waiting vehicles into the driveway, in turn assisting with the reduction of any potential congestion.
- The planning proposal seeks to retain the local character of the northern end of the precinct towards Hampden Street and create a safe pedestrian environment, and by locating the driveway at the southern end of the precinct it limits the amount of traffic movements within the precinct.
- The planning proposal seeks to provide well connected open space within the precinct which is provided as a continuous stretch of open space along the Walker Street frontage in order to maximise the pedestrian connectivity, safety and usability of the open space. If the driveway was located further north, it could result in splitting the open space unnecessarily, reducing the usability of the space by providing further vehicle curtilage to ensure safety.
- The swept path of vehicles entering at the southern end of the Precinct allows for a wider arc and in turn there is less impact on the removal of on street parking. Given the width of the lower part of Walker Street further north, the vehicle swept path may require removal of more on street parking.
- There is no need to locate the driveway north as the analysis demonstrates that:
 - the low level of traffic generation by the development will not cause queuing back to Berry Street with a maximum PM peak hour queue estimated to be 1 vehicle
 - The existing traffic arrangement allows for north bound vehicles to pass any vehicles that are waiting to turn into the Precinct

The location of the southern driveway is therefore justified as being the optimum location. Further detailed design and analysis is not deemed necessary prior to Gateway Determination. Further studies to demonstrate compliance will be undertaken prior to a Development Application being submitted.

It should also be noted that northbound vehicles have the ability to pass traffic waiting to turn right into the site. Figure 14 below shows a medium rigid vehicle waiting to turn right with a B99 vehicle travelling northbound passing the waiting vehicle, without impacting any of the existing on-street car parking or motorcycle parking. This assessment responds to feedback received following consultation with RMS as part of the project.

This is the existing arrangement and based on the traffic generation forecasts for the proposed development, it is deemed reasonable to continue this arrangement. Further traffic modelling and traffic management plan can be produced for the subsequent DA processes.

A second vehicle access point is proposed on Hampden Street which can adequately accommodate vehicle entries and exits.

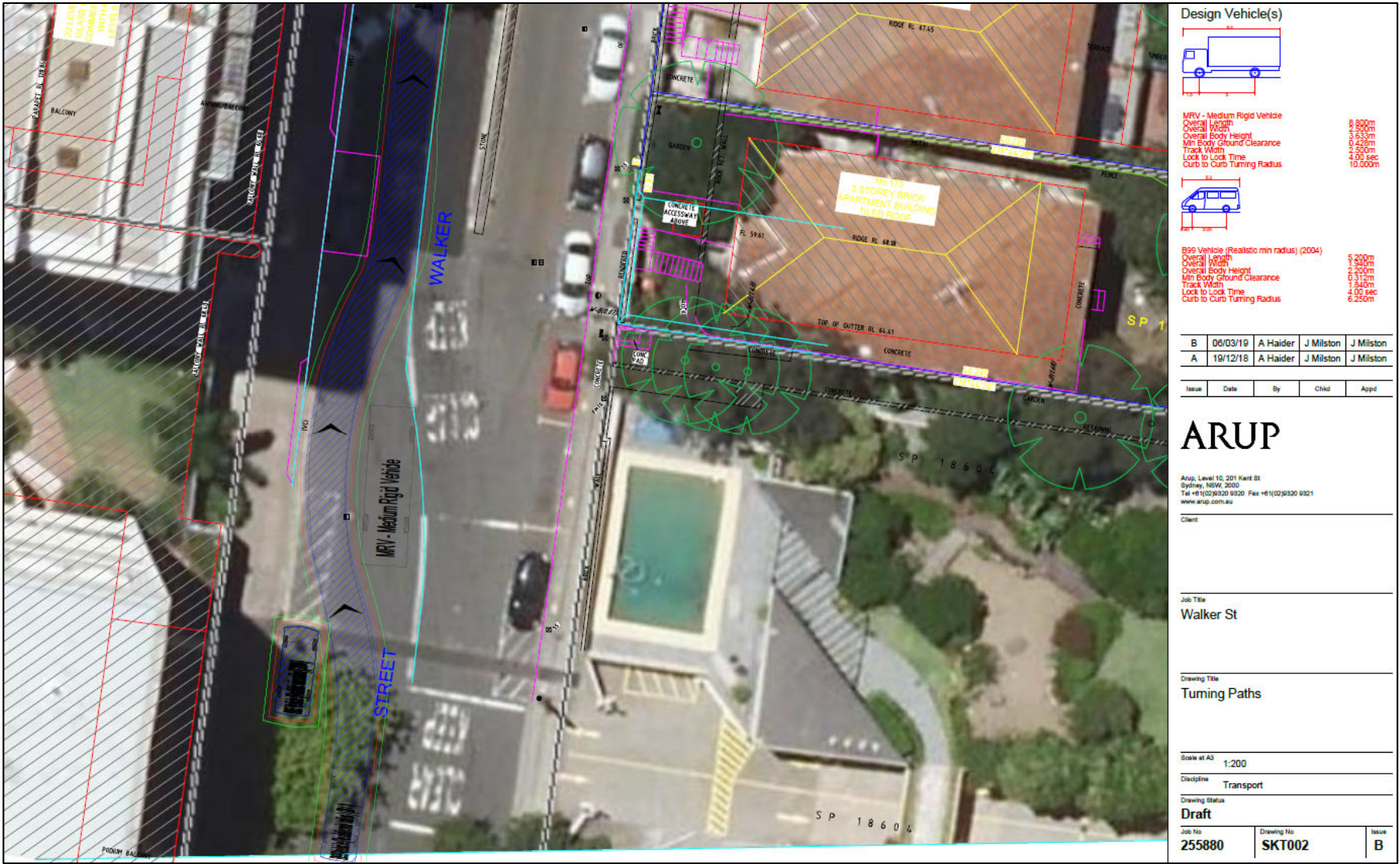


Figure 14 Ability for northbound vehicles to pass traffic waiting to turn right

5.4 Public transport

The site is forecast to generate demand for up to 61 trips by train/metro and 10 trips by bus during the AM peak hour. As shown in Figure 15, the distance to the train station is less than 600m, while the bus stops on Miller Street are approximately 200m away.

There are a high number of bus services serving the stops on Miller Street during the morning peak period, while trains operate at a 3 minute frequency through North Sydney. Once operational, the Sydney Metro is expected to operate at a 4 minute frequency.

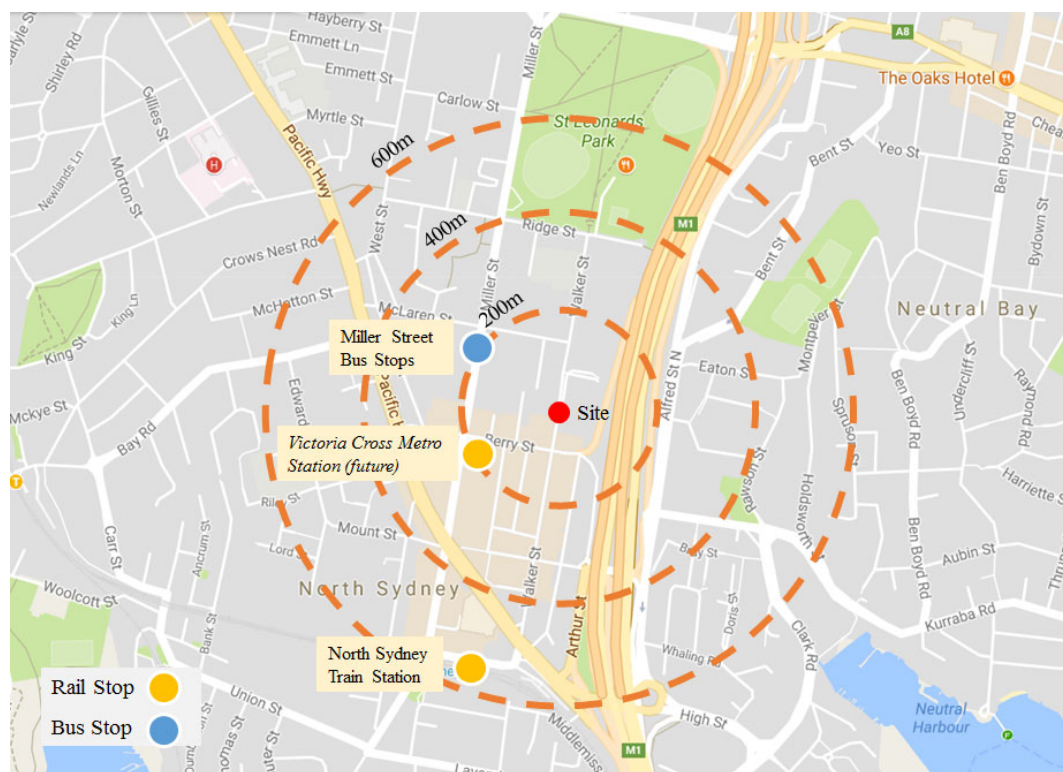


Figure 15 Distance to public transport stops

5.5 On-street car parking

The proposed location of the driveways into the precinct, as well as the pocket park on Hampden Street, will result in the estimated loss of 6 on-street parking spaces – 3 each on Walker Street and Hampden Street. These changes are presented in Figure 16.

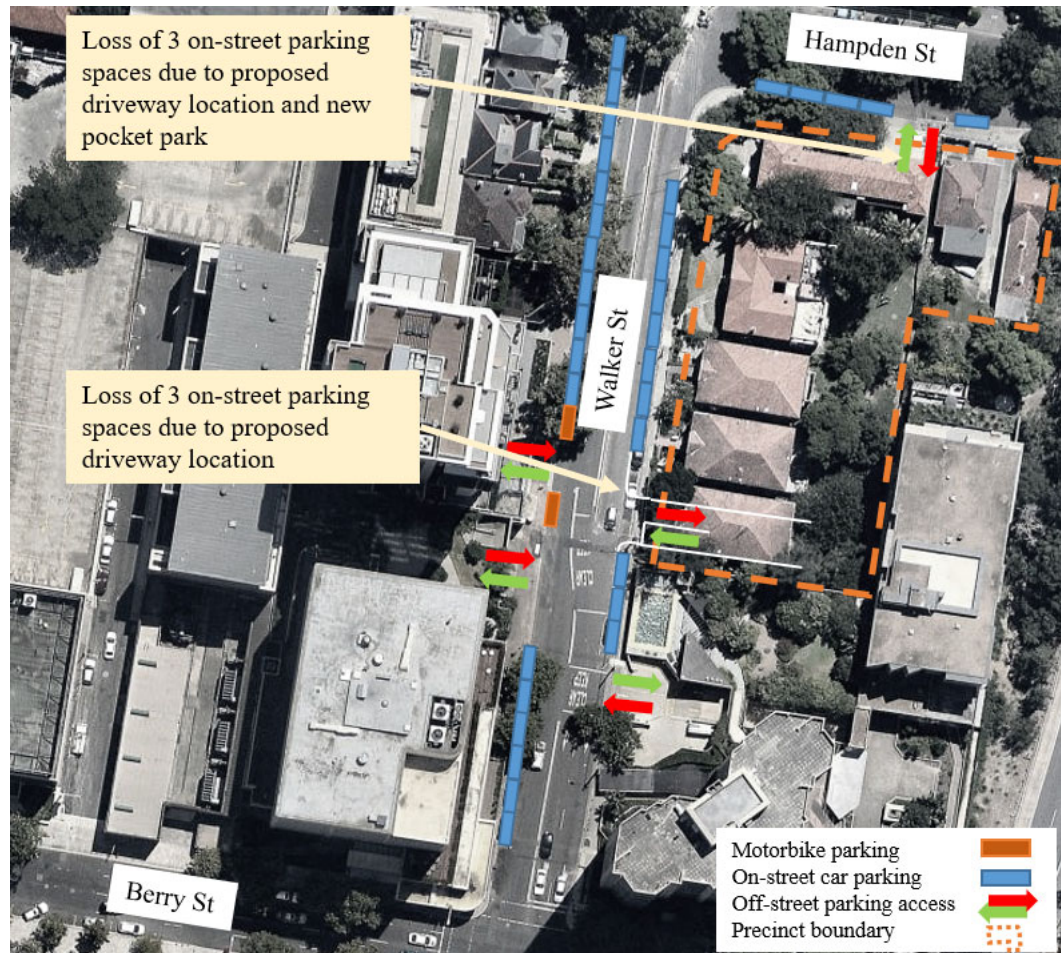


Figure 16 Proposed on-street parking

While it is acknowledged parking demand is high in the area, the proposed loss of on-street parking spaces is considered acceptable given that:

- The existing residential dwellings on Walker Street and Hampden Street which make up the proposed site do not have any off-street parking. Each of these existing dwellings would be entitled to a residential parking permit
- Total demand for on-street parking in the vicinity of the site will reduce should the development proceed, as residents of the dwellings would no longer be competing for parking spaces.
- The existing residential dwellings at 173-179 Walker Street and 17 Hampden Street which make up the proposed Precinct do not have any off-street parking. Each of these existing dwellings would be entitled to a residential on street parking permit, or currently park vehicles on the surrounding road network. There is also limited parking for residents at 11 Hampden Street.

5.6 Pedestrians

The development of the precinct provides an opportunity to enhance the safety and efficiency of pedestrian movements. This includes an upgraded public domain with wider setbacks and a new pocket park to provide a more amenable pedestrian environment.

The capacity for inclusion of pedestrian crossings of Walker Street to improve pedestrian access was investigated as part of this study. Key locations considered were at the northern end of the heritage wall near the access stairs to Hampden Street and to the southern end of the heritage wall near the proposed driveway location. The investigation found that the proposed development does not require such crossings in order to meet compliant pedestrian access requirements. RMS feedback was they would prefer if there was not a pedestrian crossing in these locations. Further, the Ward Street precinct masterplan identifies Walker Street as being of a lower order in terms of pedestrian priority when compared with McLaren Street, Berry Street and Miller Street

Inclusion of a ramp for less mobile road users near the Hampden Stairs was considered, however, it is deemed not required for the compliant servicing of the proposed development.

5.7 Green travel plan

5.7.1 Background

A Green Travel Plan (GTP) is a package of measures put in place by the development occupants to try and encourage more sustainable travel. It is a means for a development to demonstrate a commitment and take a pro-active step towards improving the environmental sustainability of its activities.

More generally, the principles of a GTP are applied to all people travelling to and from a site. Government authorities are placing increasing emphasis on the need to reduce the number and lengths of motorised journeys and in doing so encourage greater use of alternative means of travel with less negative environmental impacts than the car.

5.7.2 Objectives

The main objectives of the GTP are to reduce the need to travel and promotion of sustainable means of transport. The more specific objectives include:

- High mode share for public transport, cycling and walking to work journeys;
- Ensuring adequate facilities are provided at the site to enable the tenants and visitors of the development to commute by sustainable transport modes;
- Reduce the number of car journeys associated with business travel;
- Facilitate the sustainable and safe travel of occupants; and

- Raise awareness of sustainable transport amongst residents of the development.

5.7.3 Potential measures

A suite of potential measures is described below to be implemented as part of the GTP, which can be developed further as the development progresses.

Table 7 List of potential GTP measures

Action	Responsibility
Cycling	
Provide sufficient cycle parking to meet needs, which is easily accessible and secure	Developer
Provide adequate cycle parking facilities for visitors	Developer
Ensure cycle parking is clearly visible or provide signage to direct people to cycle bays	Building manager
Produce a map showing cycle routes and bike stands in the area	Building manager
Walking	
Produce a map showing safe walking routes to and from the site with times, distances to local facilities, such as shops and bus stops	Building manager
Public Transport	
Develop a map showing public transport routes in the area	Building manager
Put up a noticeboard with leaflets and maps showing the main public transport routes to and from the site	Building manager
Carshare / Carpooling	
Put a poster on the noticeboard where residents would register their interest in carpooling by indicating their work location	Building manager
Develop a map showing car-share spots in the area	Building manager
General actions	
Promotion including: <ul style="list-style-type: none"> • an events calendar – 3-4 events per year. Best in conjunction with statewide events such as National Bike Week and Bike2Work Day, National Walk to Work Day. • Display boards in prominent locations to show public transport maps and timetables. 	Building manager

5.7.4 Monitoring and review

In order for the GTP to be effective, it must be reviewed on a regular basis. It is important to ensure that the GTP is meeting its objectives and having the intended impact on car use and transport choices. The GTP should be reviewed on a yearly basis by undertaking resident and other users of the building travel surveys. It is recommended that the mode shares are first reviewed at least 18 months after occupation, to allow activity levels to settle at the site.

6 Summary

Avenor Pty Limited engaged Arup to carry out a traffic and transport assessment of their proposed high density residential development at 173-179 Walker Street and 11-17 Hampden Street, North Sydney. Key findings of the study are as follows:

- The provision of an access driveway on Walker Street and Hampden Street will result in the loss of approximately six on-street car parking bays, which are currently used by residents of the subject site. It is acknowledged parking demand is high in the area, however this loss of spaces is considered acceptable given that:
 - The existing residential dwellings on Walker Street and Hampden Street which make up the proposed site do not have any off-street parking. Each of these existing dwellings would be entitled to a residential parking permit
 - Total demand for on-street parking in the vicinity of the site will reduce should the development proceed, as residents of the dwellings would no longer be competing for parking spaces.
 - Residents of the future site will not have access to residential parking permits. Therefore there would be a reduction in the number of parking permits issued in the area, despite the estimate loss of six on-street parking spaces.
- The proposal will provide bicycle parking in line with rates outlined in the North Sydney DCP, and car parking at rates below the DCP given the proximity of the precinct to public transport.
- Due to the location of the site in close proximity to public transport, in particular the future Victoria Cross metro station, only a maximum of 31 vehicle trips during peak hours are forecast. In this AM peak hour, this would equate to approximately 25 vehicle trips leaving the development in the morning which is less than 1 vehicle every two minutes during the peak period and is considered to be of negligible impact
- The future measures proposed under the Ward Street Precinct Masterplan and the Victoria Cross Metro Station will significantly improve the accessibility of the development by foot and by public transport.

Appendix A

Vehicle Swept Paths

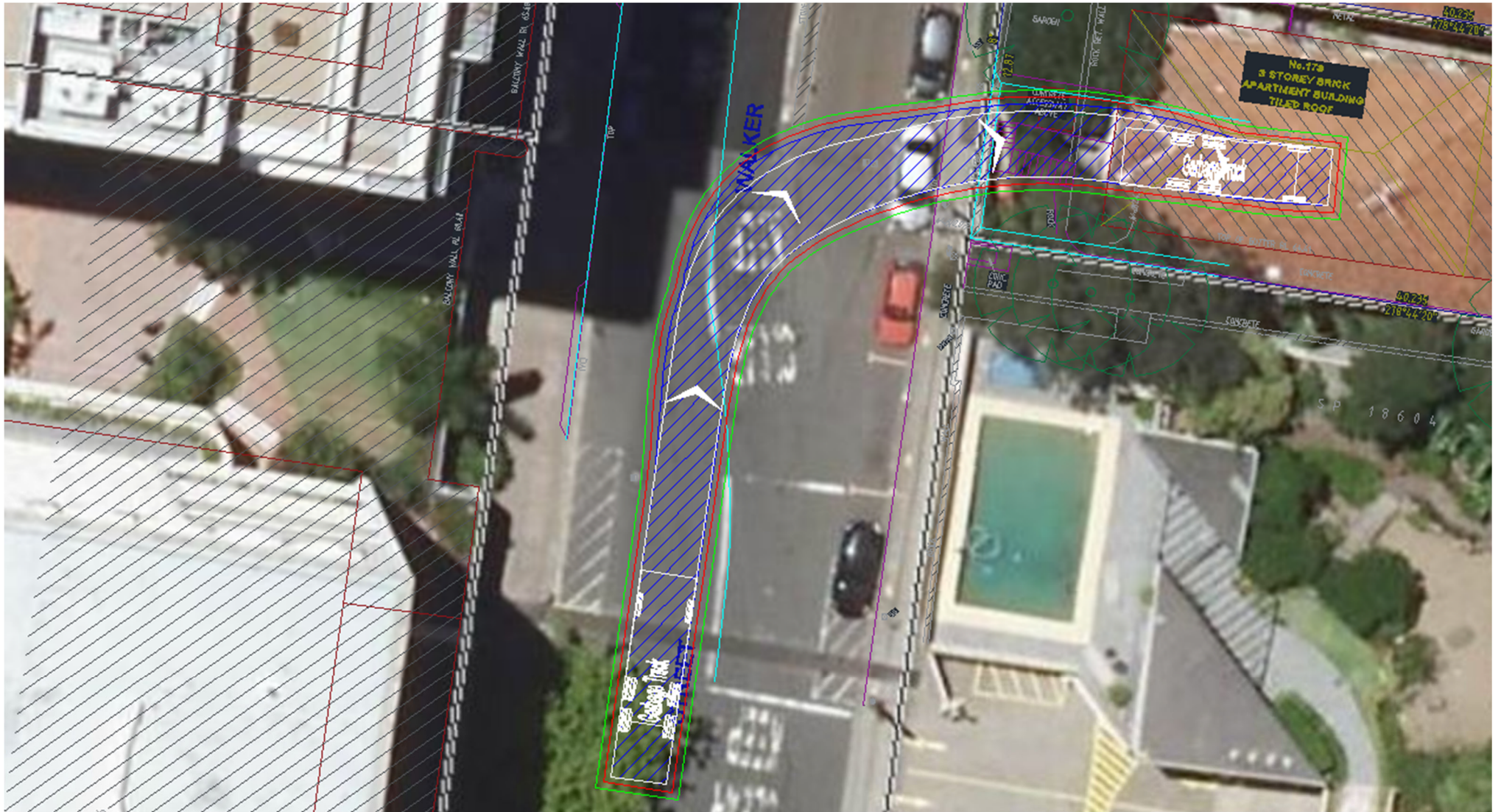


Figure 17 Swept path of 10.24m vehicle entering the precinct from Walker Street

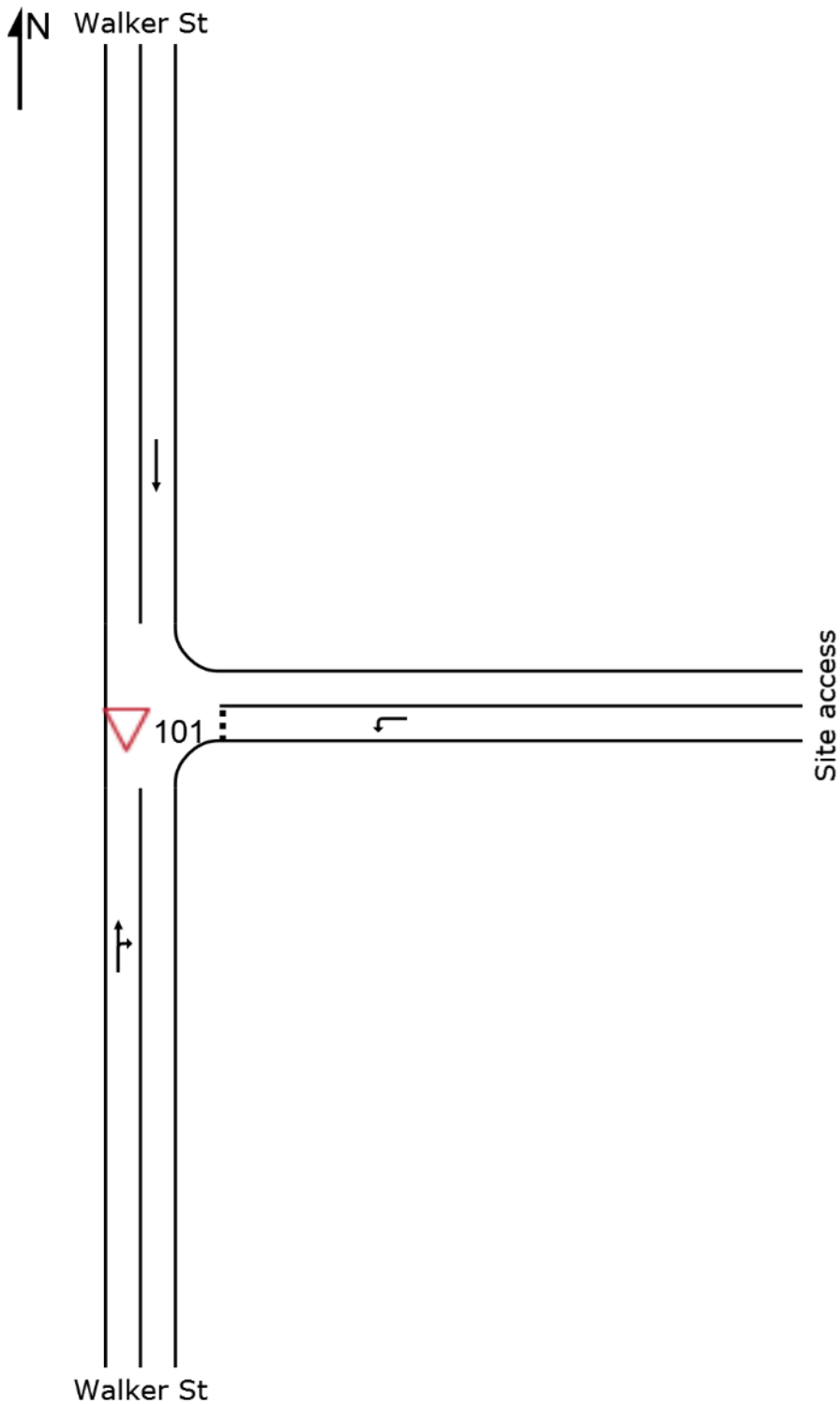
Appendix B

Traffic Modelling Outputs

SITE LAYOUT

▽ Site: 101 [Walker St North Sydney PM]

New Site
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 101 [Walker St North Sydney PM]

New Site
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Walker St											
2	T1	415	0.8	0.245	0.3	LOS A	0.4	2.8	0.11	0.05	59.1
3	R2	37	0.0	0.245	7.4	LOS A	0.4	2.8	0.11	0.05	56.9
Approach		452	0.7	0.245	0.8	NA	0.4	2.8	0.11	0.05	58.9
East: Site access											
4	L2	11	0.0	0.009	6.9	LOS A	0.0	0.2	0.42	0.59	52.3
Approach		11	0.0	0.009	6.9	LOS A	0.0	0.2	0.42	0.59	52.3
North: Walker St											
8	T1	407	0.3	0.209	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		407	0.3	0.209	0.0	NA	0.0	0.0	0.00	0.00	60.0
All Vehicles		869	0.5	0.245	0.5	NA	0.4	2.8	0.06	0.03	59.3

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

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

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

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

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

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