

# **TRANSPORT TRAFFIC AND PEDESTRIAN ASSESSMENT REPORT**

APPENDIX N



# Sydney Metro City & Southwest: Crows Nest Over Station Development (Amended)

Transport, traffic and parking assessment report

NWRLSRT-MET-SCN-TI-REP-000008

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## Table of Contents

	Executive Summary.....	5
<b>1.0</b>	<b>Introduction .....</b>	<b>7</b>
1.1	Purpose of this report.....	7
1.2	Changes between the Exhibited Scheme and Amended Scheme.....	7
1.3	Assumptions .....	11
<b>2.0</b>	<b>Existing Condition (Pre-demolition).....</b>	<b>12</b>
2.1	Land Use .....	12
2.2	Travel Pattern and Trip Generation.....	12
2.2.1	Travel Pattern and Mode Choice.....	12
2.2.2	Trip Generation.....	14
2.3	Accessibility.....	16
2.3.1	Rail Access.....	16
2.3.2	Road Access.....	17
2.3.3	Service Vehicle Access.....	18
2.3.4	Bus Access.....	20
2.3.5	Pedestrian Access .....	22
2.3.6	Taxi Service and Facilities .....	25
2.3.7	Bicycle Access.....	25
<b>3.0</b>	<b>Exhibited Over Station Development.....</b>	<b>27</b>
3.1	Land-Use.....	27
3.2	Parking Provision.....	27
3.3	Trip Generation.....	30
3.3.1	Vehicular Trips.....	30
3.3.2	Pedestrian Trips.....	31
3.4	Car Lifts Assessment.....	32
3.5	Service Vehicle Access and Loading Dock Provision.....	33
3.6	Coach and Taxi.....	33
3.7	Other Impacts .....	34
3.7.1	Public Transport.....	34
3.7.2	Emergency Vehicle Access.....	34
<b>4.0</b>	<b>Proposed Land-Use Amendments and Impact Assessment.....</b>	<b>36</b>
4.1	Amended Land-Use.....	36
4.2	Proposed Parking Provision.....	36

4.3	Trip Generation.....	38
4.3.1	Vehicular Trips.....	38
4.3.2	Pedestrian Trips.....	40
4.4	Assessment of Impacts of Amended OSD Scheme .....	41
4.4.1	Impacts on Trip Generation.....	41
4.4.2	Impact on Parking .....	45
4.4.3	Vehicle Lift Assessment.....	45
4.4.4	Impacts on Service Vehicle Traffic and Loading Dock.....	47
4.4.5	Impacts on Coach and Taxi .....	50
4.4.6	Impacts on Pedestrian, Bike and Traffic Circulation .....	50
4.4.7	Impacts on Intersections design and Level of Service.....	50
4.4.8	Other Impacts .....	54
<b>5.0</b>	<b>Recommendations and Conclusion .....</b>	<b>55</b>
5.1	Recommendations.....	55
5.1.1	Car share scheme.....	55
5.1.2	Construction traffic management .....	55
5.1.3	Travel plans .....	55
5.1.4	Loading dock management.....	56
5.2	Conclusions .....	56

## Executive Summary

This report documents the traffic and transport impact assessment for the proposed amended over station development (amended OSD) at Crows Nest Station. It discusses the proposed changes of land uses and intensities of the amended OSD developments from the exhibited OSD scheme and identifies the potential impacts on the surrounding road and pedestrian networks and highlights the change of impacts due to the change of proposed land use changes and intensities.

The identified impacts of this report are based in the following land use information of the amended OSD scheme:

Site	Land Use Type	Land Use Intensity
Site A	Commercial	40,000 sqm (GFA)
Site B	Residential	143 units
Site C	Commercial	3,100 sqm (GFA)

This report also includes the findings of the previous 'Transport, Traffic and Parking Assessment Report' (EIS 2018) for the existing condition and exhibited OSD scheme.

The identified impacts of the amended OSD scheme as presented in this report are:

### Impacts on trip generation including vehicular and pedestrian trips

It is identified that the amended OSD scheme would increase the total number of vehicular and pedestrian trips in comparison to the exhibited OSD scheme due to the change of land use type and intensities.

### Impacts on parking

A total of 46 and 49 car parking spaces are proposed for Site A and Site B respectively in the amended OSD scheme which is a reduction of total 55 car parking space from the exhibited OSD scheme.

### Impacts on vehicle lifts

The amended OSD scheme does not have any unacceptable queues or delays to cars or bikes or other road users.

### Impacts on service vehicle traffic and loading dock

The amended OSD scheme does not have any unacceptable queues or delays to service vehicle traffic, loading docks, or other road users.

### **Impacts on coach and taxi**

The amended OSD scheme does not include any 'Hotel' type land use. As such, it is anticipated that there would be reduced impact of coach and taxi trips on the road network due to the amended OSD scheme.

### **Impacts on pedestrian, bike and traffic circulation**

The amended OSD scheme would increase the total number of pedestrian trips. The pedestrian network assessment indicated that the pedestrian footpaths surrounding the amended OSD scheme would perform with acceptable Level of Service (LoS).

The number of bikes to the new OSD scheme are likely to increase overall, driven by increased commercial floorspace, but can be accommodated by the proposed bike paths and the additional OSD bike parking now proposed on a pro-rata basis.

### **Impacts on intersection performance**

The following key intersections adjacent to the Crows Nest OSD development have been assessed to understand the impacts of the increased traffic and pedestrian volume on the performance of the intersections:

- Pacific Highway/Oxley Street Intersection
- Pacific Highway/Hume Street Intersection
- Oxley Street/Clarke Street Intersection
- Hume Street/Clarke Street Intersection

The intersections are assessed for the future year 2025 and for AM and PM peak hours. The assessment results indicate that the intersections would perform with acceptable LoS. Long queues are forecast along the Pacific Highway. It should be noted that the vehicle trip generation from the Amended OSD scheme is negligible (total 23 vehicles per hour during peak hours) compared to the growth of background traffic and would have minimal impacts on the performance of the surrounding intersections.

### **Mitigation**

The following mitigation measures are proposed:

- Consideration of car sharing schemes to reduce impacts on car parking
- Preparation of construction traffic management plans
- A separate travel plan for the future employees and residents of the amended OSD scheme should be prepared to reduce the demand for car parking
- A loading dock management plan should be prepared to manage the loading dock activities efficiently.

## 1.0 Introduction

### 1.1 Purpose of this report

This report supports the Response to Submissions Report (Submissions Report) for the concept State Significant Development application (concept SSD Application) submitted to the Department of Planning, Industry and Environment (DPIE) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The concept SSD Application is made under Section 4.22 of the EP&A Act.

Sydney Metro is seeking to secure concept approval for a mixed use development comprising three buildings above the Crows Nest Station, otherwise known as the over station development (OSD). The concept SSD Application seeks consent for building envelopes and land uses, maximum building heights, maximum gross floor areas, pedestrian and vehicular access, circulation arrangements and associated car parking and the strategies and design parameters for the future detailed design of the development.

The station and public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPIE on 9 January 2017.

As the development is within a rail corridor, is associated with railway infrastructure and is for commercial premises and residential accommodation with a Capital Investment Value of more than \$30 million, the project is identified as State Significant Development (SSD) pursuant to Schedule 1, 19(2)(a) of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). The development is, therefore, State significant development for the purposes of Section 4.36 of the EP&A Act.

A Transport, Traffic and Parking Assessment Report (2018) was prepared as Appendix AA of the Environmental Impact Statement for the concept SSD Application to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued on 26 September 2018. Following Exhibition of the Environmental Impact Statement, the design of the OSD has responded to issues raised in submissions. The purpose of this report is to identify those changes in the Amended OSD Scheme and to assess the impacts of changes with regards to Transport, Traffic and Parking Assessment.

### 1.2 Changes between the Exhibited Scheme and Amended Scheme

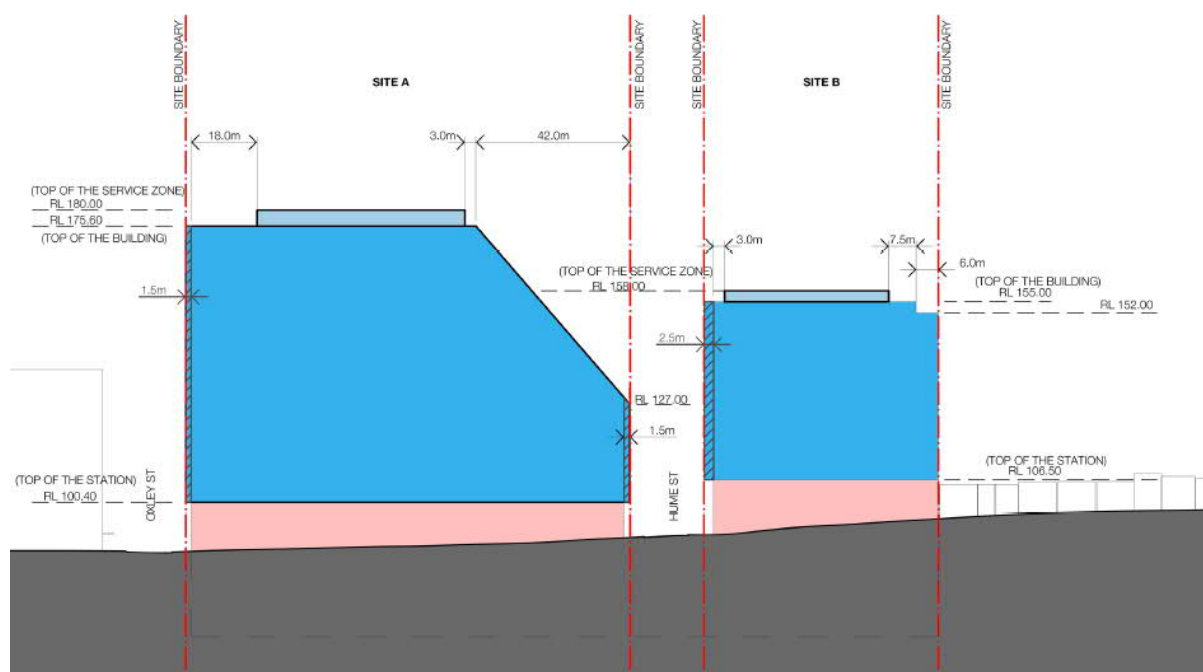
In response to the submissions made on the Exhibited Scheme, the following changes have been made to the concept SSD Application under what is termed the Amended Scheme:

- Changes to the building envelope
- Changes in proposed land use on each site
- Reduction in car parking numbers
- Inclusion of an articulation zone



- Clarification on the provision of social infrastructure
- Amendments to the Design Guidelines

These changes are described in further detail in Chapter 7 of the Submissions Report. The western elevation of the Amended Scheme is shown below, with a summary of the changes between the Exhibited Scheme and Amended Scheme provided in the table below.



**Figure 1-1 West elevation of the building envelope under the Amended Scheme, showing CSSI Approval (pink) and OSD components (blue)**

**Table 1-1 Changes to overall concept scheme per site under the Exhibited Scheme and Amended Scheme (excluding station GFA)**

	Exhibited Scheme <sup>1</sup>	Amended Scheme <sup>1</sup>
<b>Site A</b>		
Land Use	Residential <sup>2</sup>	Commercial
GFA	37,500m <sup>2</sup>	40,207m <sup>2</sup>
Max height - top of roof (RL)	183	175.6
Max height – top of services zone (RL)	188	180

	Exhibited Scheme <sup>1</sup>	Amended Scheme <sup>1</sup>
FSR - OSD	9.67:1	10.4:1
Non-residential FSR - OSD	0.7:1	10.4:1
Car parking	125	46
<b>Site B</b>		
Land Use	Tourist/visitor accommodation	Residential
GFA	155	155
Max height - top of roof (RL)	158	158
Max height – top of services zone (RL)	15,200m <sup>2</sup>	12,685m <sup>2</sup>
FSR - OSD	8.12:1	6.8:1
Non-residential FSR - OSD	8.12:1	0.1:1
Car parking	25	55
<b>Site C</b>		
Land Use	Commercial <sup>2</sup>	Commercial
GFA	127	127
Max height - top of roof (RL)	132	132
Max height - top of services zone (RL)	2,700m <sup>2</sup>	3,031m <sup>2</sup>
FSR - OSD	4.44:1	4.9:1
Non-residential FSR - OSD	4.44:1	4.9:1
Car parking	0	0

<sup>1</sup> GFA figures exclude GFA attributable to the station and station retail space approved under the CSSI approval

<sup>2</sup> The Exhibited Scheme included a provisional option for social infrastructure GFA to be located on Site A or Site C inclusive of the GFA figures nominated above.

The revised concept SSD Application (SSD-9579) under the Amended Scheme seeks approval for the following:

- Maximum building envelopes for Sites A, B and C, including street wall heights and setbacks as illustrated in the plans prepared by Crows Nest Design Consortium for Sydney Metro at Appendix A to the Submissions Report
- Maximum building heights:

- **Site A:** RL 175.60 metres or equivalent of 21 storeys (includes two station levels and conceptual OSD space in the podium approved under the CSSI Approval)
- **Site B:** RL 155 metres or equivalent of 17 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval)
- **Site C:** RL 127 metres or 9 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval).

**Note 1:** *the maximum building heights defined above are measured to the top of the roof slab and exclude building parapets which will be resolved as part of future detailed SSD Application(s)*

- Maximum height for a building services zone on top of each building to accommodate lift overruns, rooftop plant and services:
  - **Site A:** RL 180 or 4.4 metres
  - **Site B:** RL 158 or 3 metres
  - **Site C:** RL 132 or 5 metres.

**Note 1:** *the use of the space within the building services zone is restricted to non-habitable floor space.*

**Note 2:** *for the purposes of the concept SSD Application, the maximum height of the building envelope does not make provision for the following items, which will be resolved as part of the future detailed SSD Application(s):*

- *Communication devices, antennae, satellite dishes, masts, flagpoles, chimneys, flues and the like, which are excluded from the calculation of building height pursuant to the standard definition in NSLEP 2013*
- *Architectural roof features, which are subject to compliance with the provisions in Clause 5.6 of NSLEP 2013, and may exceed the maximum building height, subject to development consent.*
- Maximum gross floor area (GFA) of 56,400 square metres for the OSD comprising the following based on the proposed land uses:
  - **Site A:** Commercial office premises - maximum 40,300 square metres
  - **Site B:** Residential accommodation - maximum of 13,000 square metres
  - **Site C:** Commercial office premises - maximum of 3,100 square metres.

**Note:** *GFA figures exclude GFA attributed to the station and station retail space approved under the CSSI Approval*

- minimum non-residential floor space for the OSD across combined Sites A, B and C of 43,505 square metres
- the use of conceptual areas associated with the OSD which have been provisioned for in the Crows Nest station box (CSSI Approval) including areas above ground level (i.e. OSD lobbies and associated spaces)
- a maximum of 101 car parking spaces on Sites A and B associated with the proposed commercial and residential uses
- modulation and expression of built forms within an articulation zone extending to the property boundary
- loading, vehicular and pedestrian access arrangements
- strategies for utilities and services provision
- strategies for managing stormwater and drainage
- a strategy for the achievement of ecological sustainable development
- a public art strategy
- indicative signage zones
- a design excellence framework
- the future subdivision of parts of the OSD footprint, if required.

### 1.3 Assumptions

This update for the Amended scheme has retained the original assumptions around trip generation rates from the exhibited November 2018 report so that the changes resulting from the Amended scheme can be easily compared.

## 2.0 Existing Condition (Pre-demolition)

### 2.1 Land Use

The existing land uses for the Crows Nest OSD site prior to demolition were primarily retail or bulky goods retail stores. A summary of the pre-existing lots and their uses is presented in Table 2-1.

**Table 2-1 Existing land uses on Crows Nest OSD site.**

Property Address	Approx. GFA (sqm)	Use	Site
14-20A Clarke St, Crows Nest (Lot 1 only)	922.50	Car tyre retail outlet	C
477 Pacific Hwy Crows Nest	893.75	Furniture Store	B
479 Pacific Hwy Crows Nest	0.00	Vacant	B
491-495 Pacific Hwy Crows Nest	850.00	Post Office	B
497 Pacific Hwy Crows Nest	875.00	Furniture Store	A
501 Pacific Hwy Crows Nest	875.00	Furniture Store	A
503-505 Pacific Hwy Crows Nest	875.00	Furniture Store	A
507-509 Pacific Hwy Crows Nest	875.00	Furniture Store	A
511-519 Pacific Hwy Crows Nest	3750.00	Office	A
521-543 Pacific Hwy Crows Nest	0	Vacant	A

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

## 2.2 Travel Pattern and Trip Generation

### 2.2.1 Travel Pattern and Mode Choice

The 2016 Australian Bureau of Statistics (ABS) census data for method of travel to work place was analysed for the area around the proposed Crows Nest OSD, including areas generally to be considered part of St Leonards due to similarities in future urban form.

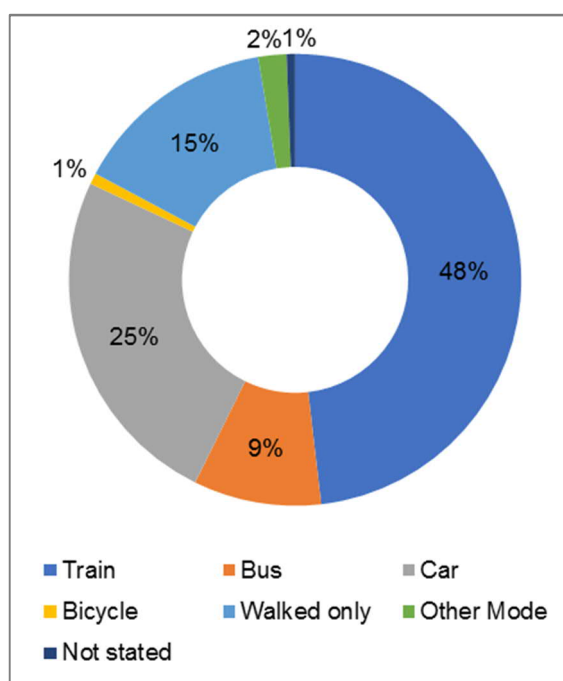
The following ABS Level 1 Statistical Areas were considered for this analysis:

- 1141407
- 1141435
- 1141444
- 1140110
- 1140117
- 1140119
- 1140120
- 1140123.

Within the Level 1 Statistical Areas analysed, there were 3,109 residents.

The main mode of travel for employees who work in the following ABS Destination Zones were also considered for this study: 114013269 and 114143316. Within the Destination Zones analysed, there were 11,571 workers.

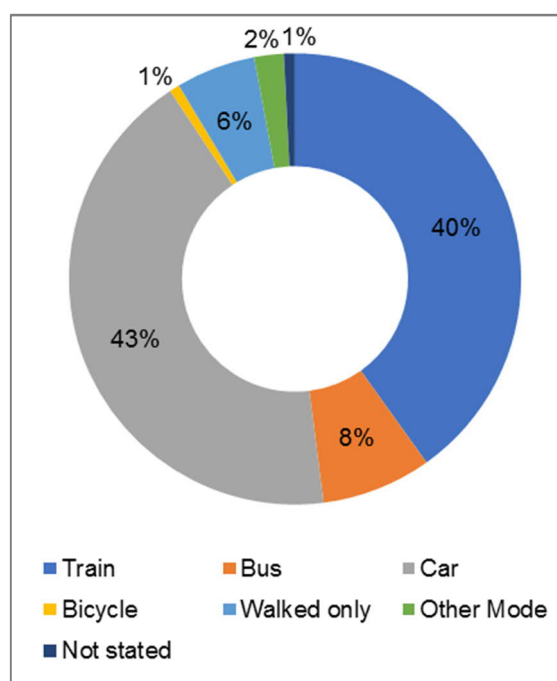
The mode split for commute to work for residents living in the vicinity of the proposed Crows Nest OSD is shown in Figure 2-1. The mode split for commute to work for employees working in the vicinity of the proposed Crows Nest OSD is shown in Figure 2-2.



**Figure 2-1: Mode split for commute to work for residents living near the proposed Crows Nest Station.**

Note: "Other" includes census responses for Ferry, Light Rail, Truck, Motorbike and Other. Data excludes "Not applicable" and "Did not go to work".

Source: Transport, Traffic and Parking Assessment Report, EIS 2018



**Figure 2-2: Mode split for commute to work for employees working near the proposed Crows Nest Station.**

Note: "Other" includes census responses for Ferry, Light Rail, Truck, Motorbike and Other. Data excludes "Not applicable" and "Did not go to work".

As can be seen from Figure 2-1, travel by train accounts for 48% of total travel, 15% of travel by pedestrians and 25% by car. As opposed to residents, employees working near the proposed Crows Nest Station reported a much higher usage of cars, 43%, while only 6% reported walking as their main mode of transport and 40% by train as shown in Figure 2-1.

It was concluded based on NSW Household Travel Survey for North Sydney that residents around the OSD site are less likely to require a car compared to areas that are less dense and have lower availability of public transport. It was also stated that public transportation growth

was outpacing that of private transport, with the private vehicle transport growth rate being significantly lower than the population growth rate.

## 2.2.2 Trip Generation

### 2.2.2.1 Trip generation - Person

The number of persons trips generated by the previously existing land-uses were estimated based on the rates provided in the RMS *Guide to Traffic Generating Development* provided in Table 2-2. Estimated person trips from the previously existing land-uses are provided in Table 2-3 below.

**Table 2-2 Person trip generation rates, per sqm of GFA, used to estimate number of trips for Exhibited OSD**

Land Use	Land-use Intensity	Unit	Trip Rate			Person Trips		
			AM Peak	PM Peak	Daily	AM Peak	PM Peak	Daily
Car tyre retail outlet	922.50	Per sqm	0.010	0.01	0.1	9	9	92
Furniture Store	893.75	Per sqm	0.043	0.0168	0.2452	38	15	219
Vacant	0.00	Per sqm	0.000	0	0	0	0	0
Post Office	850.00	Per sqm	0.031	0.0772	1.0578	26	66	899
Furniture Store	875.00	Per sqm	0.043	0.0168	0.2452	38	15	215
Furniture Store	875.00	Per sqm	0.043	0.0168	0.2452	38	15	215
Furniture Store	875.00	Per sqm	0.043	0.0168	0.2452	38	15	215
Furniture Store	875.00	Per sqm	0.043	0.0168	0.2452	38	15	215
Office	3750.00	Per sqm	0.013	0.0108	0.0947	49	41	355
<b>Total</b>						<b>273</b>	<b>189</b>	<b>2424</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

The estimated number of person trips generated across the OSD site were then proportionally split into different modes, based on the mode share for the site presented in Section 2.2.1. The resulting estimate of number of people previously travelling to the OSD site, by mode, is presented in Table 2-3.

**Table 2-3: Volumes of workers previously travelling to the Crows Nest Station site, by mode (based on ABS Method of Travel to Work statistics for Crows Nest-St Leonards).**

Mode	AM Peak	PM Peak	Daily
Train	109	76	972
Bus	21	15	191
Car	116	81	1035
Bicycle	2	1	17
Walked only	16	11	138
Other Mode	6	4	51
Not stated	2	1	19
<b>Total</b>	<b>273</b>	<b>189</b>	<b>2424</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

### 2.2.2.2 Trip Generation – Vehicle

Private vehicle trip generation rates for the pre-existing buildings on the OSD sites were not recorded prior to demolition occurring for construction of the Crows Nest Station. An estimate of trips generated has been produced based on the floor space of each of the buildings on the OSD sites and the associated use, as well as estimated trip generation rates based on the RMS *Guide to Traffic Generating Development, 2013*. The trip rates used are presented in Table 2-4 and the resulting trips are summarised in Table 2-5. Given the commercial nature of the previous uses, the peak hour distribution for all sites was assumed to be:

- AM: 90% In / 10% Out
- PM: 10% In / 90% Out



**Table 2-4 Trip rates used to estimate existing trip generation**

Use	Trip Rate (AM) per sqm	Trip Rate (PM) per sqm
Car tyre retail outlet	0.01	0.01
Furniture Store	0.024	0.01
Vacant	0.00	0.00
Post Office	0.0096	0.0257
Office	0.002	0.0014

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

**Table 2-5: Estimated vehicle trip generation for existing developments on OSD sites**

Property Address	Site	Approx. GFA (sqm)	Use	Estimated AM In	Estimated AM Out	Estimated PM In	Estimated PM Out
14-20A Clarke St, Crows Nest (Lot 1 only)	C	922.50	Car tyre retail outlet	8	1	1	8
477 Pacific Hwy Crows Nest	B	893.75	Furniture Store	20	2	1	8
479 Pacific Hwy Crows Nest	B	0.00	Vacant	0	0	0	0
491-495 Pacific Hwy Crows Nest	B	850.00	Post Office	7	1	2	20
497 Pacific Hwy Crows Nest	A	875.00	Furniture Store	19	2	1	8
501 Pacific Hwy Crows Nest	A	875.00	Furniture Store	19	2	1	8
503-505 Pacific Hwy Crows Nest	A	875.00	Furniture Store	19	2	1	8
507-509 Pacific Hwy Crows Nest	A	875.00	Furniture Store	19	2	1	8
511-519 Pacific Hwy Crows Nest	A	3750.00	Office	6	1	1	5
521-543 Pacific Hwy Crows Nest	A	0	Vacant	0	0	0	0
<b>Total</b>				<b>118</b>	<b>13</b>	<b>8</b>	<b>73</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

## 2.3 Accessibility

### 2.3.1 Rail Access

St Leonards station is located 550m from the OSD site. A summary of train service frequencies for the station are listed in Table 2-6 below.

**Table 2-6 Service destinations and frequencies for train services departing St Leonards train station**

Destination	Service Frequency (trains per hour)				
	AM Peak	PM Peak	Interpeak	Evening	Weekend
Sydney CBD	19	19	8	8	8
North Sydney CBD	19	19	8	8	8

Destination	Service Frequency (trains per hour)				
	AM Peak	PM Peak	Interpeak	Evening	Weekend
Chatswood	20	16	8	8	8
Macquarie Park & Epping	8	4	4	4	4
Parramatta	12	15	4	5	6

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

As can be seen from above Table 2-6, the station provides a high level of service to major employment centres in the AM and PM peaks, and provides a good service to major centres in the off-peak periods.

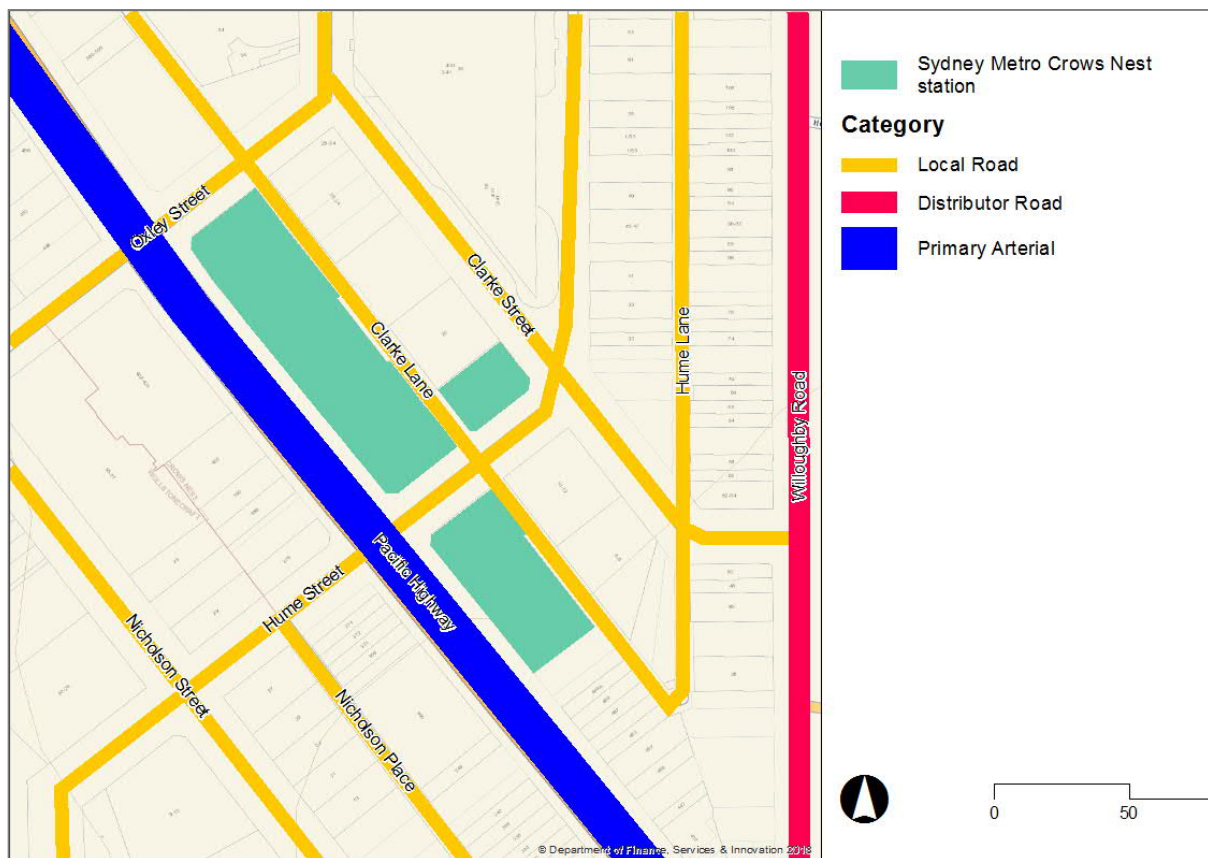
### 2.3.2 Road Access

A summary of roads around the OSD site and their classifications are listed in Table 2-7. These roads and their respective hierarchy classifications are presented in Figure 2-3.

**Table 2-7 Road hierarchy around Crows Nest Station**

Street	Hierarchy	Description
Pacific Highway	Primary Arterial	Two-way road with three lanes of traffic in each direction. Parking is generally permitted in the kerbside lane outside of peak hours.
Oxley Street	Local Road	Two-way road with one lane of traffic in each direction. Parking is generally permitted in kerbside areas.
Hume Street	Local Road	Two-way road with one lane of traffic in each direction. Parking is generally permitted in kerbside areas.
Hume Lane	Local Road	One-way laneway, with traffic permitted northbound north of Clarke Street and southbound south of Clarke Street.
Clarke Street	Local Road	Two-way road with one lane of traffic in each direction. Parking is generally permitted in kerbside areas. Classified as an on-road cycle route, with some on-road and some segregated cycle lanes installed.
Clarke Lane	Local Road	One-way laneway, with traffic permitted northbound only.
Willoughby Road	Distributor Road	Two-way road with one lane of traffic in each direction and kerbside parking. Frequent traffic calming measures have been installed. Partly classified as an on-road cycle route, with on-road pavement markers installed

Source: Transport, Traffic and Parking Assessment Report, EIS 2018



Source: Transport, Traffic and Parking Assessment Report, EIS 2018

**Figure 2-3 Road hierarchy around Crows Nest Station**

### 2.3.3 Service Vehicle Access

Pre-demolition service vehicle access routes and loading areas around the proposed Crows Nest OSD sites are shown in Figure 2-4 below.



Source: Transport, Traffic and Parking Assessment Report, EIS 2018

**Figure 2-4 Service vehicle routes and docks in the vicinity of Crows Nest OSD**

Prior to construction commencing on the Crows Nest Station site, there were approximately 32 service vehicle loading areas to properties off Clarke Lane. This comprised a variety of different loading areas including driveways with off-street spaces, dedicated loading docks and on-street spaces adjacent to rear property access points. Once the station has been built and is operational, 22 of these service vehicle access points will remain in operation, not including those proposed for the Crows Nest Station and OSD.

Clarke Lane traffic is one-way from Clarke Street, running first southbound, then makes an acute angle turn, to head approximately northbound to Oxley Street. Clarke Lane is then two-way between Oxley St and Pole Lane, then one-way northbound again from Pole Lane to Albany Street.

The access routes for service vehicles to loading areas on Clarke Lane are generally divided into the following blocks:

- **North of Oxley Street:** Vehicles access these properties by turning into Clarke Lane (northbound) from Oxley Street, or by turning left (southbound) into Clarke Lane from

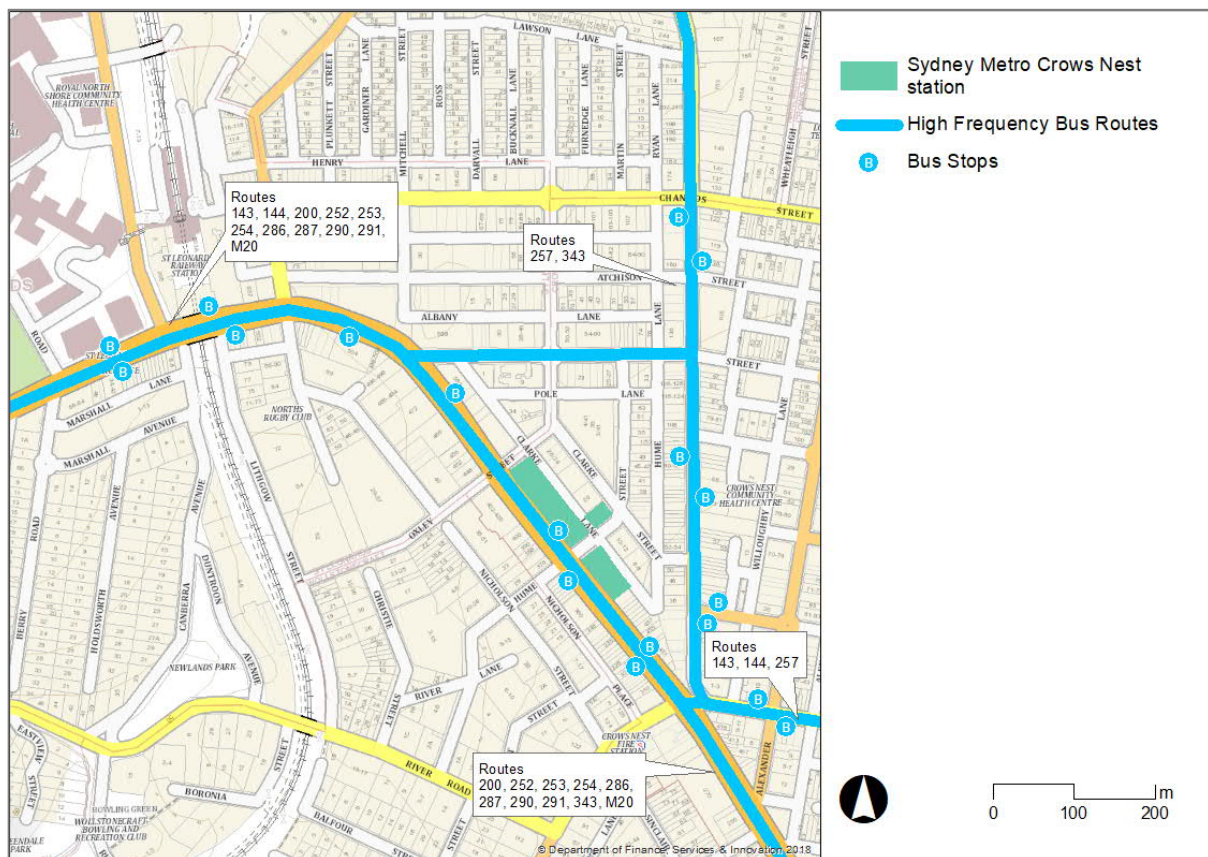


Pole Lane. Vehicles can then exit via Oxley Street for properties south of Pole Lane, or via Albany Street, for properties north of Pole Lane.

- **Between Oxley Street and Hume Street:** Vehicles access these properties by turning into Clarke Lane from Hume Street. Vehicles can exit via Oxley Street.
- **Between Hume Street and Clarke Street:** vehicles access these properties by turning into Hume Lane from Clarke Street and following the laneway around to Clarke Lane.

### 2.3.4 Bus Access

Numerous bus stops are located close to the Crows Nest OSD site, with buses serving a variety of destinations across the North Shore, Northern Beaches, Northern Suburbs and Inner City. A summary of where bus routes operate and locations of bus stops in the vicinity of the site are shown in Figure 2-5.



Source: Transport, Traffic and Parking Assessment Report, EIS 2018

**Figure 2-5: Existing bus conditions in the vicinity of Crows Nest Station.**

A summary of the destinations serviced by bus routes which operate in the vicinity of the site is included in Table 2-8.

**Table 2-8: Bus routes through Crows Nest**

Destination	Serviced By	AM Peak Frequency (mins, average)	PM Peak Frequency (mins, average)	Weekend Frequency (mins, average)	Time to destination (mins, approximate)
Sydney CBD	252, 343, M20	2	4	6	20-30
North Sydney CBD	252, 254, 291, M20, 343	<1	3	6	5-10
Chatswood	143, 144, 200, 257, 343	3	4	6	20-30
Manly	143, 144	15	6	15	45
Green Square	343, M20	4	5	8	50-60
Castle Hill	612X	-	6	-	60
Bella Vista, Rouse Hill	602X	-	10	-	45-60
Balmoral	257	30	15	30	25
Neutral Bay	143, 144, 257, 263	10	5	10	10-15
Willoughby Shops	257, 267, 343	7	6	10	15-20
Lane Cove	252, 253, 254, 286, 287, 290, 291	10	5	12	15
Ryde	286, 287	-	12	-	40-45
Macquarie Park	291	30	30	60	30-35

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

Table 2-8 shows that bus services to most destinations are focused heavily on providing weekday peak direction services, with some bus services to destinations not provided in the non-peak direction on weekdays (for example outbound in AM peak) or at weekends. Service frequencies at weekends are also generally lower than during weekdays, however trunk routes to major destinations such as the Sydney CBD, North Sydney, Chatswood, Lane Cove, Neutral Bay and Green Square maintain a reasonably high frequency through the weekend, across various services.

A summary of the bus stops near the proposed Crows Nest OSD are listed in Table 2-9.

**Table 2-9: Bus stops and amenities in Crows Nest.**

Bus Stop Location	Bus Stop Number	Routes	Stop Amenity
Pacific Highway at Hume Street	206515	143, 144, 252, 254, 257, 265, 286, 287, 290, 291, M20	Covered, partially covered seating provided, timetable provided.

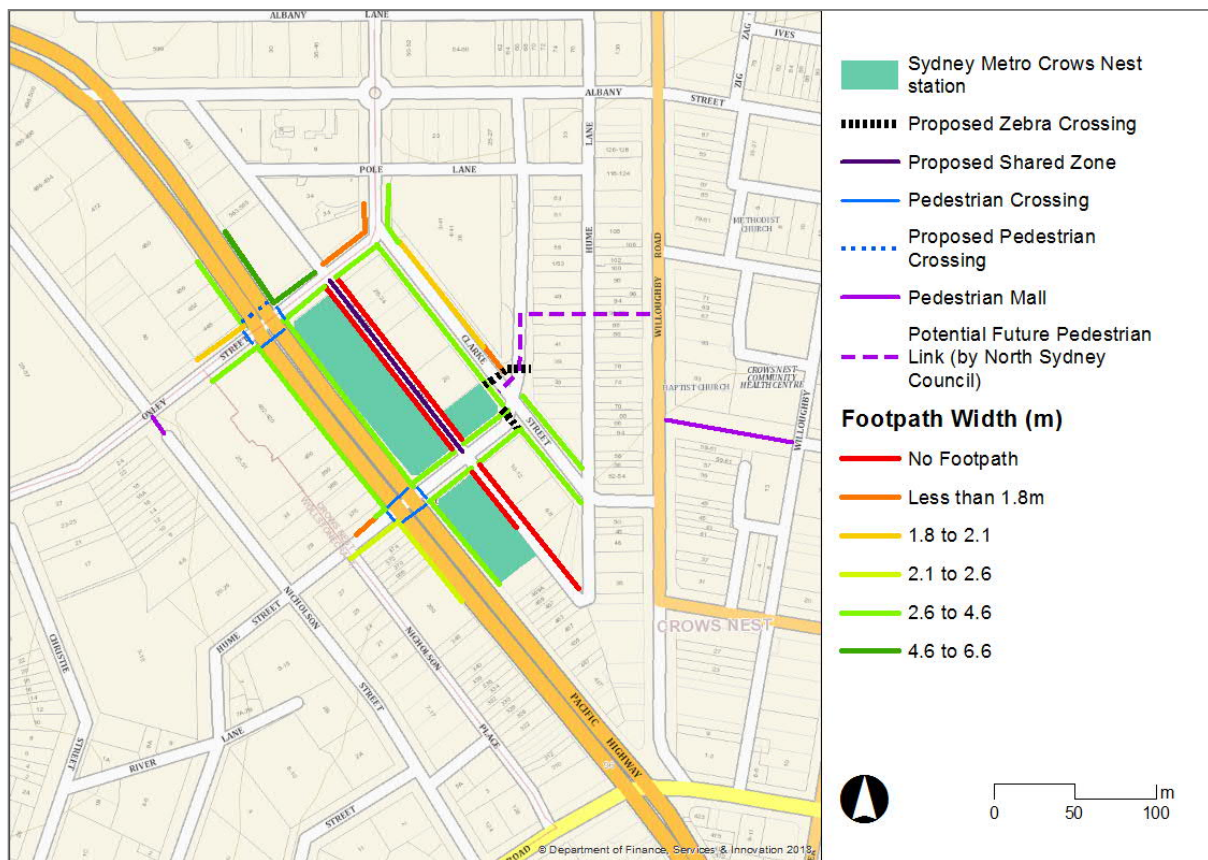
Bus Stop Location	Bus Stop Number	Routes	Stop Amenity
Pacific Highway at Hume Street	206512	143, 144, 252, 254, 286, 287, 290, 291, M20	Covered, covered seating provided, timetable provided (pre-Metro construction)
Pacific Hwy after Shirley Rd	206524	143, 144, 200, 252, 254, 286, 287, 290, 291, 602X, 612X, 622, 653, M20	Covered, partially covered seating provided, timetable provided.
Pacific Hwy after Albany St	206514	143, 144, 252, 254, 257, 265, 286, 287, 290, 291, M20	Covered seating, timetable provided
Crows Nest, Burlington St, Stand 1	206546	257, 343	Covered seating, timetable provided
Crows Nest, Burlington St, Stand 3	206544	265	Weather protection available, uncovered seating, timetable provided
Crows Nest, Burlington St, Stand 4	206540	263, 267	Covered seating, timetable provided
Crows Nest, Burlington St, Stand 5	206541	343	Covered seating, timetable provided
Willoughby Rd opposite Holtermann St	206547	257, 343	Weather protection available, uncovered seating, timetable provided
Willoughby Rd after Holtermann St	206538	263, 267, 343	Weather protection available, uncovered seating, timetable provided

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

Existing bus stops throughout Crows Nest are generally of good quality and provide a combination of shelter, covered seating and service information at all stops, with most containing all four.

### 2.3.5 Pedestrian Access

The pedestrian network around the OSD site is shown in Figure 2-6, below.



Source: Transport, Traffic and Parking Assessment Report, EIS 2018

**Figure 2-6 Proposed Pedestrian network around Crows Nest**

Pedestrian volumes around the OSD site are shown in Figure 2-7.



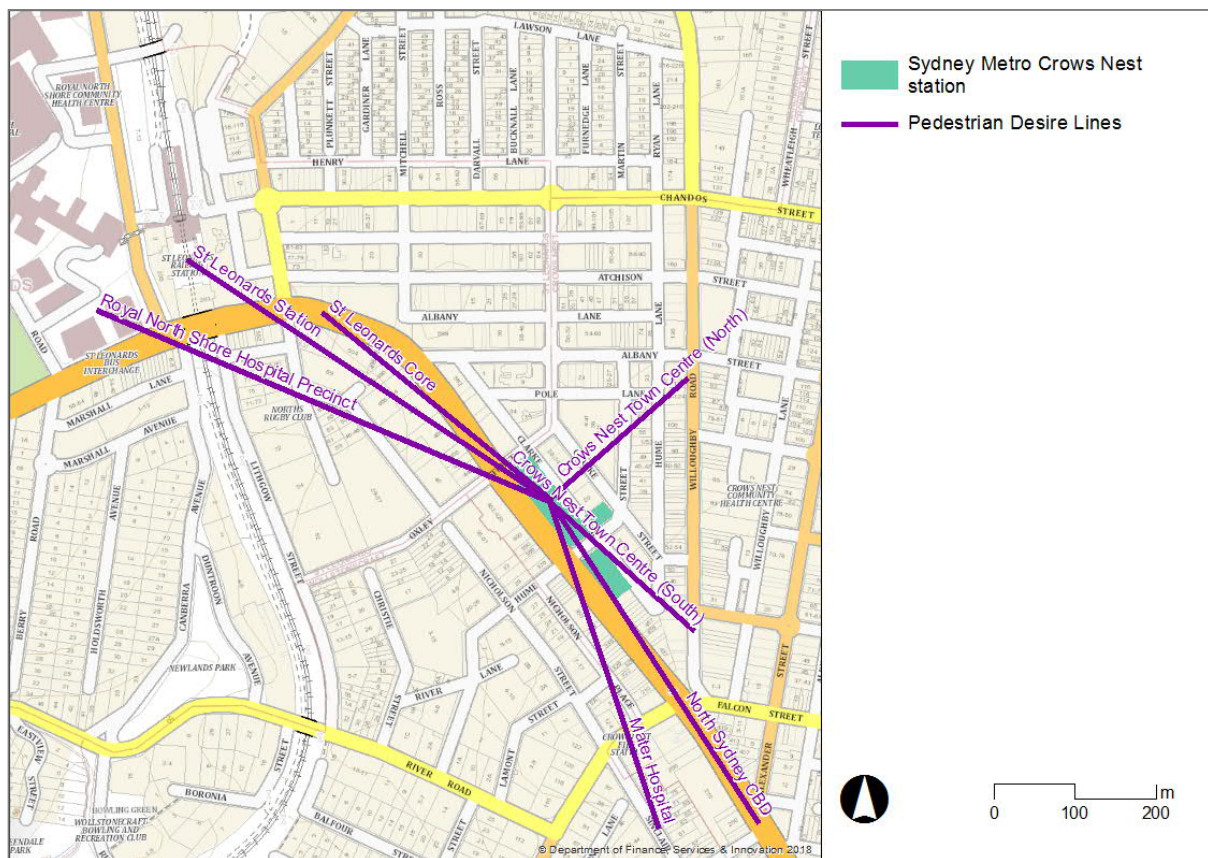


**Figure 2-7: Existing pedestrian volumes at crossings between 7am and 10am**

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

As can be seen in Figure 2-7, the pedestrian volumes around the proposed OSD site are generally low in the existing environment.

Pedestrian desire lines from the proposed Crows Nest OSD site are shown in Figure 2-8. It is expected that there will be a change to existing pedestrian trip patterns to the OSD and Metro, once construction of both is complete. Additionally, there are proposed upgrades to Hume Street Park as well as upgrades to footpaths and crossings around the OSD site, resulting in further changes to existing trip patterns.



**Figure 2-8: Pedestrian desire lines from the Crows Nest Station OSD**

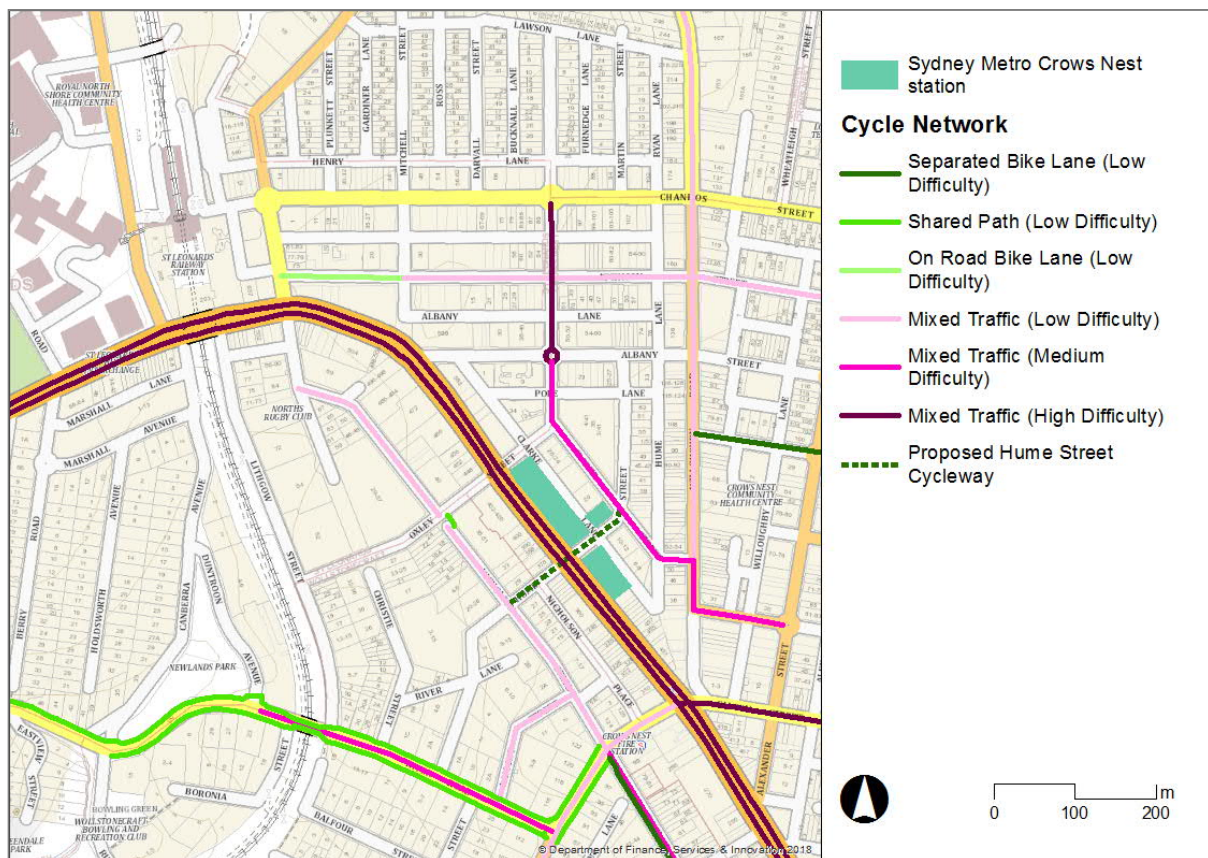
Source: Transport, Traffic and Parking Assessment Report, EIS 2018

### 2.3.6 Taxi Service and Facilities

No secure taxi ranks are currently located in the immediate vicinity of the proposed site.

### 2.3.7 Bicycle Access

Figure 2-9 below shows the existing bicycle network, infrastructure, associated cycle route hierarchy, and level of difficulty.



**Figure 2-9 Crows Nest cycling network and infrastructure**

Source: Transport, Traffic and Parking Assessment Report, EIS 2018



## 3.0 Exhibited Over Station Development

This section summarises the findings of the assessment of the Exhibited OSD for Crows Nest Metro Station as per the “Transport, Traffic and Parking Assessment Report” prepared for Sydney Metro ( EIS Appendix AA version P08 Dated November 2018).

### 3.1 Land-Use

Table 3-1 summarises the previously approved land-uses for the Exhibited OSD development.

**Table 3-1 Proposed internal land use and quantities (in the concept proposal) of Exhibited OSD scheme**

Building	Land Use	Scale (total units, sqm NLA)	Studio	1 bedroom	2 bedroom	3 bedroom
A North	Residential	175 units	35	38	63	38
A South	Residential	175 units	35	38	63	38
B	Hotel	250 rooms	-	-	-	-
C	Commercial	2700m <sup>2</sup>	-	-	-	-

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

### 3.2 Parking Provision

Table 3-2 shows the car ownership rates for households which are apartments in multi-dwelling buildings of four storey or more for selected suburbs that present living characteristics of similar density, inner city suburbs with good access to public transport and/or that are highly walkable.

**Table 3-2 Average car ownership rates per unit in multi-dwelling buildings in high density, well-connected inner-city Sydney suburbs**

Suburb	Studio	One bedroom	Two bedrooms	Three bedrooms
Bondi Junction	0.3	0.65	0.8	1
Darlinghurst	0.25	0.45	0.85	1.4
Elizabeth Bay	0.2	0.5	0.8	1.25
Haymarket	0	0.25	0.45	0.6
Milsons Point	0	0.5	0.9	1.4
Potts Point	0.15	0.35	0.7	1.2
St Leonards	0.15	0.5	0.95	1.3
Sydney	0.15	0.3	0.55	0.85

Suburb	Studio	One bedroom	Two bedrooms	Three bedrooms
Proposed Crows Nest OSD parking space rate	0	0.25	0.5	0.5

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

The lowest parking space rates for various type of apartment unit for different suburbs were adopted to estimate the car parking space required for the proposed OSD scheme. This was done based on the fact that by providing a minimal number of parking spaces per apartment, residents would be discouraged from owning and using private vehicles, reducing the impact of the development on the local and broader road network. This was also in line with the recommendation in the Department of Planning and Environment's Strategic Transport Study: St Leonards and Crows Nest Station Precinct, where car parking spaces surrounding the rail and metro stations would be minimised or not provided to catalyse a shift to sustainable transport modes.

The Crows Nest OSD would have good public transport links to major employment hubs throughout the North Shore, Macquarie Park, North West, Sydney CBD and Inner City. As such it was expected that most residents of the proposed Crows Nest OSD site would elect to travel to work by public transport due to both the convenience of the metro and the faster journey times expected on the metro network.

Similarly, due to the high provision of public transport and restricted parking space provision, it was expected that workers travelling to the proposed commercial building and hotel building would use public transport to access the site. The hotel was likely to be a business hotel, which would attract guests without access to private vehicles who would likely rely on the public transport network or point to point transport, such as taxis or ride sharing services.

As such, it was expected that most peak hour trips being generated from the OSD site would be by public transport, with a minimal number of trips being taken by car.

However, a significant number of trips each week taken within North Sydney LGA were not commute to work trips. For residents living in the OSD buildings, these would be shopping or social and recreational trips that might reasonably require the use of a private vehicle, either due to the nature of the trip (e.g. shopping for bulky goods) or due to lack of public transport options to these areas.

Table 3-3 summarises the proposed parking provision for modes for the previously approved OSD land-uses.

**Table 3-3 Proposed parking provision for Exhibited OSD Land-uses**

Building	Proposed Parking Spaces	Proposed Accessible Car Spaces	Motorcycle Spaces	Bicycle Spaces	Service Vehicles	Car Lift	Car Share
A South	56	6	6	176	1 MRV 3 SRV	1 in, 1 out	0
A North	57	6	18	176		1 in, 1 out	0
B	25	0	2	73	1 SRV	1 in, 1 out	0
C	0	0	0	0	-	-	0
<b>Total</b>	<b>150</b>		<b>26</b>	<b>198</b>	<b>-</b>	<b>-</b>	<b>0</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

Overall, there was a reduction in the number of parking spaces provided on the Exhibited OSD sites, when compared to the number of parking spaces provided across all lots prior to station construction commencing. There was also a change in the nature of the use of the parking spaces, with the previously existing spaces likely to be used primarily for car trips to work at Crows Nest, while the Exhibited OSD car spaces would be used for residents travelling from home at Crows Nest. It was also expected that due to the high level of public transport connectivity from the site, week day peak period car trips would be minimised, with residents expected to take advantage of the public transport options available near the site.

For both Site A and Site B, vehicle access to loading docks and to OSD parking areas would be via Clarke Lane, as shown in Figure 3-1. There were no off-street vehicle access or parking arrangements proposed for Site C due to space constraints



**Figure 3-1 Overview of access arrangements to Exhibited OSD at Crows Nest**

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

## 3.3 Trip Generation

### 3.3.1 Vehicular Trips

Following Table 3-4 shows the vehicular trips generated from the Exhibited OSD scheme (EIS 2018) land-uses based on the land-use intensity. The trip rates for various land use type were derived from the previous 'Transport, Traffic and Parking Assessment Report (EIS 2018)'.

**Table 3-4 Estimated traffic generated from the Exhibited OSD Scheme (EIS 2018) in the AM and PM peak hours based on land-use intensity**

Building	Land Use	Scale (unit, sqm GFA)	AM				PM				Daily			
			Rate	Total	In	Out	Rate	Total	In	Out	Rate	Total	In	Out
A North	Resi.	174	0.14	24	5	19	0.07	12	10	2	0.77	134	67	67
A South	Resi.	174	0.14	24	22	2	0.07	12	1	11	0.77	134	67	67
B	Hotel	250	0.05	13	6	6	0.05	13	6	6	0.05	13	6	6
C	Com.	2160	0.0017	5	4	0	0.0014	4	0	3	0.0123	33	17	17
			Total	61	33	28	Total	37	17	20	Total	280	140	140

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

Given the highly accessible location of the OSD, directly above Crows Nest Station, it was anticipated that the majority of the AM and PM peak hours trips would not be undertaken by car.

As stated in the EIS (2018), RMS *Guide to Traffic Generating Development* (GTGD) is used to estimate the trips generated from the proposed OSD land-uses. A car space trip generation rate of 0.1 for high density residential buildings was used for AM peak trip generation. A trip rate of 0.38 was used to estimate trips from the commercial office type development.

**Table 3-5 Estimated traffic generated from the Exhibited OSD Scheme (EIS 2018) in the AM and PM peak hours based on parking space**

Building	Spaces	Peak 1 Hr Generation	AM			PM			Daily		
			Total	In	Out	Total	In	Out	Total	In	Out
A North	62	6.2	6	1	5	6	5	1	35	17	17
A South	63	6.3	6	1	5	6	5	1	35	18	18
B	25	10	10	9	1	9	1	8	71	36	36
		<b>Total</b>	<b>22</b>	<b>11</b>	<b>11</b>	<b>20</b>	<b>10</b>	<b>10</b>	<b>141</b>	<b>71</b>	<b>71</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

It was proposed to consider the vehicular trips estimated based on the number of parking spaces for traffic assessment, given that that the OSD developments would be above the proposed Crows Nest Metro station which would encourage more residents and workers to use the public transport for their daily commute.

### 3.3.2 Pedestrian Trips

Table 3-6 shows the estimated number of pedestrians to be generated by the Exhibited OSD scheme (EIS 2018).

**Table 3-6 Estimated number of trips generated by Exhibited OSD scheme in 1 hour peak**

Building	Land Use	Scale (unit,sqm GFA)	Estimated Population	Populati on Generati on Rate	Pop. Moving in 3.5hr Peak	3.5hr Conversi on Rate	1 Hr Peak	
							AM	PM
A North	Res.	174	344	1.98	206	0.60	116	105
A South	Res.	174	344	1.98	206	0.60	116	105
B	Hotel	250	370	1.48	370	1	207	189
C	Comm.	2700	135	0.05	135	1	76	69
Crows Nest		<b>Total</b>	<b>1193</b>		<b>918</b>		<b>514</b>	<b>468</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

The pedestrian trips were estimated based on the worst-case scenario where all potential trips by residents and workers were taken using pedestrian access to the building and with no access to the building via private vehicle and the proposed parking garages.



### 3.4 Car Lifts Assessment

Two car lifts have been proposed to access the car parking area of Site A and Site B as part of the proposed exhibited OSD scheme. Expected round-trip times considered to assess the car lifts for Site A and Site B for the exhibited OSD scheme are provided in Table 3-7 below.

**Table 3-7 Summary of round-trip for car lift in Site A and Site B**

Component	Site A Lift (sec)	Site B Lift (sec)
Doors opening	4	4
Vehicle manoeuvring	15	15
Movement of vehicle lift car to required floor	128	80
Door opening	4	4
Manoeuvring vehicle out of lift	15	15
Doors closing	4	4
Movement of lift car back to ground floor.	128	80
<b>Total</b>	<b>299</b>	<b>203</b>
Cycles per hour	12	18

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

The PM peak was assessed for potential vehicle queuing on Clarke Lane to enter the OSD parking garages.

Under the Exhibited concept design, it was estimated that 12 vehicles would arrive to enter Site A (either Building A South or Building A North) during the PM peak hour, and 9 vehicles would arrive to enter Building B. Queue length probabilities were calculated using Steady State Queuing analysis, and are presented in Table 3-8 below. The queuing analysis for Site A was treated as one queue due to the nature of the concept proposal for the site.

**Table 3-8 Queue length probabilities for Site A and Site B**

Queue Length (vehicles)	0	1	2	3	4	5	6	7
Site A north	50%	25%	13%	6%	3%	2%	1%	0%
Site B	51%	25%	12%	6%	3%	1%	1%	0%

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

As shown, it is more likely than not that there would be no vehicles queuing for any of the car lifts during the PM Peak hour for Site B, and equally likely that there would be vehicles queuing or not queuing for Site A. There was a 75 per cent or more probability that only one or no cars would be queuing at both sites during the PM peak hour. There was a negligible chance that the queue would be 7 vehicles or longer in length for either Site A or Site B.

The car lift speed was specified by the EIS Architect as operating at 0.15 m/s, which was noted as being at the low end of operating speeds for vehicle lifts.

### 3.5 Service Vehicle Access and Loading Dock Provision

Table 3-9 shows the proposed service vehicle provisions to access the various buildings of the Exhibited OSD at Crows Nest for service vehicles.

**Table 3-9 Proposed Service vehicle provisions**

Site	Land uses to be served	Location	Loading dock access & management
Site A (Building A-North and Building A-South)	Shared Residential and Metro	<ul style="list-style-type: none"> <li>Loading Dock: <ul style="list-style-type: none"> <li>1 medium rigid vehicle</li> <li>3 small rigid vehicles</li> <li>vehicle turntable for access to spaces</li> </ul> </li> <li>1 medium rigid vehicle on rolled kerb in Clarke Lane</li> </ul>	<ul style="list-style-type: none"> <li>Shared loading dock for residential (Building A-North and A-South) and metro use.</li> <li>Access loading dock and loading zone off Clarke Lane (one way northbound)</li> <li>Private refuse collection via rolled kerb space in Clarke Lane</li> </ul>
Site B/ Building B	Hotel/ Conference facilities or Commercial	<ul style="list-style-type: none"> <li>Loading Dock: <ul style="list-style-type: none"> <li>2 Small rigid vehicles</li> </ul> </li> <li>1 medium rigid vehicle on rolled kerb in Clarke Lane</li> </ul>	<ul style="list-style-type: none"> <li>Access loading dock via Clarke Lane (one way northbound)</li> <li>Private refuse collection via driveway space in Clarke Lane</li> </ul>
Site C/ Building C	Commercial	<ul style="list-style-type: none"> <li>Lay-by in Clarke Lane for waste collection</li> </ul>	<ul style="list-style-type: none"> <li>Deliveries and loading and refuse collection will be undertaken from Clarke Lane</li> </ul>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

As stated in the EIS report (EIS 2018), it was expected that the peak number of vehicles using the docks for Site A/Site C would be four vehicles per hour.

Long stay trade services vehicles would utilise up to 2 spaces in the garages of each of the buildings across the Exhibited OSD site. In the case of the indicative design developed, these would be accommodated within the number of parking spaces indicatively proposed.

### 3.6 Coach and Taxi

Due to the constrained street environment and the anticipated limited demand for a dedicated coach parking area for the Site B hotel, coach parking was intended to be accommodated in the existing bus zone on Clarke Street, north of Hume Street, adjacent to Hume Street Park, based on the following assumptions:

- Coach standing was not expected to be needed very often due to largely business clientele (rather than tourist groups);
- Coach standing not to be used in peak hours (that is, not during weekdays 6-10am and 4-7pm);
- Coach standing use and demand to be managed by hotel.

A Taxi zone accommodating three spaces was proposed as part of the Metro Integrated Access Plan on Hume Street between Clarke Street and Clarke Lane. This was located within a 50-200m walk for all three Crows Nest OSD sites.

While residents and workers of Site A and B would generate taxi trips from the OSD site, it was expected that these trips would be irregular and low in numbers. As such it was expected that the proposed hotel use on Site B would be the main driver for taxi trip generation. Given the nature of guest arrival and departures, it was also anticipated that hotel taxi trip generation in the peak periods would be low.

## 3.7 Other Impacts

### 3.7.1 Public Transport

The bus network through Crows Nest provides good access to locations throughout the Lower North Shore and further afield, particularly during peak periods.

The bus stops situated on Pacific Highway outside the metro station site were proposed to be retained once Metro operations commence, with the northbound bus stop currently located south of Hume Street proposed to be relocated to the south of Oxley Street to improve access and interchange for Crows Nest Station. It was assumed that the current high frequency of bus services through Crows Nest would continue in future and the number of bus trips generated by the OSD would have minimal demand impact on the bus network during the morning peak hour.

It was assumed that most train journeys taken from and to the OSD would be via Sydney Metro and that there would be ample capacity for the foreseeable future on this service through Crows Nest once operations commence.

### 3.7.2 Emergency Vehicle Access

Emergency vehicle access would continue to be possible via Pacific Highway, Clarke Lane, Hume Street and Clarke Street. It was not anticipated that there would be any impacts to emergency vehicle access as a result of the Exhibited OSD proposal. An emergency response plan would be prepared for the OSD development which would take into account the metro station specific emergency response plan.

Vehicles queuing in Clarke Lane would need to circulate on the wider road network if emergency vehicles need to access or pass by on Clarke Lane.

## 4.0 Proposed Land-Use Amendments and Impact Assessment

### 4.1 Amended Land-Use

Following Table 4-1 shows the proposed land-uses as per the Amended OSD Scheme.

**Table 4-1 Proposed Land-uses as per the Latest Amended OSD Scheme (2019)**

Site	Land-Use	Unit	Intensity
Site A	Commercial	Sqm GFA	40,000
Site B	Residential	Unit	143
Site C	Commercial	Sqm GFA	3,100

Note that the nature of the potential mix of uses in Site C was assumed to equate to an effective commercial Gross Floor Area (GFA) of 2,700 sqm for the purposes of calculating trip generation in the Amended OSD Scheme.

### 4.2 Proposed Parking Provision

Following Table 4-2 summarises proposed number of car parking spaces provided in the Amended OSD Scheme.

**Table 4-2 Proposed Parking Provisions for the Latest OSD Schemes (2019)**

Site	Land-Use	Proposed Parking Spaces in Amended OSD Scheme	Maximum Number of Parking Spaces per DCP
A	Commercial	46	100
B	Residential	49	50*
C	Commercial	0	7
<b>Total</b>		<b>95</b>	<b>157</b>

The Proposed Parking Spaces in the Amended OSD Scheme are based on the assumptions of the resultant traffic generation and car lift capacity constraints and road network capacity constraints outlined in the following sections of this report. The actual number of car spaces shown on the architectural drawings may exceed that number to allow for additional areas that will not generate additional traffic. This may include the shared spaces next to the accessible/disabled spaces required by Australian Standards, spaces for electric vehicle charging, spaces for car washing, spaces to be left vacant for vehicle manoeuvring and queuing to and from the car lifts, motorcycle parking, cars stored on the basis that they cannot

enter or leave via the lift booking system during the peak periods, and maintenance vehicle storage.

The parking rates for a residential apartment building are partly based on different apartment sizes (e.g. studio, one-bedroom, two-bedrooms etc.). Studio apartments will not usually be allocated a parking space, while one-bedroom apartments will be allocated around 0.25 parking spaces per apartment, two- and three-bedroom apartments will be allocated around 0.5 parking spaces per apartment. These parking rates have been determined based on a reduced need for car ownership for residents living in the Crows Nest OSD due to its location above a metro station. As such, an average parking rate of 0.38 for the different apartment sizes have been adopted to estimate the maximum number of parking spaces required by the DCP. 1 parking space per 400 sqm GFA has been used to estimate the maximum parking spaces required for commercial land-uses.

By providing a lower number of parking spaces per apartment, residents will be discouraged from owning and using private vehicles, reducing the impact of the development on the local and broader road network. This is in line with the recommendation in the Department of Planning and Environment's Strategic Transport Study: St Leonards and Crows Nest Station Precinct, where car parking spaces surrounding the rail and metro stations will be minimised or not provided to catalyse a shift to sustainable transport modes<sup>1</sup>.

The Crows Nest OSD will have good public transport links to major employment hubs throughout the North Shore, Macquarie Park, North West, Sydney CBD and Inner City. As such it is expected that most residents of the proposed Crows Nest OSD site will elect to travel to work by public transport due to both the convenience of the metro and the faster journey times expected on the metro network.

Similarly, due to the high provision of public transport and restricted parking space provision, it is expected that workers travelling to the proposed commercial building will use public transport to access the site.

As such, it is expected that most peak hour trips being generated from the OSD site will be by public transport, with a minimal number of trips being taken by car.

However, as noted in 3.2, a significant number of trips each week are taken within North Sydney LGA that are not commute-to-work trips. For residents living in the OSD buildings, these will be shopping or social and recreational trips that may reasonably require the use of a private vehicle, either due to the nature of the trip (e.g. shopping for bulky goods) or due to lack of public transport options to these areas.

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<sup>1</sup> Cardno, for Department of Planning and Environment, *Strategic Transport Study: St Leonards and Crows Nest Station Precinct*, 2018, pg. 96

## 4.3 Trip Generation

### 4.3.1 Vehicular Trips

Vehicular trip generation is measured in terms of generation based on land use floor space allocation and then generation based on the car parking spaces proposed in the Amended OSD scheme.

The following Table 4-3 shows the estimated traffic generated from the Exhibited land-uses of Crows Nest OSD as per the “Transport, traffic and parking assessment report” (EIS 2018).

**Table 4-3 Estimated traffic generated in the AM and PM peak hours for the Exhibited OSD scheme based on land-use and scale**

Site	Land Use	Scale (unit, sqm GFA)	AM				PM				Daily			
			Rate	Total	In	Out	Rate	Total	In	Out	Rate	Total	In	Out
A North	Residential	174	0.14	24	5	19	0.07	12	10	2	0.77	134	67	67
A South	Residential	174	0.14	24	22	2	0.07	12	1	11	0.77	134	67	67
B	Hotel	250	0.05	13	6	6	0.05	13	6	6	0.05	13	6	6
C	Commercial	2700	0.0017	5	4	0	0.0014	4	0	3	0.0123	33	17	17
			<b>Total</b>	<b>61</b>	<b>33</b>	<b>28</b>	<b>Total</b>	<b>37</b>	<b>17</b>	<b>20</b>	<b>Total</b>	<b>280</b>	<b>140</b>	<b>140</b>

Source: Transport, Traffic and Parking Assessment Report, EIS 2018

Note that the Exhibited scheme included two building components on Site A (North and South). The directional distribution of traffic (IN/OUT) are also calculated based on the information provided in Table 4-3 and presented in Table 4-4 below.

**Table 4-4 Directional distribution of traffic derived from Table 4-3**

Site	Land Use	Scale (unit, sqm GFA)	AM			PM			Daily		
			Rate	In	Out	Rate	In	Out	Rate	In	Out
A (North)	Residential	174	0.14	21%	79%	0.07	83%	17%	0.77	50%	50%
B	Hotel	250	0.05	50%	50%	0.05	50%	50%	0.05	50%	50%
C	Commercial	2700	0.0017	80%	20%	0.0014	25%	75%	0.0123	50%	50%

The Exhibited 2018 scheme included two residential building components on Site A (North and South). It should be noted that different directional distribution ratio was used for North and South buildings to estimate the ‘In’ and ‘Out’ trips from the residential land-use as shown in Table 4-4. It is understood that a residential building typically produces more outbound trips than inbound trips during the morning peak hour. SMEC has previously assumed 20% and 80% split ratio to estimate the inbound

and outbound trips from residential developments for other traffic impact studies which was accepted by RMS. Therefore, the directional split used for north building of Site A is used to estimate the inbound and outbound trips generated from the apartment units of Amended scheme in Site B.

The assumptions regarding trip rate and directional distribution as shown in Table 4-3 and Table 4-4 above are also applied to the Amended OSD scheme presented in Table 4-5 below. Table 4-5 also shows a comparative analysis of traffic generation estimation from the previously exhibited land-uses and the amended land-uses of Crows Nest OSD.

**Table 4-5 Estimated vehicle trip generation from the Amended OSD scheme land-uses, based on land use scale**

Site	Land Use	Scale (unit, sqm GFA)	AM				PM				Daily			
			Rate	Total	In	Out	Rate	Total	In	Out	Rate	Total	In	Out
A	Commercial	40000 sqm	0.0017	68	54	14	0.0014	56	14	42	0.0123	492	246	246
B	Residential	143 unit	0.14	20	4	16	0.07	10	8	2	0.77	110	55	55
C	Commercial	2700 sqm	0.0017	5	4	1	0.0014	4	1	3	0.0123	34	17	17
			<b>Total</b>	<b>93</b>	<b>62</b>	<b>30</b>	<b>Total</b>	<b>70</b>	<b>23</b>	<b>47</b>	<b>Total</b>	<b>636</b>	<b>318</b>	<b>318</b>

However, given the highly accessible location of the OSD, directly above Crows Nest Station, it is anticipated that the majority of the AM and PM peak hours trips will not be undertaken by car. As such, vehicle trips generated from the Amended OSD scheme is estimated based on the proposed number of car parking spaces as shown in Table 4-6.

As stated in the EIS (2018), RMS *Guide to Traffic Generating Development* (GTGD) is used to estimate the trips generated from the proposed OSD land-uses. A car space trip generation rate of 0.1 for high density residential buildings is used for AM peak trip generation. A trip rate of 0.38 is used for estimate trips from the commercial office type development.

**Table 4-6 Estimated vehicle trip generation from the Amended OSD scheme, based on number of parking spaces**

Site	Proposed Parking Spaces	Peak 1 Hr Generation	AM			PM			Daily		
			Total	In	Out	Total	In	Out	Total	In	Out
A	46	17.5	<b>18</b>	16	2	<b>18</b>	2	16	<b>131</b>	66	66
B	49	4.9	<b>5</b>	1	4	<b>5</b>	4	1	<b>27</b>	14	14



Site	Proposed Parking Spaces	Peak 1 Hr Generation	AM			PM			Daily		
			Total	In	Out	Total	In	Out	Total	In	Out
Total			23	17	6	23	6	17	158	80	80

### 4.3.2 Pedestrian Trips

As stated in the “Transport, traffic and parking assessment report” prepared for Sydney Metro (EIS Appendix AA version P08 Dated November 2018), pedestrian movement into and out of the OSD buildings has been assessed on a worst-case scenario where all potential trips by residents and workers are taken using pedestrian access to the building and with no access to the building via private vehicle and the proposed parking garages. The estimated pedestrian trips generated by the Amended OSD scheme based on the rates provided in Table 3-6 are presented in Table 4-7 below:

**Table 4-7 Estimated number of pedestrian trips generated by Amended OSD scheme in 1 hour peak**

Building	Land Use	Scale (unit, sqm GFA)	Population Generation Rate	Estimated Population	3.5hr Conversion Rate	Pop. Moving in 3.5hr Peak	1 Hr Peak	
							AM	PM
A	Commercial	40000	0.05	2000	1	2000	1120	1019
B	Residential	143	1.98	283	0.60	170	95	86
C	Commercial	2700	0.05	135	1	135	76	69
Total				2418		2305	1291	1174

It is evident from Table 4-7 that there will be an increase of pedestrian trips generated from the Amended OSD scheme due to the change in land use allocation providing an increase in commercial floorspace. However, it is anticipated that most of these pedestrian trips will be between the OSD and the Metro station because they will be commuting by Metro train and are already included in the forecast Metro station patronage. Most OSD-generated pedestrian trips will not need to cross the surrounding road network.

## 4.4 Assessment of Impacts of Amended OSD Scheme

### 4.4.1 Impacts on Trip Generation

#### 4.4.1.1 Vehicular Trips

Table 4-8 and Table 4-9 provide a comparative assessment of vehicular trips generated by the Exhibited and Amended OSD land-uses based on the land-use intensity and proposed parking space respectively.

**Table 4-8 Comparative analysis of vehicular trip generation based on land-use intensity**

Scheme	AM			PM			Daily		
	Total	In	Out	Total	In	Out	Total	In	Out
Exhibited Scheme	61	33	28	37	17	20	280	140	140
Amended Scheme	93	62	30	70	23	47	636	318	318
Difference	52%	89%	8%	89%	37%	133%	127%	127%	127%

**Table 4-9 Comparative analysis of vehicular trip generation based on proposed parking space**

Scheme	AM			PM			Daily		
	Total	In	Out	Total	In	Out	Total	In	Out
Exhibited Scheme	22	11	11	20	10	10	141	71	71
Amended Scheme	23	17	6	23	6	17	159	80	80
Difference	5%	55%	-46%	15%	-40%	70%	12%	13%	13%

Table 4-8 and Table 4-9 show that there is an increase in trip generation estimated for the Amended OSD scheme. It is evident from Table 4-9 that the Amended OSD scheme will generate more traffic than the Exhibited OSD scheme. It should be noted that the Exhibited OSD scheme provided 125 car park spaces for Site A residential apartments which has a trip generation rate of 0.1 per car parking space, however the Amended OSD scheme proposed 46 car parking for Site A with commercial land use which has a trip generation rate of 0.38 per car parking space. Therefore, although the total number of car parking spaces has been reduced in the Amended OSD scheme, the total trips generated from Site A has been increased due to the change of land use of Site A. Vehicle trips generated from the residential units have decreased due to the decrease in the number of parking spaces and the change of land use type.

However, it is to be noted that the estimated trips generation from the Amended OSD scheme using both floor area (Table 4-8) and parking spaces (Table 4-9) are still lower than the trip

generation from the pre-existing land-uses on the OSD sites prior to demolition which was estimated to be approximately 131 trips in the AM peak and 81 trips in the PM peak.

If consideration is given to the location of the OSD above a metro station, which is likely to encourage more residents and workers of the proposed OSD to utilise public transport for their commute, as well as the restriction on the provision of parking spaces for residents and workers of the OSD buildings, the number of trips generated per parking space is recommended to be adopted for the assessment. This means that the site is likely to generate 23 vehicle trips in the AM peak and 23 vehicle trips in the PM peak as indicated in Table 4-8 above.

#### 4.4.1.2 Pedestrian Trips

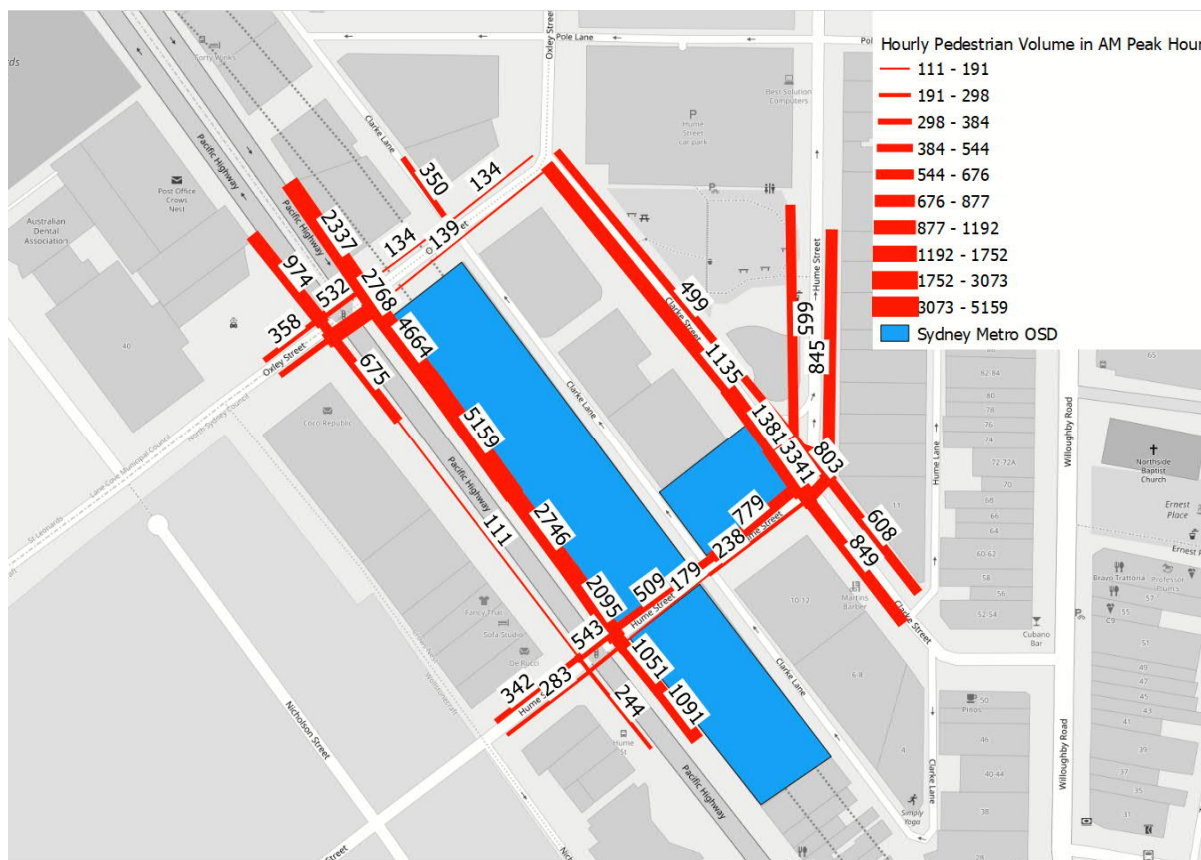
Table 4-10 provides a comparative analysis of pedestrian trips generated by the Exhibited OSD land-uses and the Amended OSD Scheme.

**Table 4-10 Comparative analysis of pedestrian trip generation**

Scheme	AM (Hourly)	PM (Hourly)
Exhibited OSD	515	468
Amended OSD	1291	1174
<i>Difference</i>	<i>151%</i>	<i>151%</i>

It is evident from Table 4-10 that that there will be an increase of pedestrian trips generated from the Amended OSD scheme due to the change in land use allocation providing an increase in commercial floorspace. However, it is anticipated that most of these pedestrian trips will be between the OSD and the metro station because they will be commuting by metro train and are considered in the forecast metro station patronage. Most OSD-generated pedestrian trips will not need to cross the surrounding road network.

The cumulative pedestrian flows from Crows Nest Station, the Amended OSD scheme and background pedestrian flows are shown in Figure 4-1 below. It should be noted that these pedestrian flows are calculated for the Crows Nest concept design and are projected for 2036 with a 15% increase in volume above the forecast for contingency.

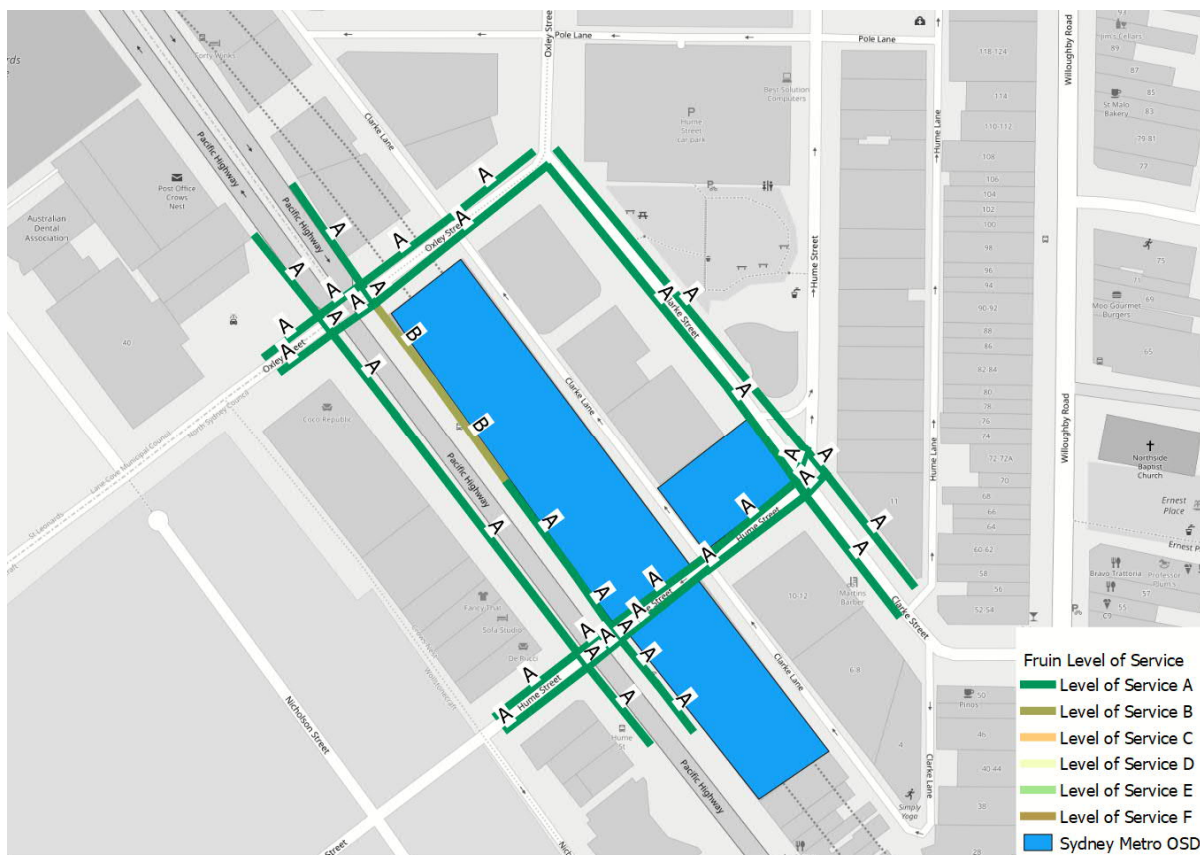


**Figure 4-1 2036 pedestrian volumes during AM peak hour, including background flows, metro station and Amended OSD scheme flows**

It should be noted that the Amended OSD scheme is likely to produce a maximum of 9.7% of all pedestrian trips on the pedestrian network around Crows nest station in 2036. Crows Nest station would generate approximately 82.9% of pedestrian trips, while background pedestrian movements would account for approximately 7.4%.

The corresponding Fruin Level of Service (LoS) for the worst-case period during peak hour (“peak of peak”) for the above is shown below in Figure 4-2 using the similar methodology stated in the ‘Transport, traffic and parking assessment report’ prepared for the Exhibited OSD scheme.

A Fruin LoS “C” is considered acceptable for the purposes of this assessment. Footpath widths have been taken as current widths, and pedestrian crossings have conservatively been assumed at 3.6m wide (minimum width for pedestrian crossings).



**Figure 4-2 2036 Fruin Level of Service for footpaths around Amended OSD scheme during AM peak hour**

As can be seen, the cumulative impact of pedestrian volumes from background volumes, Crows Nest Station and the Amended OSD achieve a LoS A along all except two segments of the pedestrian network around the proposed OSD. A LoS B is recorded on a segment of footpath between the intersection of Oxley Street and Pacific Highway as well as the Pacific Highway entry to Crows Nest Station. It is to be noted that there is an access point to the Exhibited OSD scheme Site 'A' along this section of footpath, however a LoS B is still regarded as very good level of service for a busy location. Given the very low contributions to passenger flows from the Amended OSD, particularly compared to passenger flows from Crows Nest Station, the impact of the OSD on the pedestrian network is negligible.

Upgrades to the public domain surrounding the Amended OSD as part of the Crows Nest Station State Significant Infrastructure proposal will also benefit pedestrians accessing the OSD, through the installation of additional pedestrian crossings on the Pacific Highway, Hume Street and Clarke Street. This will improve safety outcomes for pedestrians and help encourage walking as the main form of transport for local trips.

Part of these public domain changes include changes to Clarke Lane between Hume Street and Oxley Street to change it to a Shared Zone for pedestrians and vehicles, with one-way

northbound traffic maintained. This will enable pedestrians to safely access OSD access points off Clarke Lane by reducing vehicle speeds and increasing driver awareness of pedestrian activity in Clarke Lane, particularly for drivers accessing the car garages and loading docks off Clarke Lane.

It is not proposed to have any pedestrian access points for the OSD Building B along Clarke Lane.

#### 4.4.2 Impact on Parking

Following Table 4-11 shows a comparative analysis of proposed car parking spaces for the Exhibited OSD land-uses and the Amended OSD Scheme.

**Table 4-11 Comparative analysis of proposed car parking spaces**

Site	Proposed Parking Spaces in Exhibited OSD Scheme	Proposed Parking Spaces in Amended OSD Scheme	Differences in Spaces
A	125	46	-79
B	25	49	24
C	0	0	0
<b>Total</b>	<b>150</b>	<b>95</b>	<b>-55</b>

As can be seen, the Amended OSD scheme for Crows Nest provides 46 parking spaces for Site A which is 79 parking spaces less than the previously proposed parking spaces provided for Site A. However, 24 additional parking spaces are provided in the Amended OSD scheme for Site B. Therefore, there is an overall reduction of 55 parking spaces. The number of parking spaces provided in the Amended OSD scheme are still within the maximum range of required parking spaces as per the DCP as shown in Table 4-2 above.

It should be noted that the Council plans to demolish the existing recreational centre, childcare and car park east of Clarke Street and replace them with a park on top of an underground car park. This car park would have some capacity to serve some of the demand from the OSD, particularly the commercial use of Site C.

It is also to be noted that the proposed 46 car spaces in Site A are envisaged to accommodate 10 service vehicles, 10 fleet commercial and 26 staff cars. Consideration should also be given to bike parking and car-share spaces on-site, and on-street. It is proposed to include 65 external on-street bike rings in the Amended OSD scheme.

#### 4.4.3 Vehicle Lift Assessment

The Amended Scheme includes the proposed two vehicle lifts provided to access the car parking area and bike parking in Site A and B. The lifts will carry service vehicles to the building, not for the car parking of tenants, and will be available to carry bicycles. The following

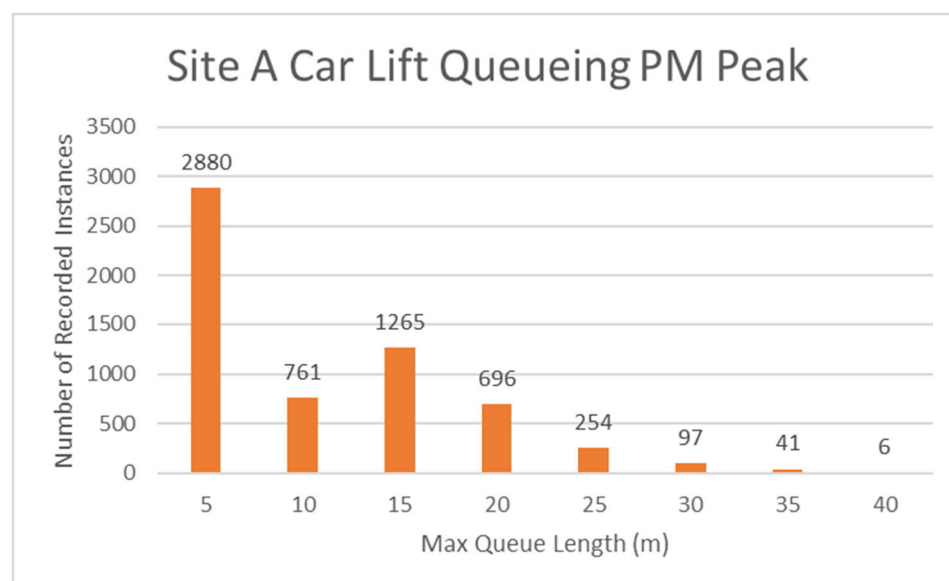


Table 4-12 summarises the assumptions used to assess the performance of the proposed vehicle lifts to access Site A and Site B for the Amended OSD scheme.

**Table 4-12 Assumptions for assessing the performance of proposed vehicle lifts by the Amended OSD scheme**

Site	PM Demand (Critical Peak)	Peak	Lift Cycle Time	Number of Lifts	Lift Arrangement	Distance to next Intersection
A	12 veh/hr <sup>2</sup>		299s <sup>2</sup>	2 <sup>3</sup>	1 in, 1 out <sup>2</sup>	75m to Hume St <sup>3</sup>
B	9 veh/hr <sup>2</sup>		200s <sup>2</sup>	2 <sup>4</sup>	1 in, 1 out <sup>2</sup>	>100m to Clarke St <sup>4</sup>

A VISSIM microsimulation model was developed to stochastically assign this demand within the peak hour. The simulation was run over 100 iterations with different seed values in order to draw robust conclusions on queueing implications on Clarke Lane. This methodology resulted in 100 unique arrival patterns tested across the peak hour. VISSIM provides the maximum queue at each vehicle lift for each 60 second time interval within the peak hour. The maximum queue for each time interval across all 100 iterations was aggregated into 5m bins and is provided in the Figure 4-3 and Figure 4-4 below.



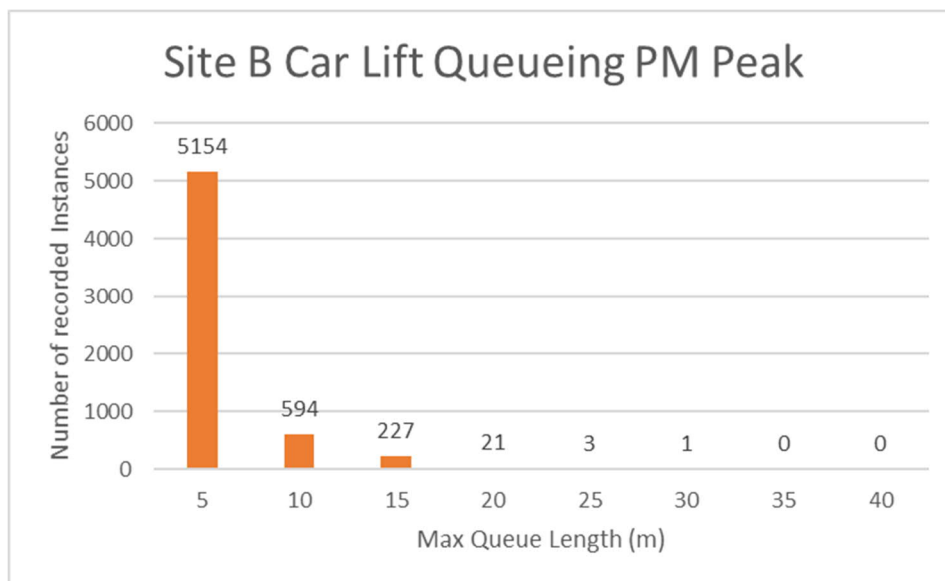
**Figure 4-3 Site A Vehicle Lift Queueing During PM Peak Hour**

<sup>2</sup> Sydney Metro City & Southwest: Crows Nest Over Station Development Transport, traffic and parking assessment report (Nov, 2018)

<sup>3</sup> Crows Nest Station Architectural Design Stage 1 Refresh, DWG 140007 31/7/19

<sup>4</sup> Crows Nest Station Architectural Design Stage 1 Refresh, DWG 140006 31/7/19





**Figure 4-4 Site B Vehicle Lift Queueing During PM Peak Hour**

Site A modelling showed that it is unlikely for the queueing from the Site A vehicle lift to interfere with traffic on Hume Street, with no queues being recorded greater than 36m (70m total distance from the Site A vehicle lift to Hume Street). 80% of the recorded queues were less than 15m and 98% were less than 25m. This indicates that it is unlikely for the queues to exceed 3-5 car lengths.

Site B modelling showed that it is likely that the queue at this site would rarely exceed 15m, with 99.6% of all recorded queues not exceeding this value. 86% of the recorded queues did not exceed 5m. This indicates that the queue length is unlikely to exceed 1 car length.

Based on the EIS methodology and the above modelling methodology, it was concluded that the Amended OSD scheme will operate at least as well as the Exhibited scheme, and that the car park and vehicle lift operations and Clarke Lane traffic flow would benefit from an electronic car parking booking system to smooth out any peaks in arrivals at the vehicle lifts.

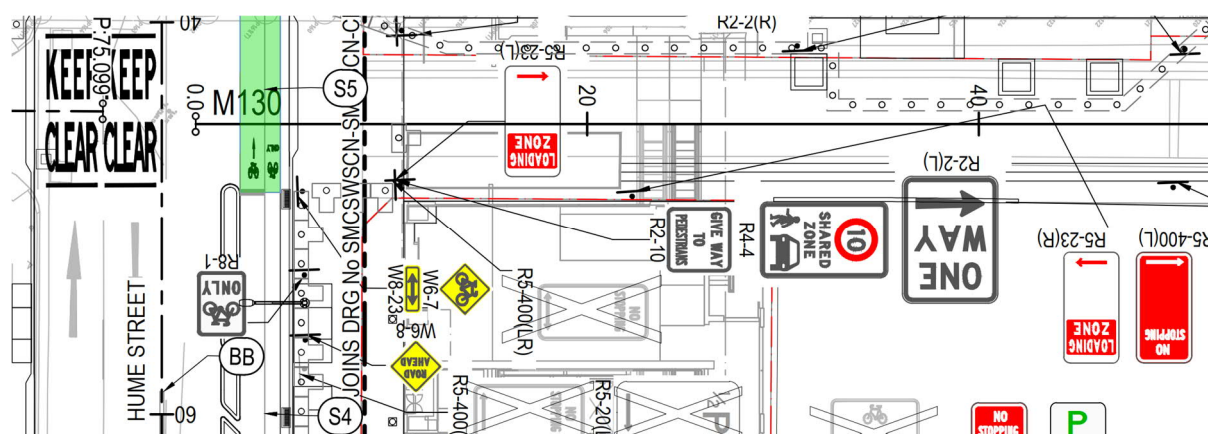
#### 4.4.4 Impacts on Service Vehicle Traffic and Loading Dock

Table 4-13 lists the proposed service vehicle provisions to access the various buildings of the Amended OSD scheme at Crows Nest.

**Table 4-13 Proposed service vehicle provisions for Amended OSD scheme**

Site	Land uses to be served	Location	Loading dock access & management
A	Shared Commercial and Metro	<ul style="list-style-type: none"> <li>Loading Dock: <ul style="list-style-type: none"> <li>1 medium rigid vehicle</li> <li>3 small rigid vehicles</li> <li>vehicle turntable for access to spaces</li> </ul> </li> <li>1 medium rigid vehicle on rolled kerb in Clarke Lane</li> </ul>	<ul style="list-style-type: none"> <li>Shared loading dock for commercial and metro use.</li> <li>Access loading dock and loading zone off Clarke Lane (one way northbound)</li> <li>Private refuse collection via rolled kerb space in Clarke Lane</li> </ul>
B	Residential	<ul style="list-style-type: none"> <li>Loading Dock: <ul style="list-style-type: none"> <li>2 Small rigid vehicles</li> </ul> </li> <li>1 medium rigid vehicle on rolled kerb in Clarke Lane</li> </ul>	<ul style="list-style-type: none"> <li>Access loading dock via Clarke Lane (one way northbound)</li> <li>Private refuse collection via driveway space in Clarke Lane</li> </ul>
C	Commercial	<ul style="list-style-type: none"> <li>Lay-by in Clarke Lane for waste collection</li> </ul>	<ul style="list-style-type: none"> <li>Deliveries and loading and refuse collection will be undertaken from Clarke Lane</li> </ul>

Deliveries and loading and refuse collection for Site C will be undertaken from a lay-by in Clarke Lane designated as a Loading Zone located as shown in Figure 4-5. Deliveries and refuse will be transferred from Site C via the Site C building lifts by trolleys to the lay-by. The use of the lay-by by these vehicles will be infrequent and will be programmed by building management to avoid peak hours and to avoid overlaps of activities. There will be no unacceptable impacts on pedestrians, cyclists, or traffic.



**Figure 4-5: Lay-by Loading Zone in Clarke Lane for Site C waste collection, deliveries and loading.**

Swept path analysis for each of the vehicle type and loading locations mentioned above have been included in the 'Transport, traffic and parking assessment report' prepared for Sydney Metro (EIS Appendix AA version P08 Dated November 2018). No changes have been proposed for the vehicle types and loading locations in the Amended OSD scheme. As such, it is anticipated that the proposed loading locations in the Amended OSD scheme are adequate.

The Dock Activity Assessment (DAA) for various sites of Exhibited OSD scheme, prepared by the Sydney Coordination Office (SCO), showed that the proposed number of loading facilities were adequate to accommodate the expected number of vehicles for the Exhibited OSD development at Crows Nest with minor queueing potential at the peak time. No DAA has been undertaken for the Amended OSD Scheme and land uses. The findings of the previous DAA for the Exhibited scheme are still applicable for the Amended OSD scheme.

It should be noted that the total expected number of service vehicles at Site 'B' would be reduced due to the reduced number of apartment units. However, it is anticipated that total number of expected service vehicles at Site 'A' would be increased because of the increased commercial GFA at Site 'A'. A Loading Dock Management Plan with a booking system needs to be considered as part of the building operation to manage the any additional service vehicles and to avoid any potential queues on Clarke Lane.

The traffic assessment report for the Exhibited OSD scheme indicated that the average expected frequency of removalists using the dock for Site A would be 1.74 per week. This was based on average changes in residential address for people living in North Sydney LGA over a five-year period. It should be noted that the average expected frequency of removalists was calculated based on 360 number of apartment units at Site A. The Amended OSD scheme proposes 143 number of apartment units at Site B. As such, the average expected frequency of removalists using dock for Site B would be 0.7 per week for the Amended OSD scheme, as shown in Table 4-14.

**Table 4-14 Assumed frequency of removalists using Site B loading each week**

Proportion of residents who have moved in last 5 years	63%
Proportion of residents who have not moved in last 5 years	37%
Average percent of residents relocating each year in five-year period	12.6%
Number of Apartments in Amended OSD scheme	143
Expected number of residents moving to and from Crows Nest OSD each year	36
Expected average number of removalists using Site A dock each week	0.7

It is anticipated that the Amended OSD scheme would have lesser removalists activities than the Exhibited scheme. It is however, recommended to establish a formalised management system for the loading docks through the building owner or ownership corporation to manage dock usage and minimise queueing in Clarke Lane.

#### 4.4.5 Impacts on Coach and Taxi

As stated in the “Transport, traffic and parking assessment report” prepared for Sydney Metro (EIS Appendix AA version P08 Dated November 2018), taxi use by the residents and workers of the proposed OSD would be irregular and low in numbers. It was also anticipated that the proposed hotel use would be the main driver for taxi trip generation. However, in the Amended OSD scheme, a hotel land use is no longer sought. As such, there will be a reduced impact of the coach/taxi trips on the network.

#### 4.4.6 Impacts on Pedestrian, Bike and Traffic Circulation

It is anticipated that the road network surrounding the proposed OSD will remain the same as stated in the “Transport, traffic and parking assessment report” prepared for Sydney Metro (EIS Appendix AA version P08 Dated November 2018). However, due to the change of land-use type, the volumes of pedestrians, and other modes will be changed. For example, the land-use of ‘Site A’ has been changed from residential apartments to commercial use. This will result in more workers travelling by non-car modes towards ‘Site A’ during the morning peak hours. Current pedestrian modelling is expected to demonstrate that a Fruin Level of Service C or better will be achieved for the Amended Scheme.

The number of bikes to the new OSD scheme are likely to increase overall, driven by increased commercial floorspace, but can be accommodated by the proposed bike paths and the additional OSD bike parking now proposed on a pro-rata basis.

#### 4.4.7 Impacts on Intersections design and Level of Service

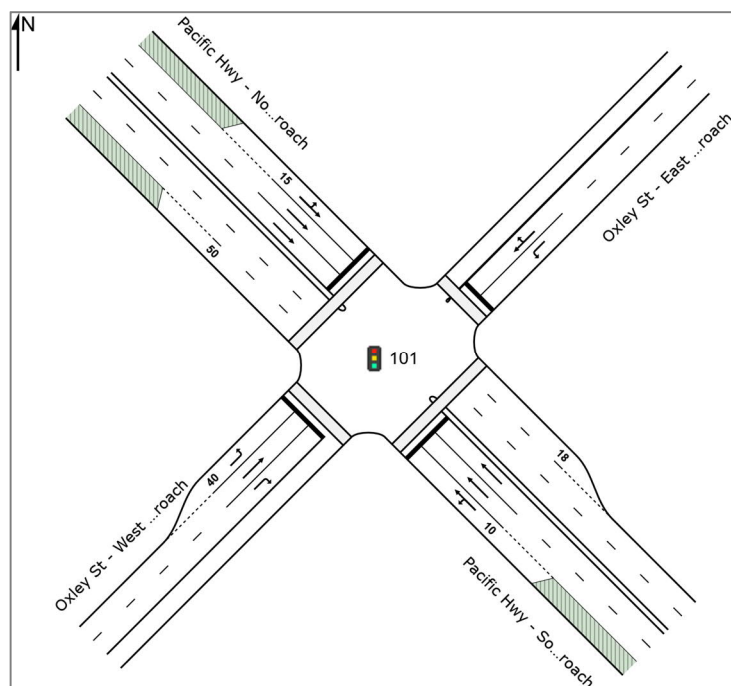
As shown in Table 4-9 and Table 4-10 there will be some localized increases of vehicular and pedestrian traffic due to the proposed land-use changes. Following key intersections adjacent to the Crows Nest OSD development have been assessed to understand the impacts of the increased traffic and pedestrian volume on the performance of the intersections:

- Pacific Highway/Oxley Street Intersection
- Pacific Highway/Hume Street Intersection
- Oxley Street/Clarke Street Intersection
- Hume Street/Clarke Street Intersection

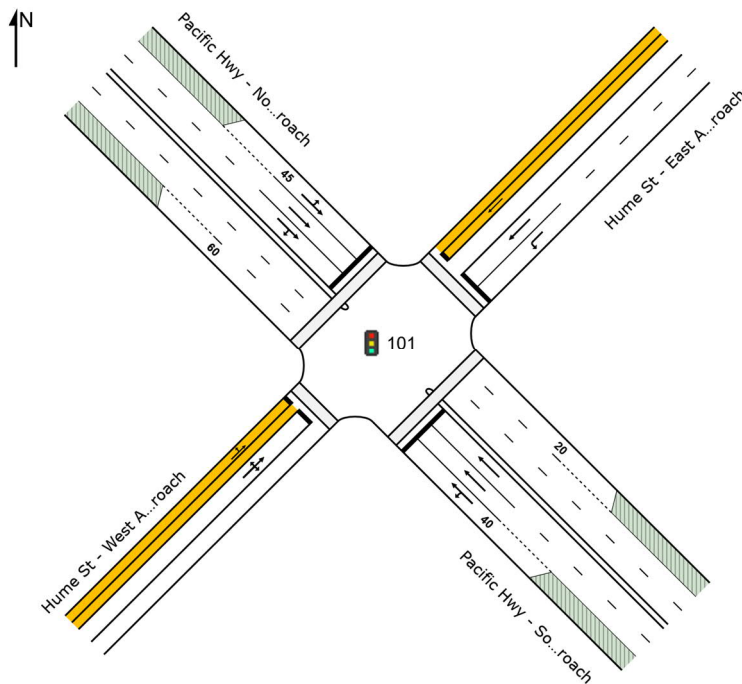
A cycleway is proposed along Hume Street and considered in assessing the performance of Pacific Highway/Hume Street intersection as shown in Figure 4-7 Intersection layout of Pacific Highway/ Hume Street intersection. It should be noted that the left/right turn movements for the cyclists to access the Pacific Highway (southbound) from Hume Street are not considered in the signal phasing to avoid any conflict with the vehicular movements and enhance the safety. It is anticipated that the cyclists would cross the Pacific Highway and then utilise the pedestrian facilities to cross Hume Street to access the Pacific Highway (southbound).

The performance of these intersections is assessed for the opening year 2025 scenarios and for both AM and PM peak hours. A 1% annual traffic growth rate has been assumed and applied to the recent traffic counts data to estimate the future year 2025 intersection turning flows. The annual growth traffic growth rate has been calculated based on the traffic volume data derived from the nearby RMS permanent traffic count viewer (Station ID: 33098) between the year 2016 and 2018. The traffic data indicates a total traffic volume 34002 vehicles (both directions) in the year 2016, whereas 34348 vehicles (both directions) in the year 2018 which implies an annual traffic growth of 0.51% between the year 2016 and 2018. Therefore, assumption of 1% annual traffic growth rate for the purpose of traffic assessment is considered to be conservative and represents a worst-case scenario.

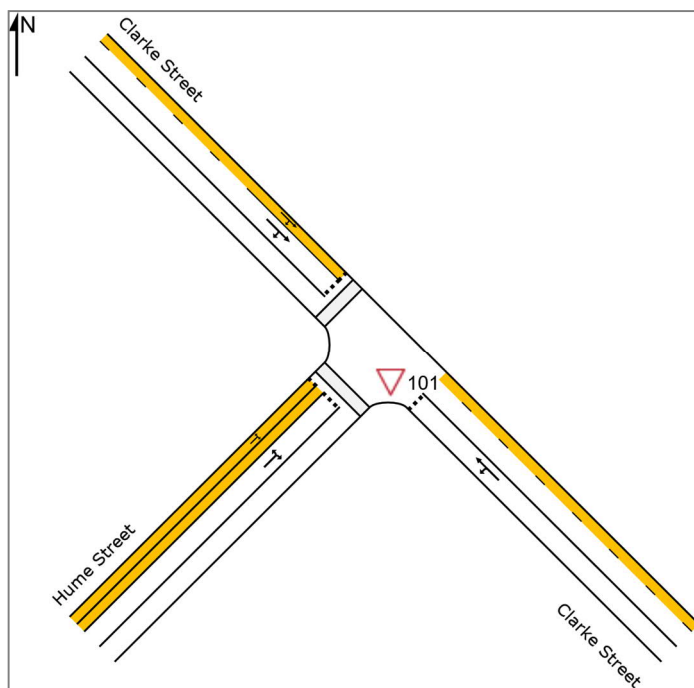
SIDRA version 8.0.1.7778 has been used to assess the performance of these intersections. Figure 4-6 to Figure 4-9 show the proposed intersection layouts of the assessed intersections.



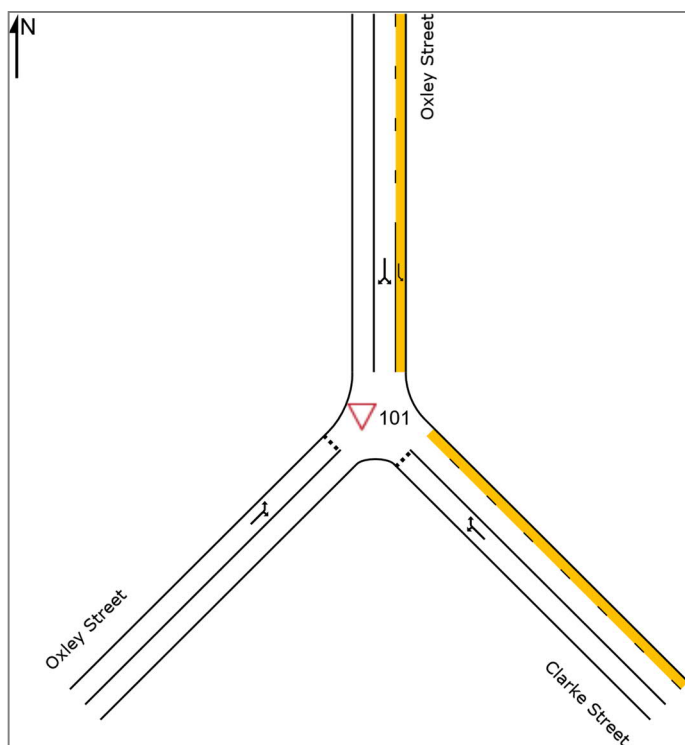
**Figure 4-6 Intersection layout of Pacific Highway/Oxley Street intersection**



**Figure 4-7 Intersection layout of Pacific Highway/ Hume Street intersection**



**Figure 4-8 Intersection layout of Oxley Street/Clarke Street intersection**



**Figure 4-9 Intersection layout of Hume Street/Clarke Street intersection**

The following key changes to the existing intersection layout are considered for the intersection performance assessment purpose:

- Right turn restriction on east approach of Pacific Highway/Hume Street intersection as per IAP
- Provision of east approach right turn on Pacific Highway/Oxley Street intersection as per the IAP
- Pedestrian crossing on north approach of Pacific Highway/Oxley Street intersection
- Pedestrian crossings on north and west approaches of Hume Street/Clarke Street intersection

Table 4-15 summarises the intersection performance results of the assessed intersections for opening year 2025 for both AM and PM peak hours.



**Table 4-15 Intersection performance results for 2025 AM and PM peak hours**

INTERSECTION	AM				PM			
	LOS	Delay (Sec)	DoS	95 <sup>th</sup> Percentile Queue Length	LOS	Delay (Sec)	DoS	95 <sup>th</sup> Percentile Queue Length
Pacific Highway/Oxley Street	D	41.1	0.93	387m South Approach 237m North Approach	D	40.2	0.88	278m South Approach 276m North Approach
Pacific Highway/Hume Street	D	42.1	0.91	309m South Approach 271m North Approach	D	47.2	0.97	386m North Approach 202m South Approach
Oxley Street/Clarke Street	A	7.2	0.17	-	A	6.9	0.2	-
Hume Street/Clarke Street	A	9.2	0.2	-	A	11.6	0.22	-

As shown in Table 4-15, all intersections would perform with an acceptable Level of Service and delays in opening year 2025 during both AM and PM peak hours. However, long queues are modelled along the Pacific Highway during both AM and PM peak hours. It should be noted that the trip generation from the Amended OSD scheme is negligible (total 23 vehicles per hour during peak hours) compared to the growth of background traffic and would have minimal impacts on the performance of the surrounding intersections.

#### 4.4.8 Other Impacts

It is assumed that proposed land-use changes of the Amended OSD Scheme will not have any impacts on the public bus services and emergency vehicle service.

## 5.0 Recommendations and Conclusion

### 5.1 Recommendations

#### 5.1.1 Car share scheme

Given the physical constraints of the site, it is not possible to provide additional parking spaces to address potential weekend car demands.

Car share schemes have been shown to directly alter car ownership rates, with one car share vehicle found to remove 9 to 13 vehicles from roads and to support 22 to 23 car share scheme members<sup>5</sup>. Additionally, car share schemes are considered to be beneficial in reducing the amount of kerbside space dedicated to parking<sup>6</sup>, freeing up more space for bike lanes, clearways, bus lanes or wider pedestrian paths. Concern about increased demand for on-street parking due to the OSD has been identified in early community consultation and in this sense inclusion of a car share scheme in the OSD buildings would help to address this concern.

To ensure that the impact to on-street parking is minimised, and assuming that Crows Nest OSD will have car ownership rates similar to Sydney and Haymarket, car share spaces should be provided as part of the residential buildings on Site B of the Amended OSD scheme.

#### 5.1.2 Construction traffic management

A separate Construction Traffic Management Plan should be prepared which would address construction traffic.

#### 5.1.3 Travel plans

The limited private car parking proposed for all of the Crows Nest Amended OSD scheme land uses seeks to demonstrate that exceptional public transport and active transport accessibility can effectively and successfully support the travel needs of a broad range of urban land uses and activities.

To support the success of the sites, it is recommended that Travel Plans (TP) be prepared for each site, held by Council, and provided to owners/ tenants. The following site-specific and customer-specific Travel Plans should be prepared and incorporated into the operational plans of the sites.

- Site A (Commercial) – Employees TP

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<sup>5</sup> Benefit-Cost Analysis of Car Share within the City of Sydney, SGS Economics & Planning, 2012, pg. 25.

<sup>6</sup> The Impact of Car Share Services in Australia, Phillip Boyle & Associates, 2016, pg. 10

- Site B (Residential) – Residential TP.
- Site C (Commercial) – Employees TP

As part of the travel plans, information will need to be distributed to residents regarding queuing for the vehicle lift both inside the OSD buildings and in Clarke Lane, and this should include:

- Warnings about the potential queue times during peak periods in Clarke Lane (dependent on final design)
- A potential booking system for residents who regularly use the vehicle lift as part of their journey to work;
- Considerations for neighbours when queuing, including turning off vehicle engines to reduce vehicle exhaust and noise impacts; and
- Avoiding peak periods if planning to use a car or other vehicle stored in the OSD car parks in order to avoid development of queues.

#### 5.1.4 Loading dock management

It is anticipated that the proposed loading dock provision is adequate for the Amended OSD scheme. However, the following mitigation measures as identified in the DAA report are also proposed to manage the loading dock facilities in a more efficient way:

- Provision of lockers for the residents to reduce the frequency of deliveries
- All non-essential station servicing activity, including facilities maintenance and cleaning and vending machines replenishment, should be conducted out of normal business hours as these services likely require dwell time in excess of an hour. Services to retailers and the commercial building should be encouraged to occur outside of peak hours
- Space at the dock should be provided to encourage courier bike or motorbikes making deliveries
- A travel demand management strategy should be prepared and adopted by the building managers to consider the movement of people and goods
- A preliminary delivery service plan as proposed in the previous 'Transport, traffic and parking assessment report (Appendix D, EIS 2018) should be adopted to manage the loading activities efficiently and to minimise queues on the external roads.

## 5.2 Conclusions

This analysis indicates that the transport impacts of the Amended OSD scheme development scheme have not significantly changed from the Exhibited ODS scheme and can be accommodated within the multi-modal transport and traffic controls outlined in the "Transport, traffic and parking assessment report" prepared for Sydney Metro (EIS Appendix AA version P08 Dated November 2018).