5.3. Sydney Metro Crows Nest

AUTHOR: Iman Mohammadi, Acting Manager Traffic and Transport Operations

ENDORSED BY: Duncan Mitchell, Director Engineering and Property Services

ATTACHMENTS:

1. 5.3 Attach 01 Crows Nest Kerbside Usage Concept [**5.3.1** - 1 page]
2. 5.3 Attach 02 Pacific Hwy Hume St Layout 14 Oct 2022 [**5.3.2** - 1 page]
3. 5.3 Attach 03 Pacific Hwy Hume St Swept Path Analysis 14 Oct 2022 [**5.3.3** - 1 page]
4. 5.3 Attach 04 Crows Nest WAD Package 01 Technical Note Pacific& Oxley [**5.3.4** - 32 pages]

PURPOSE:

The purpose of this report is to update and seek endorsement from the North Sydney Traffic Committee on the Crows Nest Interchange Access Plan traffic and parking arrangements for Crows Nest Station along Oxley Street, Clarke Street and Hume Street, Crows Nest that affect local roads and existing parking arrangements.

Updates are also provided on the Sydney Metro website at https://www.sydneymetro.info/

EXECUTIVE SUMMARY:

Consent for the Metro City & South-West (Metro) project was granted by the Department of Planning and Environment on 9 January 2017. The consent can be viewed in full at www.majorprojects.planning.nsw.gov.au.

The project will deliver new railway infrastructure for Sydney, including two new Metro stations within the North Sydney Local Government Area - at Crows Nest and Victoria Cross (North Sydney Centre). Construction commenced in early 2017, with train operations expected to be underway by 2024.

As part of the project planning condition (E92), Sydney Metro must develop an Interchange Access Plan for each station to inform the final design of transport and access facilities and services, including footpaths, cycleways, passenger facilities, parking, traffic and road changes, and integration of public domain and transport initiatives around and at each station.

The Crows Nest Interchange Access Plan has been approved by Department of Planning and Environment (DPE) in March 2022.

Sydney Metro and North Sydney Council worked collaboratively over the past year to provide facilities and services for Crows Nest Station. These facilities and services will be operational upon ‘day one’ of train operations. The changes involve the following:

1. Kerb side parking changes on Oxley Street and Clarke Street.
2. A new marked foot crossing (northern approach), widening of the existing eastern and southern crossing at Pacific Highway and Oxley Street Intersection. These proposed changes have been approved by Transport for NSW.
3. New pedestrian zebra crossing along Clarke Street (northern leg) and Hume Street (western leg) at Hume Street/ Clarke Street intersection.
4. Introduction of an on-road cycleway along Hume Street between Nicholson Street and Clarke Street.
5. Removal of eastbound traffic lane along Hume Street between Pacific Highway and Clarke Street. The unused width adjacent to northern kerb (painted as chevron marking) could potentially be used for activation area, future OSD construction or increased footpath.
6. Crossing widening of the eastern crossing of Hume Street at Pacific Highway and Hume Street intersection (approved by Transport for NSW).

As part of these facility and services changes, Sydney Metro and North Sydney Council will review capacity and operation of kiss-and-ride (and taxi) spaces 12 months after metro opening to ensure the capacity accommodates demand.

It is expected Sydney Metro will begin works relating to these changes in late 2022 (TBC), further consultation will be provided to Stakeholders and the Community closer to the anticipated start date.

This matter was presented and approved by Traffic Committee at the 22 July meeting. Follow the meeting, an email was received from David Osborne of TfNSW in relation to the proposed for a Zebra crossing at Hume Street stating *the design does not meet Australian Standards as it crosses 2 lanes traveling in the same direction.*

In that regard, TfNSW rescind this LTC approval until such time that a design to comply with standards is prepared.

This matter was brought up to the 2 September 2022 meeting where it was resolved to recommend:
*1. **THAT** the committee rescind the approval and a further report come back to the committee.*

This report provides details of the changes to the proposed pedestrian crossing in Hume Street, Crows Nest.

FINANCIAL IMPLICATIONS:

There are no direct financial implications arising from this report.

RECOMMENDATION:
1. THAT the information concerning Sydney Metro City & South-West Crows Nest Station Interchange Access Plan be received and endorsed.

2. THAT detailed design plans for the proposed pedestrian crossings and associated works in Hume Street and Clarke Street be consulted with North Sydney Council prior to construction.

LINK TO COMMUNITY STRATEGIC PLAN

The relationship with the Community Strategic Plan is as follows:

2. Our Built Infrastructure
2.1 Infrastructure and assets meet community needs
2.4 Improved traffic and parking management

5. Our Civic Leadership
5.2 Council is well governed, and customer focused
5.3 Community is informed and consulted

BACKGROUND

Consent for the Metro City & South-West (Metro) project was granted by the Department of Planning and Environment on 9 January 2017. The consent can be viewed in full at www.majorprojects.planning.nsw.gov.au

The project will deliver new railway infrastructure for Sydney, including two new Metro stations within the North Sydney Local Government Area - at Crows Nest and Victoria Cross (North Sydney Centre). Construction commenced in early 2017, with train operations expected to be underway by 2024.

This matter was presented and approved by Traffic Committee at the 22 July meeting. Follow the meeting, an email was received from David Osborne of TfNSW in relation to the proposed for a Zebra crossing at Hume Street stating that:

As a follow on from an internal meeting with Metro on Friday it was noted that the design does not meet Australian Standards as it crosses 2 lanes traveling in the same direction. A point raised for consideration was:

1. *Zebra crossing across Hume St at Clarke St. In accordance with the RMS Austroads Guide Supplements - Austroads Guide to Traffic Management, Part 6:*
    - *Section 8: NSW practice does not permit Pedestrian (Zebra) Crossings on roads with 2 or more marked travel lanes in same direction. This also applies to roads with 2 unmarked travel lanes in the same direction, ie where vehicles can pass other vehicles travelling in the same direction.*

    Accordingly, the zebra crossing across two westbound travel lanes would not be supported, on the basis of safety.

Following this internal meeting it has been requested that TfNSW/NSC arrange for the approval for this part of the Metro works to be rescinded on the basis of safety. We will meet

again with Metro tomorrow afternoon to advise them that we have been in touch with North Sydney Council and to discuss alternative options for them. Metro will need to come up with a new design that is in accordance with Australian Standards.

TfNSW needs to rescind this LTC approval until such time that a design to comply with standards is prepared.

This matter was brought up to the 2 September 2022 meeting where it was resolved to recommend:

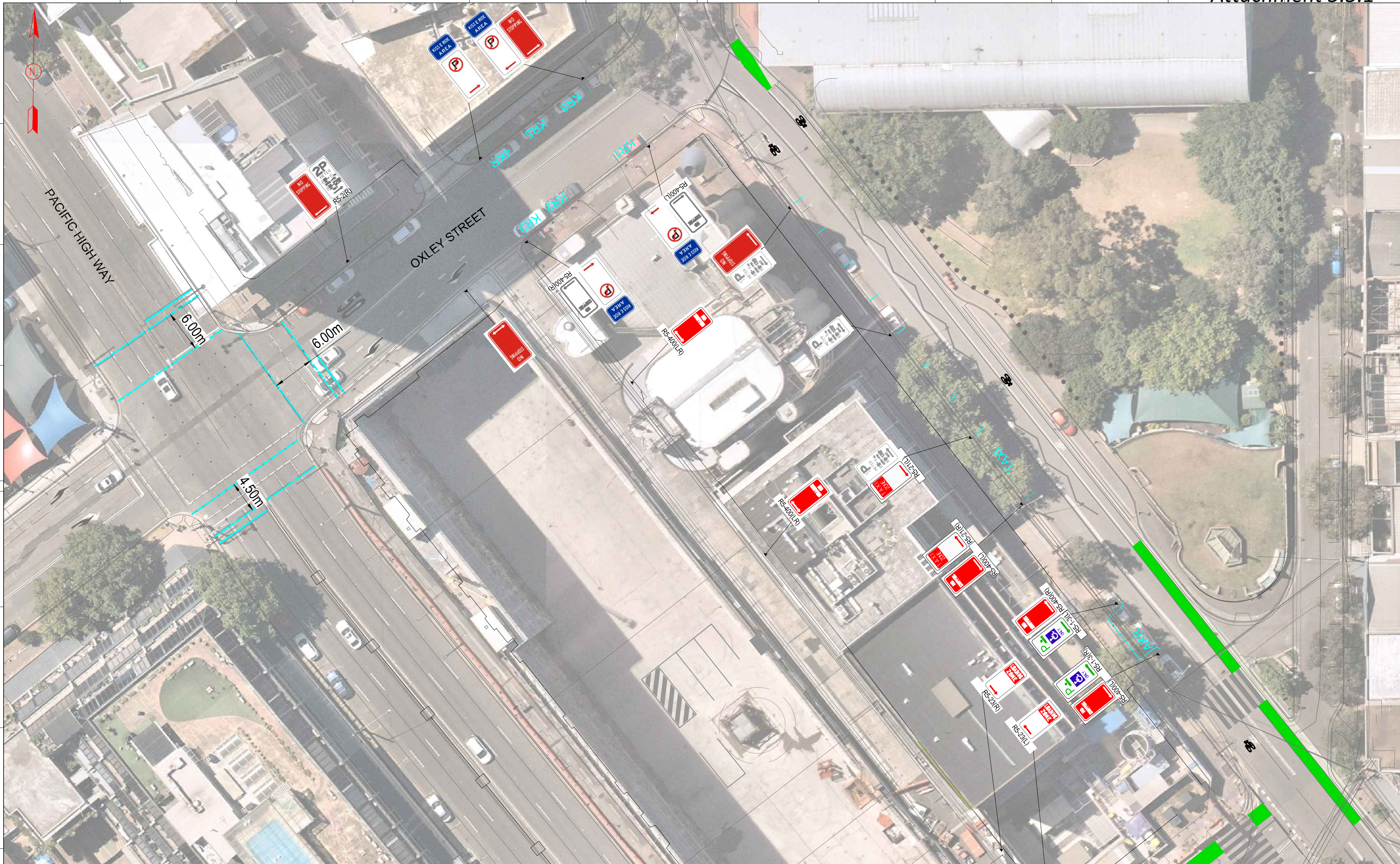
***1. THAT** the committee rescind the approval and a further report come back to the committee.*

This report provides details of the changes to the proposed pedestrian crossing in Hume Street, Crows Nest.

CONSULTATION REQUIREMENTS

Community engagement will be undertaken in accordance with Council's Community Engagement Protocol.

Relates to ECM No: 8958298
Standard or Guideline Used: AS1742.2, 2890.5
Signs & Lines Priority: 2
Precinct and Ward: Holtermann, Tunks
Impact on Bicycles: Bicycle access is improved under the proposed works
Impact on Pedestrians: Pedestrian's access is improved under the proposed works
Impact on Parking: The proposal will result in loss of 8 parking spaces in Oxley Street and 5 parking spaces in Clarke Street. The motorbike parking on Clarke Street will be used for taxi zone and kiss-and-ride spaces.



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CO-ORDINATE SYSTEM: HEIGHT DATUM: SCALE:

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DRAWN S.RODD 09/06/2022
DESIGNED
DRG CHECK
DESIGN CHECK
APPROVED

SYDNEY METRO CITY AND SOUTH WEST
CROWS NEST
OXLEY ST - PASIFIC HIGHWAY

FILE No.
STATUS: DRAFT
DRG No.
SHEET: OF
TMC:
EDMS No.
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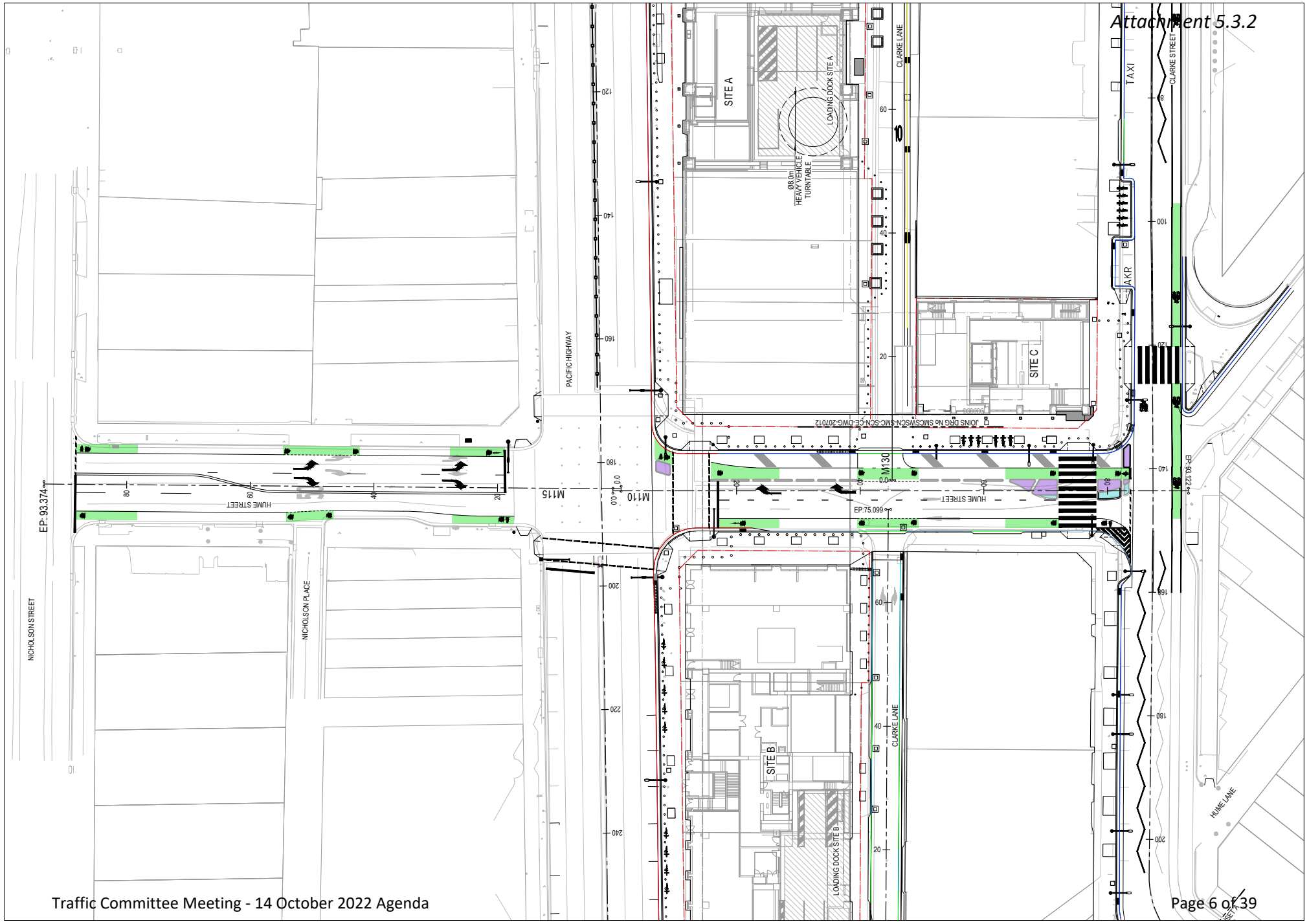
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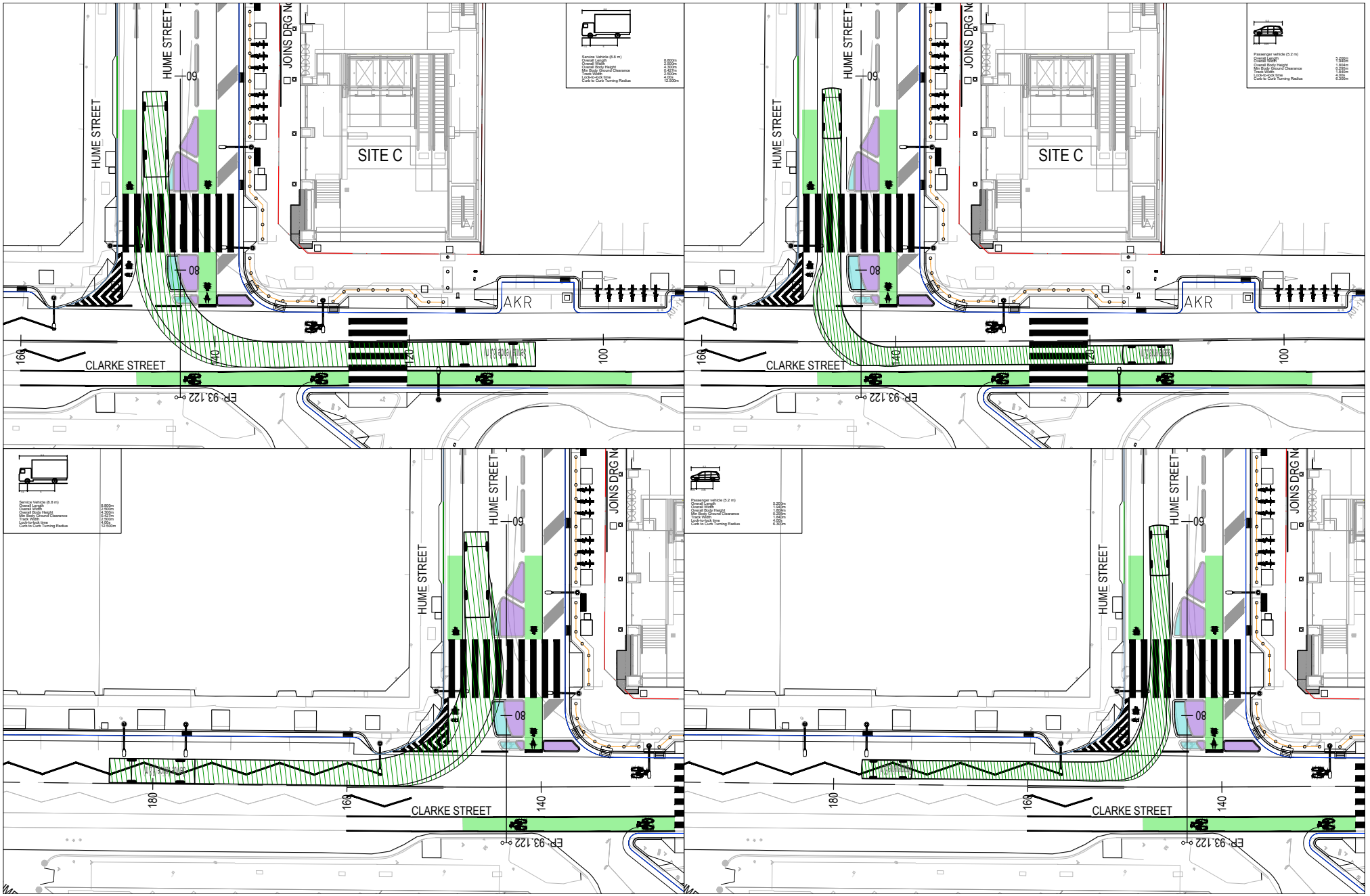
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Crows Nest Station WAD Package 01 – Signalised crossing upgrades at the intersection of the Pacific Highway / Oxley Street, Crows Nest

WAD Package TECHNICAL NOTE

Project:	Sydney Metro City and Southwest	**Date:**	28/04/2022
Group:	Metro Operations, Customer & Placemaking	**Status:**	Draft Final
Author:	P Brogan / K Hind / G Hitchcox	**Revision:**	5
Company:	Sydney Metro	**File number:**	N/A
File name:	Crows Nest Station WAD Package 01 - Technical Note		

Revision	Revision date	Status	Brief reason for update	Author	Reviewer/ Approver	Signature
0	12/06/2018	Draft	Develop tech note	P Brogan / K Hind / Traffic Advisor / Sydney Metro	Program Manager, Trans. Planning	
1	06/08/2019	Draft	Edits and updates	P Brogan / K Hind / Traffic Advisor / Sydney Metro	Program Manager, Trans. Planning	
2	20/09/2019	Draft Final	Edits and updates	P Brogan / K Hind / Traffic Advisor / Sydney Metro	Program Manager, Trans. Planning	
3	14/11/2019	Draft Final	Issue to RMS	P Brogan / K Hind / Traffic Advisor / Sydney Metro	Program Manager, Trans. Planning	
4	07/04/2022	Draft Final	Issued to Planning and Programs for review / approval	G Hitchcox / Senior Manager / Transport Planning Advisory / Sydney Metro	TfNSW GS Planning and Programs	
5	28/04/2022	Draft Final	Updates based on TfNSW comments.	G Hitchcox / Senior Manager / Transport Planning Advisory / Sydney Metro	TfNSW GS Planning and Programs	

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Executive Summary Table

Item	WAD Package Assessment Summary	TfNSW Response
1.WAD Package No	Crows Nest Station WAD Package 01 – Signalised crossing upgrades at the intersection of the Pacific Highway & Oxley Street, Crows Nest.	
2.WAD Package Description	The works include a new 6.0m wide marked foot crossing of the Pacific Highway (northern approach) at the intersection with Oxley Street and widening of the existing eastern crossing of Oxley Street (from 3.4m to 6.0m) and southern crossing of Pacific Highway (from 3.4m to 4.5m). The previously proposed changes to the marked foot crossings received in principle support from the TfNSW Planning and Program (former RMS) by way of email dated 11 December 2019.	
3.Rationale	Customer accessibility, safety & crossing capacity – provides for improved access for pedestrians crossing the Pacific Highway, and increases crossing capacity in response to forecast increased pedestrian demands without significant changes or impact on traffic flow.	
4.RMS Warrants & Design Standards	Satisfies TfNSW warrant for pedestrian crossings on all legs of a signalised intersection in accordance with TfNSW (previously RMS) Traffic Signal Design Guide.	
5.Meeting RMS KPI's	Supporting increased pedestrian movement and activity at the intersection with opening of Sydney Metro and growth in St Leonards and Crows Nest.	
5.1 Traffic & Pedestrian Demands	Pacific Highway: 2,680(AM) – 2,390(PM) veh/hr. Oxley St: 300(AM) - 380(PM) veh/hr. Forecast 2036 pedestrians - Highway/Oxley St intersection: 4,430(AM) - 4,100(PM) ped/hr.	
5.2 Network Efficiency	The works would not adversely impact traffic flow efficiency or journey time reliability for traffic and pedestrians.	
5.3 Pedestrian Safety	The works would improve pedestrian safety by accommodating forecast growth in pedestrian activity through this intersection.	
5.4 Intersection Operation	The works would not significantly impact the operation of the Pacific Highway / Oxley Street intersection.	

5.5 Crashes	Four (4) crashes at the Pacific Highway / Oxley Street intersection recorded in the July 2013 to June 2017 survey period. One crash involved a collision with a pedestrian.	
5.6 Regulatory Signage and linemarking	Minor changes to regulatory, advisory or way finding signage and linemarking.	
6.Conclusions	The works are required to enhance pedestrian accessibility, safety & signalised crossing capacity at the intersection. The works will not adversely impact traffic flow efficiency.	

1. WAD Package Proposal

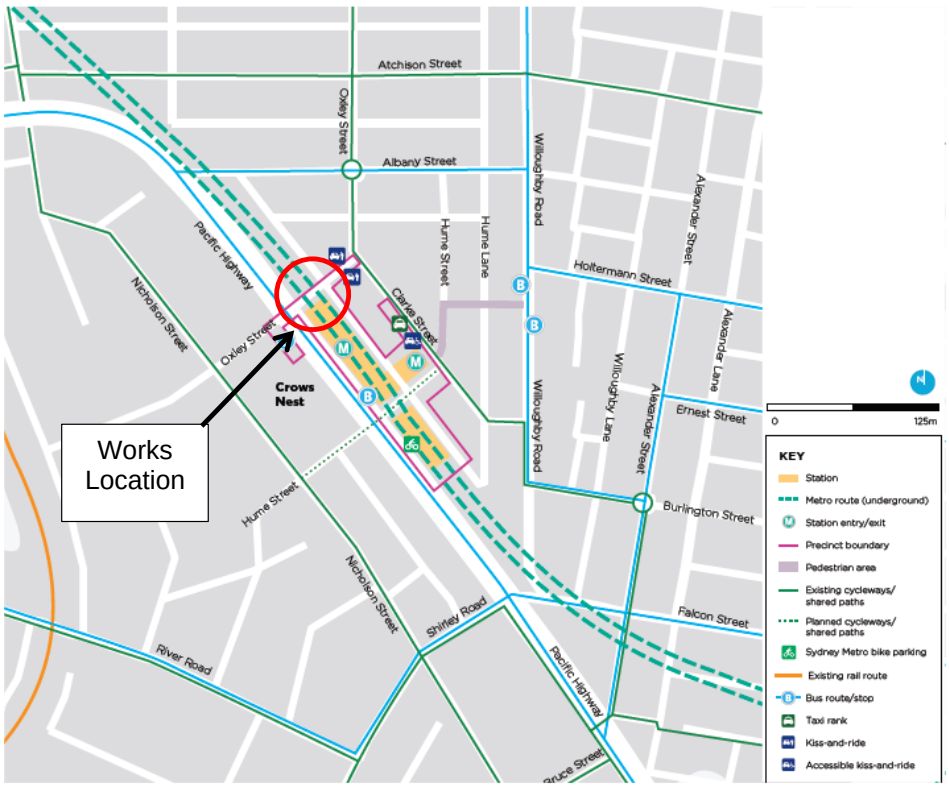
The works involve the following:

- New marked foot crossing on the northern side of Pacific Highway (6.0m wide).
- Widening of the eastern marked foot crossing of Oxley Street (from 3.2m to 6.0m).
- Widening of the southern marked foot crossing of Pacific Highway (from 3.2m to 4.5m)
- The western crossing is not proposed to be widened.

The works are required to enhance pedestrian accessibility, safety & crossing capacity in response to forecast growth in pedestrian activity through this intersection. Pedestrian modelling has indicated the proposed works improve the pedestrian level of service to an acceptable level for 2036. These works were agreed in principle through a TfNSW collaboration forum between Sydney Metro and Greater Sydney Division. The changes will involve the following works, to be defined during detailed design:

- Carriageway line marking removal and installation.
- Footpath kerb ramp installation and modifications.
- Traffic signal post / lantern, detectors, and light pole relocation/installation.
- Possible road carriageway and drainage works.
- Traffic signal personality modifications (TfNSW responsibility).

The works are required to support end state Metro Day One operational outcomes. Refer to **Figure 1** for an indicative layout of the proposed station location and accesses.



Crows Nest Station – interchange and transfer requirements overview

Figure 1 – Crows Nest Station indicative layout (Crows Nest IAP ver v5, February 2022)

A proposed TCS design is provided in **Figure 2** and **Appendix 1**.

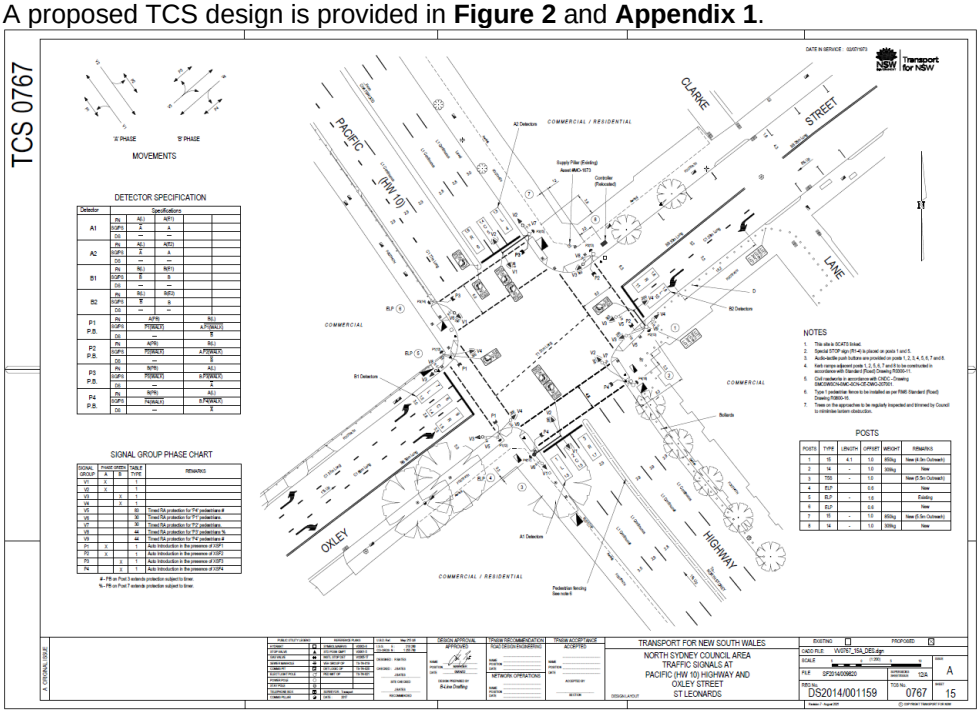


Figure 2 – Pacific Highway/Oxley Street TCS plan

2. Rationale

The WAD package works are required for the following reasons:

1. Accessibility – pedestrian movement across the Pacific Highway and other roads will increase over time with the introduction of the Crows Nest Metro station and planned growth in the St Leonards and Crows Nest centres. The new marked foot crossing and increased marked foot crossing width will facilitate improved access to and from the Metro station entry and the St Leonards activity centre.
2. Safety – the new marked foot crossing and increased marked foot crossing width will provide direct access and additional space for pedestrian movement at the intersection, reducing the risk of pedestrian-vehicle conflict from overspill or illegal carriageway crossings.
3. Capacity - the new marked foot crossing and increased marked foot crossing width will increase crossing capacity in response to forecast increase in pedestrian activity.

The works require delivery via the Works Authorisation Deed (WAD) because they will impact traffic signal geometry and layout at the Pacific Highway / Oxley Street intersection, and require additional traffic signal hardware and programming.

3. TfNSW Warrants

The proposal to install a pedestrian crossing across the Pacific Highway on the northern side of the intersection complies with Section 2.4 of the TfNSW (previously RMS) Traffic Signal Design Manual document which states *"A signalised marked foot crossing must be provided on each leg of a signalised intersection (including T junctions), in a built up area…"* Section 2.4 also lists circumstances where a crossing may not be provided, however, it is considered that none of the listed circumstances would apply to this intersection.

A proposal to widen an existing marked foot crossing at a signalised intersection does not require assessment against the RMS warrants. Section 6.3 of the TfNSW Traffic Signal Design document states that "*the standard width of a marked foot crossing at an intersection is 3.6 metres measured to the outside edge of the dashed paint lines. However, where large flows of pedestrians use the crossing (more than two ranks per cycle in either direction during peak periods) or large numbers of pedestrians arrive in platoons (eg: near railway stations or schools), wider crossings may be used. Wider crossings should be 4.5m, 6m or 10 m in width shown on the design layout*."

4. Key WAD assumptions

The key assumptions for Crows Nest WAD Package 01 are as follows:

1. The existing marked foot crossings at the intersection are between 3.3 and 3.6 metres wide.
2. The proposed new marked foot crossing on the northern side of Pacific Highway will be 6.0 metres wide.
3. It is proposed to widen the eastern existing marked foot crossing on Oxley Street to 6.0 metres.
4. It is proposed to widen the southern existing marked foot crossing on Pacific Highway to 4.5 metres.
5. The western crossing is not proposed to be widened.
6. The extent of the post, lantern and light pole relocations has yet to be defined.
7. The works will require footpath kerb ramp and drainage modifications.
8. It is anticipated that the changes will occur immediately prior to Metro Station opening in 2024 and remain in place post 2024.

The key assumptions adopted in the SIDRA analysis (applies to all Crows Nest station end-state WAD packages) are as follows:

1. The volumes at the following intersections were obtained from traffic surveys undertaken on Tuesday 25 October 2016:
   - Pacific Highway / Albany Street (signals)
   - Pacific Highway / Oxley Street (signals)
   - Pacific Highway / Hume Street (signals)
   - Pacific Highway / Falcon Street (signals)
   - Clarke Street / Oxley Street (sign control)
   - Clarke Street / Hume Street (sign control)
2. Existing signal phasing was based on SCATS data obtained for the above signalised intersections.
3. Traffic volumes for the modelling are for total passenger car units (PCU), to take account of the heavy vehicle volumes.
4. Zero background traffic growth was assumed for future scenarios, based on nearby RMS traffic count stations indicating stable traffic volumes in the peak periods.
5. A sensitivity test was undertaken with +15% background traffic growth to understand potential future performance with additional traffic.
6. Scenarios modelled included the following:
   a. Scenario 0 – Existing 2016
   b. Scenario 1 – Future base layout (additional 2036 traffic & pedestrians but no physical changes)
   c. Scenario 2 – Future proposed layout (additional 2036 traffic & pedestrians)
   d. Scenario 3 – Sensitivity test with proposed layout
7. Civil works assumed in the future proposed layout (Scenario 2) and associated traffic and pedestrian modelling:
   - Additional crossing on the Northern approach of the Pacific Highway / Oxley Street intersection (this intersection)
   - Crossing widening on the Eastern approach of the Pacific Highway / Oxley Street intersection (this intersection)
   - Crossing widening on the Southern approach of Pacific Highway / Oxley Street intersection (this intersection).

- Provision of an on-road cycleway on Hume Street between Nicholson Street and Clarke Street, removing a travel lane (adjacent intersection) and associated signal phasing changes would be included in Crows Nest Station WAD Package 02 - Technical Note (currently working in progress).

Figure 3 – Looking south along the Pacific Highway at the Oxley Street intersection.

Figure 4 – Looking east along Oxley Street at the Pacific Highway intersection.

5. Network Operations

Section 5 demonstrates how the WAD package meets the RMS KPI's of safety and traffic flow efficiency. This has been done with reference to the criteria below.

5.1. Traffic & Pedestrian Demand

Traffic count data has been obtained from the 2016 Traffic surveys. The peak period vehicle flows were as follows:

Pacific Highway (between Oxley & Hume) southbound (AM/PM): 1,340 / 1,260 veh/hr
Pacific Highway (between Oxley & Hume) northbound (AM/PM): 1,340 / 1,130 veh/hr
Oxley Street (east of Highway) westbound (AM/PM): 173 / 142 veh/hr
Oxley Street (east of Highway) eastbound (AM/PM): 126 / 240 veh/hr

Pedestrian volumes (Nov 2015) from the EIS at the Pacific Highway / Oxley Street intersection are shown **Appendix 2**.

The forecast Crows Nest Metro station patronage demands were obtained from PTPM outputs and are consistent with the 2016 EIS volumes. The adopted patronage demand is as follows:

- AM passenger entries: 4,700 ped/hr (2036)
- AM passenger exits: 5,800 ped/hr (2036)

It was estimated from the EIS and Stage 1 design analysis that passengers will use the station entries in the following proportions:

- AM passenger entries and exits 2036 (Highway entry): 64% (6,760)

- AM passenger entries and exits 2036 (Clarke St entry): 36% (3,740)

The eastern marked pedestrian crossing of Oxley Street accommodates the bulk of pedestrian movement at the Pacific Highway / Oxley Street intersection, about 60% of total intersection pedestrian demand in 2015 (AM).

The southern marked pedestrian crossing of Pacific Highway accommodates the pedestrian movements travelling to and from the northbound bus stop and south western side of Pacific Highway.

The northern crossing of Pacific Highway accommodates the pedestrian movements travelling in a North West direction along Pacific Highway.

There is no widening proposed for the western crossing of Pacific Highway.

The forecast additional pedestrian volumes and modelling in the precinct necessitate the proposed additional crossing and widened marked foot crossings.

5.2. Network Efficiency

SIDRA network performance outputs for all scenarios are presented in **Appendix 3**. Implementing the proposed changes was assessed using SIDRA and observed to have minimal impact on overall network performance. Queueing along the Pacific Highway increases under all future 2036 scenarios and may spill over to adjacent intersections at the 95th percentile, however SIDRA network modelling indicated that network performance was not impacted. Implementation of the proposed works is expected to have negligible incremental impact, as is demonstrated by the performance of Scenario 2 relative to Scenario 1.

5.3. Pedestrian Safety

The additional signalised crossing will provide a formal, safe crossing point for an existing and future pedestrian desire line across the Pacific Highway at Oxley Street, significantly reducing the risk of conflict at the intersection. The widened crossing on Oxley Street will provide additional space and capacity for pedestrian movement along the Pacific Highway with consequent reductions in the risk of conflict at the intersection.

5.4. Intersection Operations

SIDRA intersection performance outputs for all scenarios are presented in **Appendix 3**. The results indicate that the intersection modifications will not significantly impact intersection operation. The intersection operates at level of service ‘A’ under existing conditions, as well as under future scenarios 1 and 2. Under the sensitivity test, the intersection is expected to operate at level of service ‘B’, with a degree of saturation greater than 1 in both peak periods.

5.5. Bus Operations

The proposed WAD works would not impact bus operations.

5.6. Crashes

TfNSW recorded crash data was analysed for the period July 2013 to June 2017 (inclusive). At the Pacific Highway / Oxley Street intersection there were four (4) crashes recorded in the four year survey period. One of the crashes was a 'hit pedestrian' crash. Two of the crashes were 'intersection adjacent approaches' crashes. The other crash was a rear end crash. Two of the crashes resulted in injuries, including one major injury. The crash data is presented in **Appendix 4**.

5.7. Regulatory Signage

The proposed WAD works may require minor changes to regulatory, advisory or way finding signage and line marking at the Pacific Highway and Oxley Street intersection.

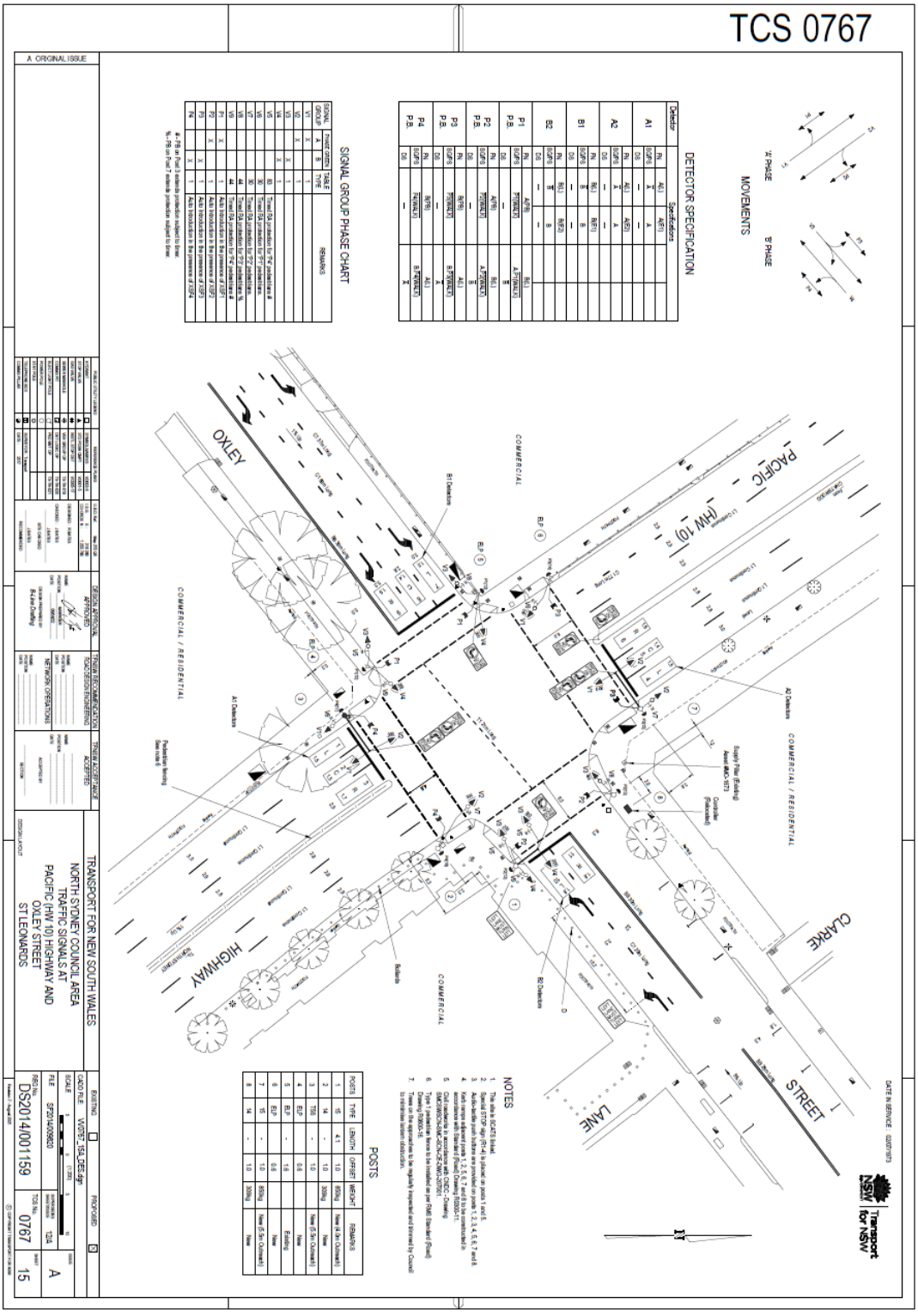
6. Conclusion

The proposed works are required on pedestrian accessibility, safety and capacity grounds. The additional crossing and increased marked foot crossing width will facilitate improved access to and from the Metro station entries and the Crows Nest activity centre. The changes will provide direct access, additional space and capacity for pedestrian movement with consequent reductions in the risk of conflict at the intersection.

SIDRA traffic modelling results indicate that the proposed works will not significantly impact on Pacific Highway or intersection operations.

The works require delivery via the Works Authorisation Deed (WAD) as they will impact traffic signal geometry and layout at the Pacific Highway / Oxley Street intersection. Initial analysis indicates the proposed works will result in improvements to intersection geometry and reduce the potential for vehicle/pedestrian conflict.

Appendix 1 – Traffic Control Signal design (proposed)



Traffic Control Signal TCS0767 Plan (proposed)

Appendix 2 – Existing (2015) Pedestrian Volumes (WSP)

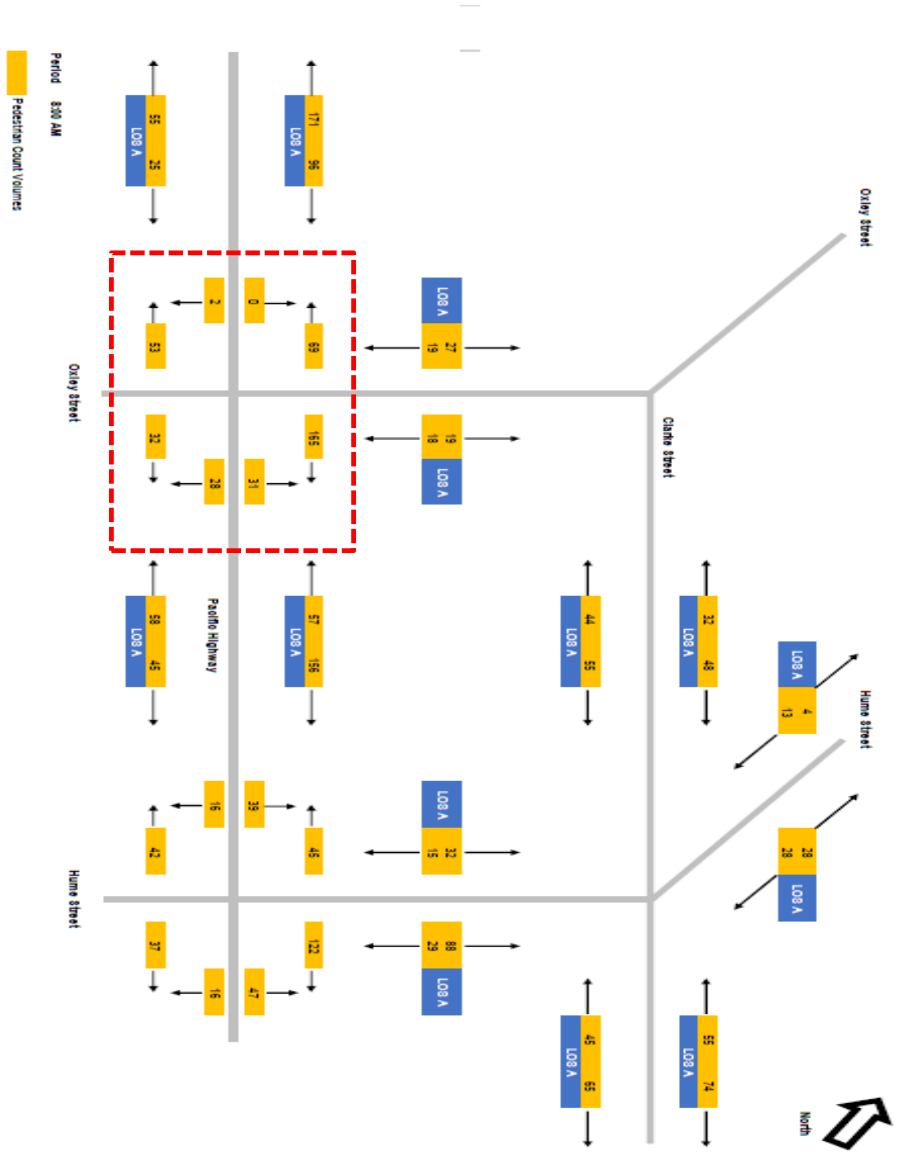


Figure 1.4 Crows Nest station – Background pedestrian counts AM peak hour

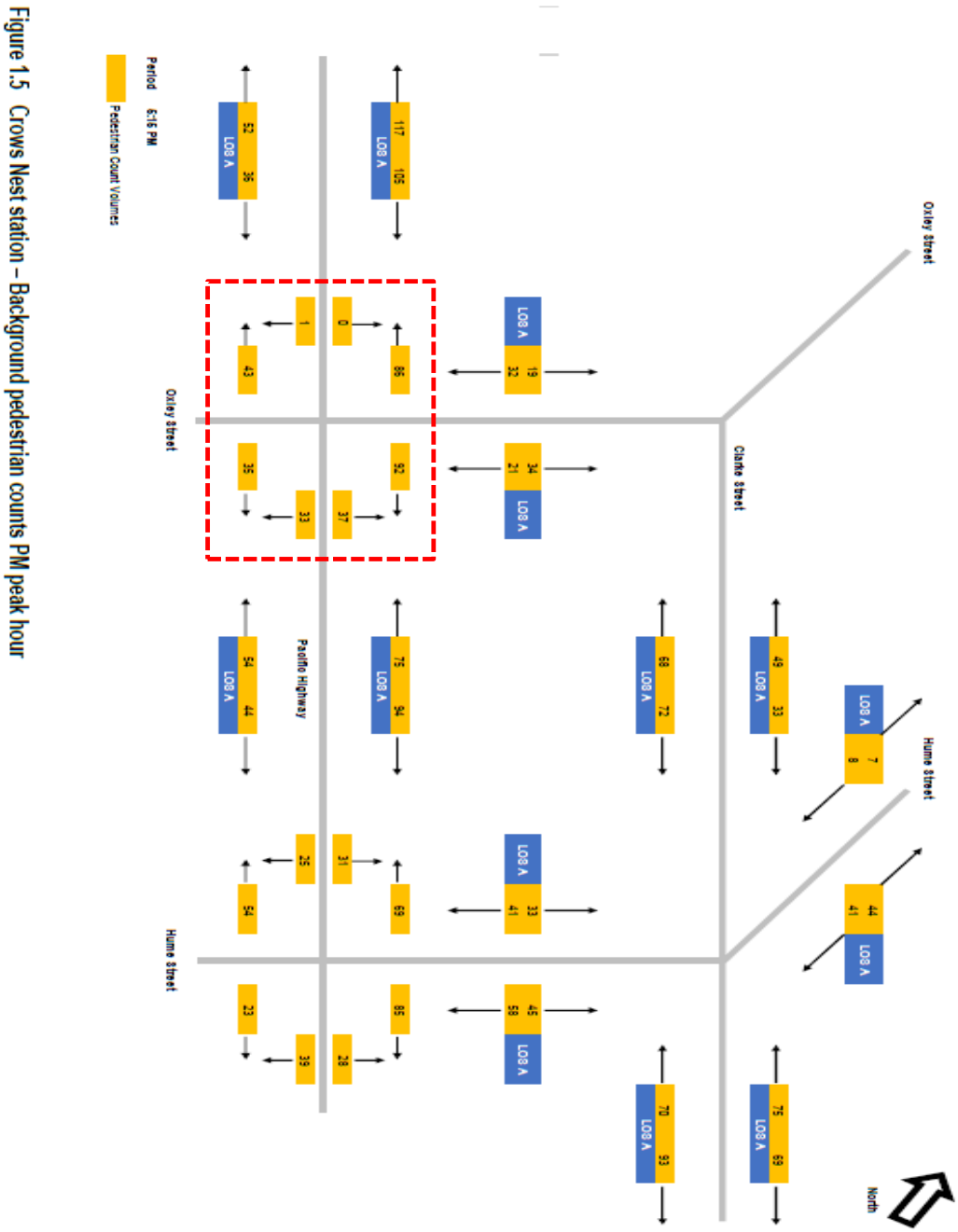
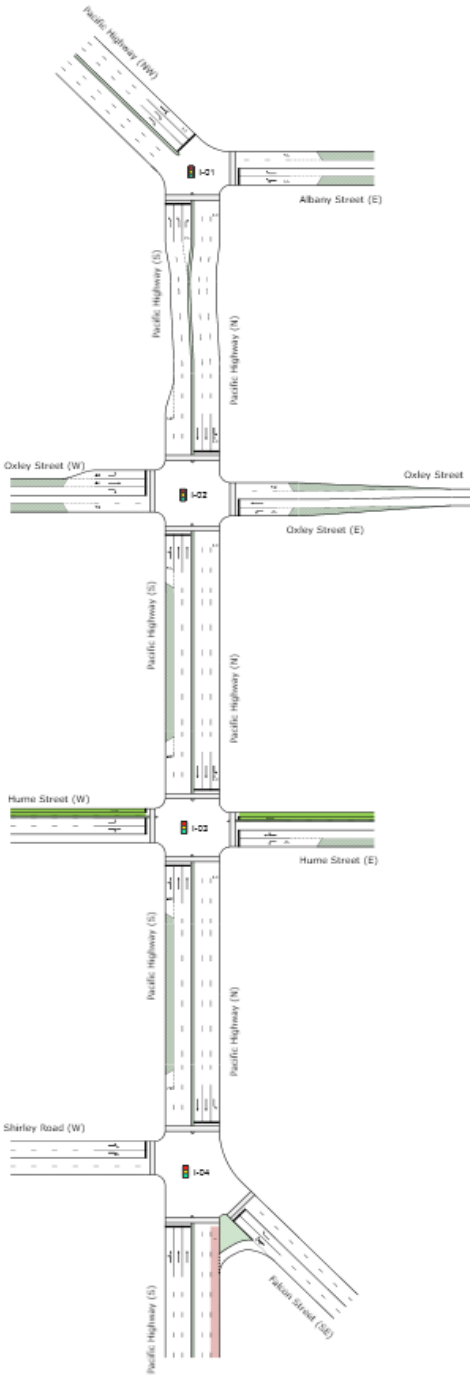


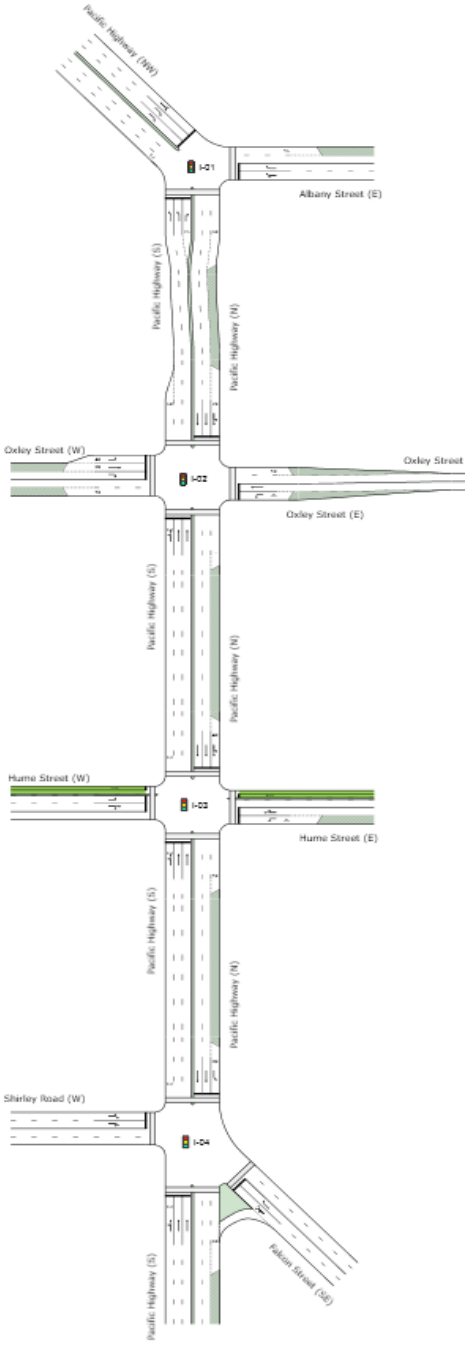
Figure 1.5 Crows Nest station – Background pedestrian counts PM peak hour

Appendix 3 – SIDRA Traffic Modelling Outputs & Checklist

Future Network Layout



AM Peak



PM Peak

Intersection Performance

Site ID	Intersection		Scenario	Peak	DoS	Ave. Delay	LoS	Queue
I-01	Pacific Highway / Albany Street	S0	2016 Existing	AM	0.88	27	B	170 (S)
		S1	Future Base		0.88	32	C	246 (NW)
		S2	Future Proposed		0.88	32	C	246 (NW)
		S3	S2+15% traffic		1.04	49	C	388 (NW)

Peak	DoS	Ave. Delay	LoS	Queue
PM	0.84	25	B	146 (S)
	0.88	28	B	175 (E)
	0.88	28	B	175 (E)
	0.88	29	C	222 (S)

Site ID	Intersection		Scenario	Peak	DoS	Ave. Delay	LoS	Queue
I-02	Pacific Highway / Oxley Street	S0	2016 Existing	AM	0.87	9	A	56 (E)
		S1	Future Base		0.84	10	A	67 (E)
		S2	Future Proposed		0.84	10	A	67(E)
		S3	S2+15% traffic		0.93	21	B	196 (S)

Peak	DoS	Ave. Delay	LoS	Queue
PM	0.82	12	A	75 (W)
	0.95	13	A	72 (W)
	0.95	14	A	72 (W)
	1.02	16	B	89 (S)

Site ID	Intersection		Scenario	Peak	DoS	Ave. Delay	LoS	Queue
I-03	Pacific Highway / Hume Street	S0	2016 Existing	AM	0.59	11	A	94 (S)
		S1	Future Base		0.64	13	A	98 (N)
		S2	Future Proposed		0.85	16	B	106 (N)
		S3	S2+15% traffic		1.75	53	D	299 (E)

Peak	DoS	Ave. Delay	LoS	Queue
PM	0.61	12	A	70 (N)
	0.87	15	B	95 (N)
	0.87	17	B	112 (N)
	0.87	17	B	137 (N)

Site ID	Intersection		Scenario	Peak	DoS	Ave. Delay	LoS	Queue
I-04	Pacific Highway / Falcon Street	S0	2016 Existing	AM	0.89	39	C	211 (N)
		S1	Future Base		0.89	38	C	223 (N)
		S2	Future Proposed		0.89	38	C	222 (N)
		S3	S2+15% traffic		1.53	117	F	614 (W)

Peak	DoS	Ave. Delay	LoS	Queue
PM	0.98	38	C	296 (SE)
	0.98	39	C	229 (SE)
	0.97	39	C	229 (SE)
	1.64	121	F	653 (W)

Network Performance

Network Performance AM Peak

Scenario		Network LoS	Travel Time Index	Travel Speed (km/h)	Degree of Saturation	Control Delay (total veh. Veh-h/h)
S0	2016 Existing	E	3.04	22	0.89	87.0
S1	Future Base	E	2.92	22	0.89	99.2
S2	Future Proposed	E	2.88	21.5	0.88	101.3
S3	S2+15% traffic	F	0.94	11.1	1.74	286.9

Network Performance PM Peak

Scenario		Network LoS	Travel Time Index	Travel Speed (km/h)	Degree of Saturation	Control Delay (total veh. Veh-h/h)
S0	2016 Existing	E	3.06	23	0.98	86.0
S1	Future Base	E	2.95	22	0.97	97.4
S2	Future Proposed	E	2.89	21.6	0.97	100.0
S3	S2+15% traffic	F	1.35	13.3	1.64	225.4

Movement summaries (Pacific Highway / Oxley Street)

AM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 EX AM-Pac Hwy||Oxley]

Network: 1 [Scenario 0 AM]

Pacific Highway / Oxley Street
2016 EX AM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 132 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	133	1.6	133	1.6	0.108	8.2	LOS A	1.0	7.0	0.12	0.59	0.12	39.7
2	T1	1278	4.8	1278	4.8	0.542	0.7	LOS A	2.0	14.9	0.05	0.05	0.05	55.1
Approach		1411	4.5	1411	4.5	0.542	1.4	LOS A	2.0	14.9	0.06	0.10	0.06	50.7
East: Oxley Street (E)														
4	L2	49	2.1	49	2.1	0.397	71.1	LOS F	3.2	22.8	1.00	0.75	1.00	4.0
5	T1	133	1.6	133	1.6	0.454	55.8	LOS D	7.9	56.1	0.96	0.77	0.96	15.3
Approach		182	1.7	182	1.7	0.454	60.0	LOS E	7.9	56.1	0.97	0.76	0.97	12.4
North: Pacific Highway (N)														
7	L2	54	3.9	54	3.9	0.092	8.6	LOS A	1.0	7.6	0.15	0.35	0.15	38.1
8	T1	1338	9.7	1338	9.7	0.458	0.8	LOS A	1.7	12.6	0.05	0.06	0.05	54.9
Approach		1392	9.5	1392	9.5	0.458	1.1	LOS A	1.7	12.6	0.05	0.07	0.05	54.0
West: Oxley Street (W)														
10	L2	62	8.5	62	8.5	0.286	59.4	LOS E	3.6	27.3	0.93	0.76	0.93	12.2
11	T1	79	1.3	79	1.3	0.867	61.5	LOS E	5.7	40.5	0.94	0.78	1.09	11.9
12	R2	52	2.0	52	2.0	0.867	83.0	LOS F	5.7	40.5	1.00	0.96	1.44	9.6
Approach		193	3.8	193	3.8	0.867	66.6	LOS E	5.7	40.5	0.95	0.82	1.13	11.3
All Vehicles		3177	6.5	3177	6.5	0.867	8.6	LOS A	7.9	56.1	0.16	0.17	0.17	32.2

PM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 EX PM-Pac Hwy||Oxley] **Network: 1 [Scenario 0 PM]**

Pacific Highway / Oxley Street
2016 EX PM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 130 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	64	0.0	64	0.0	0.083	8.7	LOS A	0.8	5.5	0.13	0.43	0.13	41.3
2	T1	1121	5.5	1121	5.5	0.414	1.2	LOS A	2.5	18.2	0.07	0.07	0.07	51.7
Approach		1185	5.2	1185	5.2	0.414	1.6	LOS A	2.5	18.2	0.07	0.09	0.07	49.9
East: Oxley Street (E)														
4	L2	61	0.0	61	0.0	0.305	63.7	LOS E	3.7	25.7	0.96	0.75	0.96	4.4
5	T1	88	1.2	88	1.2	0.238	48.0	LOS D	4.8	33.7	0.89	0.70	0.89	17.0
Approach		149	0.7	149	0.7	0.305	54.4	LOS D	4.8	33.7	0.92	0.72	0.92	12.0
North: Pacific Highway (N)														
7	L2	65	1.6	65	1.6	0.081	10.7	LOS A	1.2	8.7	0.21	0.47	0.21	31.5
8	T1	1143	3.3	1143	3.3	0.406	1.3	LOS A	2.2	15.6	0.07	0.07	0.07	52.7
Approach		1208	3.2	1208	3.2	0.406	1.8	LOS A	2.2	15.6	0.08	0.09	0.08	50.9
West: Oxley Street (W)														
10	L2	103	2.0	103	2.0	0.301	53.4	LOS D	5.7	40.3	0.90	0.77	0.90	13.2
11	T1	187	0.0	187	0.0	0.517	50.9	LOS D	10.7	75.0	0.94	0.78	0.94	13.9
12	R2	103	0.0	103	0.0	0.817	76.4	LOS F	7.2	50.3	1.00	0.94	1.30	10.1
Approach		394	0.5	394	0.5	0.817	58.3	LOS E	10.7	75.0	0.95	0.82	1.02	12.5
All Vehicles		2937	3.5	2937	3.5	0.817	12.0	LOS A	10.7	75.0	0.23	0.22	0.24	27.5

AM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 FU Base AM-Pac Hwy||Oxley] **Network: 1 [Scenario 1 AM]**

Pacific Highway / Oxley Street
Future Base AM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 132 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	133	1.6	133	1.6	0.142	8.5	LOS A	1.2	8.9	0.12	0.49	0.12	40.8
2	T1	1278	4.8	1278	4.8	0.710	2.3	LOS A	6.4	47.0	0.16	0.16	0.16	46.4
Approach		1411	4.5	1411	4.5	0.710	2.9	LOS A	6.4	47.0	0.15	0.19	0.15	45.0
East: Oxley Street (E)														
4	L2	140	0.8	140	0.8	0.778	72.6	LOS F	9.5	66.7	1.00	0.88	1.18	3.9
5	T1	133	1.6	133	1.6	0.378	51.5	LOS D	7.6	53.7	0.93	0.75	0.93	16.2
Approach		273	1.2	273	1.2	0.778	62.3	LOS E	9.5	66.7	0.96	0.82	1.05	9.8
North: Pacific Highway (N)														
7	L2	54	3.9	54	3.9	0.101	9.0	LOS A	1.1	8.3	0.15	0.34	0.15	37.6
8	T1	1428	9.1	1428	9.1	0.506	0.9	LOS A	2.0	14.9	0.06	0.06	0.06	54.2
Approach		1482	8.9	1482	8.9	0.506	1.2	LOS A	2.0	14.9	0.06	0.07	0.06	53.3
West: Oxley Street (W)														
10	L2	62	8.5	62	8.5	0.291	56.3	LOS D	3.6	26.7	0.91	0.76	0.91	12.7
11	T1	79	1.3	79	1.3	0.225	49.8	LOS D	4.4	30.8	0.89	0.70	0.89	14.2
12	R2	52	2.0	52	2.0	0.839	83.4	LOS F	3.7	26.7	1.00	0.89	1.43	9.4
Approach		193	3.8	193	3.8	0.839	60.9	LOS E	4.4	30.8	0.93	0.77	1.04	12.1
All Vehicles		3358	6.1	3358	6.1	0.839	10.3	LOS A	9.5	66.7	0.22	0.22	0.24	29.4

PM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 FU Base PM-Pac Hwy||Oxley] **Network: 1 [Scenario 1 PM]**

Pacific Highway / Oxley Street
Future Base PM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 130 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	64	0.0	64	0.0	0.090	9.2	LOS A	0.8	6.0	0.14	0.42	0.14	40.9
2	T1	1121	5.5	1121	5.5	0.449	1.3	LOS A	2.8	20.2	0.07	0.07	0.07	51.1
Approach		1185	5.2	1185	5.2	0.449	1.8	LOS A	2.8	20.2	0.07	0.09	0.07	49.4
East: Oxley Street (E)														
4	L2	144	0.0	144	0.0	0.561	62.2	LOS E	8.7	61.2	0.98	0.80	0.98	4.5
5	T1	88	1.2	88	1.2	0.205	44.2	LOS D	4.6	32.2	0.85	0.68	0.85	17.9
Approach		233	0.5	233	0.5	0.561	55.3	LOS D	8.7	61.2	0.93	0.75	0.93	9.6
North: Pacific Highway (N)														
7	L2	65	1.6	65	1.6	0.091	10.2	LOS A	1.1	7.9	0.18	0.44	0.18	32.8
8	T1	1226	3.1	1226	3.1	0.453	1.4	LOS A	2.5	18.1	0.07	0.08	0.07	52.0
Approach		1292	3.0	1292	3.0	0.453	1.9	LOS A	2.5	18.1	0.08	0.09	0.08	50.5
West: Oxley Street (W)														
10	L2	103	2.0	103	2.0	0.272	49.8	LOS D	5.4	38.7	0.87	0.77	0.87	13.9
11	T1	187	0.0	187	0.0	0.436	46.9	LOS D	10.2	71.7	0.91	0.75	0.91	14.8
12	R2	103	0.0	103	0.0	0.951	94.1	LOS F	8.1	57.0	1.00	1.09	1.65	8.5
Approach		394	0.5	394	0.5	0.951	60.0	LOS E	10.2	71.7	0.92	0.85	1.09	12.2
All Vehicles		3103	3.4	3103	3.4	0.951	13.2	LOS A	10.2	71.7	0.25	0.24	0.27	25.9

AM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 Proposed AM-Pac Hwy||Oxley] **Network: 1 [Scenario 2 AM]**

Pacific Highway / Oxley Street
Future Proposed AM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 132 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	133	1.6	133	1.6	0.136	7.0	LOS A	0.6	4.2	0.06	0.49	0.06	42.4
2	T1	1278	4.8	1278	4.8	0.682	1.2	LOS A	4.0	29.3	0.09	0.09	0.09	51.7
Approach		1411	4.5	1411	4.5	0.682	1.8	LOS A	4.0	29.3	0.08	0.13	0.08	49.3
East: Oxley Street (E)														
4	L2	140	0.8	140	0.8	0.778	72.6	LOS F	9.5	66.7	1.00	0.88	1.18	3.9
5	T1	133	1.6	133	1.6	0.378	51.5	LOS D	7.6	53.7	0.93	0.75	0.93	16.2
Approach		273	1.2	273	1.2	0.778	62.3	LOS E	9.5	66.7	0.96	0.82	1.05	9.8
North: Pacific Highway (N)														
7	L2	54	3.9	54	3.9	0.101	9.0	LOS A	1.1	8.3	0.15	0.34	0.15	37.6
8	T1	1428	9.1	1428	9.1	0.506	0.9	LOS A	2.0	14.9	0.06	0.06	0.06	54.2
Approach		1482	8.9	1482	8.9	0.506	1.2	LOS A	2.0	14.9	0.06	0.07	0.06	53.3
West: Oxley Street (W)														
10	L2	62	8.5	62	8.5	0.534	69.4	LOS E	4.0	30.4	0.99	0.77	0.99	10.8
11	T1	79	1.3	79	1.3	0.225	49.8	LOS D	4.4	30.8	0.89	0.70	0.89	14.2
12	R2	52	2.0	52	2.0	0.839	83.4	LOS F	3.7	26.7	1.00	0.89	1.43	9.4
Approach		193	3.8	193	3.8	0.839	65.1	LOS E	4.4	30.8	0.95	0.78	1.07	11.5
All Vehicles		3358	6.1	3358	6.1	0.839	10.1	LOS A	9.5	66.7	0.19	0.20	0.21	29.7

PM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 Proposed PM-Pac Hwy||Oxley] **Network: 1 [Scenario 2 PM]**

Pacific Highway / Oxley Street
Future Proposed PM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 130 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	64	0.0	64	0.0	0.094	6.7	LOS A	0.3	2.3	0.05	0.37	0.05	44.4
2	T1	1121	5.5	1121	5.5	0.472	1.7	LOS A	3.4	24.8	0.09	0.09	0.09	49.3
Approach		1185	5.2	1185	5.2	0.472	2.0	LOS A	3.4	24.8	0.09	0.11	0.09	48.6
East: Oxley Street (E)														
4	L2	144	0.0	144	0.0	0.561	62.2	LOS E	8.7	61.2	0.98	0.80	0.98	4.5
5	T1	88	1.2	88	1.2	0.205	44.2	LOS D	4.6	32.2	0.85	0.68	0.85	17.9
Approach		233	0.5	233	0.5	0.561	55.3	LOS D	8.7	61.2	0.93	0.75	0.93	9.6
North: Pacific Highway (N)														
7	L2	65	1.6	65	1.6	0.091	10.2	LOS A	1.1	7.9	0.18	0.44	0.18	32.8
8	T1	1226	3.1	1226	3.1	0.453	1.4	LOS A	2.5	18.1	0.07	0.08	0.07	52.0
Approach		1292	3.0	1292	3.0	0.453	1.9	LOS A	2.5	18.1	0.08	0.09	0.08	50.5
West: Oxley Street (W)														
10	L2	103	2.0	103	2.0	0.468	61.7	LOS E	6.2	44.2	0.97	0.79	0.97	11.8
11	T1	187	0.0	187	0.0	0.439	46.9	LOS D	10.2	71.7	0.91	0.75	0.91	14.8
12	R2	103	0.0	103	0.0	0.951	94.1	LOS F	8.1	57.0	1.00	1.09	1.65	8.5
Approach		394	0.5	394	0.5	0.951	63.1	LOS E	10.2	71.7	0.95	0.85	1.12	11.8
All Vehicles		3103	3.4	3103	3.4	0.951	13.7	LOS A	10.2	71.7	0.26	0.25	0.28	25.4

AM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 Proposed AM-Pac Hwy||Oxley] **Network: 1 [Scenario 3 AM]**

Pacific Highway / Oxley Street
Future Proposed AM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 132 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	153	1.4	149	1.4	0.182	7.3	LOS A	0.9	6.3	0.07	0.43	0.07	42.8
2	T1	1469	4.8	1435	4.9	0.908	24.5	LOS B	26.9	195.8	0.46	0.56	0.60	15.2
Approach		1622	4.5	1584[N1]	4.6	0.908	22.9	LOS B	26.9	195.8	0.43	0.55	0.55	17.8
East: Oxley Street (E)														
4	L2	147	0.7	147	0.7	0.844	75.2	LOS F	10.4	73.1	1.00	0.95	1.29	3.8
5	T1	153	1.4	153	1.4	0.386	49.0	LOS D	8.5	60.4	0.91	0.74	0.91	16.7
Approach		300	1.1	300	1.1	0.844	61.9	LOS E	10.4	73.1	0.95	0.84	1.10	10.1
North: Pacific Highway (N)														
7	L2	61	3.4	61	3.4	0.122	10.1	LOS A	1.1	8.1	0.18	0.43	0.18	33.2
8	T1	1629	9.2	1629	9.2	0.612	1.1	LOS A	2.9	22.2	0.07	0.07	0.07	53.7
Approach		1691	9.0	1690[N1]	9.0	0.612	1.4	LOS A	2.9	22.2	0.07	0.08	0.07	52.5
West: Oxley Street (W)														
10	L2	72	8.8	72	8.8	0.550	66.9	LOS E	4.6	34.6	0.99	0.79	0.99	11.1
11	T1	91	1.2	91	1.2	0.229	47.2	LOS D	4.9	34.4	0.88	0.69	0.88	14.7
12	R2	59	1.8	59	1.8	1.084	164.0	LOS F	6.4	45.8	1.00	1.18	2.22	5.1
Approach		221	3.8	221	3.8	1.084	84.7	LOS F	6.4	45.8	0.94	0.85	1.27	9.2
All Vehicles		3834	6.2	3794[N1]	6.2	1.084	20.0	LOS B	26.9	195.8	0.34	0.38	0.42	20.2

PM Peak

MOVEMENT SUMMARY

Site: I-02 [I-02 Proposed PM-Pac Hwy||Oxley] **Network: 1 [Scenario 3 PM]**

Pacific Highway / Oxley Street
Future Proposed PM
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 130 seconds (Network Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Pacific Highway (S)														
1	L2	74	0.0	73	0.0	0.133	8.8	LOS A	1.1	8.0	0.13	0.36	0.13	42.2
2	T1	1289	5.6	1273	5.6	0.663	4.0	LOS A	9.3	68.3	0.22	0.22	0.22	40.0
Approach		1363	5.3	1345N1	5.3	0.663	4.3	LOS A	9.3	68.3	0.22	0.23	0.22	40.3
East: Oxley Street (E)														
4	L2	154	0.0	154	0.0	0.543	58.0	LOS E	9.1	63.4	0.96	0.81	0.96	4.8
5	T1	101	1.0	101	1.0	0.199	40.0	LOS C	5.0	35.0	0.82	0.65	0.82	19.1
Approach		255	0.4	255	0.4	0.543	50.9	LOS D	9.1	63.4	0.90	0.75	0.90	10.5
North: Pacific Highway (N)														
7	L2	75	1.4	75	1.4	0.128	10.5	LOS A	1.5	10.4	0.17	0.40	0.17	33.2
8	T1	1399	3.2	1399	3.2	0.642	2.0	LOS A	4.4	32.0	0.11	0.11	0.11	49.3
Approach		1474	3.1	1474	3.1	0.642	2.4	LOS A	4.4	32.0	0.11	0.13	0.11	48.2
West: Oxley Street (W)														
10	L2	118	1.8	118	1.8	0.521	58.4	LOS E	7.0	49.7	0.96	0.80	0.96	12.3
11	T1	216	0.0	216	0.0	0.483	42.8	LOS D	11.3	79.4	0.88	0.73	0.88	15.7
12	R2	119	0.0	119	0.0	1.027	130.6	LOS F	11.5	80.4	1.00	1.26	1.92	6.4
Approach		453	0.5	453	0.5	1.027	70.0	LOS E	11.5	80.4	0.93	0.89	1.17	10.8
All Vehicles		3544	3.4	3526N1	3.4	1.027	15.3	LOS B	11.5	80.4	0.32	0.31	0.35	23.8

Crows Nest SIDRA traffic analysis checklist
Site Visit: 25 October 2016 by Chris Chun
Model Name/Revision: CN - Scenario X RevC
Date of checklist: 19 September 2019

No.	Topic	Sub Topic	Status	Response
0	**General setting**			
0a		Current setup – "New South Wales"	✓	Checked
0b		Parameter Settings - Site level of service method – "Delay (RTA NSW)"	✓	Checked
0c		Confirm original data source (traffic/pedestrian volume, signal timing)	✓	• Existing traffic data at intersections was collected from the primary traffic surveys in October 2016. • Existing and future pedestrian volumes (Nov 2015) from the EIS at the Pacific Highway / Oxley Street intersection. • Intersection signal history data was obtained from the SCATS system for all signalised intersections within the study area.
0d		Calibration/validation process as per RMS modelling guidelines	✓	The validation process of the SIDRA models was undertaken by adopting SCATS signal control data. After the initial modelling results produced for base models, a calibration process was undertaken by matching the queueing vehicles and traffic behaviour observation from the peak hour site inspections.
0e		Pre analysis site visit (queue lengths, lane lengths, phasing, cycle times etc.)	✓	Site inspections were conducted during traffic surveys (Tuesday 25 October 2016) to make observations to assist with model development. While on site observations were made of: the function of the adjacent road network, existing traffic movement, traffic signal operation, pedestrian and cyclist movements and vehicle queuing.
0f		Software package and version	✓	Version 8.0.2.7846
1	**Intersection & Lane Geometry**			
1a		Approach and exit distances checked	✓	Network models were developed based on the geometry identified

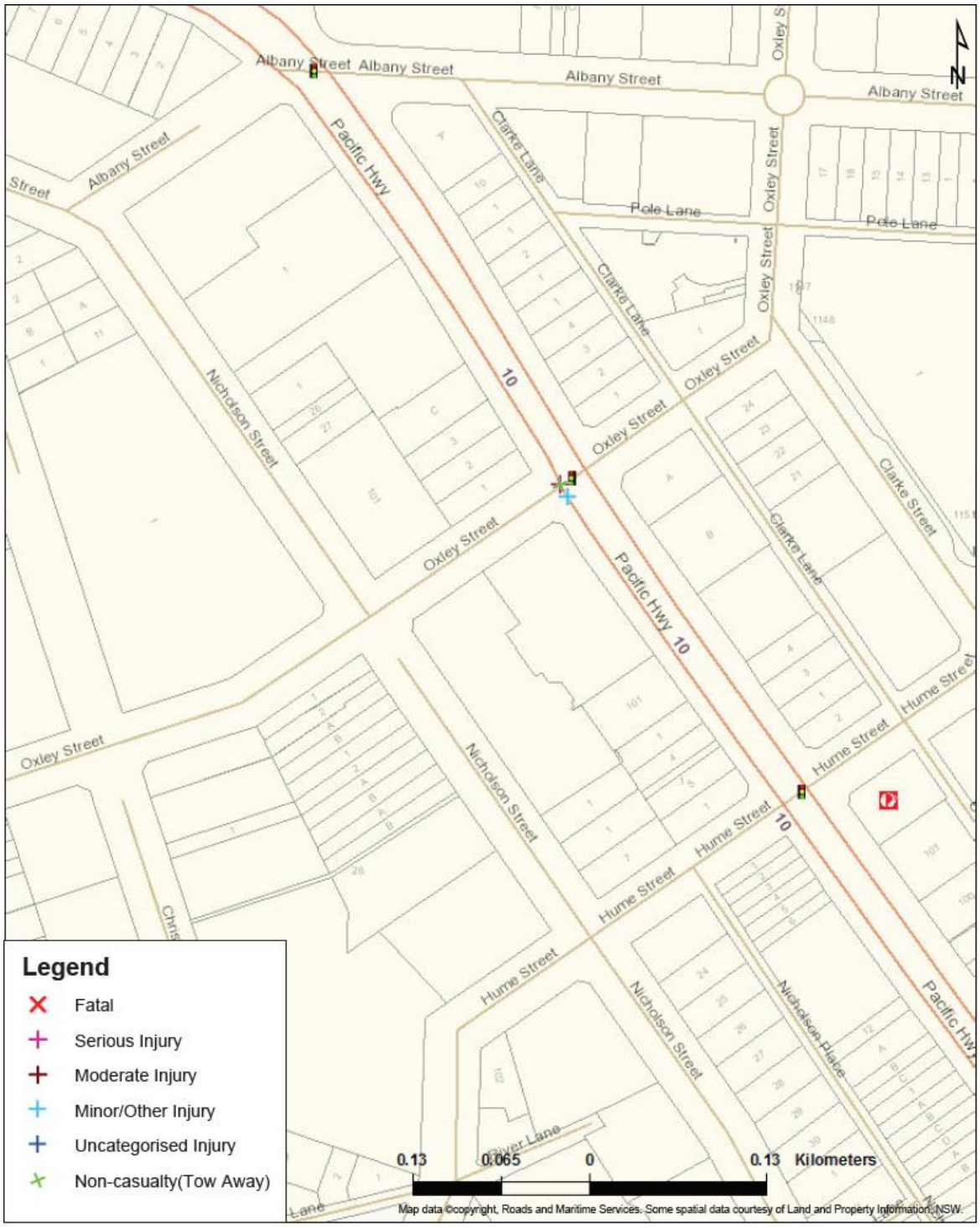
				in aerial imagery from Nearmap as well as observations from the site inspections.
1b		Arrivals profiles	✓	
1c		Length of short lane	✓	
1d		Median island	✓	
1e		Lane configuration	✓	
1f		Lane utilisation ratio	✓	Lane utilisation was adjusted based on observed traffic behaviour and lane use during the site inspection
1g		Lane discipline (for bus only lanes)	✓	
1h		Parking lane assumptions / coding	✓	Confirmed at site visit
2	**Movement Definitions**			
2a		Additional vehicles types	✓	
2b		Banned movements	✓	Confirmed at site visit
3	**Pedestrians**			
3a		Crossing location (full/slip lane)	✓	
3b		Volumes	✓	
3c		Crossing distance (if manual input required)	✓	Crossing distance was measured from Nearmap
3d		Walking speed – change to 1.2m/s	✓	Pedestrian walking speed of 1.2m/sec was adopted for all sites.
4	**Volumes**			
4a		Traffic data checked & fit for use?	✓	
4b		Pedestrian data checked & fit for use?	✓	
4c		Cyclist data checked & fit for use?	✓	
4d		HV, bus & other data checked?	✓	
4e		Peak flow factor	✓	Default parameters
4f		Growth rate applied / justification	✓	No background growth was assumed for future scenarios, based on nearby RMS traffic count stations indicating stable traffic volumes in the peak periods.
5	**Priorities**			
5a		Setting between traffic and pedestrians	✓	Priority was given to pedestrian crossing over turning traffic movements for signalised intersections.
6	**Gap acceptance**			
6a		Check if any parameters have been adjusted.	✓	Default parameters
7	**Vehicle movement data**			

7a		Applied speed	✓	Existing speed limit (60 or 50 km/h)
7b		Signal co-ord /common control group?	✓	Arrival types were coded to match the observed co-ordinated traffic flow between closely located signalised intersections. There is no common control group (CCG) operating within the developed network models
7c		Signals – applied start loss or late start	✓	Pedestrian protection time observed during site inspection was implemented in SIDRA models by allocating additional start/loss time for opposed turning movements.
8	**Phasing & Timing**			
8a		Applied cycle time / justification	✓	The signal phasing and cycle time of 132 seconds for AM peak and 130 seconds for PM Peak was utilised in SIDRA intersection modelling.
8b		Source of phasing information	✓	Intersection signal history data was obtained from the SCATS system for all signalised intersections within the study area. The signal sequences, timing and cycle times adopted in the existing base models were maintained in the future models. Where adjustments required, the phase times have been manually adjusted within the minimum and maximum phase times that are provided in the SCATS data to ensure each approach gets the appropriate green time. The overall cycle times remained unchanged.
8c		Phase transition	✓	Not required.
9	**Results**			
9a		Results in “Movement Summary” and “Lane Summary”	✓	Network model outputs were checked and reported
9b		Adopted cycle time setting in “Phasing Summary”	✓	
9c		Lane utilisation and Capacity adjustment % in “Lane Summary”	✓	
9d		Ensure sufficient delay time has been applied to traffic movement against pedestrian	✓	

		crossing in “Movement timing”		
9e				
10	**Network Model**			
10a		Site level of service method – “Delay (RTA NSW)”	✓	Checked
10b		Cycle time	✓	Network Site User-Given Phase Times of 132 seconds for AM Peak and 130 seconds for PM peak were applied at existing intersections.
10c		Signal offsets – Program or User given offsets	✓	Observed signal offset during site inspections were adopted in base models and this setting was retained unchanged for the future models
10d		Network routes	✓	
10e		Network configuration – check network layout	✓	
10f				

Appendix 4 – Crash Data

TfNSW CrashLink map (Centre for Road Safety) – all crashes at intersection of Pacific Highway and Oxley Street, 1 July 2013 to 30 June 2017.



Summary Crash Report

# Crash Type		
Car Crash	4	100.0%
Light Truck Crash	1	25.0%
Rigid Truck Crash	0	0.0%
Articulated Truck Crash	0	0.0%
*Heavy Truck Crash	*(0)*	*(0.0%)*
Bus Crash	0	0.0%
*Heavy Vehicle Crash	*(0)*	*(0.0%)*
Emergency Vehicle Crash	0	0.0%
Motorcycle Crash	0	0.0%
Pedal Cycle Crash	0	0.0%
Pedestrian Crash	1	25.0%

* Rigid or Artic. Truck " Heavy Truck or Heavy Bus
# These categories are NOT mutually exclusive

Location Type		
*Intersection	4	100.0%
Non intersection	0	0.0%

* Up to 10 metres from an intersection

Collision Type		
Single Vehicle	0	0.0%
Multi Vehicle	4	100.0%

Road Classification		
Freeway/Motorway	0	0.0%
State Highway	4	100.0%
Other Classified Road	0	0.0%
Unclassified Road	0	0.0%

Contributing Factors		
Speeding	0	0.0%
Fatigue	0	0.0%
Alcohol	0	0.0%

Weather		
Fine	3	75.0%
Rain	0	0.0%
Overcast	1	25.0%
Fog or mist	0	0.0%
Other	0	0.0%

Road Surface Condition		
Wet	0	0.0%
Dry	4	100.0%
Snow or ice	0	0.0%

Natural Lighting		
Dawn	0	0.0%
Daylight	3	75.0%
Dusk	1	25.0%
Darkness	0	0.0%

Intersection, adjacent approaches		
Head-on (not overtaking)	0	0.0%
Opposing vehicles; turning	0	0.0%
U-turn	0	0.0%
Rear-end	1	25.0%
Lane change	0	0.0%
Parallel lanes; turning	0	0.0%
Vehicle leaving driveway	0	0.0%
Overtaking; same direction	0	0.0%
Hit parked vehicle	0	0.0%
Hit railway train	0	0.0%
Hit pedestrian	1	25.0%
Permanent obstruction on road	0	0.0%
Hit animal	0	0.0%
Off road, on straight	0	0.0%
Off road on straight, hit object	0	0.0%
Out of control on straight	0	0.0%
Off road, on curve	0	0.0%
Off road on curve, hit object	0	0.0%
Out of control on curve	0	0.0%
Other crash type	0	0.0%

Speed Limit		
40 km/h or less	0	0.0%
50 km/h zone	0	0.0%
60 km/h zone	4	100.0%
70 km/h zone	0	0.0%
80 km/h zone	0	0.0%
90 km/h zone	0	0.0%
100 km/h zone	0	0.0%
110 km/h zone	0	0.0%

Day of the Week							
Monday	1	25.0%	Wednesday	1	25.0%	Friday	0
Tuesday	0	0.0%	Thursday	2	50.0%	Saturday	0

~ 40km/h or less	0	0.0%
~ 07:30-09:30 or 14:30-17:00 on school days	0	0.0%

~ School Travel Time Involvement	0	0.0%

#Holiday Periods							
New Year	0	0.0%	Easter	0	0.0%	Queen's BD	0
Aust. Day	0	0.0%	Anzac Day	0	0.0%	Labour Day	0

0.0%	Sunday	0	0.0%	Christmas	0	0.0%	Easter SH	0	0.0%	Sept./Oct. SH	1	25.0%
0.0%	WEEKEND	0	0.0%	January SH	0	0.0%	June/July SH	0	0.0%	December SH	1	25.0%

CRASHES		
Fatal	0	0.0%
Serious inj.	1	25.0%
Moderate inj.	0	0.0%
Minor/Other inj.	1	25.0%
Uncategorised inj.	0	0.0%
Non-casualty	2	50.0%

Self Reported Crash	0	0%

Time Group		% of Day
00:01 - 02:59	0	0.0%
03:00 - 04:59	0	0.0%
05:00 - 05:59	0	0.0%
06:00 - 06:59	0	0.0%
07:00 - 07:59	0	0.0%
08:00 - 08:59	0	0.0%
09:00 - 09:59	0	0.0%
10:00 - 10:59	0	0.0%
11:00 - 11:59	0	0.0%
12:00 - 12:59	0	0.0%
13:00 - 13:59	0	0.0%
14:00 - 14:59	1	25.0%
15:00 - 15:59	1	25.0%
16:00 - 16:59	1	25.0%
17:00 - 17:59	1	25.0%
18:00 - 18:59	0	0.0%
19:00 - 19:59	0	0.0%
20:00 - 21:59	0	0.0%
22:00 - 24:00	0	0.0%

Street Lighting Off/Nil	of	Dark	% of Dark
	0	in Dark	0.0%

CASUALTIES		
Killed	0	0.0%
Seriously inj.	1	50.0%
Moderately inj.	0	0.0%
Minor/Other inj.	1	50.0%
Uncategorised inj.	0	0.0%
^ Unrestrained	0	0.0%

^ Belt fitted but not worn, No restraint fitted to position OR No helmet worn

Crashes	Casualties
1 2017	1
1 2014	1
2 2013	0

McLean Periods		% Week
A	0	0.0% 17.9%
B	0	0.0% 7.1%
C	1	25.0% 17.9%
D	0	0.0% 3.5%
E	0	0.0% 3.6%
F	2	50.0% 10.7%
G	1	25.0% 7.1%
H	0	0.0% 7.1%
I	0	0.0% 12.5%
J	0	0.0% 10.7%

Session dataset North Sydney, Willoughby LGAs; all crashes for 01 Jul 2013 to 30 Jun 2017.

Note: *All crashes at intersection of Pacific Highway and Oxley Street, 1 July 2013 to 30 June 2017*

Crash self reporting, including self reported injuries began Oct 2014. Trends from 2014 are expected to vary from previous yrs. More unknowns are expected in self reported data.

Reporting yrs 1996-2004 and 2018 onwards contain uncategorised inj crashes.

Percentages are percentages of all crashes. Unknown values for each category are not shown on this report.

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