



Sydney Zoo – Improve Accessibility for Organised Tours during Pre-Opening Hours

Transport Impact Assessment

Prepared for:

Sydney Zoo Pty Ltd

20 December 2021

The Transport Planning Partnership

Sydney Zoo – Improve Accessibility for Organised Tours during Pre-Opening Hours

Transport Impact Assessment

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- A. SIDRA RESULTS
- B. 14.5M LONG RIGID BUS (COACH) SWEEP PATH ANALYSIS PREPARED BY NORTHROP

1 Introduction

1.1 Background

Sydney Zoo Pty Ltd has commissioned The Transport Planning Partnership Pty Ltd (TPPP) to prepare a Transport Impact Assessment report to amend the 300 person cap during the pre-opening hours.

Under the current approval, SSD7228 MOD3, the following consent conditions are imposed by DPIE on the Sydney Zoo in Bungaribee, NSW:

- *B10B. Private Zoo experiences / guided tours that take place outside of general opening hours are limited to a maximum patronage of 60 persons per tour*
- *B10C. The maximum number of visitors permitted on site for private zoo experiences / small group tours commencing between the hours of 7:30am and 9:00am is limited to a maximum total of 300 visitors.*

This development application seeks to amend these limitations.

1.2 Report Structure

The report assesses the traffic implications of the proposal and is set out as follows:

- Chapter 2 discusses the existing conditions including a description of the subject site
- Chapter 3 provides a brief description of the proposal
- Chapter 4 examines the traffic and parking implications
- Chapter 5 presents the conclusions of the assessment.

1.3 Referenced Documents

In preparing this report, reference has been made to the following documents:

- Sydney Zoo Bungaribee Precinct, Eastern Creek Transport Impact Assessment by GTA Consultants (GTA) dated 7 December 2015.
- Sydney Zoo Development, Response to Request for Information by GTA Consultants dated 14 April 2016.
- SSD 7228 Development Consent Conditions dated 8 September 2017 and subsequent modifications.
- Sydney Zoo, Operational Transport Management Plan by TPPP dated 8 February 2019.

2 Existing Conditions

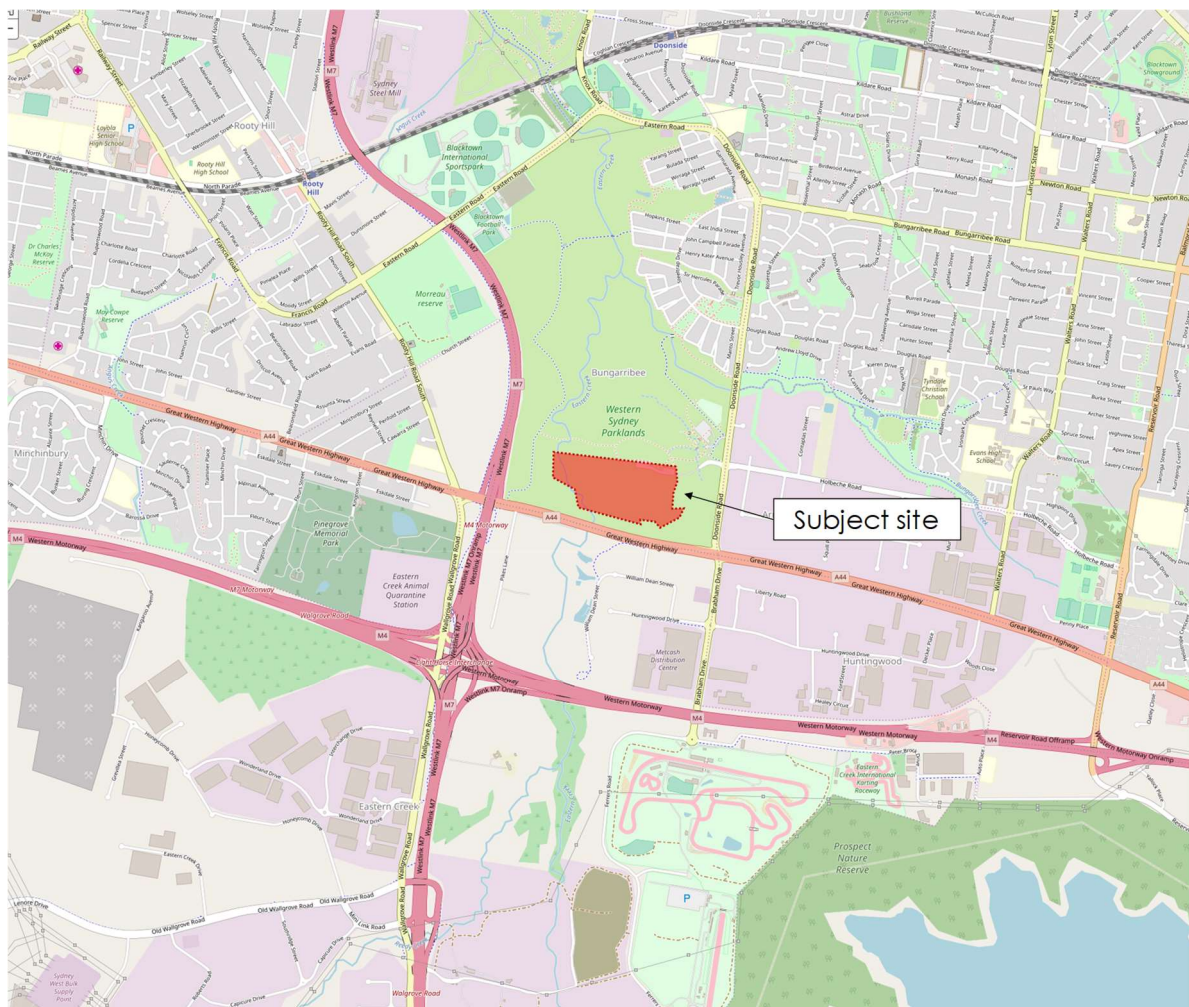
2.1 Subject Site

The subject site is located in the Western Sydney region approximately 6 km south-west of Blacktown CBD within the local government area of Blacktown City Council. The site comprises an area of approximately 16.5 ha within the Bungarrabee Precinct in the Western Sydney Parklands.

The site is bound by Doonside Road to the east and Great Western Highway to the south. Surrounding land uses consist of Western Sydney Parklands to the north, low-density residential dwellings to the north-east and Huntingwood industrial precinct to the east and south-east.

The location of the subject site and its surrounding environs are presented in Figure 2.1.

Figure 2.1: Site Locality



Basemap Source: ArcGIS

2.2 Car Park and Circulation

A car park with 476 formal car parking spaces and some 550 unmarked spaces with six coach parking spaces is provided at the site. Vehicle circulation throughout the formal car park is marked as one-way. The formal car park and area containing unmarked parking spaces are connected by a two-way circulation road as shown in Figure 2.2.

Figure 2.2: Car Park Circulation



Base Map Source: Aspect Studios

Aerial photos of the formal and informal car parks are provided in Figure 2.3 and Figure 2.4.

Figure 2.3: Formal Car Park

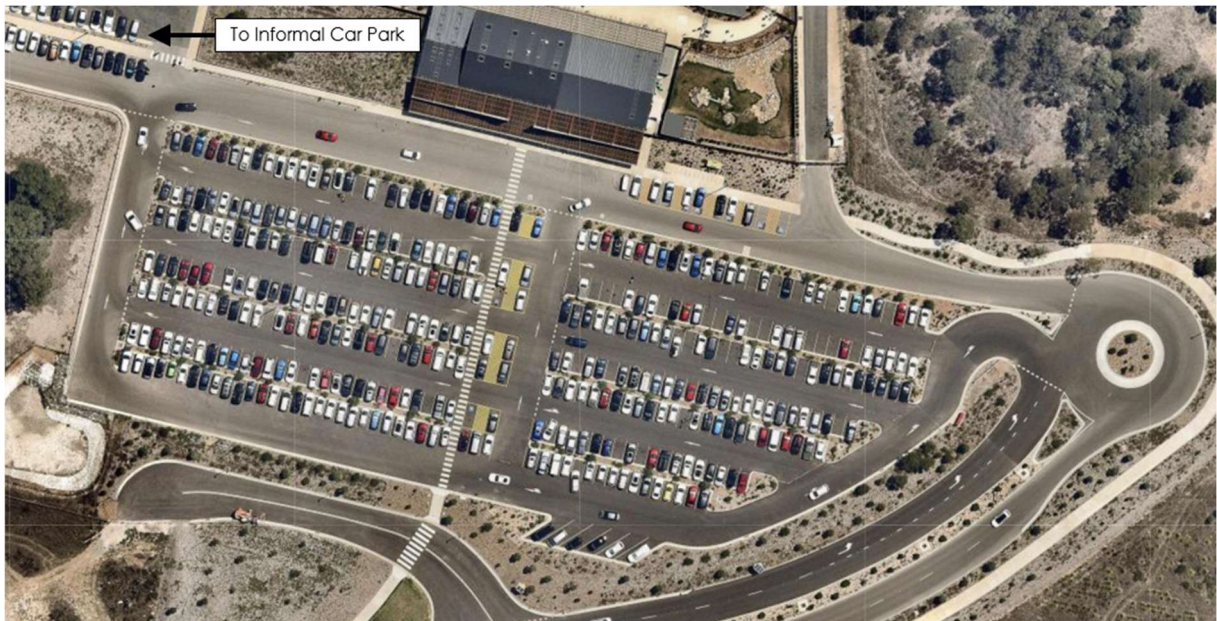


Figure 2.4: Informal Car Park



2.3 Surrounding Road Network

Great Western Highway (GWH) is a State Road that runs in an east-west direction through Sydney which carries traffic volumes in the order of 40,000 two-way vehicles daily. GWH connects to Sydney's key motorways including Westlink M7 and M4 Western Motorway (via Westlink M7). It has a speed limit of 80 km/h and there is no on-street parking permitted surrounding the subject site.

Sydney Zoo Access Road is a two-way local road which provides access to the subject site off GWH and forms the northern leg of the main signalised intersection adjacent to the site. The road is divided by a median and generally has one traffic lane in each direction. A posted speed limit along the access road is 30 km/h. On-street parking is not permitted at all times.

Rudders Street is a two-way local road that forms the southern leg of the signalised intersection used to access the subject site. It runs through the Huntingwood industrial precinct located on the south side of GWH. At the intersection with GWH, Rudders Street is a two-lane two-way road with a posted speed limit of 50 km/h. On-street parking is not permitted at all times.

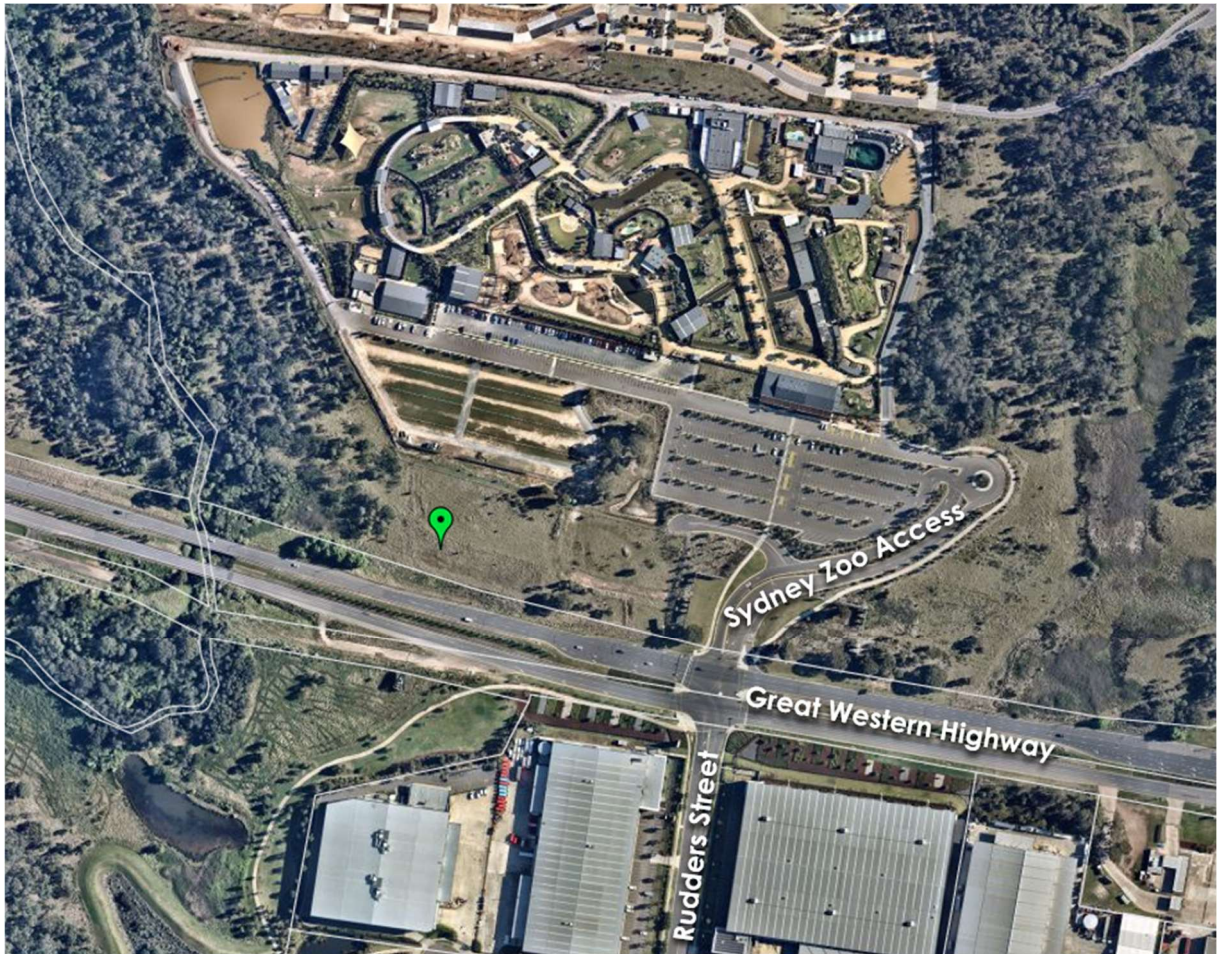
Doonside Road is a Regional Road with a four-lane two-way carriageway aligned in a north-south direction which can be used to access the Western Sydney Parklands. Parking is not permitted on Doonside Road in vicinity of the site. Doonside Road has a posted speed limit of 70 km/h.

2.4 Vehicle Access

Vehicle access to Sydney Zoo is via the northern leg of the intersection of GWH and Rudders Street. These roads intersect at a signalised junction where there is a dedicated left-turn lane (from GWH to the Sydney Zoo Access Road) and dedicated right-turn lane (from GWH to the Sydney Zoo Access Road) in the direction towards the Sydney Zoo.

The current layout of the signalised intersection of GWH and Sydney Zoo Access is presented in Figure 2.5.

Figure 2.5: Great Western Highway and Sydney Zoo Access Intersection



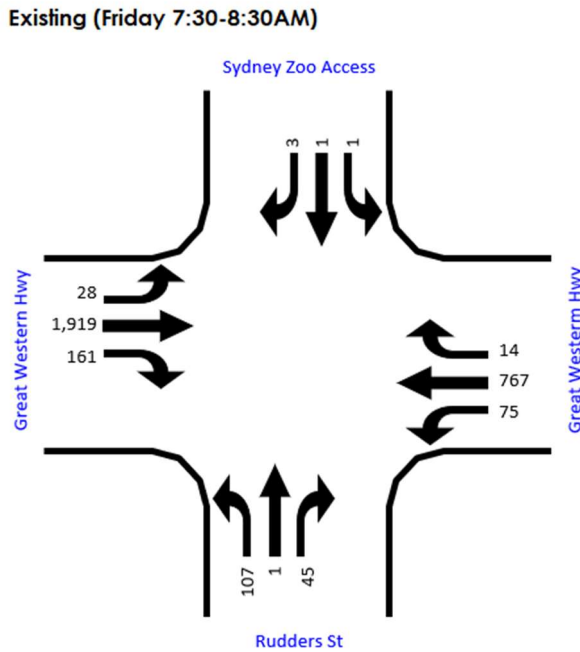
Base Map Source: Nearmap, aerial photo dated 3/12/2021

2.5 Existing Traffic Volumes

Traffic surveys were conducted on Friday 6 March 2020 between 7 to 9AM to determine the existing traffic passing through the intersection of GWH / Rudders Street/ Sydney Zoo Access.

Figure 2.6 represents the turning movements at the abovementioned intersection during the morning peak hour (7:30-8:30AM).

Figure 2.6: Intersection Volumes at GWH / Rudders Street/ Sydney Zoo Access



2.6 Intersection Operation

The existing operation of the GWH / Rudders Street/ Sydney Zoo Access intersection has been assessed using SIDRA Intersection 9, a computer-based modelling package which assesses intersection performance under prevailing traffic conditions.

SIDRA calculates intersection performance measures such as 'average delay' that vehicles encounter and the level of service (LoS). SIDRA provides analysis of the operating conditions which can be compared to the performance criteria set out in Table 2.1.

Table 2.1: Level of Service Criteria for Intersection Operation

Level of Service	Average Delay (seconds per vehicle)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	Less than 14	good operation	good operation
B	15 to 28	good with acceptable delays and spare capacity	acceptable delays and spare capacity
C	29 to 42	satisfactory	satisfactory, but accident study required
D	43 to 56	operating near capacity	near capacity and accident study required
E	57 to 70	at capacity At signals, incidents will cause excessive delays.	at capacity, requires other control mode
F	Greater than 71	unsatisfactory with excessive queuing	unsatisfactory with excessive queuing; requires other control mode

Source: Roads and Maritime Guide to Traffic Generating Developments, 2002

Table 2.2 presents a summary of the existing operation of the GWH / Rudders Street/ Sydney Zoo Access intersection.

Table 2.2: Existing Operating Conditions

Scenario	Weekday Morning Peak Hour (7:30-8:30AM)	
	Ave. Delay (s)	LoS
Existing (Friday 6/3/2020)	23	B

Table 2.2 indicates that the intersection operates at a good level of service (“B” with an average delay of 23 seconds) during a typical morning peak hour.

Detailed SIDRA results are included in **Appendix A**.

2.7 Public Transport

Doonside Railway Station is the nearest station to the subject site which is located approximately 4 km north of the site. The closest major station is Blacktown Railway Station which is around 6 km north-east of the site. Both stations are served by Sydney Trains T1 Western Line services which connects to other major centres including Penrith, Parramatta, and Sydney City. Blacktown Railway Station also interchanges with the T5 Cumberland Line and Intercity Blue Mountains Line (BML).

Transport interchanges exist at Blacktown Station and the nearby Westpoint Shopping Centre. The bus interchange at Westpoint is located a few minutes’ walk from Blacktown Station. Bus Route 729 (which is shown in Figure 2.7) operates between the bus interchanges and the subject site during weekdays and weekends. Bus stops for Bus Route 729 serving the subject site are located on GWH near the Sydney Zoo Access road as shown in Figure 2.8. These bus stops are located within 400m of Sydney Zoo which is equivalent to a five-minute walk.

Bus Route 723 services the Huntingwood industrial precinct on weekdays only. The service runs from the transport interchanges to bus stops on Rudders Street which are located approximately 200m walking distance from Sydney Zoo.

Bus routes departing Blacktown Transport Interchange and Westpoint Interchange provide links to surrounding suburbs including Mt Druitt, St Marys, Doonside, Rouse Hill, Prospect, Eastern Creek, Glenwood and Castle Hill. A snapshot of bus services at the interchanges is given in Figure 2.9.

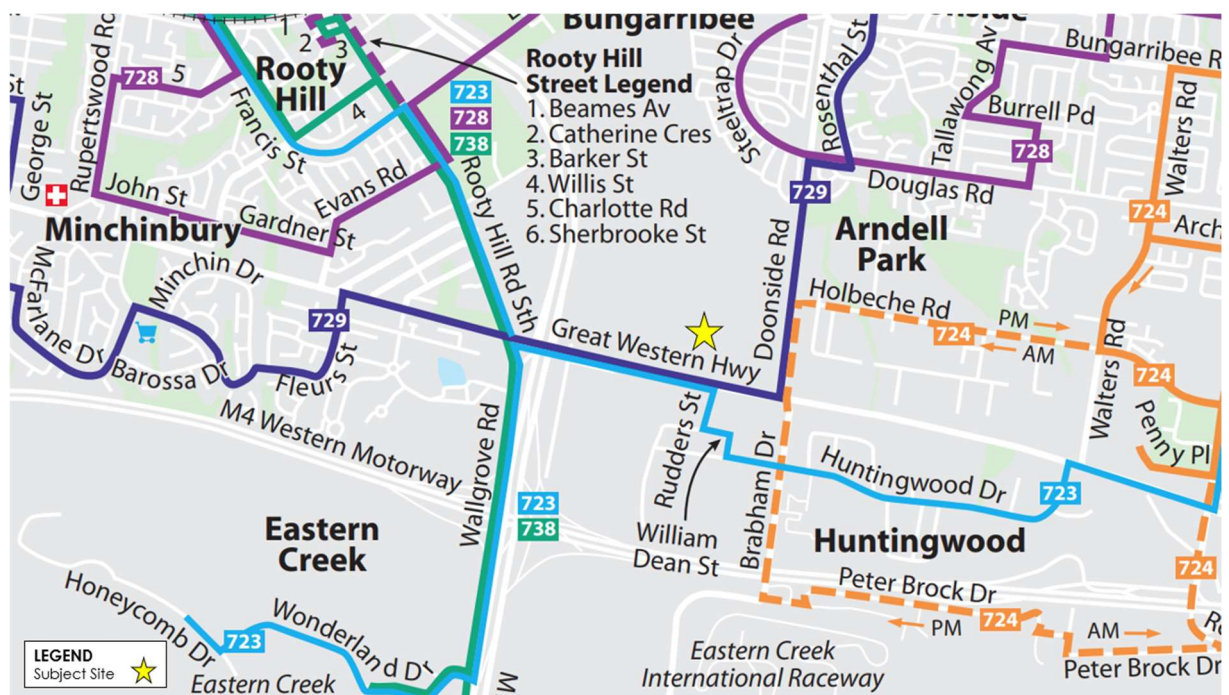
A summary of the public transport provisions surrounding the subject site is given in Table 2.3.

Table 2.3: Public Transport Services

Service	Route	Route Description	Location of Stop	Last Service		
				Weekday	Saturday	Sunday
Sydney Trains	T1	Emu Plains or Richmond to City	Doonside Station Blacktown Station	12:35 AM*	12:18 AM*	11:48 PM
		City to Emu Plains or Richmond		2:00 AM*	2:03 AM*	1:17 AM*
	T5	Richmond to Leppington	Blacktown Station	11:46 PM	12:11 AM*	12:11 AM*
		Leppington to Richmond		1:17 AM	12:55 AM	12:25 AM
NSW Trains	BMT	Bathurst to Central		11:46 PM	12:36 AM*	12:36 AM*
		Central to Bathurst		12:52 AM*	12:58AM*	12:58AM*
Busways Western Sydney	729	Mount Druitt to Blacktown via Minchinbury	Stop ID: 276738 GWH opposite Rudders Street	10:55 PM	11:49 PM	8:35 PM
		Blacktown to Mount Druitt via Minchinbury	Stop ID: 276628 GWH before Rudders Street	10:43 PM	11:01 PM	8:06 PM
	723	Blacktown to Mount Druitt via Eastern Creek	Stop ID: 2766154 Rudders Street before GWH	9:06 PM	n/a	n/a
		Mount Druitt to Blacktown via Eastern Creek	Stop ID: 2766155 Rudders Street after GWH	7:57 PM	n/a	n/a

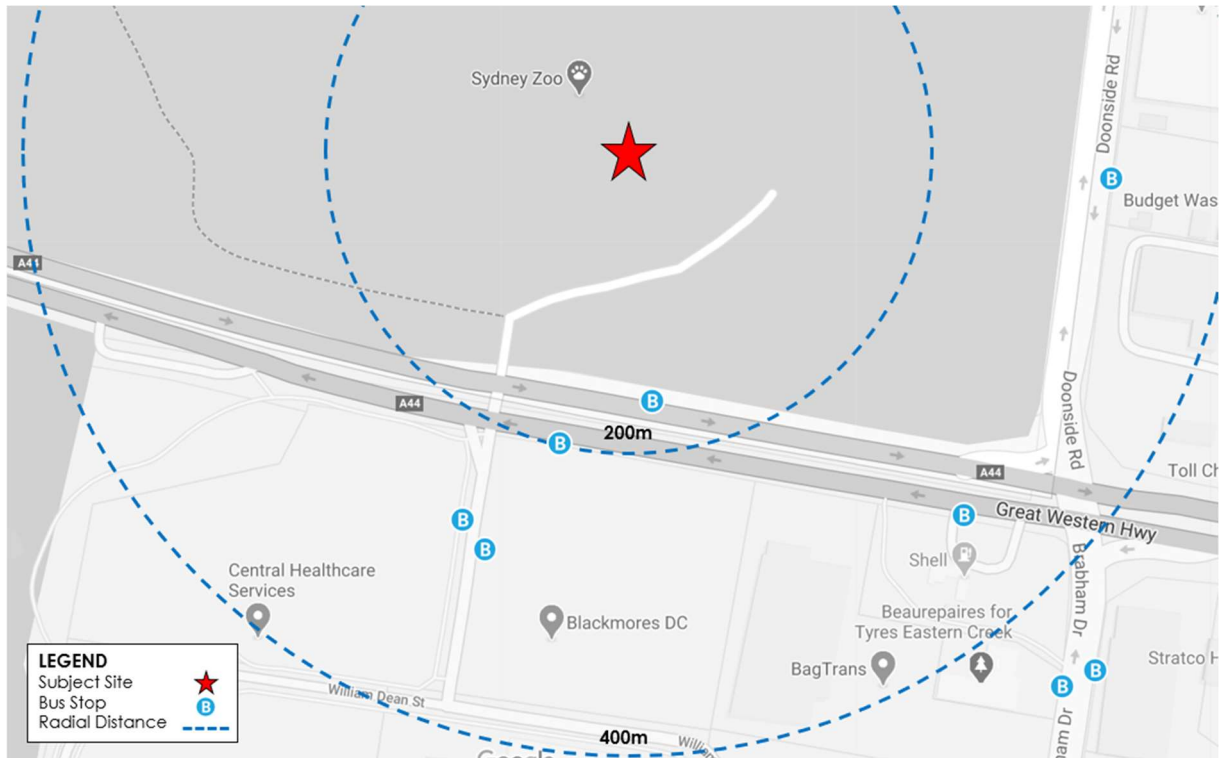
Source: General Transit Feed Specification, "*" indicates a service on the following day

Figure 2.7: Local Bus Network



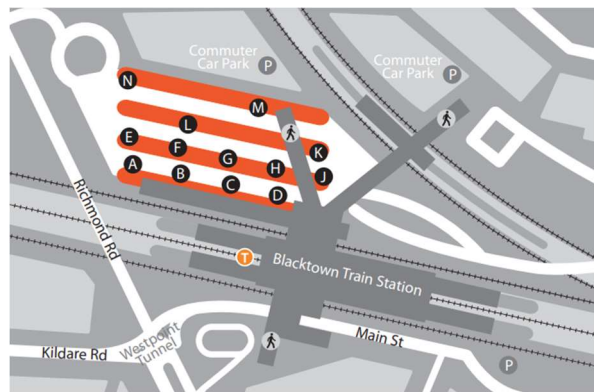
Source: Busways, viewed online 19/11/21

Figure 2.8: Nearby Bus Stops

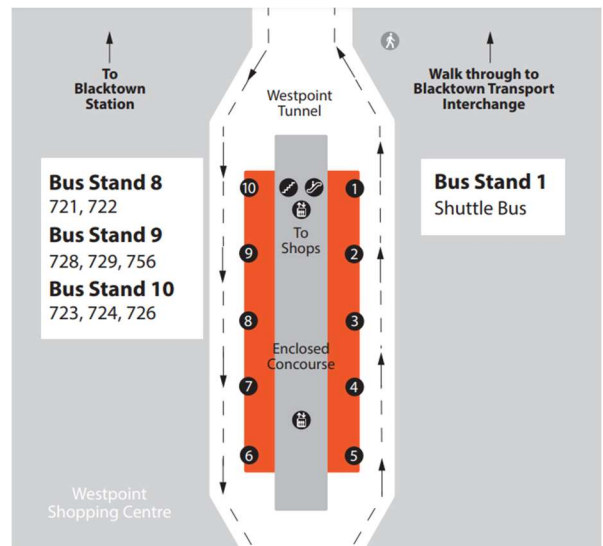


Base Map Source: Google Maps, viewed online 19/11/2021

Figure 2.9: Interchange Bus Services



Bus Stand A 752 Shuttle Bus	Bus Stand E 728, 729	Bus Stand N 743
Bus Stand B 753, 756	Bus Stand F 723, 724, 726	Bus Stand M 730, 731, 732, 734, 735, 744, S7
Bus Stand C 750, 751, 754	Bus Stand G 721, 722	



Source: Busways, viewed online 22/11/21

2.8 Pedestrian and Cycling

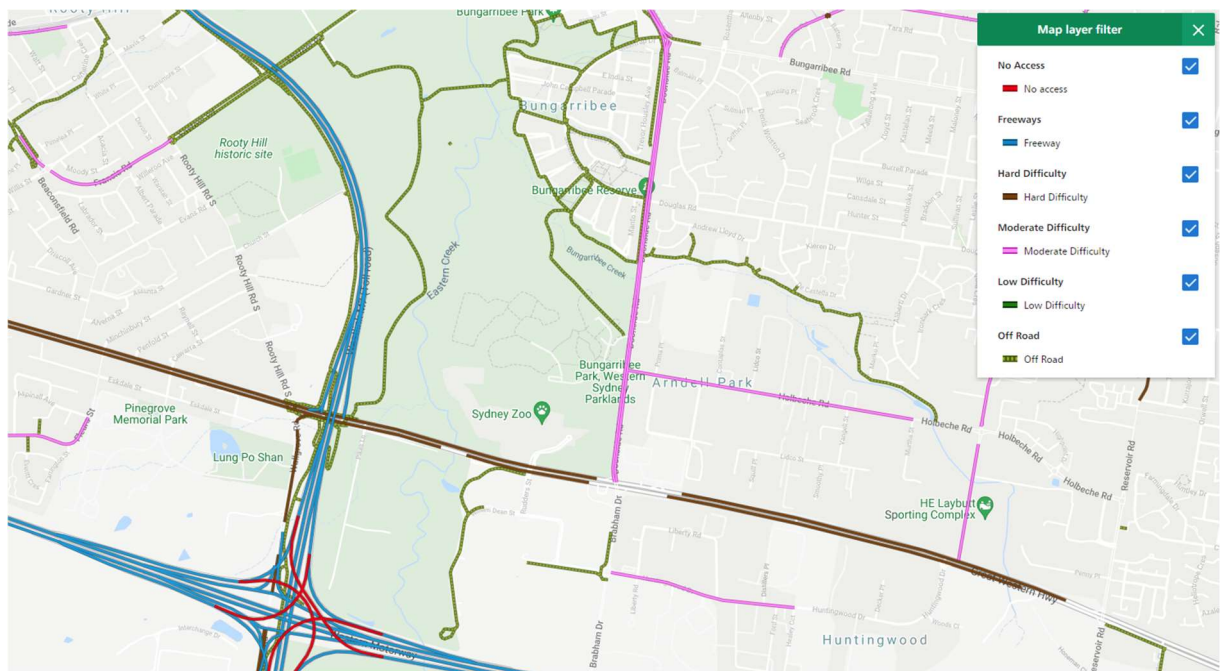
Pedestrian and cycling infrastructures are available in the vicinity of the subject site.

Pedestrian footpaths are provided on both sides of Rudders Street and are between 1.2 m – 2.2 m wide. Marked pedestrian crossings are provided on all legs of the nearby intersection of Rudders Street / Great Western Highway.

Pedestrian footpaths are provided on the Sydney Zoo Access Road, between the site and GWH, thus, providing pedestrian connectivity between Sydney Zoo and nearby bus stops.

The Roads and Maritime Services cycleway map indicates shared paths are available within the Western Sydney Parklands and along the Westlink M7. Cycling on Great Western Highway is classified as 'hard difficulty' as shown on the map in Figure 2.10.

Figure 2.10: Cycleway Map



Source: https://roads-waterways.transport.nsw.gov.au/maps/cycleway_finder (accessed 22/11/21)

3 Proposed Development

3.1 Improve Accessibility for Organised Tours during Pre-Opening Hours

Under the current approval, SSD7228 MOD3, the following consent conditions are imposed by DPIE on the Sydney Zoo in Bungaribee, NSW:

- *B10B. Private Zoo experiences / guided tours that take place outside of general opening hours are limited to a maximum patronage of 60 persons per tour*
- *B10C. The maximum number of visitors permitted on site for private zoo experiences / small group tours commencing between the hours of 7:30am and 9:00am is limited to a maximum total of 300 visitors.*

The development application seeks to amend the existing 300 visitor cap conditions (Conditions B10B and B10C) prior to 9:00am to allow up to 1,500 visitors to attend the private zoo experience/ small group tours commencing between 7:00am and 9:00am.

It is proposed to limit the 7:00am to 9:00am opening to the organised tours. Sydney Zoo will not trade to general public during this period.

3.2 Vehicle Access and Car Park

The current access arrangements and operation of the car park are discussed in Sections 2.2 and 2.4.

No changes are proposed to the current access arrangements and operation of the car park as part of this application.

4 Traffic and Parking Implications

4.1 Traffic Generation

Based on the information provided by Sydney Zoo, it is expected that up to 1,500 visitors could be attending the private zoo experience/ small group tours commencing before 9am.

It is proposed to limit the 7:00am to 9:00am opening to the organised tours. Hence, the majority of visitors will be as part of organised tours and will be transported to/from Sydney Zoo by private coaches.

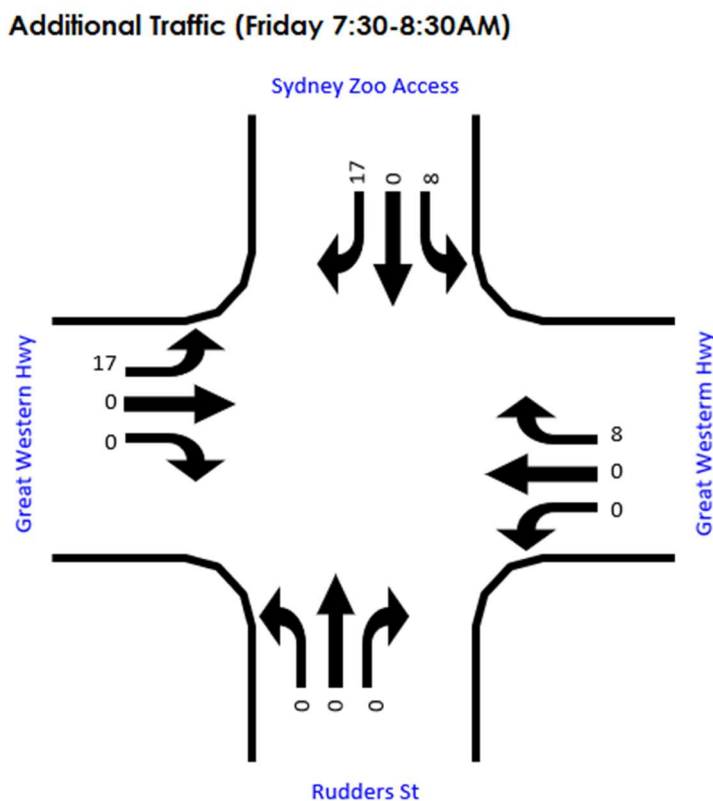
Sydney Zoo will not trade to general public during this period. Therefore, it is expected the vast majority of visitors would travel via a coach/ bus.

This would equate to a traffic generation of 25 coaches (assuming each coach will hold 60 persons) or 50 coach movements, that is, 25 inbound movements and 25 outbound movements.

The proposal would introduce an additional 50 coach movements onto the road network prior to 9:00am to accommodate the increase in visitors.

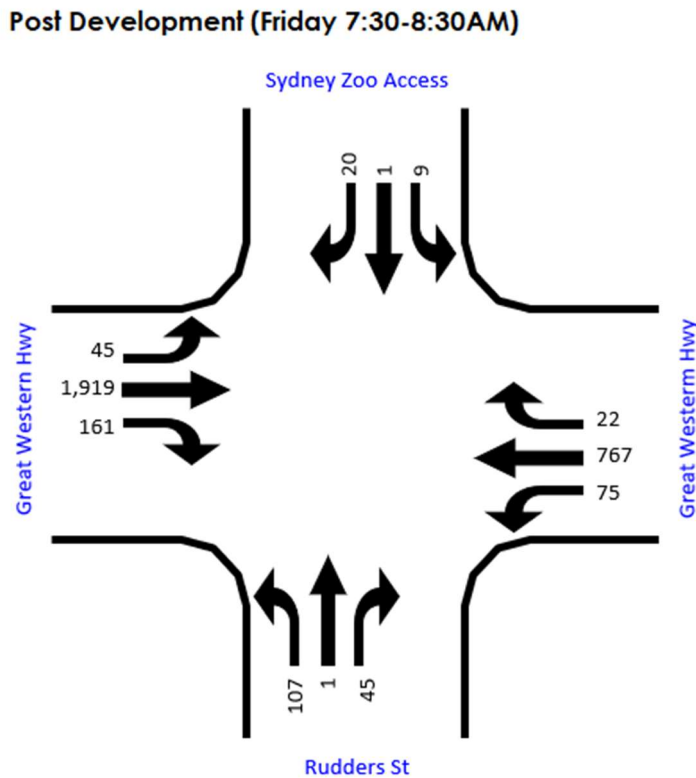
These movements have been distributed onto the road network based on existing movement proportions. Figure 4.1 shows the net increase in the intersection volume at GWH / Rudders Street as a result of the proposal.

Figure 4.1: Net Increase in Intersection Volumes at GWH/ Rudders Street/ Sydney Zoo Access



As such the total traffic movements as a result of the proposal are shown in Figure 4.2.

Figure 4.2: Post Development Intersection Volumes at GWH/ Rudders Street/ Sydney Zoo Access



4.2 Intersection Capacity

Intersection assessment has been undertaken using Figure 4.2 to produce post development scenarios.

Table 4.1 presents a summary of the existing and post development operation.

Table 4.1: Existing and Post Development Operating Conditions

Scenario	Weekday Morning Peak Hour (0730-0830)	
	Ave. Delay (s)	LoS
Existing	23	B
Existing with Development Traffic (i.e. 50 coach movements)	23	B

Table 4.1 indicates that GWH / Rudders Street/ Sydney Zoo Access intersection would operate satisfactorily with level of service of “B” during both existing and post development scenarios.

Detailed SIDRA results are included in **Appendix A**.

4.3 Parking Generation

Sydney Zoo car park has a total capacity of approximately 1,026 car parking spaces, that is 476 formal spaces with some 550 unmarked spaces, a layover area for six coaches and six minibus parking spaces as shown in Figure 2.2. The car park and coach parking areas can be accessed via Sydney Zoo Access Road off GWH.

Based on the information provided by Sydney Zoo, it is expected that up to 1,500 visitors could be attending the private zoo experience/ small group tours commencing before 9am.

This would equate to approximately 25 coaches (assuming each coach will hold 60 persons) during the pre-opening hours, that is, between 7:00 to 9:00am.

Assuming an average dwell time of approximately 10 minutes per coach, the current coach/bus layover area can accommodate up to 36 coaches per hour. Hence the current coach/bus layover area is sufficient to accommodate estimated generation of 25 coaches between 7:00 to 9:00am.

Swept path analysis for a 14.5m long rigid bus (coach) was undertaken as part of the Operational Traffic Management Plan, which shows that the vehicle would be able to adequately enter and exit the site, and circulate internal to the car park. The swept path plans previously prepared by Northrop have been included in **Appendix B**.

5 Conclusion

This report relates to the development application to amend the 300 person cap during the pre-opening hours.

Under the current approval, SSD7228 MOD3 Conditions B10B and B10C, *the maximum number of visitors permitted on site for private zoo experiences / small group tours commencing between the hours of 7:30am and 9:00am is limited to a maximum total of 300 visitors.* This development application seeks to amend these limitations.

The findings of this report are presented below.

- The existing vehicle access to Sydney Zoo is via the northern leg of the intersection of Great Western Highway/ Rudders Street/ Sydney Zoo Access.
- It is expected that up to 1,500 visitors could be attending the private zoo experience/ small group tours commencing before 9am.
- No changes are proposed to the current access arrangements and operation of the car park as part of this application.
- It is proposed to limit the 7:00am to 9:00am opening to the organised tours. Sydney Zoo will not trade to general public during this period. Hence, the majority of visitors will be as part of organised tours and will be transported to/from Sydney Zoo by private coaches.
- For the purpose of this traffic assessment, it was conservatively assumed that all 1,500 visitors would arrive within the morning peak hour, that is, 7:30-8:30am. This would be accommodated by 25 buses/coaches.
- Based on above, peak traffic generation is 50 coach movements.
- Existing and post development analysis indicates that the Great Western Highway/ Rudders Street/ Sydney Zoo Access intersection would operate satisfactorily with level of service of "B" during the weekday morning peak hour.
- Sydney Zoo car park has a total capacity of approximately 1,026 car parking spaces, that is 476 formal spaces with some 550 unmarked spaces, a layover area for six coaches and six minibus parking spaces.
- Assuming an average dwell time of approximately 10 minutes per coach, the current coach/bus layover area can accommodate up to 36 coaches per hour. Hence the current coach/bus layover area is sufficient to accommodate estimated generation of 25 coaches between 7:00 to 9:00am.
- Swept path analysis for a 14.5m long rigid bus (coach) indicated that the vehicle would be able to adequately enter and exit the site, and circulate internal to the car park.

Overall, it is concluded that the proposed development is considered acceptable from a traffic and parking perspective and is not expected to result in any noticeable adverse traffic impacts on the surrounding road network.

Appendix A

SIDRA Results

MOVEMENT SUMMARY

Site: 4466 [AM_EX (Site Folder: General)]

Existing Friday AM Peak Hour (0730-0830)

Created by: CH

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Rudders St														
1	L2	107	32	113	29.9	0.231	44.3	LOS D	5.8	50.9	0.79	0.75	0.79	32.9
2	T1	1	1	1	100.0	0.231	40.6	LOS C	5.8	50.9	0.79	0.75	0.79	26.5
3	R2	45	6	47	13.3	0.298	70.4	LOS E	3.1	24.3	0.97	0.74	0.97	26.5
Approach		153	39	161	25.5	0.298	52.0	LOS D	5.8	50.9	0.84	0.75	0.84	30.7
East: Great Western Hwy														
4	L2	75	24	79	32.0	*0.297	29.7	LOS C	9.0	75.5	0.66	0.65	0.66	41.5
5	T1	767	124	807	16.2	0.391	25.5	LOS B	14.3	113.5	0.69	0.62	0.69	47.1
6	R2	14	2	15	14.3	*0.151	77.7	LOS F	1.0	7.9	0.98	0.69	0.98	22.2
Approach		856	150	901	17.5	0.391	26.7	LOS B	14.3	113.5	0.69	0.62	0.69	46.0
North: Sydney Zoo Access														
7	L2	2	2	2	100.0	0.006	10.6	LOS A	0.0	0.5	0.34	0.53	0.34	44.0
8	T1	2	2	2	100.0	0.019	64.8	LOS E	0.1	1.8	0.94	0.59	0.94	24.0
9	R2	4	2	4	50.0	0.016	67.9	LOS E	0.1	1.3	0.94	0.61	0.94	23.0
Approach		8	6	8	75.0	0.019	52.8	LOS D	0.1	1.8	0.79	0.59	0.79	26.4
West: Great Western Hwy														
10	L2	28	1	29	3.6	0.022	11.6	LOS A	0.5	3.8	0.28	0.65	0.28	46.0
11	T1	1919	162	2020	8.4	*0.581	15.3	LOS B	26.7	200.0	0.62	0.56	0.62	54.3
12	R2	161	39	169	24.2	0.378	58.0	LOS E	7.5	62.7	0.89	0.78	0.89	30.4
Approach		2108	202	2219	9.6	0.581	18.5	LOS B	26.7	200.0	0.63	0.58	0.63	51.2
All Vehicles		3125	397	3289	12.7	0.581	22.5	LOS B	26.7	200.0	0.66	0.60	0.66	48.0

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

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

Queue Model: SIDRA Standard.

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

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

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[Ped ped	Dist] m					
South: Rudders St												
P1	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	96.7	42.2	0.44
East: Great Western Hwy												
P21	Stage 1	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.6	35.5	0.39
P22	Stage 2	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36

North: Sydney Zoo Access												
P3 Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	99.6	45.9	0.46	
P3B Slip/ Bypass	50	53	29.4	LOS C	0.1	0.1	0.92	0.92	49.6	26.3	0.53	
West: Great Western Hwy												
P41 Stage 1	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	96.6	42.0	0.43	
P42 Stage 2	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36	
All Pedestrians	350	368	59.3	LOS E	0.2	0.2	0.95	0.95	87.4	36.6	0.42	

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: C:\Users\Charbel\Desktop\Misc\18313 Sydney Zoo\18313-AM-211102.sip9

MOVEMENT SUMMARY

Site: 4466 [AM_DEV (Site Folder: General)]

Existing Friday AM Peak Hour (0730-0830) + 25 Coaches

Created by: CH

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 140 seconds (Site User-Given Phase Times)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Rudders St														
1	L2	107	32	113	29.9	0.231	44.3	LOS D	5.8	50.9	0.79	0.75	0.79	32.9
2	T1	1	1	1	100.0	0.231	40.6	LOS C	5.8	50.9	0.79	0.75	0.79	26.5
3	R2	45	6	47	13.3	0.298	70.4	LOS E	3.1	24.3	0.97	0.74	0.97	26.5
Approach		153	39	161	25.5	0.298	52.0	LOS D	5.8	50.9	0.84	0.75	0.84	30.7
East: Great Western Hwy														
4	L2	75	24	79	32.0	* 0.297	29.7	LOS C	9.0	75.5	0.66	0.65	0.66	41.5
5	T1	767	124	807	16.2	0.391	25.5	LOS B	14.3	113.5	0.69	0.62	0.69	47.1
6	R2	21	9	22	43.4	* 0.273	79.3	LOS F	1.6	15.0	0.99	0.72	0.99	22.0
Approach		863	157	909	18.2	0.391	27.2	LOS B	14.3	113.5	0.70	0.62	0.70	45.6
North: Sydney Zoo Access														
7	L2	9	9	10	100.0	0.029	12.1	LOS A	0.2	2.4	0.36	0.59	0.36	45.4
8	T1	2	2	2	100.0	0.019	64.8	LOS E	0.1	1.8	0.94	0.59	0.94	24.0
9	R2	22	20	23	90.8	* 0.195	73.0	LOS F	1.3	17.2	0.96	0.70	0.96	22.6
Approach		33	31	35	93.9	0.195	55.5	LOS D	1.3	17.2	0.79	0.66	0.79	26.3
West: Great Western Hwy														
10	L2	46	19	48	41.0	0.045	11.8	LOS A	0.9	8.3	0.29	0.65	0.29	46.0
11	T1	1919	162	2020	8.4	* 0.585	15.3	LOS B	27.0	202.1	0.62	0.56	0.62	54.3
12	R2	161	39	169	24.2	0.378	58.0	LOS E	7.5	62.7	0.89	0.78	0.89	30.4
Approach		2126	220	2238	10.3	0.585	18.5	LOS B	27.0	202.1	0.63	0.58	0.63	51.1
All Vehicles		3175	447	3342	14.1	0.585	22.8	LOS B	27.0	202.1	0.66	0.60	0.66	47.7

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

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

Intersection and Approach LOS values are based on average delay for all vehicle movements.

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

Queue Model: SIDRA Standard.

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

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

* Critical Movement (Signal Timing)

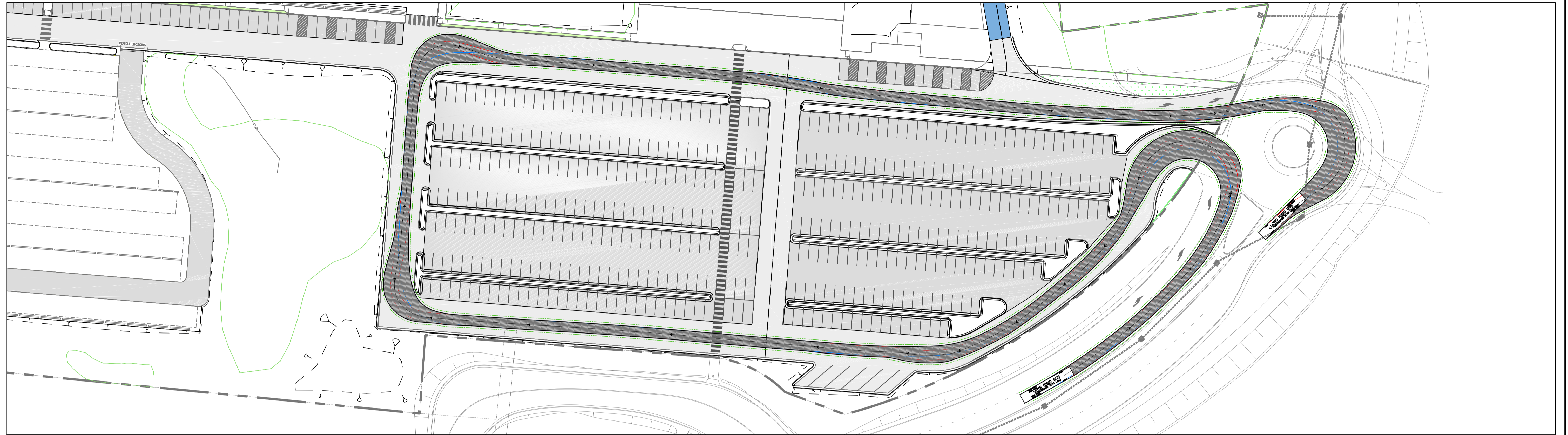
Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
						[Ped ped	Dist] m					
South: Rudders St												
P1	Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	96.7	42.2	0.44
East: Great Western Hwy												
P21	Stage 1	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	91.6	35.5	0.39
P22	Stage 2	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36

North: Sydney Zoo Access												
P3 Full	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	99.6	45.9	0.46	
P3B Slip/ Bypass	50	53	29.4	LOS C	0.1	0.1	0.92	0.92	49.6	26.3	0.53	
West: Great Western Hwy												
P41 Stage 1	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	96.6	42.0	0.43	
P42 Stage 2	50	53	64.3	LOS F	0.2	0.2	0.96	0.96	88.9	32.0	0.36	
All Pedestrians	350	368	59.3	LOS E	0.2	0.2	0.95	0.95	87.4	36.6	0.42	

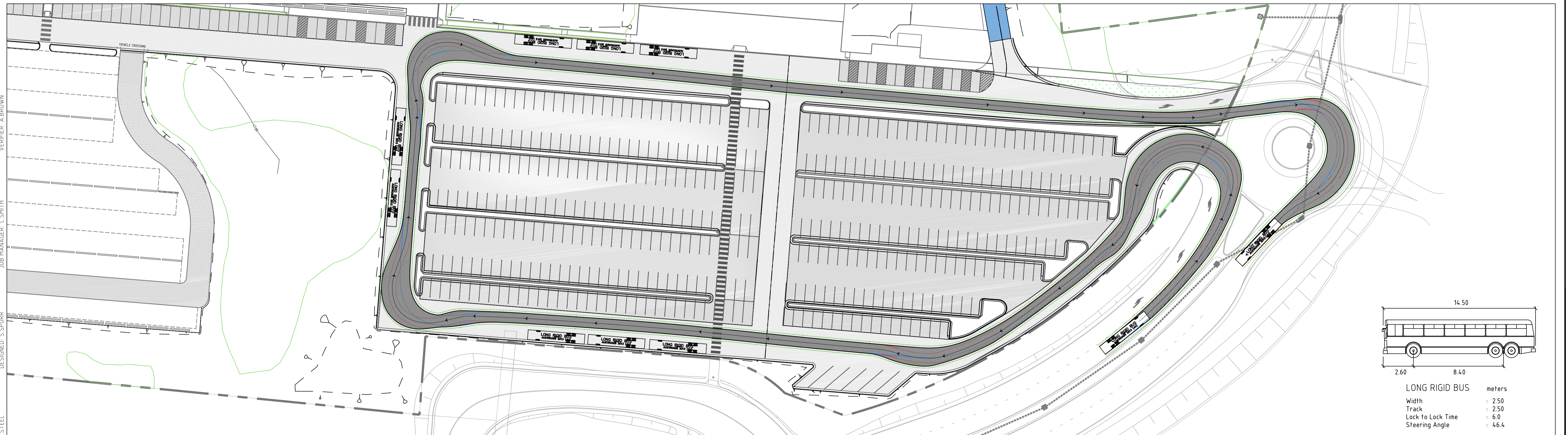
Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
 Pedestrian movement LOS values are based on average delay per pedestrian movement.
 Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Appendix B

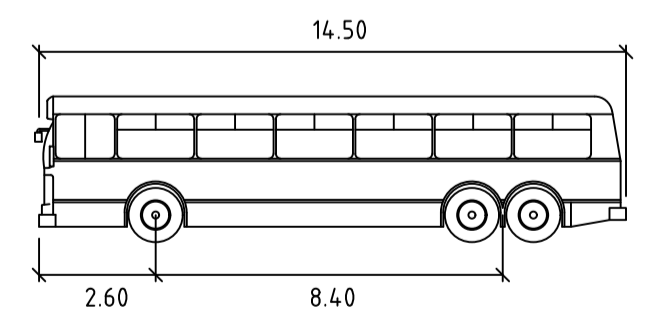
14.5m Long Rigid Bus (Coach) Swept Path Analysis
prepared by Northrop



LONG RIGID BUS 15km/h SWEPT PATH



LONG RIGID BUS 15km/h SWEPT PATH WITH ADDITIONAL PARKED BUSES



LONG RIGID BUS		units
Width	: 2.50	meters
Track	: 2.50	meters
Lock to Lock Time	: 6.0	seconds
Steering Angle	: 46.4	degrees

DRAWN: L. STEEL, DESIGNED: S. SPURR, JOB MANAGER: C. SMITH, VERIFIER: A. BROWN

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE	CLIENT
A	ISSUED FOR INFORMATION	WC		CS	21.12.18	SYDNEY ZOO

CLIENT: **SYDNEY ZOO**

SYDNEY ZOO logo

SIGNATURE Project Management logo

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ARCHITECT: **ASPECT Studios™** and **MISHO ASSOCIATES**

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PLANS 1:500

0 5 10 15 20 25m

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PROJECT: **SYDNEY ZOO GREAT WESTERN HIGHWAY BUNGARRIBEE NSW**

DRAWING TITLE: **LONG RIGID BUS SWEPT PATH PLAN**

JOB NUMBER: **NL166192**

DRAWING NUMBER: **CC7.01** REVISION: **1**

DRAWING SHEET SIZE = A1

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