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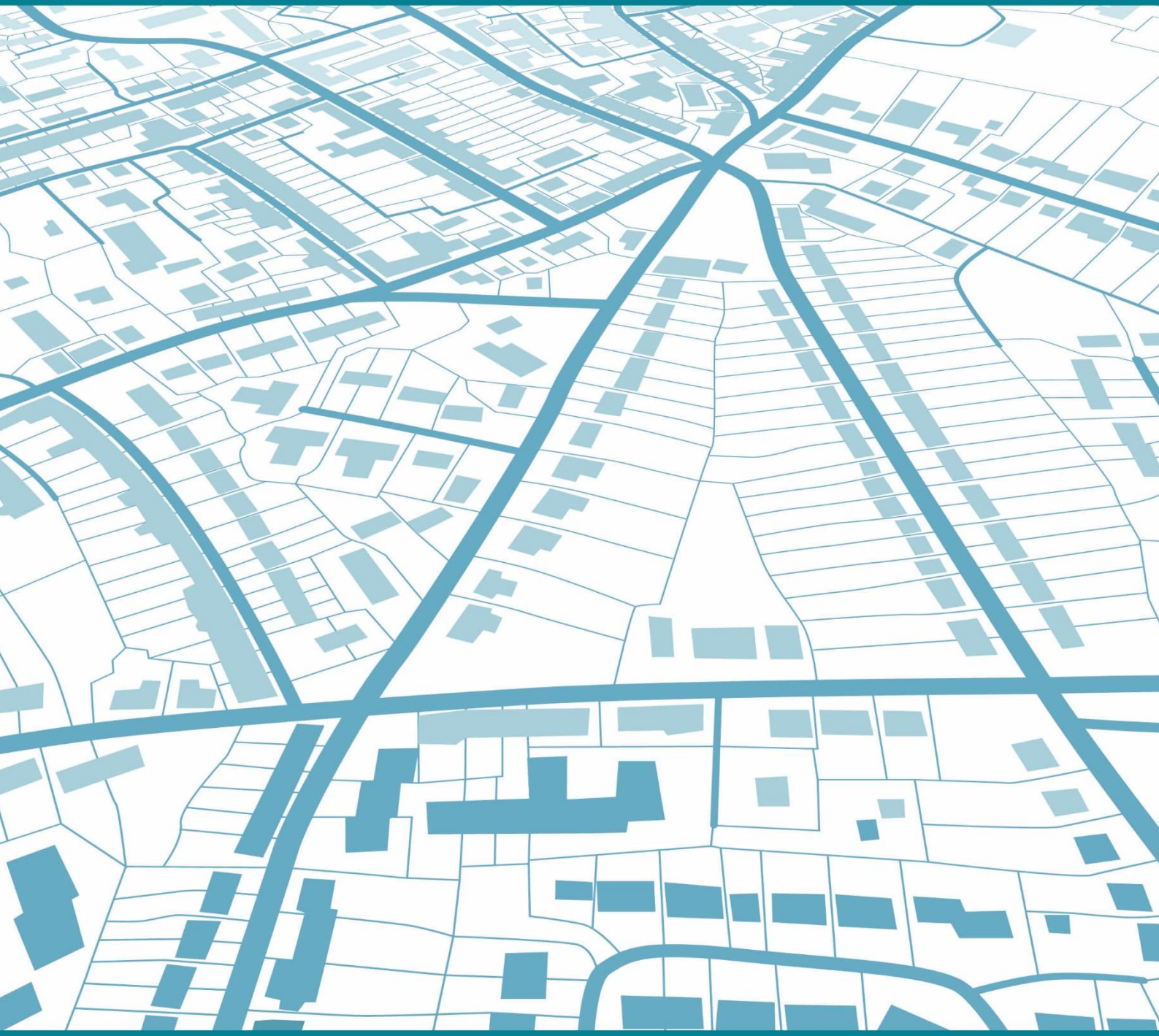


Proposed Bus Depot
21 Middleton Road, Cromer
Traffic and Parking Assessment

Ref: 20334
Date: December 2020
Issue: D

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

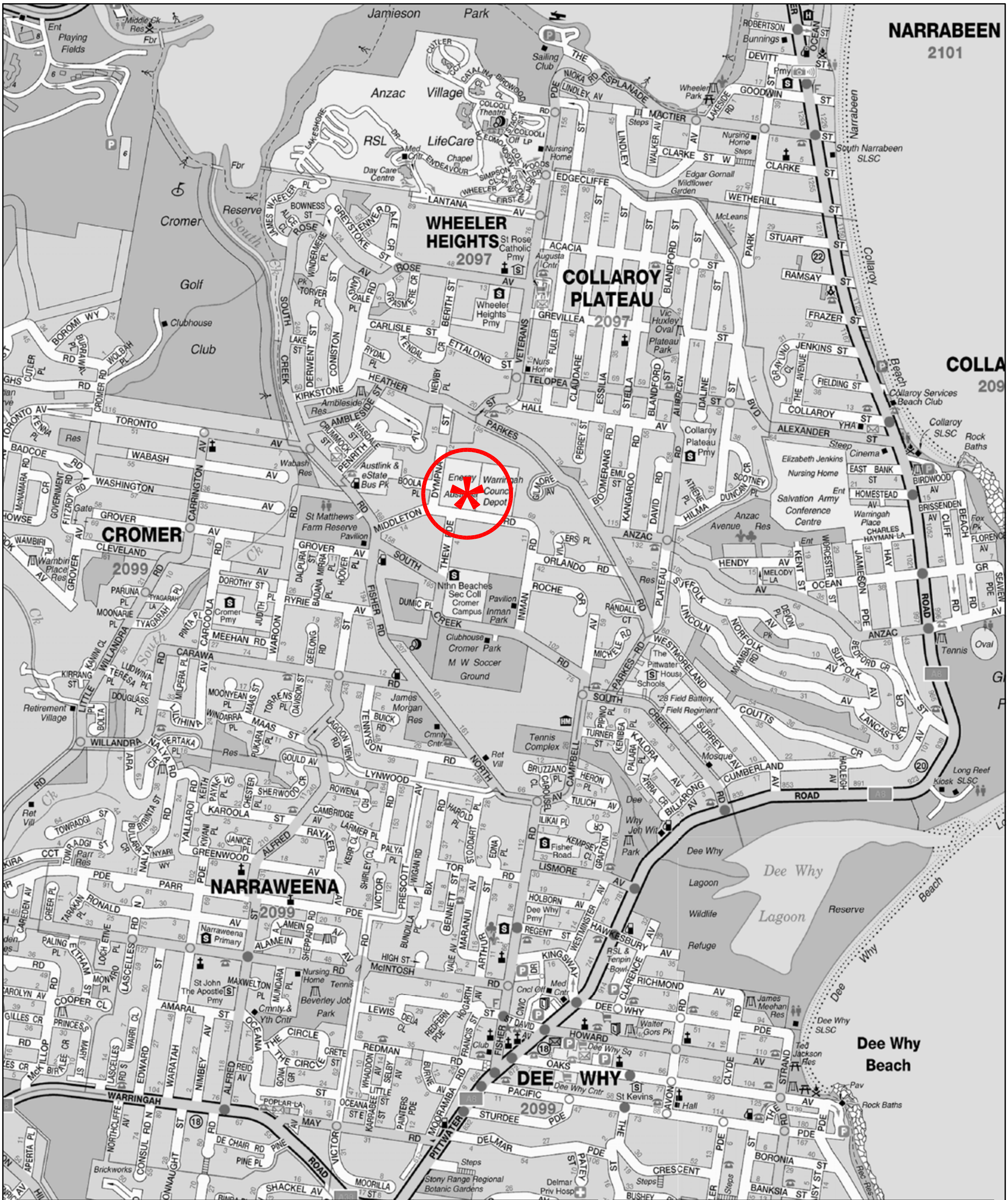
This report has been prepared for Comfort Delgro Corp. (CDC) to accompany a Development Application to Northern Beaches Council for a proposed Bus Depot in Middleton Road at Cromer (Figure 1).

CDC commenced operations in Australia in 2005 and currently operates in NSW, Victoria and Western Australia with a total fleet of some 3500 buses, coaches, taxis and ambulances. The company purchased the former Forest Coach Lines business in 2018 and this increased its NSW fleet to some 1460 vehicles.

CDC until quite recently operate a charter bus depot on part of the former Roche site in Inman Road at Cromer for 34 buses (see details overleaf); however, that site, apart from being inadequate (cramped and inflexible), is to be redeveloped. As a result, CDC now proposes to acquire part of the nearby large Ausgrid site to provide an upgraded facility that retains the convenient access for buses servicing the central and northern parts of the Northern Beaches Peninsula.

The purpose of this report is to:

- describe the site, its context and the proposed development scheme
- describe the road network serving the site and the existing traffic conditions
- assess the access circumstances for the site
- assess the potential traffic implications
- assess the adequacy of the proposed parking provision
- assess the proposed internal circulation and servicing arrangements



LEGEND

LOCATION

FIG 1


INMAN ROAD
FORMER BUS DEPOT

2.0 Proposed Development Scheme

2.1 Site, Context and Existing Circumstances

The development site (Figure 2) comprises the eastern part of the Ausgrid landholding (Lot 6 in DP771621) which occupies an area of 28,330m^2 on the corner of Middleton Road and Dympa Street in the central part of the Cromer Industrial area.

The proposed elongated generally rectangular shaped site occupies an area of some 6,131m^2 with a frontage of some 50m to the northern side of Middleton Road just to the east of Thew Parade.

The site is adjoined to the east by the large Northern Beaches Council Depot while warehouses, factories and service industries as well as some industrial unit complexes are spread throughout the Cromer Industrial Area. The former CDC bus depot was located just to the east on part of the former Roche site at 4-10 Inman Road which is to be redeveloped into the Northern Beaches Business Park.

The proposed depot site is relatively level rising slightly to the north and there is a large existing warehouse building occupying the northern part. The southern part of the site is used for open storage and vehicle access is provided by a combined ingress/egress driveway located at the western site boundary. Much of the site comprises 'hardstand' pavement apart from some trees in the southern part.

2.2 Proposed Development

It is proposed to retain the existing building structure converting part for bus driver facilities and the remainder for the parking of buses. There will also be external bus parking areas together with:

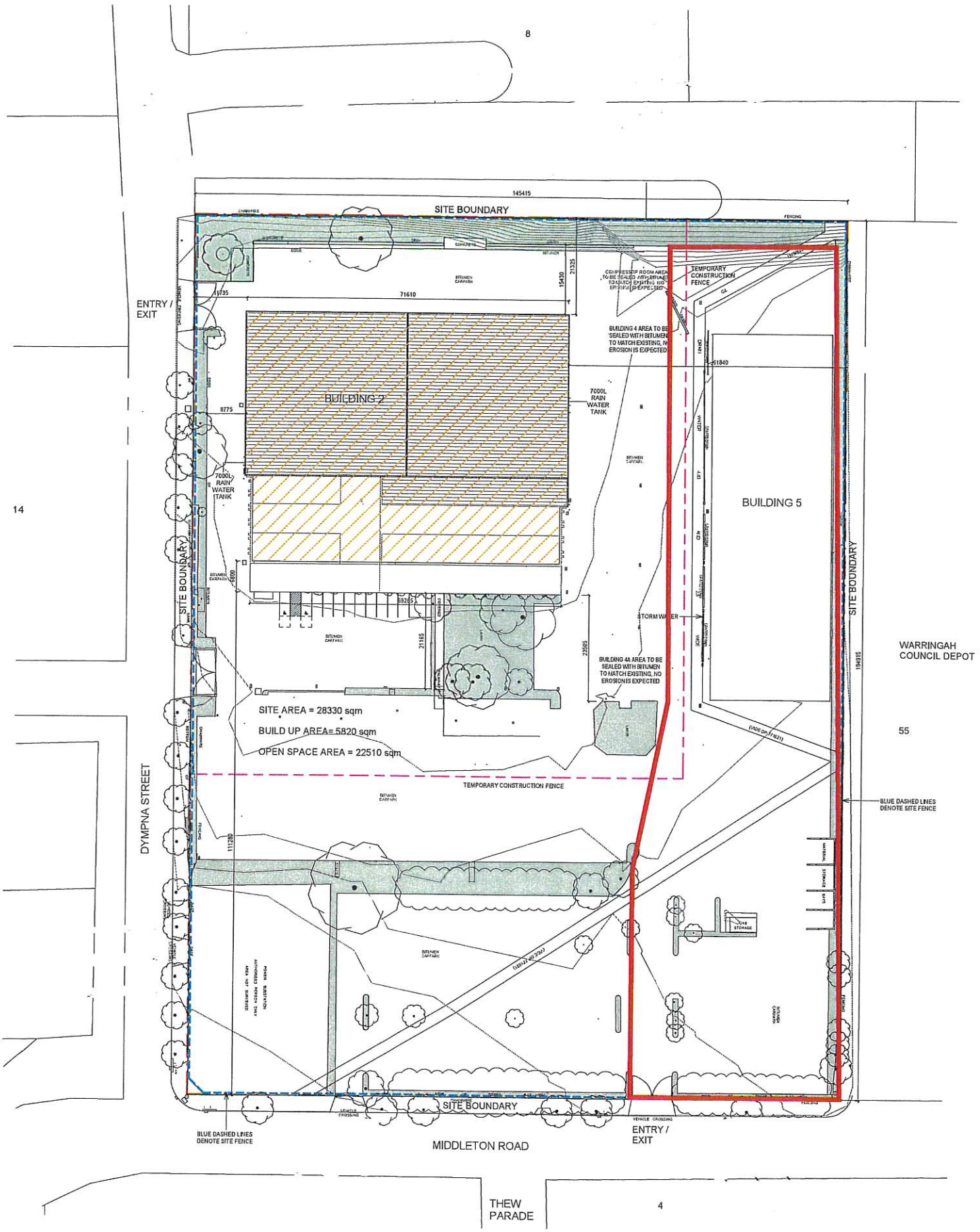
- car parking in the southern frontage part of the site
- a bus fuelling element (2 positions)

LEGEND

N

SITE

FIG 2


8
145415
SITE BOUNDARY
ENTRY / EXIT
71610
11735
21525
15430
TEMPORARY CONSTRUCTION FENCE
BUILDING 4 AREA TO BE SEALED WITH BITUMEN TO MATCH EXISTING, NO EROSION IS EXPECTED
BUILDING 2
7000L RAIN WATER TANK
8775
51849
BUILDING 5
14
SITE BOUNDARY
SITE BOUNDARY
STORM WATER
22595
21165
BUILDING 4A AREA TO BE SEALED WITH BITUMEN TO MATCH EXISTING, NO EROSION IS EXPECTED
WARRINGAH COUNCIL DEPOT
194915
55
SITE AREA = 28330 sqm
BUILD UP AREA= 5820 sqm
OPEN SPACE AREA = 22510 sqm
TEMPORARY CONSTRUCTION FENCE
BLUE DASHED LINES DENOTE SITE FENCE
DYMPNA STREET
111280
SITE BOUNDARY
BLUE DASHED LINES DENOTE SITE FENCE
MIDDLETON ROAD
ENTRY / EXIT
THEW PARADE
4

The proposed depot will provide initially for relocation of the existing 34 buses increasing over time to a maximum of 60 buses (12.5m) with 45 car parking spaces. The buses will principally be for charter services while some future provision is envisaged for route service buses. Buses will commence departing at 6.00am and all will return by 11.00pm being a slight extension to the operating times at the nearby former depot.

The existing vehicle access driveway will be retained while the western boundary will be fenced to provide separation from the remaining Ausgrid property.

Architectural details of the proposed development are provided on the plans which accompany the Development Application and are reproduced in part in Appendix A.

3.0 Road Network and Traffic Conditions

3.1 Road Network

The road network serving the site (Figure 3) comprises a network of collector roads, which connect to the State Road and arterial routes of Pittwater Road to the east and Warringah Road to the south.

Middleton Road is a local access road which, with Inman Road, forms a "crescent" connecting to the South Creek Road collector route. It is relatively straight with a 13.0 metre wide carriageway with a 90^{o} bend where it connects to Inman Road.

3.2 Traffic Controls

The principal traffic controls which have been applied to the road system serving the site (Figure 4a & 4b) comprise:

Arterial Road Connections (traffic signal controls)

- Pittwater Road & Mactier Street
- Pittwater Road & Anzac Avenue
- Pittwater Road & South Creek Road
- Pittwater Road & Lismore Avenue
- Pittwater Road & Fisher Street
- Warringah Road & Alfred Street
- Warringah Road & Willandra Road

Collector Road Connections

- **Roundabouts**
  - South Creek Road & Campbell Avenue
  - South Creek Road & Toronto Avenue
  - Fisher Road & Campbell Avenue
  - Fisher Road & McIntosh Road
  - Veterans Parade & Mactier Street various

LEGEND

- ARTERIAL
- SUB-ARTERIAL
- COLLECTOR

N

ROAD NETWORK

FIG 3

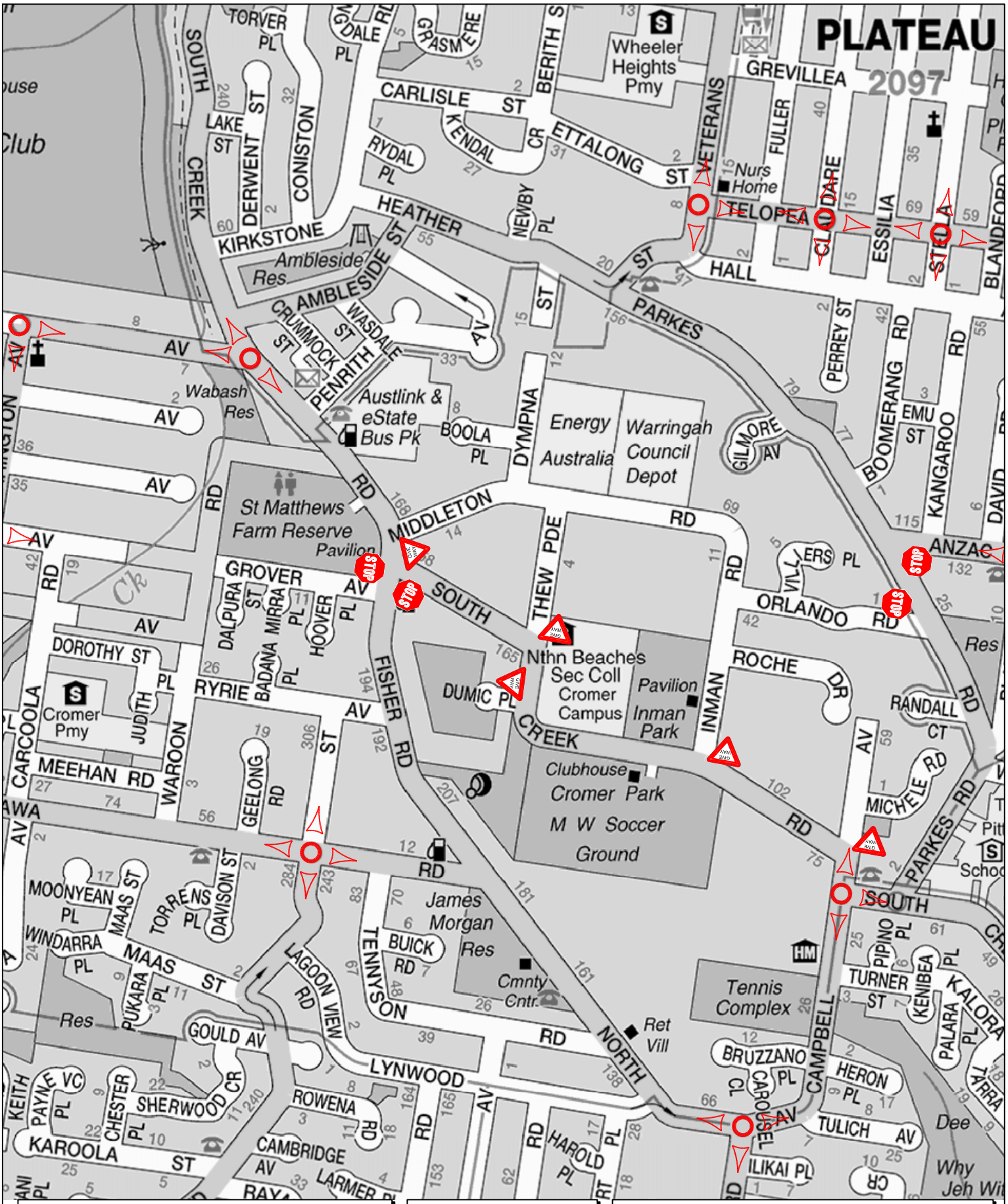
LEGEND

- TRAFFIC SIGNAL CONTROL
- ROUNDABOUT
- RESTRICTED TURNING MOVEMENT

N

TRAFFIC CONTROLS

FIG 4a



LEGEND

- TRAFFIC SIGNAL CONTROL
- ROUNDABOUT
- RESTRICTED TURNING MOVEMENT

TRAFFIC CONTROLS

FIG 4b

- **GIVE WAY Signage**
  - Middleton Road at South Creek Road
  - Inman Road at South Creek Road

- **Light Traffic Restrictions**
  - Alexander Street, Telopea Street to Pittwater Road
  - Alfred Street, McIntosh Road to Carawa Road
  - McIntosh Road, Willandra Road to Fisher Road
  - Willandra Road, Warringah Road to Carawa Road
  - Veterans Parade/Nioka Road/The Esplanade/Mactier Street, Edgecliffe Boulevard to Lakeside Road

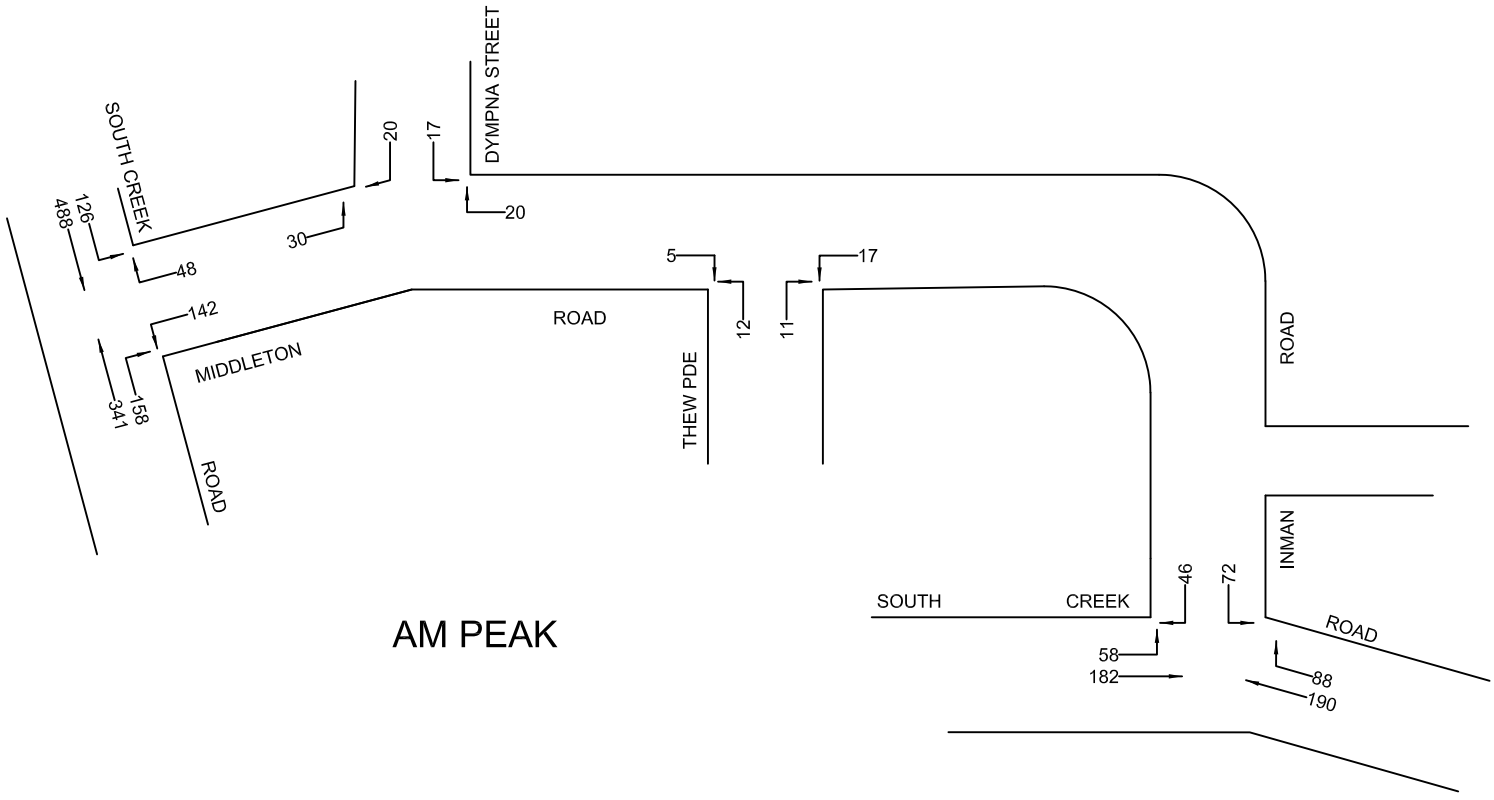
It is noted that these restrictions are largely in place to preclude the movement of trucks generated by the industrial area through the residential streets. There is no "structural" basis to the restrictions, although there are steep grades on sections of Alexander Street, Mactier Street and Nioka Road. However, there are existing bus routes along all of these light traffic restriction streets except Alexander Street and the latter route.

3.3 Traffic Conditions

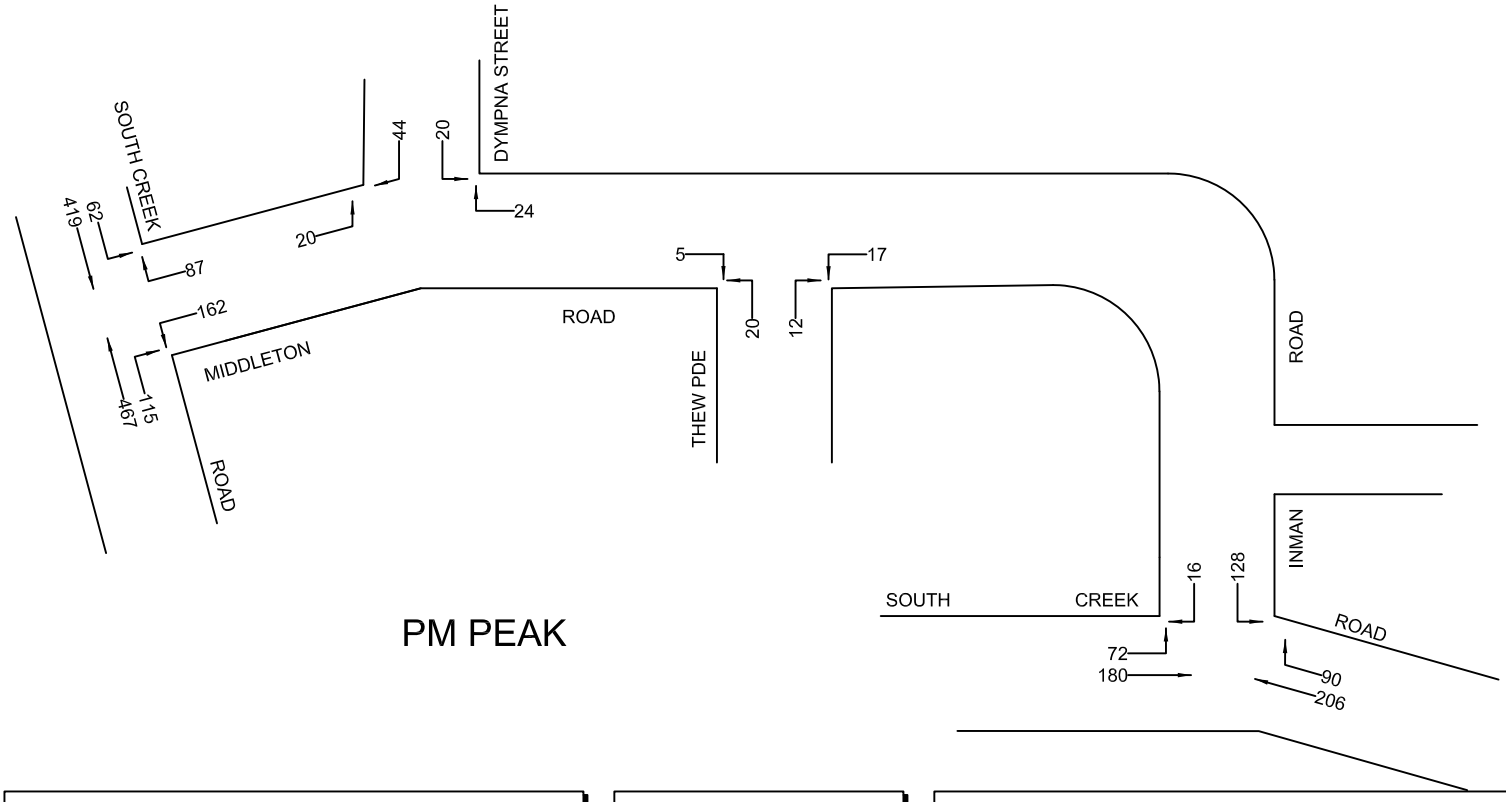
An indication of the traffic conditions in the vicinity of the site are provided by data published by TfNSW and surveys undertaken as part of the study. The TfNSW data is expressed in terms of Annual Average Daily Traffic (AADT) and details of the latest published data are provided in the following:

	AADT
Pittwater Road at South Creek Road	43,714
South Creek Road at Pittwater Road	8,356
Campbell Avenue at South Creek Road	10,639

Traffic surveys have been undertaken at the intersections South Creek Road/Middleton Road and South Creek Road/Inman Road during the morning and afternoon peak periods and the results of those surveys which include the bus movements generated by the existing depot are provided in Appendix B and summarised on Figure 5.



AM PEAK



PM PEAK

LEGEND

N

EXISTING PEAK TRAFFIC MOVEMENTS

FIG 5

The operational performances of the two South Creek Road intersections has been assessed with SIDRA and the results are provided in Appendix C and summarised in the following while the criteria for interpreting SIDRA results is reproduced overleaf.

	AM		PM	
	LOS	**AVD**	**LOS**	**AVD**
Middleton Road	B	15.8	B	16.2
Inman Road	A	6.4	A	7.4

The results indicate that these intersections operate quite satisfactorily with significant spare capacity.

3.4 Transport Services

The existing bus services operating in the vicinity of the site (see details overleaf) comprise:

- Routes 146 and 179X which operate along South Creek Road/Fisher Road
- Routes 158 which operates along Middleton Road
- Routes 180 and 180x which operate along Campbell Avenue and Parkes Road

3.5 Proposed Road/Traffic Works

Enquiries with TfNSW and Council reveal that there are no proposed or envisaged changes to the current road circumstances or traffic control/management arrangements on the road network serving the site.

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below, which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	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. Roundabouts require other control mode	At capacity and requires other control mode

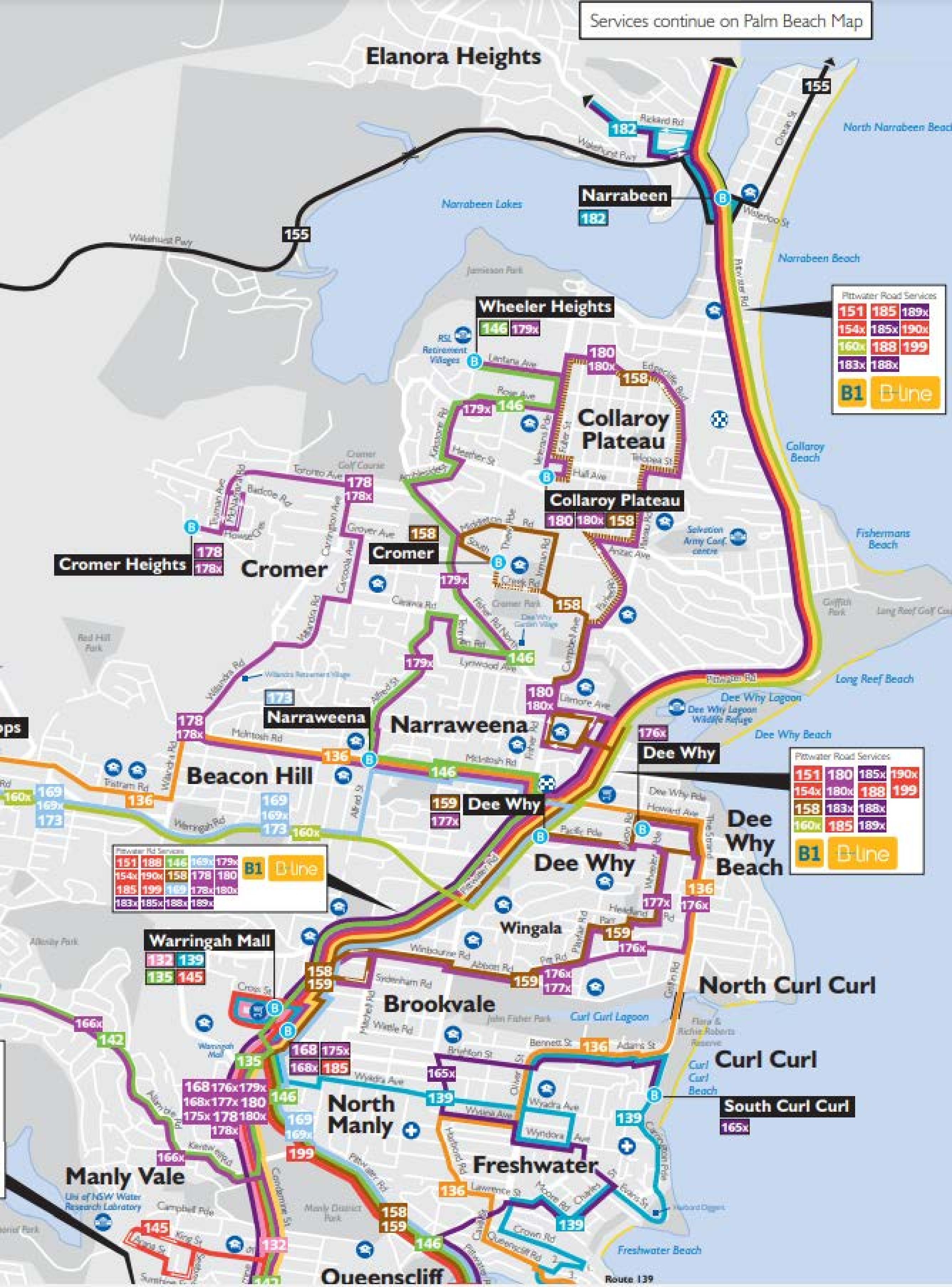
3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by **traffic signals**[1] both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

[1] *the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs*



Services continue on Palm Beach Map
Elanora Heights
North Narrabeen Beach
Narrabeen
182
155
Narrabeen Lakes
Narrabeen Beach
Wakehurst Pwy
Pittwater Road Services
151 185 189x
154x 185x 190x
160x 188 199
183x 188x
B1 B-line
Wheeler Heights
146 179x
RSL Retirement Villages
180 180x
158
Collaroy Plateau
Collaroy Beach
Collaroy Plateau
180 180x 158
Cromer
Cromer Heights
178 178x
Cromer Golf Course
Salvation Army Conf. centre
Fishermans Beach
Griffith Park
Long Reef Golf Course
Long Reef Beach
Red Hill Park
Narraweena
173
Dee Why Lagoon
Dee Why Lagoon Wildlife Refuge
Dee Why Beach
Beacon Hill
136
169 169x 173
160x
Dee Why
159 177x
176x
Pittwater Road Services
151 180 185x 190x
154x 180x 188 199
158 183x 188x
160x 185 189x
B1 B-line
Dee Why Beach
Pittwater Rd Services
151 188 146 169x 179x
154x 190x 158 178 180
185 199 169 178x 180x
183x 185x 188x 189x
B1 B-line
Dee Why
Wingala
Allenby Park
Warringah Mall
132 139
135 145
158 159
Brookvale
North Curl Curl
John Fisher Park
Curl Curl Lagoon
Flora & Richie Roberts Reserve
166x
142
168 175x
168x 185
165x
Curl Curl
Curl Curl Beach
South Curl Curl
165x
168 176x 179x
168x 177x 180
175x 178 180x
178x
135
146
139
North Manly
169 169x
199
166x
Manly Vale
Uni of NSW Water Research Laboratory
Manly District Park
Freshwater
136
158 159
139
145
132
146
Queenscliff
Freshwater Beach
Route 139

4.0 Access Routes and Site Access

Access Routes

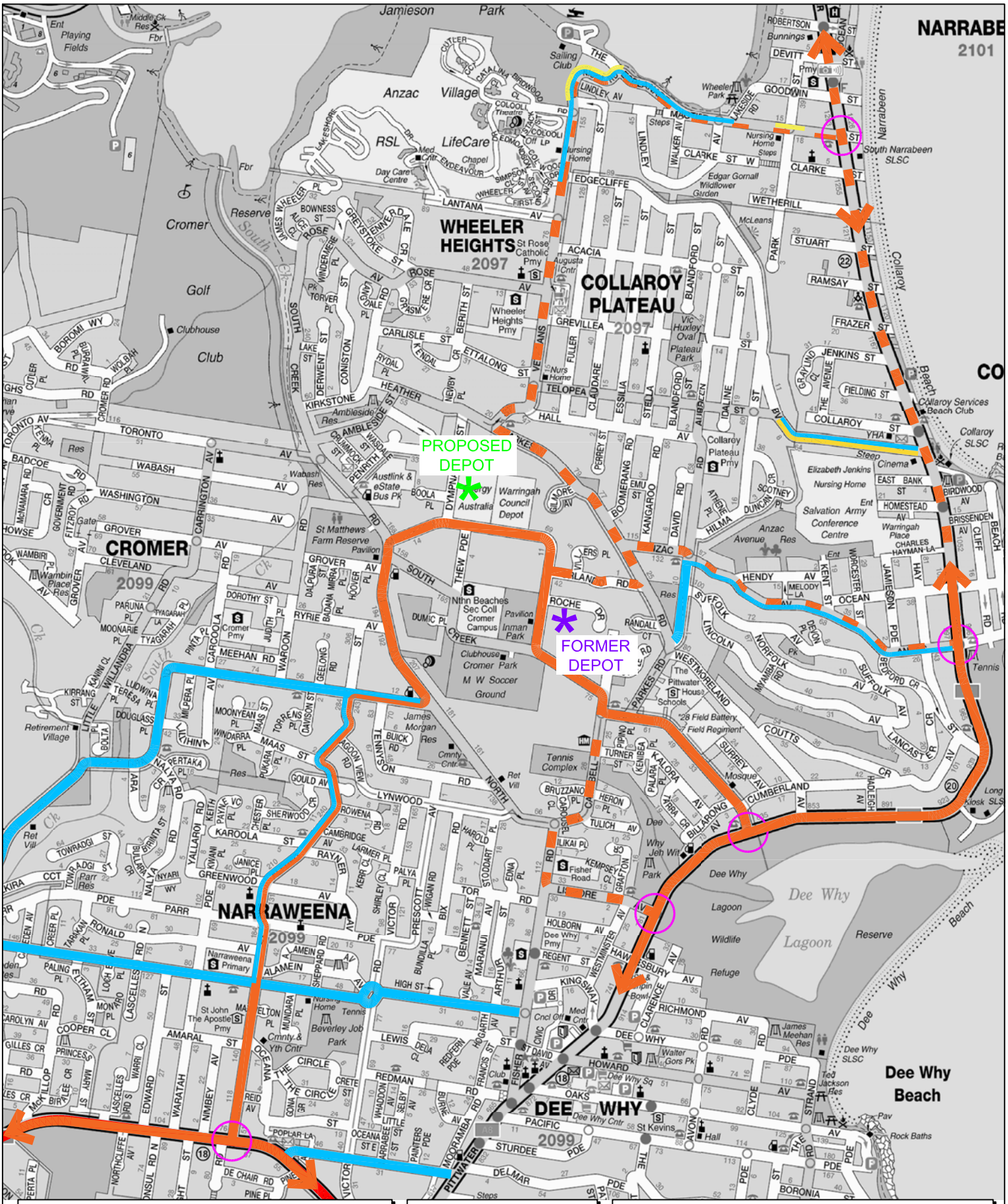
The choices and constraints for access routes for buses stationed at the proposed depot are shown on Figure 6 and the steep grades on Mactier Street and Noika Road preclude use by westbound buses while Alexander Street is not available for both directions due to the steep grade and narrow width.

A principal consideration for access is the provision of traffic signal control to access to/from the Pittwater Road arterial route and this is provided at the Mactier Street, Anzac Avenue, South Creek Road, Lismore Avenue and Fisher Road intersections while access on Warringah Road is available at the Alfred Street and Willandra Road intersections. It is apparent that the preferred routes are:

- Inman Road/South Creek Road to access to the north and Dee Why
- Fisher Road/Alfred Street to access to the west and south (avoiding Dee Why Town Centre)

Site Access

The existing wide combined ingress/egress driveway on Middleton Road at the western site boundary will be used for bus, car and other vehicle access (eg fuel delivery). There are excellent sight distances available at this driveway which will be adequate to accommodate all vehicles needing to access the depot.



LEGEND

- LIGHT TRAFFIC
- STEEP GRADE
- PREFERRED ROUTES
- SIGNAL CONTROLLED ACCESS

ACCESS ROUTES

FIG 6

5.0 Traffic

As the proposed depot will principally provide for charter bus services (as was the case for the former depot), the movements of the buses will continue to be somewhat random and dependent on “bookings” although there will be some regular ongoing bookings (e.g. school outings). The experience with the former depot in Inman Road which accommodated 34 buses is that buses commence departures at 6.00am and continue to leave up until 8.00am while returning buses arrive between 4.30 and 11.00pm.

While there will ultimately be up to 60 buses operating from the depot, it is envisaged that a maximum of 55 buses would depart and return on a busy day as follows:

Morning Departures		**Evening Returns**	
6.00 – 6.30	10	4.30 – 5.30	10
6.30 – 7.00	18	5.30 – 6.30	15
7.00 – 7.30	20	6.30 – 7.30	12
7.30 – 8.00	7	7.30 – 8.30	9
		8.30 – 9.30	6
		9.30 – 11.00	3

Thus, the maximum potential movements during the road network peak periods when the Depot reaches full capacity would be as follows:

7.00 – 8.00am	27 vtph OUT (none after 8.00am)
4.30 – 5.30pm	10 vtph IN

The great majority of buses, as at the present time, will not travel through the South Creek Road/Middleton Road intersection but will use the South Creek Road/Inman Road intersection for access to/from the site.

However, both these intersections operate with a very satisfactory Level of Service A during the AM and PM peak periods at the present time. The buses will access to/from the arterial road system with the assistance of the existing traffic signal controlled intersections (see Figure 6). In addition, the bus drivers will generally commence and finish shifts outside of the normal AM and PM peak periods and a large number of bus departure and return movements will also occur outside of these times.

It is apparent therefore that the proposed new bus depot will not result in adverse traffic implications particularly given that the former depot which only ceased operations in late 2020 did not create any apparent adverse traffic circumstances.

6.0 Parking

It is proposed to provide 45 formal parking spaces for staff (the great majority being bus drivers and as with most bus depots, cars can also be parked in bus bay areas which are not being utilised (i.e. the bays where the last returning buses will park). While there will be provision for a maximum of 60 buses to park on the site, there will never be 60 bus drivers present at one time while drivers will also:

- car pool
- travel by bus (using the routes along Middleton Road and South Creek Road)
- be dropped off and picked up by car
- travel by motorcycle.

It is apparent that the proposed provision of 45 formal parking spaces, including 1 accessible space, will be quite adequate and appropriate.

7.0 Internal Circulation and Servicing

Internal Circulation

The buses will circulate in a one-way clockwise circulate and, as with most urban depots, buses are not assigned to a particular driver or parking space but are stack parked and depart in a progressive manner while the last returning buses will park at the rear. Refuelling will be undertaken for returning buses as part of their ingress movements while buses will be washed on an “as needed” basis.

Details of the turning path assessment for bus access and internal circulation are provided in Appendix D. The design of the car park area complies with the requirements of AS2890.1 & 6 and adopts a flexible 2-way circulation arrangement.

Servicing

Fuel deliveries will be made by tankers during the middle of the day when most buses are out of the depot while it is envisaged that any new buses purchases are likely to be electric powered. Other service/delivery movements will be relatively minor involving refuse removal etc. and these will be accommodated on the large hardstand areas.

8.0 Conclusion

The development proposal is to replace a former bus depot in the Cromer Industrial area. This assessment has concluded that the proposal:

- will not result in any adverse traffic implications
- will provide adequate parking for buses and staff vehicles
- will involve vehicle access, internal circulation and servicing arrangements which will be suitable and appropriate

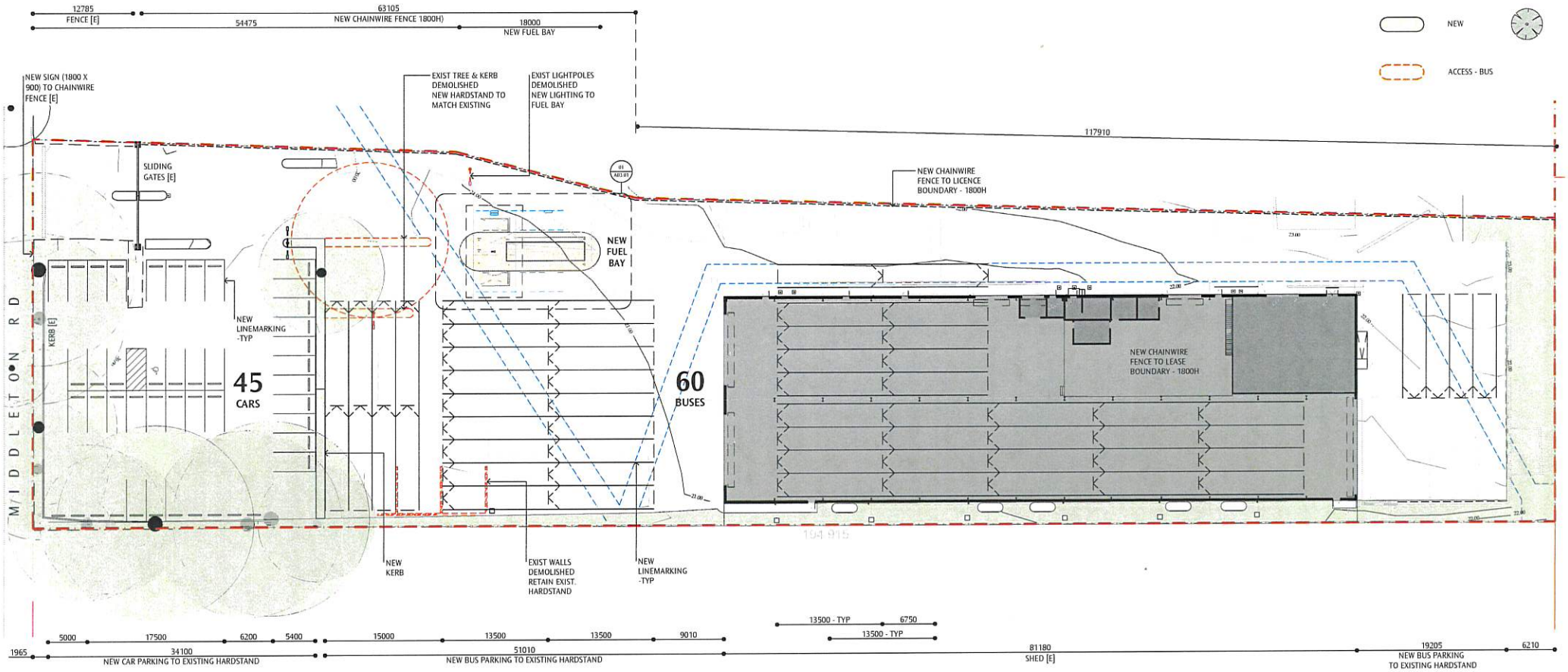
Appendix A

Development Plans

GENERAL NOTES
DO NOT SCALE OFF THIS DRAWING. USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECTS.

1.0 LEGEND

- SITE BOUNDARY - ADJOINING
- SITE BOUNDARY - SUBJECT SITE
- EASEMENTS
- PLANNING CONTROLS
- EXISTING - RETAINED
- EXISTING - DEMOLISHED
- NEW
- ACCESS - BUS



PRELIMINARY
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COMFORTDELGRO AUSTRALIA

LOT 6 DP 771621, 21 MIDDLETON ROAD
CROMER |

| 1:250@A1 | 50%@A3

SITE
GENERAL ARRANGEMENT |

15 DEC 2020 A0.1
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GENERAL NOTES
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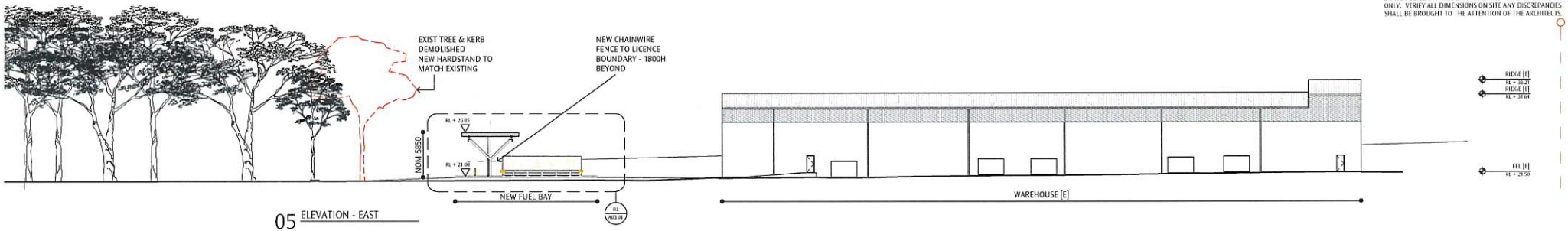
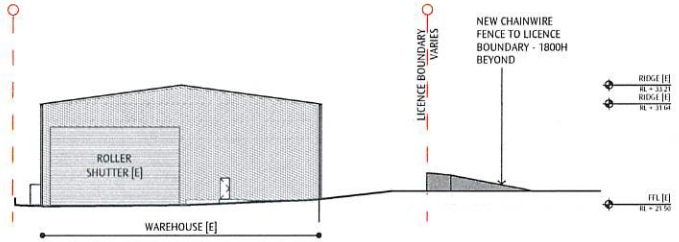
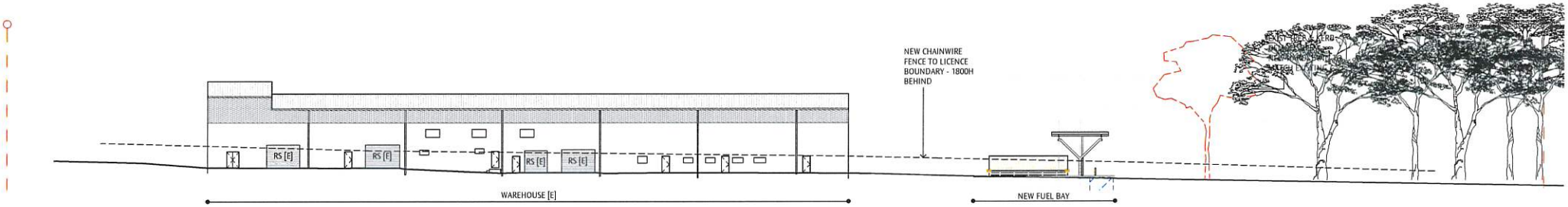


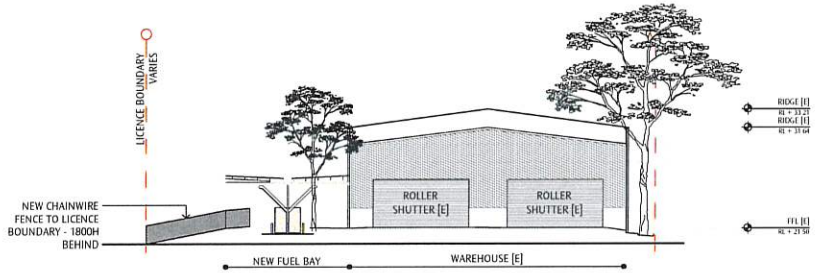
05 ELEVATION - EAST



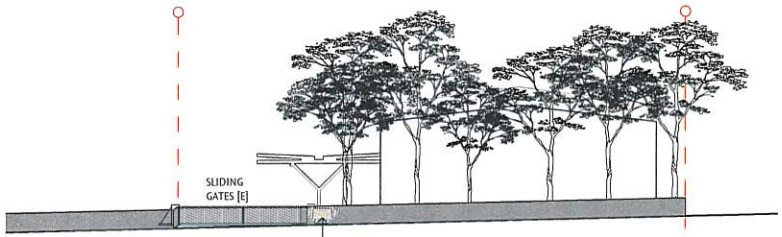
04 ELEVATION - NORTH



03 ELEVATION - WEST



02 ELEVATION - SOUTH



01 ELEVATION - SOUTH - MIDDLETON RD

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GENERAL NOTES
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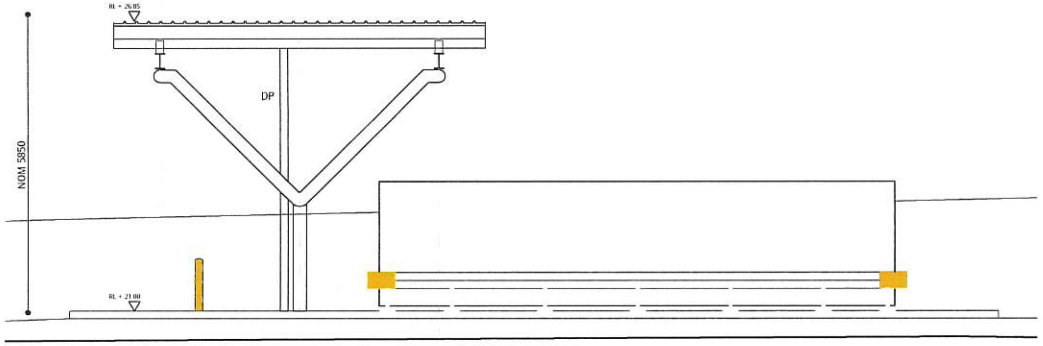
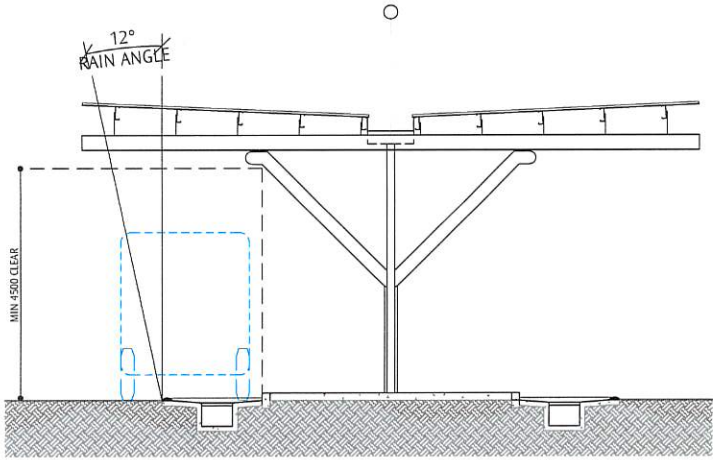
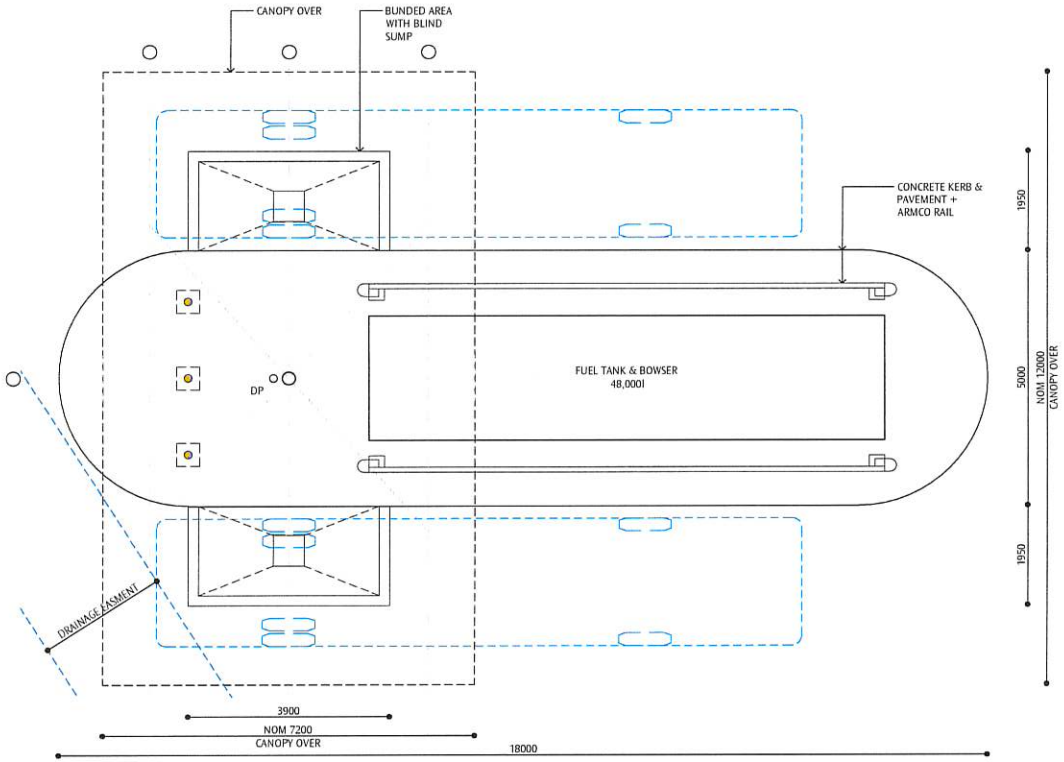


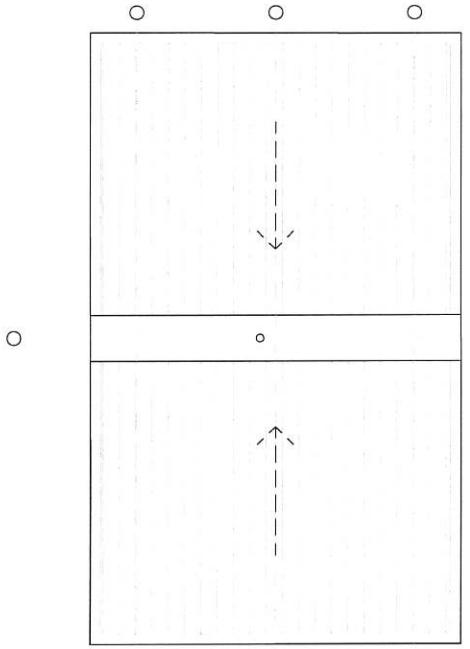
03 ELEVATION



04 SECTION



01 DETAIL PLAN - FUEL BAY



02 DETAIL PLAN - ROOF - FUEL BAY

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www.noxongiffen.com | ABN 54 109 252 360 | Nominated Architect Darren Giffen ARB NSW 6724 |

COMFORTDELGRO AUSTRALIA

LOT 6 DP 771621, 21 MIDDLETON ROAD
CROMER |

| 1:50@A1 | 50%@A3

FUEL BAY DETAILS |

15 DEC 2020 A0.1
NGA-S2020-DWG-A03.01

Appendix B

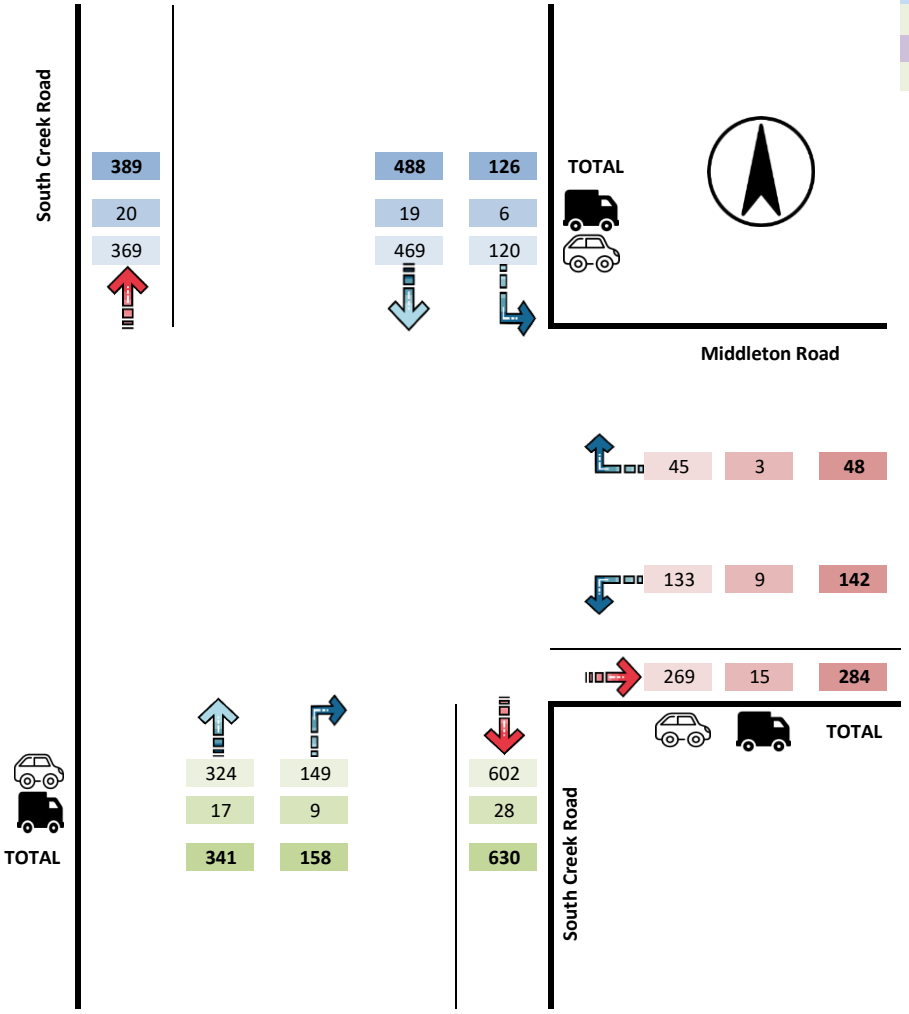
Traffic Survey Results

Location	South Creek Road	**Duration**	7:00 - 9:00
	Middleton Road		16:00 - 18:00
	South Creek Road		-
	-	**Day/Date**	Wednesday, 25 November 2020
Suburb	CROMER	**Weather**	Dry

DATA SELECTION

Select Time: PEAK

TIME RANGE		
PEAK	-	AM
PEAK		
8:00	-	9:00



-

Traffic Information Specialist

ABN: 42 613 389 923

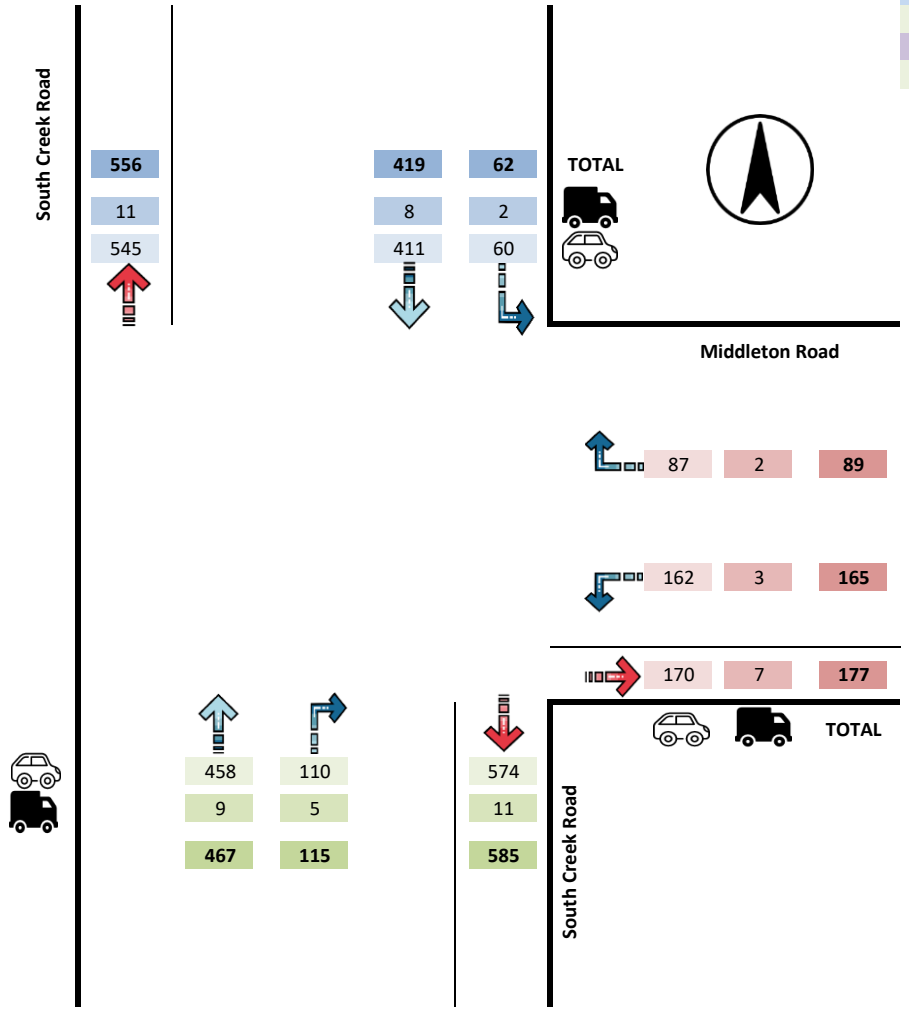
Email info@tistraffic.com.au

Location	South Creek Road	**Duration**	7:00 - 9:00
	Middleton Road		16:00 - 18:00
	South Creek Road		-
	-	**Day/Date**	Wednesday, 25 November 2020
Suburb	CROMER	**Weather**	Dry

DATA SELECTION

Select Time: PEAK

TIME RANGE		
PEAK	-	PM
PEAK		
16:45	-	17:45



-

Traffic Information Specialist

ABN: 42 613 389 923

Email info@tistraffic.com.au

Location	South Creek Road		**Duration**	7:00 - 9:00	
	Middleton Road			16:00 - 18:00	
	South Creek Road			-	
	-		**Day/Date**	Wednesday, 25 November 2020	
Suburb	CROMER		**Weather**	Dry	

All Vehicles Time Per Hour	NORTH WEST *South Creek Road*										EAST *Middleton Road*										TOTAL		TOTAL
	L			T			R				L			T			R						
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	
7:00 - 8:00	64	3	**67**	316	11	**327**				**394**	70	20	**90**				40	2	**42**	**132**	861	57	**918**
7:15 - 8:15	77	5	**82**	360	16	**376**				**458**	85	15	**100**				36	3	**39**	**139**	935	58	**993**
7:30 - 8:30	92	5	**97**	436	21	**457**				**554**	106	12	**118**				43	4	**47**	**165**	1082	66	**1148**
7:45 - 8:45	107	6	**113**	478	18	**496**				**609**	115	12	**127**				51	4	**55**	**182**	1210	65	**1275**
8:00 - 9:00	120	6	**126**	469	19	**488**				**614**	133	9	**142**				45	3	**48**	**190**	1240	63	**1303**
Period End																							
16:00 - 17:00	68	2	**70**	378	13	**391**				**461**	149	5	**154**				78	2	**80**	**234**	1222	49	**1271**
16:15 - 17:15	64	2	**66**	366	12	**378**				**444**	148	5	**153**				87	1	**88**	**241**	1233	41	**1274**
16:30 - 17:30	58	2	**60**	403	10	**413**				**473**	159	4	**163**				87	1	**88**	**251**	1257	33	**1290**
16:45 - 17:45	60	2	**62**	411	8	**419**				**482**	162	3	**165**				87	2	**89**	**254**	1289	29	**1319**
17:00 - 18:00	48	0	**48**	405	8	**413**				**462**	146	1	**147**				83	2	**85**	**232**	1240	23	**1264**
Period End																							

All Vehicles Time Per Hour	SOUTH *South Creek Road*										WEST -										TOTAL		TOTAL
	L			T			R				L			T			R						
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	
7:00 - 8:00				238	16	**254**	132	5	**137**	**392**											861	57	**918**
7:15 - 8:15				263	15	**278**	114	4	**118**	**396**											935	58	**993**
7:30 - 8:30				274	18	**292**	131	6	**137**	**429**											1082	66	**1148**
7:45 - 8:45				320	16	**336**	139	9	**148**	**484**											1210	65	**1275**
8:00 - 9:00				324	17	**341**	149	9	**158**	**499**											1240	63	**1303**
Period End																							
16:00 - 17:00				407	15	**422**	141	12	**153**	**576**											1222	49	**1271**
16:15 - 17:15				433	12	**445**	134	9	**143**	**589**											1233	41	**1274**
16:30 - 17:30				437	10	**447**	112	6	**118**	**566**											1257	33	**1290**
16:45 - 17:45				458	9	**467**	110	5	**115**	**583**											1289	29	**1319**
17:00 - 18:00				474	9	**483**	84	3	**87**	**570**											1240	23	**1264**
Period End																							

Location	South Creek Road		Duration	7:00 - 9:00	
	Middleton Road			16:00 - 18:00	
	South Creek Road			-	
	-		Day/Date	Wednesday, 25 November 2020	
Suburb	CROMER		Weather	Dry	

All Vehicles	NORTH WEST										EAST										TOTAL		
Time Per 15 Mins	South Creek Road										Middleton Road												
	L			T			R				L			T			R				TOTAL		TOTAL
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	
7:00 - 7:15	13	0	13	62	3	65				78	17	6	23				6	0	6	29	190	15	205
7:15 - 7:30	14	2	16	58	2	60				76	16	4	20				10	1	11	31	190	13	203
7:30 - 7:45	20	1	21	88	4	92				113	24	3	27				11	0	11	38	229	13	242
7:45 - 8:00	17	0	17	108	2	110				127	13	7	20				13	1	14	34	252	16	268
8:00 - 8:15	26	2	28	106	8	114				142	32	1	33				2	1	3	36	264	16	280
8:15 - 8:30	29	2	31	134	7	141				172	37	1	38				17	2	19	57	337	21	358
8:30 - 8:45	35	2	37	130	1	131				168	33	3	36				19	0	19	55	357	12	369
8:45 - 9:00	30	0	30	99	3	102				132	31	4	35				7	0	7	42	282	14	296
Period End	184	9	193	785	30	815				1008	203	29	232				85	5	90	322	2101	120	2221
16:00 - 16:15	18	0	18	118	3	121				139	49	1	50				29	1	30	80	341	15	356
16:15 - 16:30	21	0	21	80	4	84				105	35	1	36				14	0	14	50	299	10	309
16:30 - 16:45	9	0	9	87	4	91				100	28	1	29				16	0	16	45	263	11	274
16:45 - 17:00	20	2	22	93	2	95				117	37	2	39				19	1	20	59	319	13	332
17:00 - 17:15	14	0	14	106	2	108				122	48	1	49				38	0	38	87	352	7	359
17:15 - 17:30	15	0	15	117	2	119				134	46	0	46				14	0	14	60	323	2	325
17:30 - 17:45	11	0	11	95	2	97				109	31	0	31				16	1	17	48	296	7	303
17:45 - 18:00	8	0	8	87	2	89				97	21	0	21				15	1	16	37	270	7	277
Period End	116	2	118	783	21	804				923	295	6	301				161	4	165	466	2463	72	2535

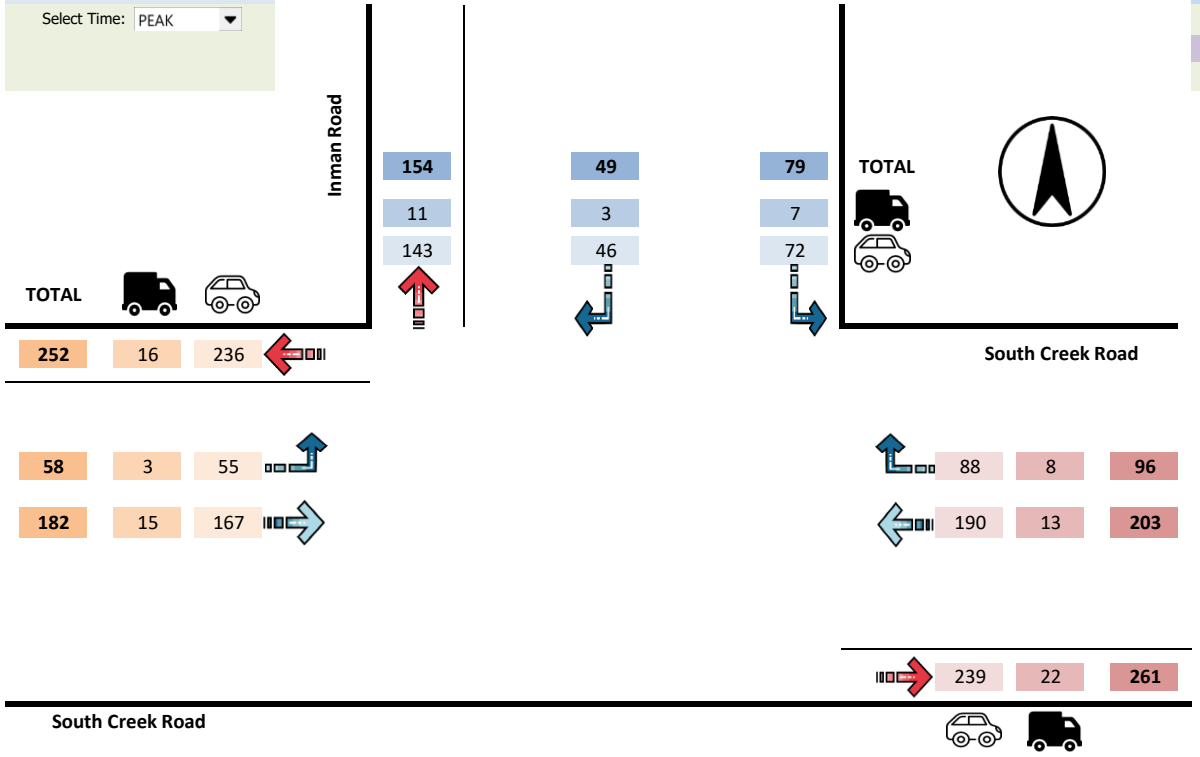
All Vehicles	SOUTH										WEST										TOTAL		
Time Per 15 Mins	South Creek Road										-												
	L			T			R				L			T			R				TOTAL		TOTAL
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	
7:00 - 7:15				47	5	52	44	1	45	98											190	15	205
7:15 - 7:30				66	3	69	26	1	27	96											190	13	203
7:30 - 7:45				55	5	60	31	0	31	91											229	13	242
7:45 - 8:00				70	3	73	31	3	34	107											252	16	268
8:00 - 8:15				72	4	76	26	0	26	102											264	16	280
8:15 - 8:30				77	6	83	43	3	46	129											337	21	358
8:30 - 8:45				101	3	104	39	3	42	146											357	12	369
8:45 - 9:00				74	4	78	41	3	44	122											282	14	296
Period End				562	33	595	281	14	295	891											2101	120	2221
16:00 - 16:15				94	7	101	33	3	36	137											341	15	356
16:15 - 16:30				109	2	111	40	3	43	154											299	10	309
16:30 - 16:45				100	3	103	23	3	26	129											263	11	274
16:45 - 17:00				104	3	107	45	3	48	156											319	13	332
17:00 - 17:15				120	4	124	26	0	26	150											352	7	359
17:15 - 17:30				113	0	113	18	0	18	131											323	2	325
17:30 - 17:45				121	2	123	21	2	23	146											296	7	303
17:45 - 18:00				120	3	123	19	1	20	143											270	7	277
Period End				881	24	905	225	15	240	1146											2463	72	2535

Location	**Inman Road**	**Duration**	**7:00 - 9:00**
	South Creek Road		**16:00 - 18:00**
	-		**-**
	South Creek Road	**Day/Date**	**Wednesday, 25 November 2020**
Suburb	**CROMER**	**Weather**	**Dry**

DATA SELECTION

Select Time: PEAK

TIME RANGE		
PEAK	-	AM
PEAK		
8:00	-	9:00

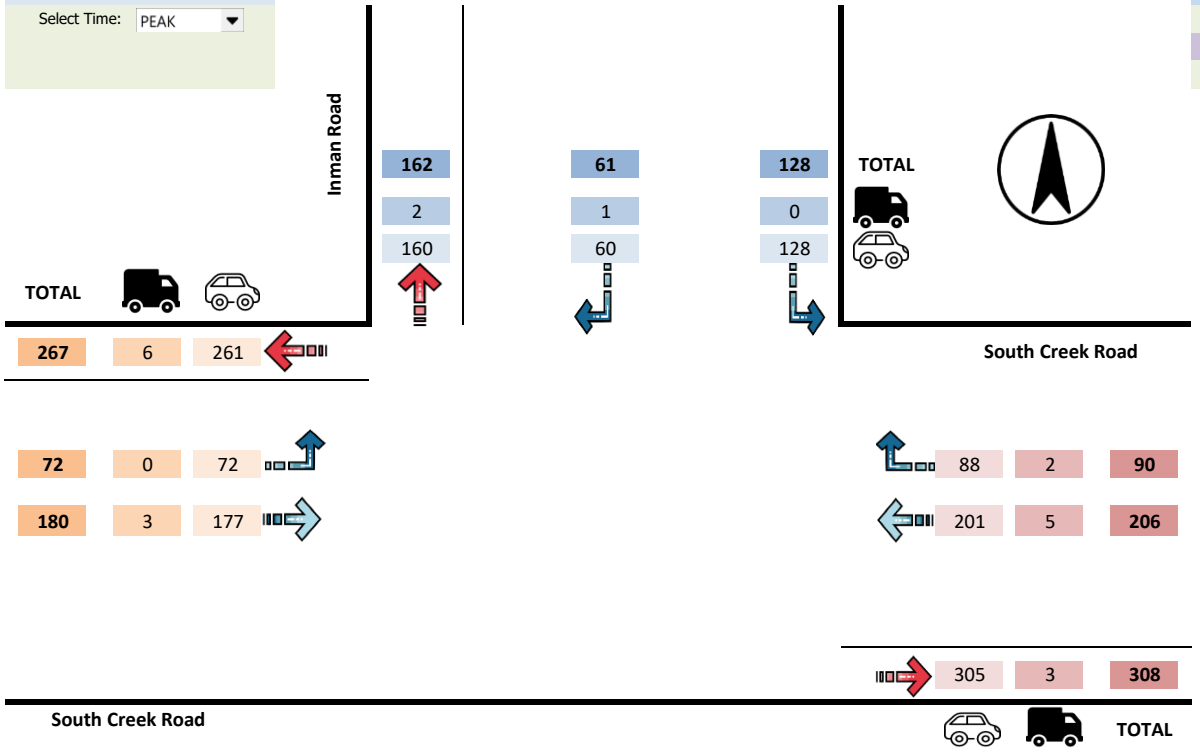


Location	**Inman Road**	**Duration**	**7:00 - 9:00**
	South Creek Road		**16:00 - 18:00**
	-		-
	South Creek Road	**Day/Date**	**Wednesday, 25 November 2020**
Suburb	**CROMER**	**Weather**	**Dry**

DATA SELECTION

Select Time: PEAK

TIME RANGE		
PEAK	-	PM
PEAK		
16:45	-	17:45



Location	Inman Road	Duration	7:00 - 9:00
	South Creek Road		16:00 - 18:00
	-		-
	South Creek Road	Day/Date	Wednesday, 25 November 2020
Suburb	CROMER	Weather	Dry

All Vehicles Time Per Hour			NORTH Inman Road										EAST South Creek Road											
			L			T			R				L			T			R				TOTAL	
			LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	TOTAL
7:00	-	8:00	64	10	74				27	2	29	103				116	7	123	83	7	90	213	431	41	472
7:15	-	8:15	51	6	57				25	2	27	84				123	5	128	78	6	84	212	436	35	471
7:30	-	8:30	64	5	69				43	3	46	115				161	11	172	84	5	89	261	564	38	602
7:45	-	8:45	66	8	74				46	3	49	123				182	13	195	88	5	93	288	609	45	654
8:00	-	9:00	72	7	79				46	3	49	128				190	13	203	88	8	96	299	618	49	667
Period End																									
16:00	-	17:00	113	5	118				74	3	77	195				187	12	199	77	1	78	277	621	29	650
16:15	-	17:15	132	4	136				61	1	62	198				175	8	183	86	2	88	271	674	20	694
16:30	-	17:30	118	0	118				59	1	60	178				192	8	200	94	2	96	296	690	16	706
16:45	-	17:45	128	0	128				60	1	61	189				201	5	206	88	2	90	296	726	11	737
17:00	-	18:00	122	0	122				36	0	36	158				187	3	190	75	1	76	266	708	7	715
Period End																									

All Vehicles Time Per Hour			SOUTH -										WEST South Creek Road											
			L			T			R				L			T			R				TOTAL	
			LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	TOTAL
7:00	-	8:00											30	3	33	111	12	123				156	431	41	472
7:15	-	8:15											32	2	34	127	14	141				175	436	35	471
7:30	-	8:30											51	2	53	161	12	173				226	564	38	602
7:45	-	8:45											57	2	59	170	14	184				243	609	45	654
8:00	-	9:00											55	3	58	167	15	182				240	618	49	667
Period End																									
16:00	-	17:00											41	0	41	129	8	137				178	621	29	650
16:15	-	17:15											62	0	62	158	5	163				225	674	20	694
16:30	-	17:30											63	0	63	164	5	169				232	690	16	706
16:45	-	17:45											72	0	72	177	3	180				252	726	11	737
17:00	-	18:00											82	0	82	206	3	209				291	708	7	715
Period End																									

Location	Inman Road		Duration	7:00 - 9:00	
	South Creek Road			16:00 - 18:00	
	-			-	
	South Creek Road		Day/Date	Wednesday, 25 November 2020	
Suburb	CROMER		Weather	Dry	

All Vehicles Time Per 15 Mins	NORTH *Inman Road*										EAST *South Creek Road*											
	L			T			R				L			T			R				TOTAL	
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	TOTAL
7:00 - 7:15	22	4	26				8	1	9	35				28	3	31	24	2	26	57	118	15	133
7:15 - 7:30	12	3	15				4	0	4	19				30	0	30	17	3	20	50	85	13	98
7:30 - 7:45	11	1	12				10	1	11	23				23	2	25	17	2	19	44	101	7	108
7:45 - 8:00	19	2	21				5	0	5	26				35	2	37	25	0	25	62	127	6	133
8:00 - 8:15	9	0	9				6	1	7	16				35	1	36	19	1	20	56	123	9	132
8:15 - 8:30	25	2	27				22	1	23	50				68	6	74	23	2	25	99	213	16	229
8:30 - 8:45	13	4	17				13	1	14	31				44	4	48	21	2	23	71	146	14	160
8:45 - 9:00	25	1	26				5	0	5	31				43	2	45	25	3	28	73	136	10	146
Period End	**136**	**17**	**153**				**73**	**5**	**78**	**231**				**306**	**20**	**326**	**171**	**15**	**186**	**512**	**1049**	**90**	**1139**
16:00 - 16:15	34	1	35				23	2	25	60				53	5	58	22	0	22	80	178	11	189
16:15 - 16:30	35	4	39				12	0	12	51				35	1	36	11	0	11	47	134	7	141
16:30 - 16:45	23	0	23				11	0	11	34				40	3	43	18	0	18	61	124	6	130
16:45 - 17:00	21	0	21				28	1	29	50				59	3	62	26	1	27	89	185	5	190
17:00 - 17:15	53	0	53				10	0	10	63				41	1	42	31	1	32	74	231	2	233
17:15 - 17:30	21	0	21				10	0	10	31				52	1	53	19	0	19	72	150	3	153
17:30 - 17:45	33	0	33				12	0	12	45				49	0	49	12	0	12	61	160	1	161
17:45 - 18:00	15	0	15				4	0	4	19				45	1	46	13	0	13	59	167	1	168
Period End	**235**	**5**	**240**				**110**	**3**	**113**	**353**				**374**	**15**	**389**	**152**	**2**	**154**	**543**	**1329**	**36**	**1365**

All Vehicles Time Per 15 Mins	SOUTH -										WEST *South Creek Road*											
	L			T			R				L			T			R				TOTAL	
	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	LIGHT	HEAVY	Σ	TOTAL	LIGHT	HEAVY	TOTAL
7:00 - 7:15											9	1	10	27	4	31				41	118	15	133
7:15 - 7:30											5	2	7	17	5	22				29	85	13	98
7:30 - 7:45											6	0	6	34	1	35				41	101	7	108
7:45 - 8:00											10	0	10	33	2	35				45	127	6	133
8:00 - 8:15											11	0	11	43	6	49				60	123	9	132
8:15 - 8:30											24	2	26	51	3	54				80	213	16	229
8:30 - 8:45											12	0	12	43	3	46				58	146	14	160
8:45 - 9:00											8	1	9	30	3	33				42	136	10	146
Period End											**85**	**6**	**91**	**278**	**27**	**305**				**396**	**1049**	**90**	**1139**
16:00 - 16:15											11	0	11	35	3	38				49	178	11	189
16:15 - 16:30											7	0	7	34	2	36				43	134	7	141
16:30 - 16:45											6	0	6	26	3	29				35	124	6	130
16:45 - 17:00											17	0	17	34	0	34				51	185	5	190
17:00 - 17:15											32	0	32	64	0	64				96	231	2	233
17:15 - 17:30											8	0	8	40	2	42				50	150	3	153
17:30 - 17:45											15	0	15	39	1	40				55	160	1	161
17:45 - 18:00											27	0	27	63	0	63				90	167	1	168
Period End											**123**	**0**	**123**	**335**	**11**	**346**				**469**	**1329**	**36**	**1365**

Appendix C

SIDRA Results

MOVEMENT SUMMARY

Site: 1 [South Creek Rd & Middleton Road AM PEAK]

South Creek Road and Middleton Road, Cromer
Site Category: Bus Depot
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand 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: South Creek Road												
2	T1	359	5.0	0.379	3.3	LOS A	2.9	21.0	0.54	0.27	0.71	46.3
3	R2	166	5.7	0.379	9.6	LOS A	2.9	21.0	0.54	0.27	0.71	46.3
Approach		525	5.2	0.379	5.3	NA	2.9	21.0	0.54	0.27	0.71	46.3
East: Middleton Road												
4	L2	149	6.3	0.313	7.8	LOS A	1.3	9.8	0.60	0.84	0.72	43.7
6	R2	51	6.3	0.313	15.8	LOS B	1.3	9.8	0.60	0.84	0.72	43.2
Approach		200	6.3	0.313	9.8	LOS A	1.3	9.8	0.60	0.84	0.72	43.6
North: South Creek Road												
7	L2	133	4.8	0.316	4.6	LOS A	0.0	0.0	0.00	0.11	0.00	48.7
8	T1	514	3.9	0.316	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	49.3
Approach		646	4.1	0.316	1.0	NA	0.0	0.0	0.00	0.11	0.00	49.1
All Vehicles		1372	4.8	0.379	3.9	NA	2.9	21.0	0.29	0.28	0.38	47.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 1 [South Creek Rd & Middleton Road PM PEAK]

South Creek Road and Middleton Road, Cromer
Site Category: Bus Depot
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand 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: South Creek Road												
2	T1	492	1.9	0.355	1.3	LOS A	1.9	13.3	0.33	0.13	0.39	48.1
3	R2	121	4.3	0.355	7.9	LOS A	1.9	13.3	0.33	0.13	0.39	47.9
Approach		613	2.4	0.355	2.6	NA	1.9	13.3	0.33	0.13	0.39	48.1
East: Middleton Road												
4	L2	174	1.8	0.425	7.9	LOS A	2.1	14.9	0.61	0.88	0.86	43.2
6	R2	94	2.2	0.425	16.2	LOS B	2.1	14.9	0.61	0.88	0.86	42.7
Approach		267	2.0	0.425	10.8	LOS A	2.1	14.9	0.61	0.88	0.86	43.0
North: South Creek Road												
7	L2	65	3.2	0.243	4.6	LOS A	0.0	0.0	0.00	0.07	0.00	48.9
8	T1	441	1.9	0.243	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	49.5
Approach		506	2.1	0.243	0.6	NA	0.0	0.0	0.00	0.07	0.00	49.5
All Vehicles		1386	2.2	0.425	3.5	NA	2.1	14.9	0.26	0.26	0.34	47.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [South Creek Rd & Inman Road AM PEAK]

South Creek Road and Inman Road, Cromer
Site Category: Bus Depot
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand 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
East: South Creek Road												
2	T1	214	6.4	0.182	0.6	LOS A	0.8	5.8	0.28	0.17	0.28	38.9
3	R2	101	8.3	0.182	4.6	LOS A	0.8	5.8	0.28	0.17	0.28	39.0
Approach		315	7.0	0.182	1.9	NA	0.8	5.8	0.28	0.17	0.28	39.0
North: Inman Road												
4	L2	83	8.9	0.135	4.2	LOS A	0.5	3.8	0.34	0.55	0.34	37.8
6	R2	52	6.1	0.135	6.4	LOS A	0.5	3.8	0.34	0.55	0.34	38.0
Approach		135	7.8	0.135	5.0	LOS A	0.5	3.8	0.34	0.55	0.34	37.9
West: South Creek Road												
7	L2	61	5.2	0.126	3.4	LOS A	0.0	0.0	0.00	0.11	0.00	39.8
8	T1	192	8.2	0.126	0.0	LOS A	0.0	0.0	0.00	0.11	0.00	39.6
Approach		253	7.5	0.126	0.8	NA	0.0	0.0	0.00	0.11	0.00	39.6
All Vehicles		702	7.3	0.182	2.1	NA	0.8	5.8	0.19	0.22	0.19	39.0

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.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 2 [South Creek Rd & Inman Road PM PEAK]

South Creek Road and Inman Road, Cromer
Site Category: Bus Depot
Giveway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand 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
East: South Creek Road												
2	T1	217	2.4	0.174	0.5	LOS A	0.7	5.1	0.26	0.17	0.26	48.2
3	R2	95	2.2	0.174	5.6	LOS A	0.7	5.1	0.26	0.17	0.26	47.6
Approach		312	2.4	0.174	2.1	NA	0.7	5.1	0.26	0.17	0.26	48.0
North: Inman Road												
4	L2	135	0.0	0.182	5.2	LOS A	0.7	5.1	0.33	0.59	0.33	45.3
6	R2	64	1.6	0.182	7.4	LOS A	0.7	5.1	0.33	0.59	0.33	45.8
Approach		199	0.5	0.182	5.9	LOS A	0.7	5.1	0.33	0.59	0.33	45.5
West: South Creek Road												
7	L2	76	0.0	0.128	4.6	LOS A	0.0	0.0	0.00	0.16	0.00	48.6
8	T1	189	1.7	0.128	0.0	LOS A	0.0	0.0	0.00	0.16	0.00	49.0
Approach		265	1.2	0.128	1.3	NA	0.0	0.0	0.00	0.16	0.00	48.9
All Vehicles		776	1.5	0.182	2.8	NA	0.7	5.1	0.19	0.27	0.19	47.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix D

Swept Path Analysis

LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V5.00a in conjunction with AutoCAD 2013. The vehicle used is based upon vehicle data provided by Austroads and incorporates a reasonable degree of tolerance. However, it is not possible to account for all vehicle types/characteristics and/or driver ability.

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SWEPT PATH ANALYSIS OF A 12.5m BUSES ACCESSING THE SITE

SP 1