

**“SYDNEY SUPER YACHT MARINA”
PROPOSED S75W MODIFICATION**

***Traffic, Transport and
Parking Assessment***

May 2014
(Rev D)

Reference 10028

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EXECUTIVE SUMMARY

This report documents an assessment of the potential traffic, transport and parking implications of proposed S75W modifications to the approved Sydney Super Yacht Marina development on Rozelle Bay.

There are two existing consents for the Sydney Super Yacht Marina which is located at 2 Maritime Court, Rozelle, namely:

- Water Side Related Activities – Part 4 Consent 088-05-08. This is the consent for the water and the land (excluding the former Liquidity building) under which the Marina currently operates.*
- Land Side Activities – Part 3A Consent MP09-0165. Construction works have recently commenced.*

An application was submitted in early November 2013 seeking amended Director General's Requirements for a S75W Application to modify the existing Part 3A consent including modifying the consent to include the water side related element. On 23.12.13 amended Director General's Requirements were issued including the following:

4. Transport and Accessibility Impacts

- Demonstrate the provision of sufficient on-site car parking and secure bicycle storage and amenities for the amended proposal having regard to accessibility of the site to public transport, local planning controls, and RTA guidelines; and*
- A Traffic and Transport Assessment (TTA) is to be prepared in accordance with the RTA's Guide to Traffic Generating Developments, considering traffic generation, any required road/intersection upgrades, access, loading dock(s), measures to promote public transport usage and pedestrian and bicycle linkages resulting from the amendments. The TTA is to assess the cumulative impact of the proposal associated*

with other construction and operational activities on the site and the surrounding area.

Since the time the Part 3A consent was granted three development projects in the near vicinity have come to fruition, being:

- * the Overseas Passenger Terminal (OPT) in Rozelle Bay which has become operational
- * the Mirvac development on the former Harold Park Paceway site which is under construction
- * the Glebe Island Expo Interim Facility (GIE) at Glebe Island which has recently commenced operation

1. INTRODUCTION

This report has been prepared to accompany an S75W Application to the Department of Planning for the proposed modification to the existing Part 3A consent for the Sydney Super Yacht Marina on Rozelle Bay (Figure 1).

The existing Part 4 Consent for the Sydney Super Yacht Marina (088-05-08) permits up to 24 vessels to be berthed (up to 70metres long) with temporary administration offices and carparking (50 spaces). This is the consent under which the Marina has been operational for some time.

A Part 3A Consent (MP09-0165) has been granted for land side development comprising:

- * 2 buildings of 2 levels providing for uses including marine offices, a yacht club, ancillary restaurants, bars and cafés and a provedore (6,200m² GFA) with outdoor seating areas
- * a 4 level carpark (accessed by car lifts) and at grade parking for a total of 219 spaces (including 24 spaces for the berths)
- * 24 hour public access to the waterfront

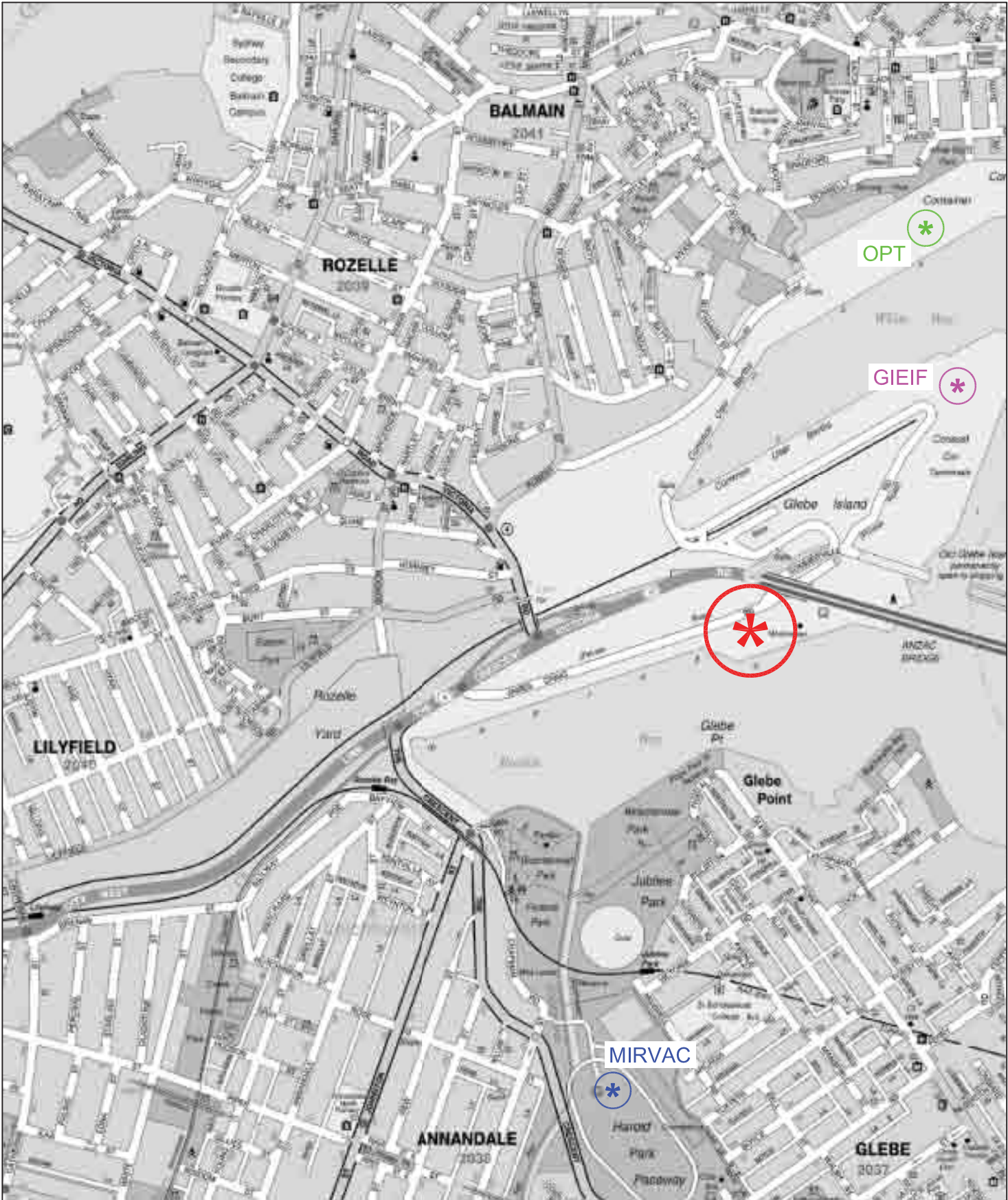
The consent required separate approval to be obtained for the proposed outdoor seating. Construction work has commenced under this consent and plans of this scheme are provided in Appendix A.

The S75W Application proposes to:

- * incorporate the water side development into the same consent
- * increase the carparking provision
- * increase the number of berths
- * modify the proposed eastern building
- * modify the outdoor seating provisions

The purpose of this report is to:

- * describe the site and the existing consent and the proposed S75W development scheme
- * describe the road network serving the site and the prevailing traffic conditions
- * assess the appropriateness of the proposed parking provision
- * assess the potential compound traffic implications in the context of the OPT, GIE and Mirvac developments
- * assess the suitability of the proposed vehicle access, internal circulation and servicing arrangements
- * respond to the relevant DGR's



LEGEND

-  SITE
-  OPT -OVERSEAS PASSENGER TERMINAL
-  MIRVAC - MIXED USE DEVELOPMENT
-  GIEIF - GLEBE ISLAND EXPO INTERIM FACILITY



LOCATION

FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE, CONTEXT AND EXISTING/APPROVED DEVELOPMENT

The site (Figure 2) comprises a land area of 11,640m² and a water area of 17,554m² located just to the west of Anzac Bridge on the northern foreshore of Rozelle Bay.

The existing Marina is confined to the water area and the waterfront strip. The remainder of the site has been largely cleared for construction works with temporary fencing and sheds.

The surrounding uses represent a very diverse environment with many former industrial uses having been replaced by a mixture of new development uses. Significant nearby uses include:

- * the NSW Maritime operations building just to the east and Sydney City Marine further to the east
- * the various smaller maritime related uses to the west
- * the Glebe Island terminals to the north-east and the Rozelle Railway Goods Yard to the north-west
- * Glebe Point and Bi-Centennial Park opposite on the southern foreshore of Rozelle Bay

The existing development consents provides for:

DA 088-05-08

- 24 vessel berths up to 70m long
- temporary administration office
- 50 parking spaces

DA 09-0165

- | | |
|------------------------|-------------------------|
| - Marine | 2,851m ² GFA |
| - Club | 1,932m ² GFA |
| - Provedore | 451m ² GFA |
| - Ancillary Restaurant | 966m ² GFA |

TOTAL:	6,200m² GFA
---------------	-------------------------------

- Parking 219 spaces in a 4 level carpark
accessed by lifts

2.2 OTHER DEVELOPMENTS

There are 3 other developments which are relevant to the traffic assessment for the proposed S75W Application, namely:

* Overseas Passenger Terminal

The new OPT on White Bay Wharves 4 and 5 provides a berth for smaller cruise ships visiting Sydney (ie ones that can safely navigate under the Harbour Bridge). A berthing schedule has been prepared by Sydney Ports Corporation for the first 8 years of the OPT operation. That schedule provides for an average of 1 cruise ship per week visiting the terminal while records to date indicate that in the peak season there are some occasions when the frequency rises to 2 ships per week. These ships almost invariably arrive in the morning and depart in the afternoon on the same day. General vehicle access for the OPT is via James Craig Road, however access for service and other official vehicles is provided on Robert Street.



SITE

LEGEND



SITE

FIG 2

*** Glebe Island Expo Interim Facility**

The existing Sydney Convention and Exhibition Centre facilities at Darling Harbour are to cease operations and are being demolished to provide for the construction of new enlarged facilities.

In order to provide for events while the new facilities are being constructed a temporary facility has recently been completed on Glebe Island. This interim facility will comprise:

- 15,000m² of “constant” exhibition space
- 10,000m² of “expansion” area (temporary structure) for larger exhibitions
- a total of 2,247 parking spaces available on a full time or part time basis:
 - o Robert Street carpark 387 spaces
 - o OPT carpark 550 spaces
 - o Main carpark 1,040 spaces
 - o Temporary carpark 270 spaces

Vehicle access arrangements comprise:

- Ingress for cars and trucks via James Craig Road
- Egress for cars and trucks via James Craig Road and Robert Street

The development consent is for a period of 4 years and the projected use is as follows:

- 120 days of exhibition use per year with a majority of events having an attendance of 1,000 to 9,000 persons per day
- 12 days per year when attendance will exceed 10,000 persons per day

* **Mirvac Harold Park Redevelopment**

Mirvac is currently in the process of redeveloping the former Harold Park Paceway site at Glebe for a residential apartment based mixed use precinct. The proposed development when completed will comprise:

- 1,250 apartments
- 5,394m² retail
- 947m² community and gym

The site will have vehicle accesses on Minogue Crescent/The Crescent (3 locations) and Wigram Road/Ross Street.

2.3 PROPOSED S75W DEVELOPMENT SCHEME

The S75W Application seeks to incorporate the separately approved water side part of the site into the Part 3A consent and to:

- increase the number of berths to 43 (> 12m length) plus tenders with a theoretical maximum of 79 boats
- increase the carparking provision to 237 dedicated car spaces with the ability for some periodic use of 70 other spaces normally occupied by:
 - 20 spaces along the foreshore for tender boat and recreational water craft storage
 - 33 spaces on levels 1, 2 and 3 of the car park building for marine storage
 - 17 spaces on the ground level of the car park building for marine commercial units

The car park building is to be modified to provide 195 dedicated car spaces with ramps replacing car park car lifts, adding a passenger car park lift and an additional level added.

- modification of the eastern building in part to accommodate changes to the carpark structure increasing the overall building floorspace to some 6,880m² (+11%) comprising:

- Marine	3,718 m ² GFA
- Club	1,745 m ² GFA
- Providedore	465 m ² GFA
- Ancillary Restaurant	952 m ² GFA

Outdoor seating as follows:

- * 295m² for Yacht Club use
- * 152m² for the Western Building decks
- * 573m² for the Eastern Building decks
- * 302m² for the Eastern Building balconies
- * 850m² for the Eastern Building wharf level

TOTAL: 2,172m²

24 hour public access will be maintained for the waterfront.

Architectural details of the proposed development are provided on the plans prepared by Scott Carver which accompany the Application and are reproduced in Appendix B.

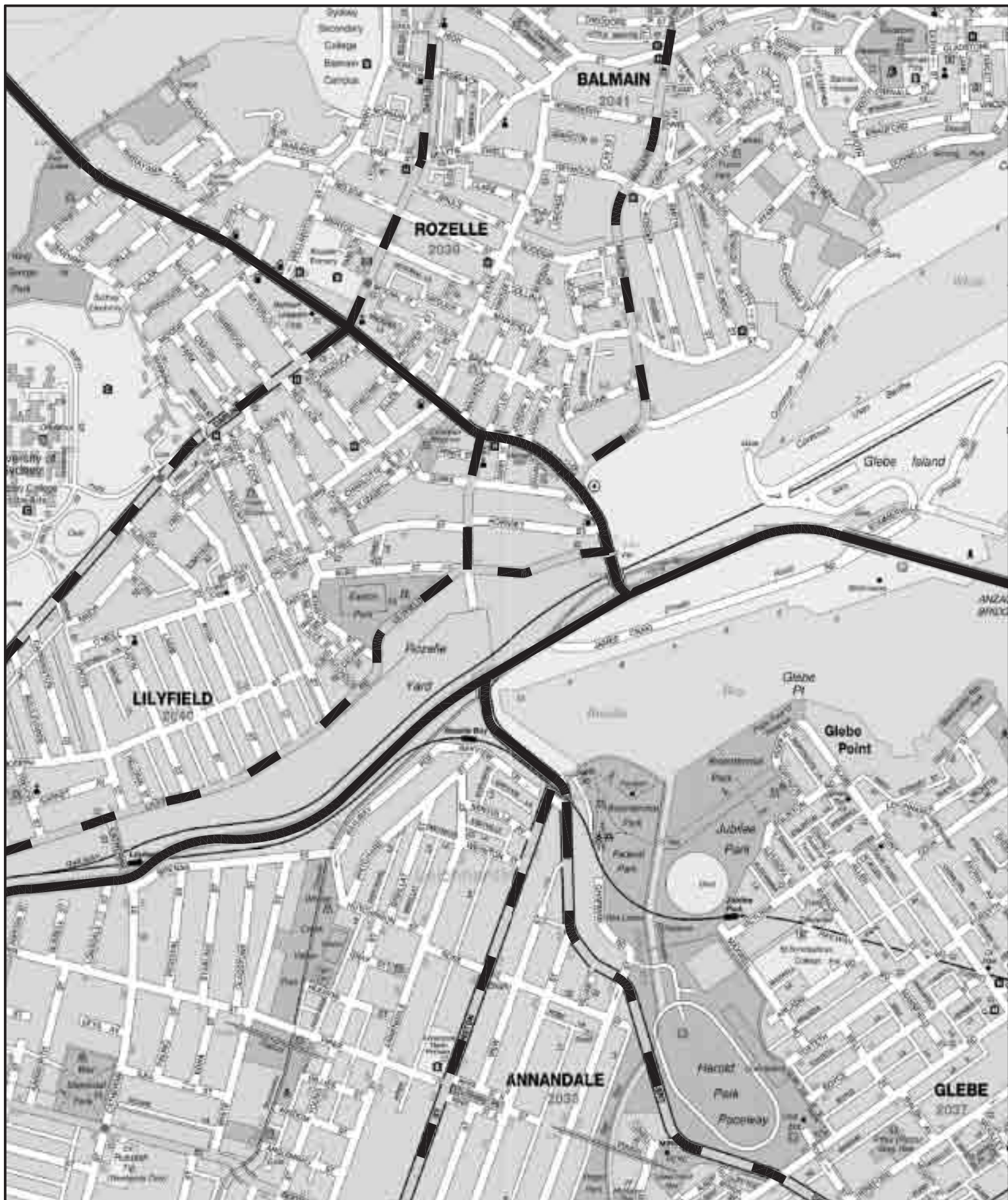
3. ROAD NETWORK AND TRAFFIC CONDITIONS

3.1 ROAD NETWORK

The existing road network serving the site (Figure 3) comprises:

- * *City West Link Road* – a State Road and arterial route connecting between the Anzac Bridge and Parramatta Road
- * *Victoria Road* – a State Road and arterial route connecting between the City and Parramatta
- * *Darling Street and Roberts Road* – major collector road routes serving the Balmain Peninsula
- * *Johnson Street and The Crescent* – major collector road routes through Annandale
- * *Lilyfield Road and Gordon Street* – a minor collector road route through Lilyfield
- * *James Craig Road* – a private road providing access to the Rozelle Bay Marine precinct

City West Link Road generally has 2 traffic lanes in each direction with supplementary through and turning lanes in the vicinity of the marine precinct and an eastbound underpass of the Victoria Road.



LEGEND

-  ARTERIAL
-  COLLECTOR



ROAD NETWORK

FIG 3

3.2 TRAFFIC CONTROLS

The existing traffic controls on the road system surrounding the site (Figure 4) comprise:

- * the traffic control signals at the City West Link Road and James Craig Road intersection. Details of this recently upgraded intersection are provided on the traffic signal design plan reproduced overleaf
- * the traffic signals at intersections along the Victoria Road route
- * the traffic signals at the City West Link Road/The Crescent intersection
- * the NO STOPPING restrictions along The Crescent/City West Link Road and Victoria Road routes
- * the 60 kmph speed restriction along The Crescent and 50 kmph restriction along James Craig Road
- * the BUS ZONES on Victoria Road just to the north of The Crescent and along The Crescent

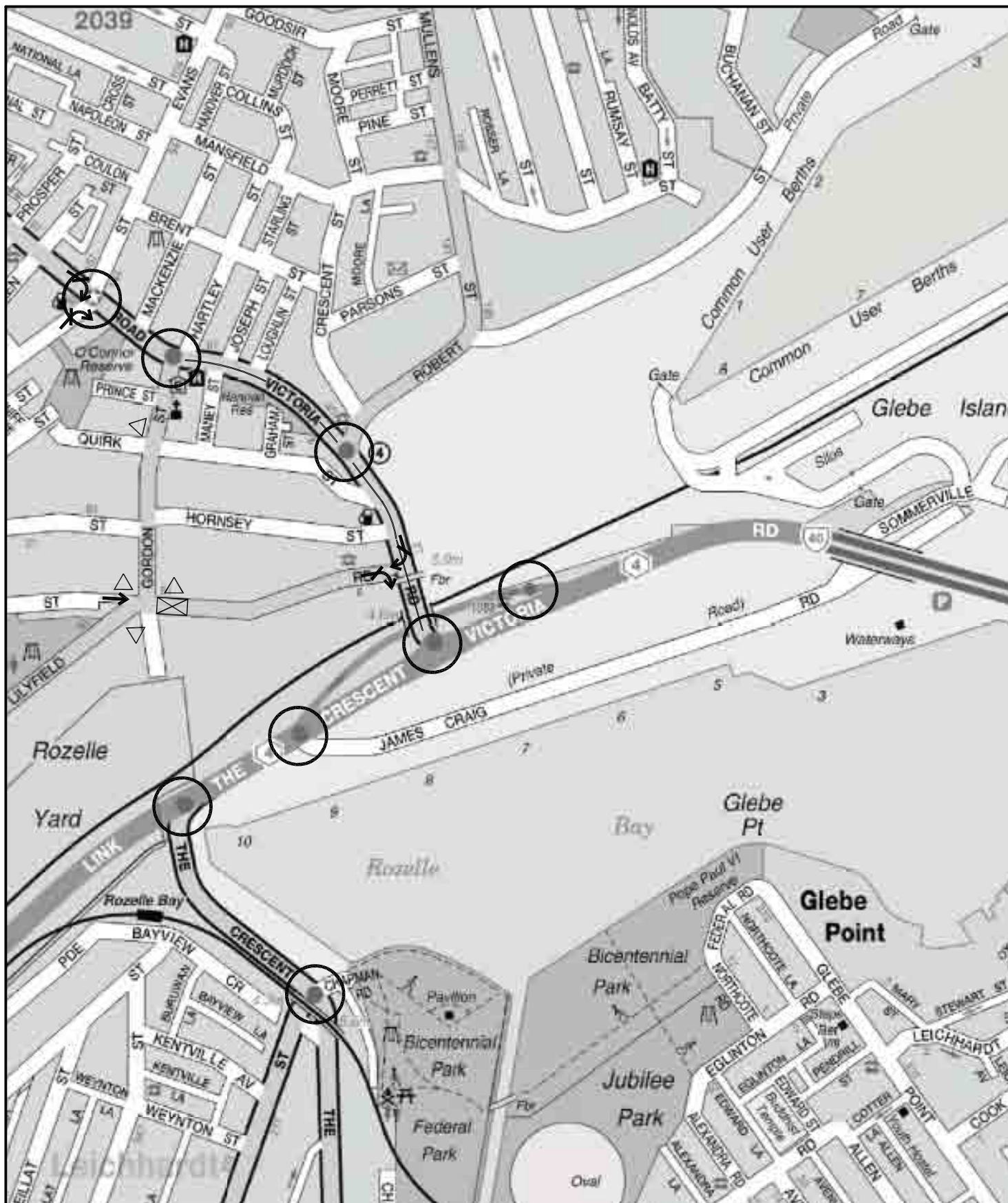
3.3 TRAFFIC CONDITIONS

An indication of traffic conditions in the area is provided by data published by RMS and surveys undertaken as part of this study. The RMS data is provided in the terms of Annual Average Daily Traffic (AADT) and the latest published data is as follows:

	AADT
City West Link Road west of The Crescent	64,058
The Crescent south of City West Link Road	29,133

Traffic surveys have been undertaken at the intersection of The Crescent and James Craig Road in November 2013 for the circumstances of:

- Weekday AM and PM and Saturday Midday peak periods
- Without a ship berthed in the OPT
- With a ship berthed in the OPT



LEGEND

-  TRAFFIC SIGNAL CONTROL
-  ROUNDABOUT
-  RESTRICTED TURNING MOVEMENT



TRAFFIC CONTROLS

FIG 4

During the survey period intense construction works were in progress on both the GIE and the Mirvac development sites. The results of these surveys in terms of the peak vehicle trips per hour for each movement are provided in Appendix C and summarised on Figure 5a and 5b.

The operational performance of this intersection for these circumstances has been modelled using SIDRA and the results provided in Appendix D and summarised in the following indicating a satisfactory operation while the criteria for interpreting SIDRA are reproduced overleaf:

	AM		PM		Sat MD	
	LOS	AVD	LOS	AVD	LOS	AVD
No OPT use	B	22.6	B	17.6	A	8.8
OPT in use	B	22.7	B	17.6	A	9.9

3.4 TRANSPORT SERVICES

Public transport serving the site is currently provided largely by frequent STA bus services along Victoria Road, The Crescent and Lilyfield Road. This servicing is enhanced by the light rail service which runs along the Railway Goods Line just to the west with the Rozelle Bay stop located at the corner of The Crescent and City West Link Road.

The bus services comprise:

- * Routes 432, 433 and 434, linking Birchgrove and Balmain with Millers Point, with services every 15 to 30 minutes in each direction. During weekday peak periods services are more frequent
- * Routes 441 and 442, linking Birchgrove and Balmain Wharf with QVB and the city, with services every 10 minutes in each direction Monday to Saturday and every 15 minutes on Sundays. During peak periods, services are more frequent

THE CRESCENT

3506 → ← 2354
60 ↓ ↓ 98

24 34

JAMES
CRAIG
ROAD

AM PEAK

7 - 8 AM 5/11/13

THE CRESCENT

2916 → ← 2915
22 ↓ ↓ 32

60 87

JAMES
CRAIG
ROAD

PM PEAK

5 - 6 PM 5/11/13

THE CRESCENT

3199 → ← 2699
33 ↓ ↓ 59

25 49

JAMES
CRAIG
ROAD

SAT MIDDAY

12 - 1 PM 9/11/13

LEGEND



**EXISTING TRAFFIC
VOLUMES
(NO OPT USE)**

FIG 5A

THE CRESCENT

3345 → ← 2294
101 ↓ ↓ 167

49 64

JAMES
CRAIG
ROAD

AM PEAK

7 - 8 AM 8/11/13

THE CRESCENT

3124 → ← 2941
17 ↓ ↓ 27

88 80

JAMES
CRAIG
ROAD

PM PEAK

5 - 6 PM 8/11/13

THE CRESCENT

3142 → ← 2645
44 ↓ ↓ 207

74 166

JAMES
CRAIG
ROAD

SAT MIDDAY

12 - 1 PM 2/11/13

LEGEND



**EXISTING TRAFFIC
VOLUMES
(OPT IN USE)**

FIG 5B

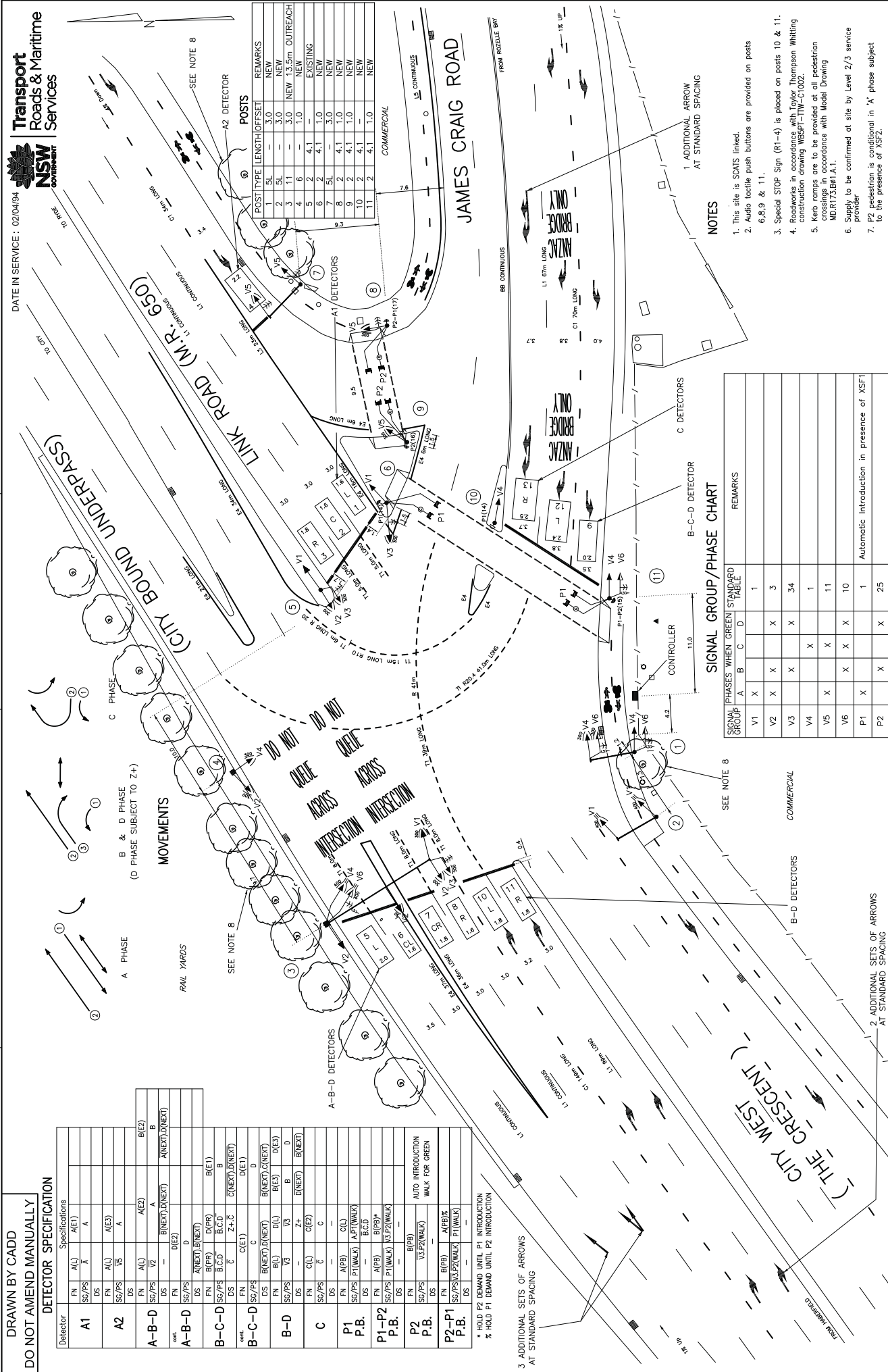
DRAWN BY CADD
DO NOT AMEND MANUALLY

DETECTOR SPECIFICATION

Detector	Specifications			
	FN	AL	AE(1)	
A1	SC/PS	A	A	
	DS			
A2	FN	AL	AE(3)	
	DS	VS	A	
A-B-D	FN	AL	AE(2)	BE(2)
	DS			B
A-B-D	SC/PS	V2	A	
	DS			
A-B-D	FN		B(NEXT),D(NEXT)	A(NEXT),D(NEXT)
	DS		D(2)	
B-C-D	SC/PS	D		
	DS			
B-C-D	FN	B(P)	D(P)	BE(1)
	DS	B,C,D	B,C,D	B
B-C-D	FN	C	Z+Z	C(NEXT),D(NEXT)
	DS			D(1)
B-C-D	SC/PS	C		
	DS			
B-D	FN	B(NEXT),D(NEXT)	B(NEXT),D(NEXT)	
	DS	B(L)	D(L)	D(3)
B-D	SC/PS	V3	V3	B
	DS			D
C	FN	C(L)	C(2)	D(NEXT)
	DS			
P1	FN	A(P)		
	DS			
P1-P2	SC/PS	P1(WALK)	A(P1(WALK))	
	DS			
P1-P2	FN	A(P)	B(P)	
	DS			
P2	SC/PS	P2(WALK)	A(P2(WALK))	
	DS			
P2-P1	FN	B(P)		
	DS			
P2-P1	SC/PS	V3,P2(WALK)	A(P2(WALK))	
	DS			

* HOLD P2 DEMAND UNTIL P1 INTRODUCTION
% HOLD P1 DEMAND UNTIL P2 INTRODUCTION

3 ADDITIONAL SETS OF ARROWS
AT STANDARD SPACING



SIGNAL GROUP/PHASE CHART

SIGNAL GROUP	PHASES WHEN GREEN STANDARD				REMARKS
	A	B	C	D	
V1	X				1
V2	X	X			3
V3		X	X		34
V4			X		1
V5	X		X		11
V6	X	X	X		10
P1	X				1
P2		X			25

NOTES

- This site is SDATS linked.
- Audio tactile push buttons are provided on posts 6.8.9 & 11.
- Special STOP Sign (R1-4) is placed on posts 10 & 11.
- Roadworks in accordance with Taylor Thompson Whiting construction drawing NBSPT-11W-C1002.
- Kerb ramps are to be provided at all pedestrian crossings in accordance with Model Drawing MD.R173.B4.A.1.
- Supply to be confirmed at site by Level 2/3 service provider
- P2 pedestrian is conditional in 'A' phase subject to the presence of XSF2.
- Trees to be kept trimmed for signal visibility.

A ORIGINAL ISSUE		ROADS AND MARITIME SERVICES		EXISTING ☐ PROPOSED ☒	
LEICARDT COUNCIL AREA		CITY WEST LINK (MR 650) ROAD AND JAMES CRAIG ROAD		CAAD FILE: VV3033_6A.dgn	
TRAFFIC SIGNALS AT		TCS No 3033		SCALE 1:1200	
JAMES CRAIG ROAD		DESIGN LAYOUT		FILE 255 TS 288	
0650.255.VV.3033		SHEET 6		SUPERSEDES 1H	
DATE: 02/04/94		DATE: 02/04/94		DATE: 02/04/94	

- * Routes 500, 501, 502, 504, 505, 506, 507, 510, 515, 518, 520, M50 and 52 plus express services pass along Victoria Road to/from the city every 5 – 10 minutes in each direction. During weekday peak periods services are even more frequent
- * the light rail line connects Lilyfield with the City and the 'Rozelle Bay' light rail station is located just to the west of The Crescent/City West intersection some 400 metres walking distance from the site. This service, which operates every 10 to 15 minutes in each direction, has recently been extended to Dulwich Hill offering a significantly enhanced public transport option.
- * Victoria Road and the Anzac Bridge provide a significant pedestrian and cycle route between Pyrmont and the City and areas to the west
- * NSW Maritime operates a shuttle bus services for employees between Wynyard Station and the site during weekday morning and afternoon peak periods. This service operates half hourly between 7.00am and 9.00am and 3.30pm and 6.30pm.

The site therefore has good access to regular public transport services as well as regional pedestrian and bicycle routes.

3.5 FUTURE TRAFFIC CIRCUMSTANCES

*** Overseas Passenger Terminal**

The traffic movements recorded at the intersection of The Crescent and James Craig Road in November 2013 when a cruise ship berthed for the day provide an accurate record of the typical traffic circumstances which are associated with this activity in the peak on-street AM, PM and Saturday Midday periods. These surveys were undertaken in the peak cruise season and when there was significant construction activity on the GIE and MIRVAC sites.

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, 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 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

*** Glebe Island Expo Interim Facility**

The forecast annual frequency/magnitude of events is as follows:

Daily Attendance	Operational Days
< 5,000	91
5,000 – 7,500	6
7,500 – 10,000	11
> 10,000	12
Total:	120

Infrastructure NSW engaged AECOM to undertake an assessment of the potential traffic and transport implications of this interim facility. That document* provides the following assessment:

Mode	Typical Event		Peak Event	
	Weekday	Weekend	Weekday	Weekend
Car	2,000	2,000	2,000	2,000
Bus	1,450	3,550	5,650	10,900
Ferry	1,050	2,450	4,550	8,600
Total:	4,500	8,000	12,200	21,500

The projected car activity is 'constant' for events and the projected generated vehicle movements in the peak periods is as follows:

	Car		Bus		Truck		TOTAL	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
AM Peak	-	-	-	-	25	25	25	25
PM Peak	-	100	0	5	11	11	11	116
Saturday MD	150	50	15	5	-	-	165	55

* Glebe Island Interim Facility
Transport Management Strategy
AECOM November 2012

The assessment considered the 'cumulative' traffic impacts including "*OPT and the marine activities on James Craig Road as advised by Sydney Ports Corporation*". The resultant assessment for operation of the intersections of The Crescent/James Craig Road, The Crescent/City West Link and Victoria Road/The Crescent was as follows:

	LEVEL OF SERVICE		
	AM	PM	SAT
James Craig	A	A	A
City West	C	B	B
Victoria	D	C	C

These results from the AECOM study indicate a satisfactory traffic outcome for their assessment of the cumulative impacts of the GIEIF, OPT and the marine activities on James Craig Road based on the projections at that time.

* **Mirvac Harold Park Development**

The redevelopment of the former Harold Park Paceway is substantially commenced and when completed will comprise:

- 1,250 residential apartments
- 5,394m² retail floorspace
- 447m² gym
- 500m² community

Vehicle access will comprise:

- Residential connection to Wigram Road
- Main residential access to Minogue Crescent
- Secondary residential access to Minogue Crescent
- Retail access to Chapman Road

An assessment² of the Tramshed Element established a total projected traffic generation in 443vtpd in the AM and 60vtpd in the PM with the projected movements along The Crescent at James Craig Road as follows:

AM	PM	WEWD
90 vtpd	247 vtpd	220 vtpd

It should be noted that the existing construction activity generates significant traffic movements.

² Harold Park Tramshed
Traffic, Transport and Parking Report
GTA Consultants, May 2013

4. TRAFFIC

The traffic generation of the existing water side related element is already incorporated into the recorded traffic flows and the projected traffic generation of the proposed 'land side' elements of the Sydney Super Yacht Marina development during the peak periods as established in the previous assessment³ is as follows:

	AM		PM		WEMD	
	IN	OUT	IN	OUT	IN	OUT
Marine*	10	5	5	10	10	10
Yacht Club	10	5	25	5	15	5
Restaurant/Bars	5	5	15	-	40	20
Provedore/Restaurant	10	10	15	5	15	15
Total:	35	25	60	20	80	50

** not including existing vessel berth*

The S75W modification proposes to increase the number of berths and the parking provision and this will inevitably result in some additional traffic movements. In regard to the implications of the additional berths there is very comprehensive data in relation to the usage and parking characteristics of Marinas provided in a number of documents⁴.

³ Sydney Super Yacht Marina
Traffic, Transport and Parking Assessment
TTPA 24.7.2012

⁴ Land and Environment Court Proceedings 11179 of 2007
Rosebay and Point Piper Marinas
Surveys at Rozelle Bay Marina

Traffic and Parking Implications of Marina Developments
Christopher Hallam and Associates, November 2008

Traffic and Parking Assessment of Proposed Modifications to Double Bay Modifications to Double Bay Marina
Christopher Hallam and Associates, July 2009

These documents provide an insight into the variabilities of “season”, “boat length”, “type of facility” (eg wet berth, dry berth, swing mooring) and “peak usage days” etc. Generalised factors established include:

- Peak “boat usage” rate in summer 15.3% of berths on weekends
- Parking demand in summer weekends
 - o Wet berth (< 20m) 0.166 cars/berth
 - o Wet berth (> 20m) 0.223 cars/berth

On weekdays in summer the boat usage rate is less than 25% of the weekend usage rate. Given the time span over which cars arrive and depart in relation to boat usage it is apparent that traffic movements associated with the proposed additional Marina berths will be largely imperceptible at less than 10vtph.

Other pre-eminent factors in relation to the traffic generation of the proposed land side development are:

- * activity during the weekday morning on-street peak period (7am – 9am) will largely be confined to:
 - employee arrival
 - deliveries
 - boat usage
- * activity during the weekday afternoon on-street peak period (4.30pm – 6.30pm) will largely be confined to:
 - employee departure
 - employee (restaurant etc) arrival
 - boat usage
 - limited patron/visitor movements
- * activity during the weekend midday period will comprise:
 - boat usage
 - club members
 - patron/visitor movements

- * the significantly “dual use” activity between boat usage and the land side elements

The peak activity times will occur with restaurant use on Friday and Saturday nights (ie after 7pm) and for occasional functions at these times. The average car occupancy for club, restaurant and function visitation will be some 2.5 persons. The projected traffic movements provided and accepted in the Traffic Report for the Part 3A Application have been reassessed having regard for:

- the increased number of berths
- the increased number of parking spaces
- the largely very comparable floor area outcome
- the outdoor seating provision

The assessed traffic generation for the S75W modification for the on street peak traffic periods is as follows:

WD AM		WD PM		WE MD	
IN	OUT	IN	OUT	IN	OUT
40	28	65	35	90	60

The other traffic generation factors relevant to the “compound” assessment are:

* **The generation of the OPT operation**

These are included in the base survey data to be used for assessment (Figure 5b)

* **The generation of the GIEI**

The projected movements are provided on P15 and these will all ingress via James Craig Road but will be able to egress via Roberts Road and James Craig Road. The assessed movements on James Craig Road are:

WD AM		WD PM		WE MD	
IN	OUT	IN	OUT	IN	OUT
25	20	11	76	165	35

In reality these movements should be discounted by the construction vehicle movements which were occurring at the time the survey was undertaken, however these movements could not be isolated and identified.

*** The generation of the Mirvac development**

The projected movements as identified in the “Tramshed” Traffic Report of May 2013 will result in flows along The Crescent at the James Craig Road intersection as follows:

WD AM		WD PM		WE MD	
EB	WB	EB	WB	EB	WB
70	20	100	147	100	120

In reality these movements should also be discounted by that which was being generated by the construction activity occurring at the time of the surveys.

The projected movements resultant to the S75W Application and the GIEIF and Mirvac developments have been added to the traffic movements recorded at the intersection of The Crescent and James Craig Road when ships were docked at the OPT. The resultant compound volumes are shown on Figure 6 and the results of SIDRA assessment of the intersection performance are provided in Appendix D and summarised in the following:

	WD AM	WD PM	WE MD
Level of Service	C	B	A
Av. Veh. Delay	23.8	24.1	11.0

The results indicate that a satisfactory Level of Service will be maintained even in the very infrequent circumstance of coincident peaks of activity at the various elements. It is also noted that the Marina development will occur in stages over a period of time while the GIE will only have a limited “lifetime”.

THE CRESCENT

3415 → ← 2314
106 ↓ ↓ 189

66 33

JAMES
CRAIG
ROAD

AM PEAK

THE CRESCENT

3224 → ← 3088
22 ↓ ↓ 86

66 66

JAMES
CRAIG
ROAD

PM PEAK

THE CRESCENT

3445 → ← 2765
109 ↓ ↓ 347

66 186

JAMES
CRAIG
ROAD

SAT MIDDAY

LEGEND



**COMPOUND TRAFFIC
VOLUMES**

FIG 6

5. PARKING

Parking provision for the proposed S75W development scheme can be assessed in relation to Council's DCP 2013 document which specifies the following:

	Minimum	Maximum
Commercial	1 space per 100m ²	1 space per 80m ²
Retail	1 space per 50m ²	1 space per 50m ²
Restaurant	1 space per 80m ²	1 space per 50m ²
Club	1 space per 30 patrons 1 space per 6 staff	1 space per 10 patrons 1 space per 3 staff
Accessible	1 space per 50 spaces	

Application of Council's criteria to the proposed development scheme would indicate the following:

		Minimum	Maximum
Club	1,745m ² 1,260 patrons 30 staff	47 spaces	136 spaces
Commercial	3,718m ²	38 spaces	47 spaces
Retail	465m ²	10 spaces	10 spaces
Restaurant	952m ²	12 spaces	19 spaces
Outdoor Seating	2,172m ²	28 spaces	44 spaces
Marina		43 spaces	43 spaces
Car Share		1 space	1 space
Total:		179 spaces	300 spaces

It is proposed to provide 237 spaces (plus the 4 space credit for car share provision) with the periodic availability of some of the other spaces which will normally be occupied for other recreational water craft or other storage. The proposed provision will be entirely consistent with Council's DCP criteria particularly when the peak of commercial floorspace activity will not coincide with the peak Club and restaurant uses. The availability of public transport services as well as walking and cycling connectivity will also serve to moderate the parking demand.

Council's DCP 2013 criteria for the provision of bicycle storage specifies the following in relation to the proposed development:

	Staff	Visitors
Commercial	1 space per 10 staff	1 space per 400m ²
Retail	1 space per 10 staff	2 spaces plus 1 space 100m ² > 100m ²
Restaurant	1 space per 10 staff	2 spaces plus 1 space per 100m ² > 100m ²
Club	1 space per 10 staff	1 space per 140m ²
Marina	Not stated	Not stated

Application of this criteria to the proposed S75W development scheme would indicate:

Commercial 90 staff and 3,718m ²	9 + 10 spaces = 19 spaces
Retail 20 staff and 465m ²	2 + 2 + 4 spaces = 8 spaces
Restaurant 30 staff and 952m ²	2 + 3 + 9 spaces = 14 spaces
Club 30 staff and 1,745m ²	3 + 13 = 16 spaces
Marina 10 staff	Not stated, say 1 space
	Total: 58 spaces

It is proposed to provide a total of 54 bicycle parking throughout the site which will be supplemented by shower and locker facilities for users and this is considered to be an acceptable quantum given the compound implications and the fact that the peak staff circumstance for the club and restaurant will be at night when there will be no retail/commercial demand.

The DCP requires provision of “car share” spaces, however because of the relative remoteness of the site (ie from any significant residential or other commercial uses) it is proposed to provide 1 car share space. It is noted that this space can be provided “in lieu” of 5 parking spaces.

The DCP specifies that the provision for motor cycle parking should be 5% of the car parking requirement (ie 9 to 15 spaces) and it is proposed to provide 9 motor bike parking spaces.

The DCP specifies a provision of accessible space at the rate of 1 space per 50 spaces for all but commercial use which is 1 space per 100 spaces. This indicates a provision of 3 to 5 spaces and it is proposed to provide 3 spaces in close proximity to the building.

6. ACCESS, INTERNAL CIRCULATION AND SERVICING

ACCESS

Vehicle access will be provided on the Maritime Court which connects to James Craig Road at the Sommerville Road intersection roundabout. This section of road is straight and level and the access connection/s will:

- * have excellent sight distances available
- * be able to accommodate all vehicles which require to access the site including fuel deliveries

INTERNAL CIRCULATION

The design of the parking and circulation areas will comply with the design criteria of AS2890.1 and 6 and will provide for satisfactory circulation, manoeuvring and parking.

SERVICING

The provisions for service vehicles will comprise:

- * a loading bay adjacent to the Marina office
- * the ability for occasional fuel tanker vehicles and provisioning vehicles to access along the pier side
- * the ability for Ausgrid vehicles to service the kiosk located at the western end of the site

Deliveries for the restaurant and club uses will occur in the morning before patrons arrive and small service/delivery vehicles (service personnel etc) will be able to also use the visitor parking spaces provided.

Details of the turning path assessments for the fuel tanker vehicle and potential Ausgrid truck are provided in Appendix E indicating that satisfactory manoeuvring will be available.

7. PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT

The S75W design maintains a wide 'board walk' corridor for public access along the waterfront on a 24 hour basis. There will also be a pathway along the front boundary and along the eastern boundary as well as connections between the buildings. These on-site provisions will allow connectivity with the off-site pedestrian and cyclists networks including the regional route across Anzac Bridge.

The frequent high capacity bus services along the Victoria Road – Anzac Bridge and the City West Link Road – The Crescent routes are in close proximity and provide connection into the Metropolitan public transport network. The Light Rail system passes within reasonable walking distance with the Rozelle Bay stop located on the corner of The Crescent and City West Link Road just to the west.

8. CONCLUSION

Assessment of the potential traffic, transport and parking implications of the proposed S75W modifications for the Sydney Super Yacht Marina has concluded that:

- * the provision of on-site carparking and bicycle storage will be adequate and appropriate having regard for the accessibility of the site in relation to public transport and Council's DCP criteria without providing excess parking so as to discourage the use of public transport or walking/cycling
- * there will be no adverse traffic implications even for the unlikely coincidence of OPT use, peak GIEIF use and peak activity at the Marina development (also having regard for the projected Mirvac development)
- * the vehicle access, service vehicle provisions and accessibility for public transport, pedestrians and cyclists will be satisfactory and will avoid undue reliance on travel by private motor vehicle

APPENDIX A

PLANS OF APPROVED DEVELOPMENT

NEW GOVERNMENT
Planning

Issued under the Environmental Planning and Assessment Act 1979

Approved Application No. MP 0.9 - C16 S

granted on the 28/01/17

Signed [Signature]

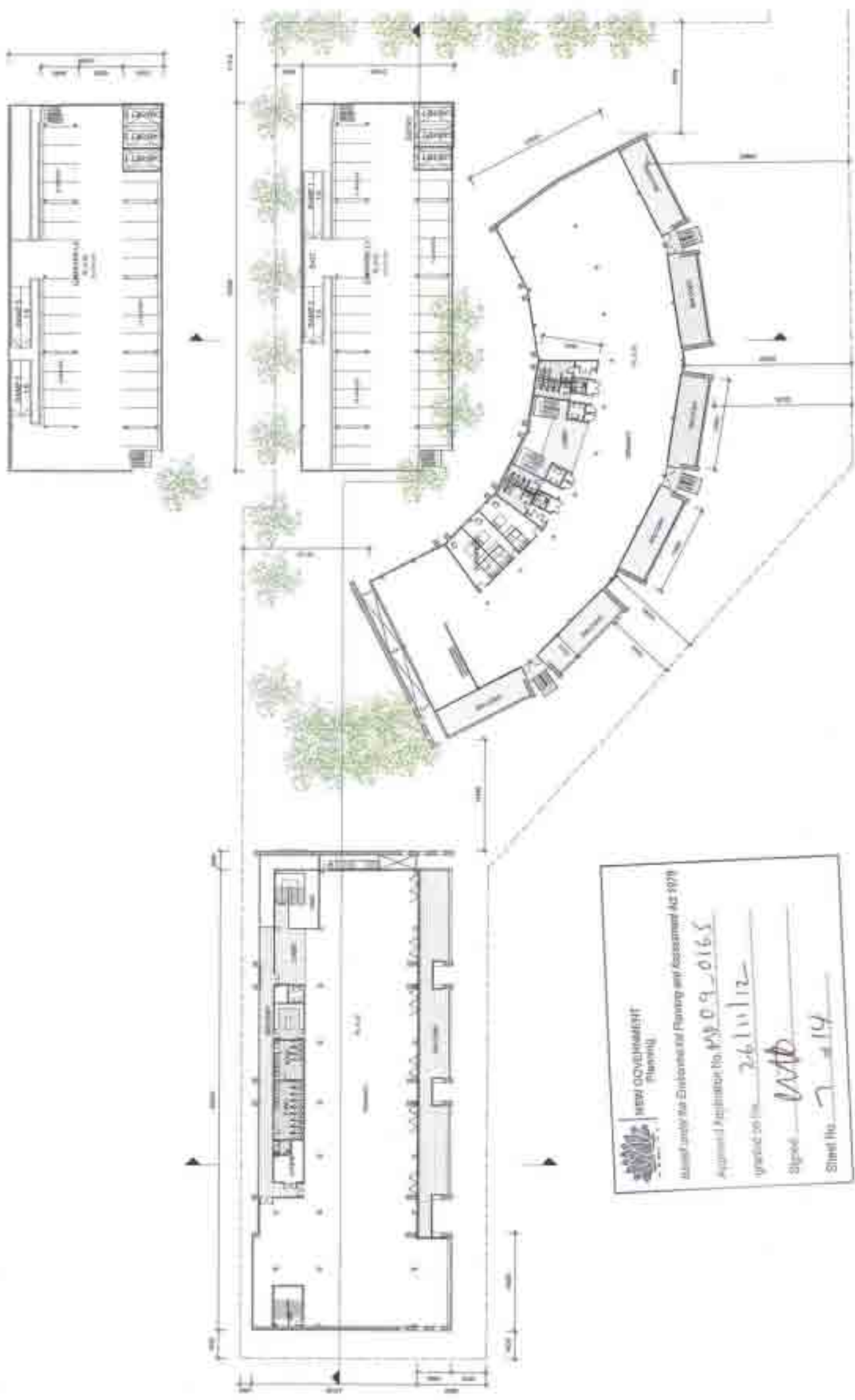
Shed No. 9 of 14

1/11/17

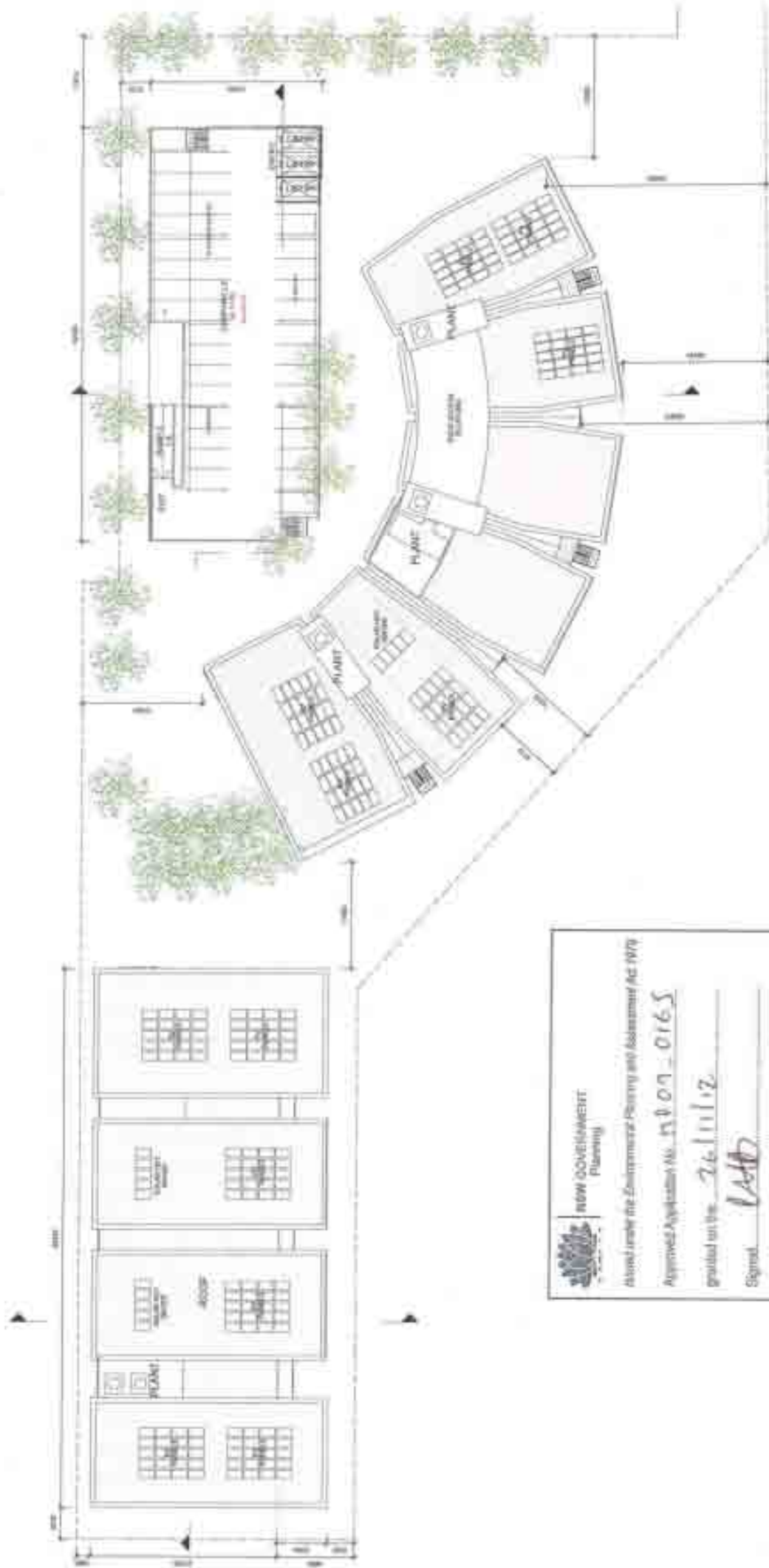
APPROVED DEVELOPMENT BEYOND

1 SOUTH ELEVATION
1:250

2 NORTH ELEVATION
1:250




NEW SOUTH WALES GOVERNMENT
 Planning
 Approved under the Environmental Planning and Assessment Act 1979
 Approved Registration No. MS 09 0165
 Issued on the 26/11/12
 Signed Wtb
 Sheet No 7 of 14



	NEW SOUTH WALES GOVERNMENT Planning
Assessed under the Environmental Planning and Assessment Act 1979	
Approved Application No. <u>NP09-0165</u>	
Granted on the <u>26/11/12</u>	
Signed <u>[Signature]</u>	
Shall be <u>8 x 14</u>	

APPENDIX B

PLANS OF PROPOSED DEVELOPMENT



Cross Section - WEST BLOCK A-A

1 : 200



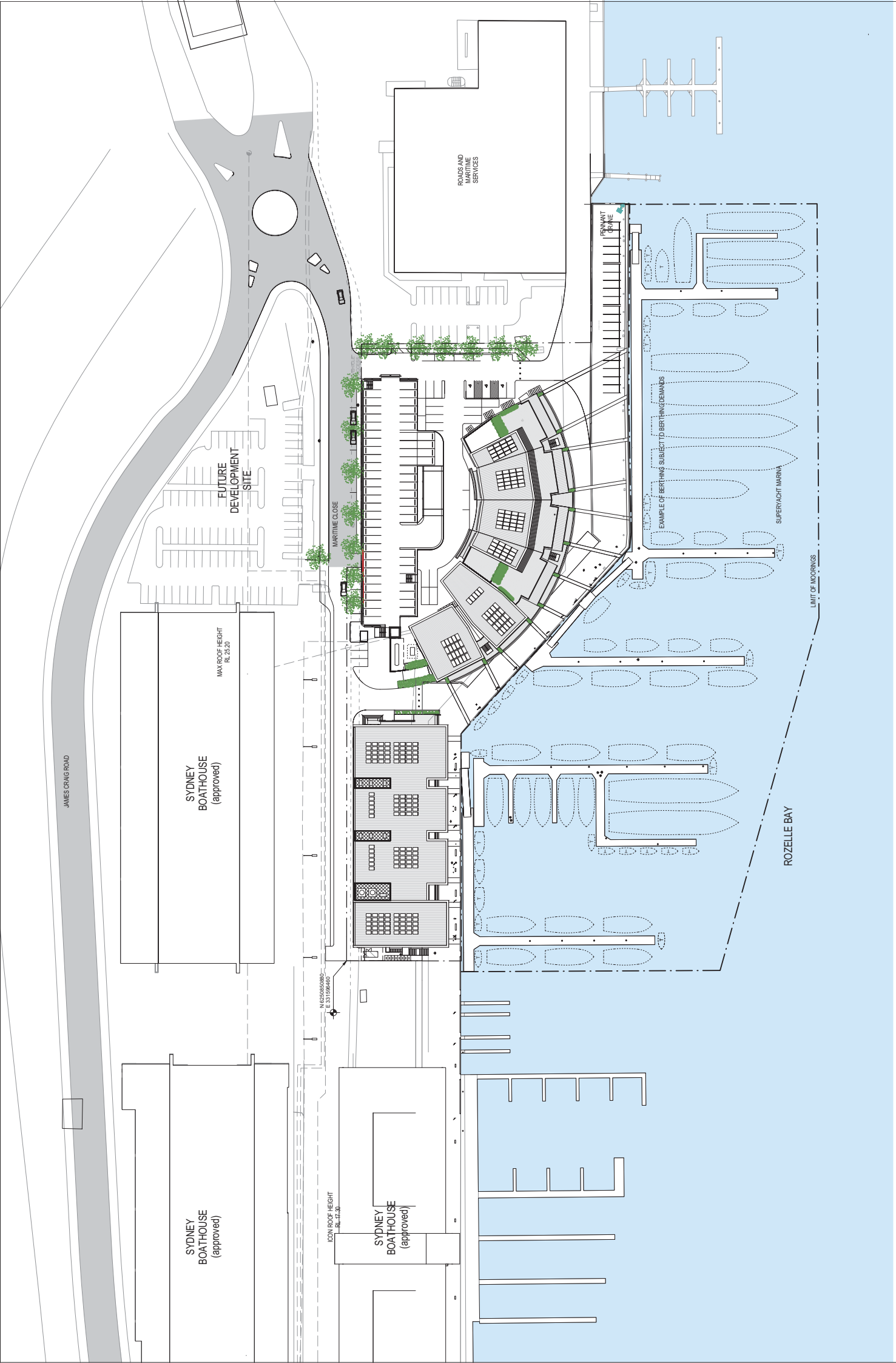
Cross Section - EAST BLOCK B-B

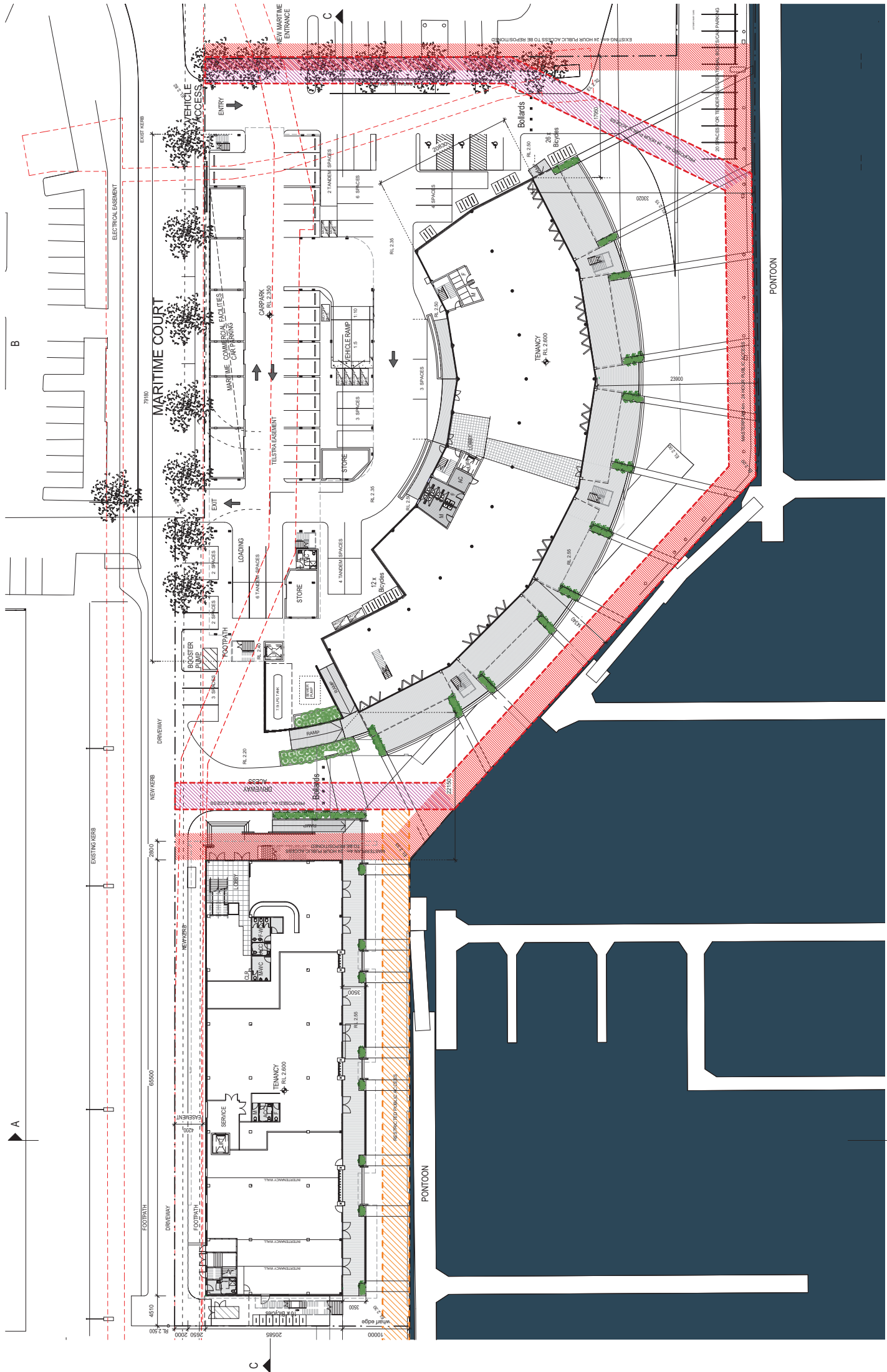
1 : 200

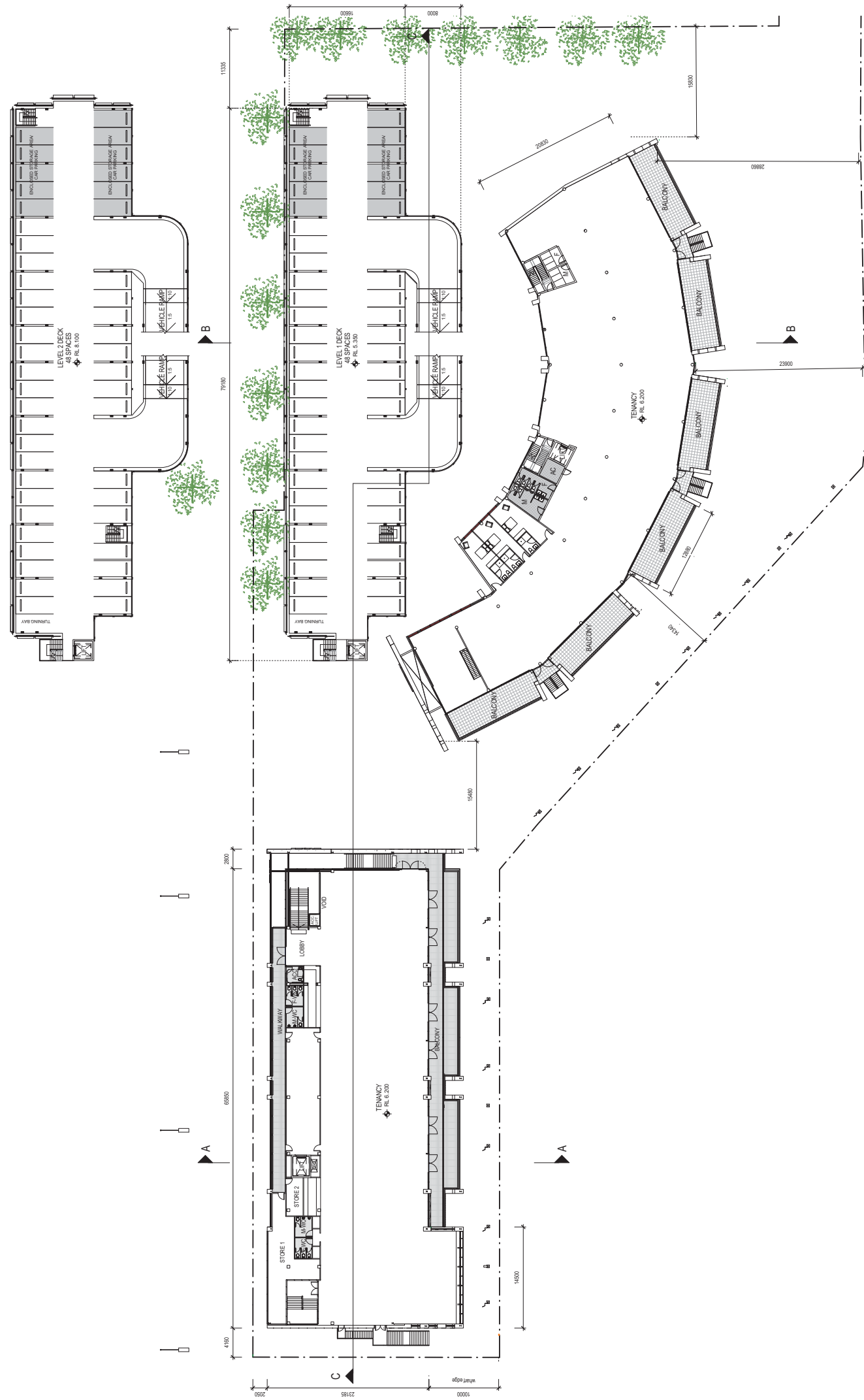


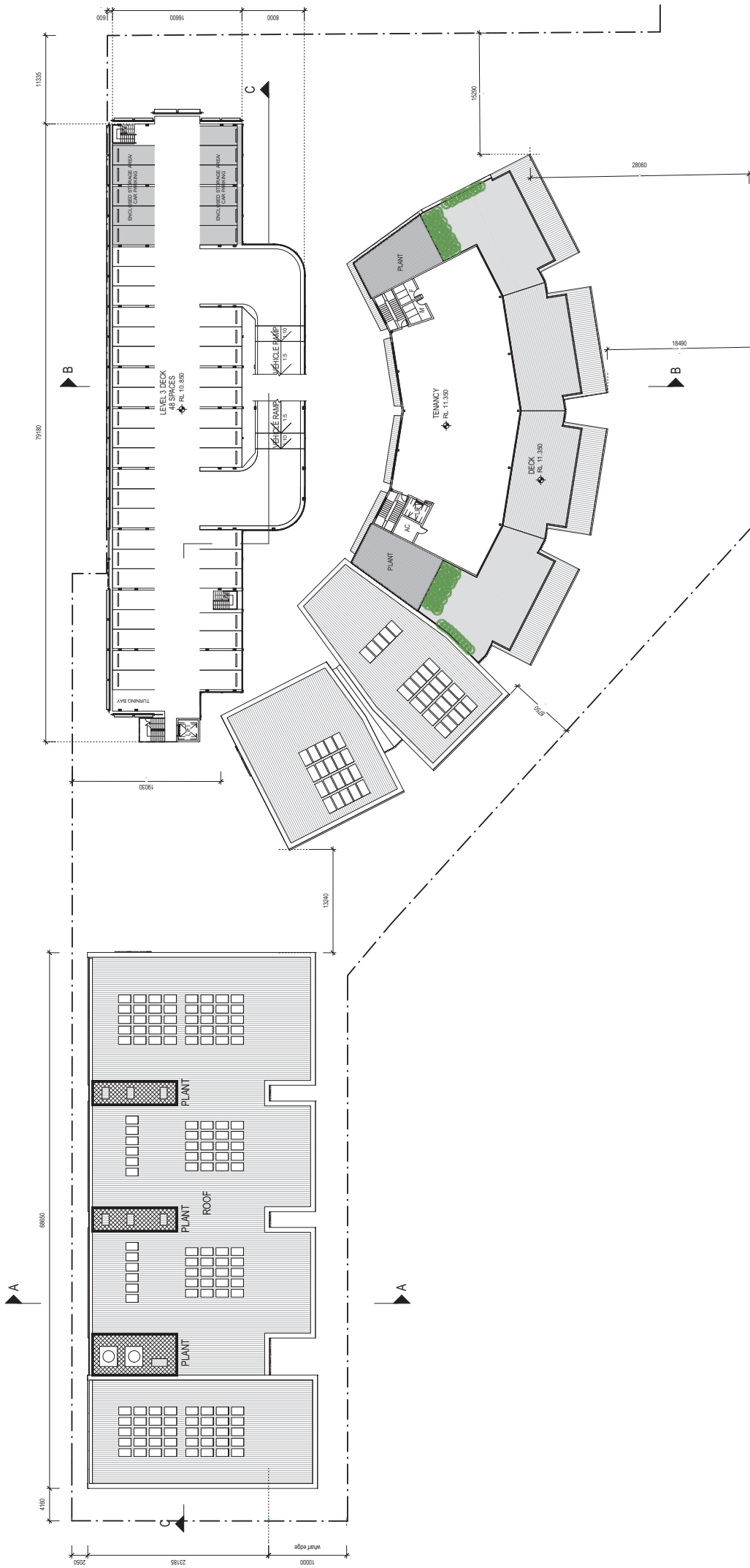
Long Section - WEST BLOCK / CARPARK C-C

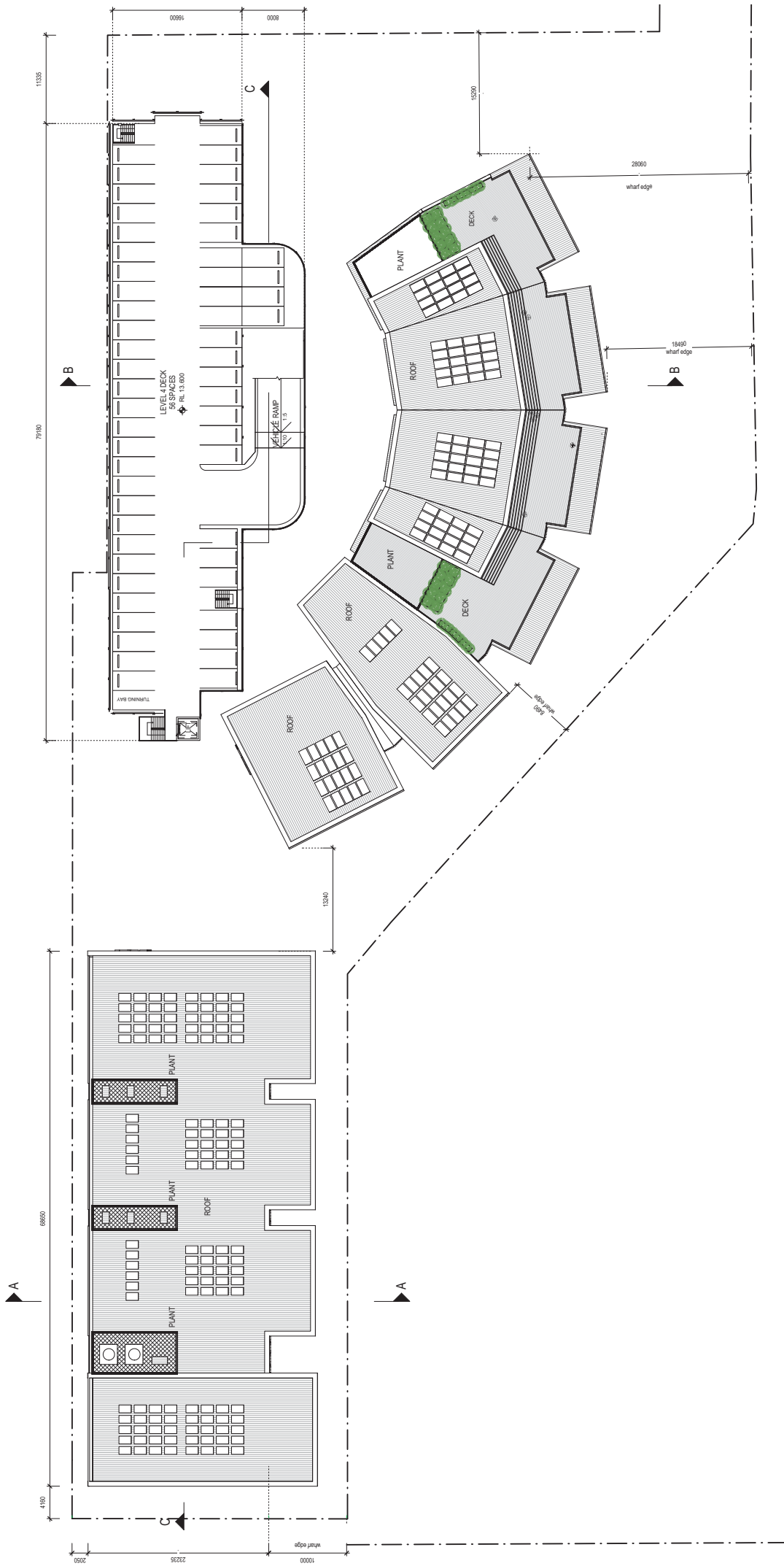
1 : 250











APPENDIX C

TRAFFIC SURVEY RESULTS

TCS 3033

ROZELLE

L1M5

RQZ

SS=2

4 PHASES



Saturday, 09 November 2013

approach - detector(s)...

Approach 1	1	2	3	4	5	6	7	8	9	10	11	12	13
01:00	501	608	394	15	313	309	34	97	10	0	7	6	6 2300
02:00	300	501	240	3	164	176	15	49	4	0	0	4	1 1457
03:00	206	400	185	4	137	138	8	26	3	0	7	0	2 1116
04:00	138	328	142	3	199	185	3	28	1	3	1	2	2 1035
05:00	116	267	105	10	122	160	8	24	4	2	9	3	3 833
06:00	144	220	122	16	359	447	15	70	12	6	8	4	1 1424
07:00	342	389	205	42	776	967	55	155	12	8	14	8	5 2978
08:00	568	569	297	58	807	917	74	244	21	10	20	10	10 3605
09:00	815	785	405	45	929	1063	113	321	22	11	15	6	11 4541
10:00	1015	825	481	66	1048	1179	172	443	18	12	17	21	19 5316
11:00	1111	905	549	52	1050	1189	233	498	25	9	8	14	22 5665
12:00	1132	873	543	49	1165	1333	220	504	32	7	9	21	22 5910
13:00	1217	914	568	59	1156	1326	227	490	25	8	10	20	29 6049
14:00	1167	937	654	39	1112	1272	209	477	35	4	4	21	34 5965
15:00	1244	933	658	29	1124	1314	191	444	13	6	6	24	26 6012
16:00	1202	923	615	36	1060	1210	224	486	20	8	15	14	25 5838
17:00	1306	957	633	17	987	1103	203	451	11	2	6	10	18 5704
18:00	1357	979	629	27	1063	1223	196	409	18	1	6	6	23 5937
19:00	1267	965	583	19	1218	1334	150	353	13	0	3	4	9 5918
20:00	910	731	427	25	1126	1235	129	294	6	3	3	6	9 4904
21:00	693	682	408	16	831	870	107	217	11	3	1	6	5 3850
22:00	691	746	384	14	772	800	95	199	6	1	5	3	11 3727
23:00	899	904	546	12	700	750	101	200	6	2	0	4	3 4127
24:00	911	963	561	15	625	645	105	171	16	2	1	4	15 4034

Approach 1 AM peak 5910 11:00 - 12:00 PM peak 6136 12:30 - 13:30 Daily
Total 98245

Tuesday, 05 November 2013

approach - detector(s)...

Approach 1	1	2	3	4	5	6	7	8	9	10	11	12	13
01:00	124	237	115	1	94	81	4	28	16	4	5	2	2 713
02:00	69	160	56	2	60	69	3	13	9	4	4	1	2 452
03:00	39	131	56	3	57	70	8	7	3	3	9	1	2 389
04:00	44	121	48	1	118	97	4	16	7	7	8	5	0 476
05:00	54	137	62	9	185	205	6	29	7	8	11	5	3 721
06:00	203	230	135	32	549	756	28	108	20	16	22	2	4 2105
07:00	691	552	338	103	1109	1418	63	263	9	17	52	15	10 4640
08:00	1012	783	559	98	1377	1563	89	477	24	15	45	17	17 6076
09:00	990	741	508	124	1126	1151	107	447	24	25	61	12	27 5343
10:00	967	771	466	100	1015	1154	147	423	30	17	42	19	28 5179
11:00	868	758	416	76	975	1085	165	372	42	15	24	28	38 4862
12:00	855	736	442	83	1001	1096	156	383	45	16	25	33	48 4919
13:00	680	636	376	70	1013	1073	193	447	41	22	15	26	59 4651
14:00	866	770	526	72	815	915	225	474	56	12	24	30	43 4828
15:00	1049	818	651	58	710	839	155	381	49	14	21	33	60 4838
16:00	1129	893	650	31	789	967	151	405	49	5	11	27	42 5149
17:00	1285	1005	737	35	858	1117	208	494	57	1	9	34	39 5879
18:00	1290	939	686	32	1001	1187	237	491	60	10	12	35	52 6032
19:00	1210	932	674	28	886	1001	151	370	47	7	10	29	38 5383
20:00	926	789	591	22	661	748	125	299	28	5	10	9	15 4228
21:00	700	699	492	15	547	619	74	232	18	4	5	6	12 3423
22:00	712	698	508	18	545	602	89	214	15	6	13	7	12 3439
23:00	571	612	416	15	439	467	39	129	6	6	10	11	5 2726
24:00	344	477	301	4	251	263	14	54	17	1	6	4	6 1742

Approach 1 AM peak 6076 07:00 - 08:00 PM peak 6046 16:45 - 17:45 Daily
Total 88193

TCS 3033 Traffic Counts.txt

Saturday, 02 November 2013

approach - detector(s)...	1	2	3	4	5	6	7	8	9	10	11	12	13
Approach 1	1	2	3	4	5	6	7	8	9	10	11	12	13
01:00	533	598	329	4	414	421	39	114	5	0	3	2	4 2466
02:00	301	493	224	9	210	203	19	59	5	2	0	4	1 1530
03:00	232	436	217	6	151	147	8	40	7	1	6	2	3 1256
04:00	161	330	162	12	189	186	12	37	6	6	7	8	4 1120
05:00	155	313	139	5	138	157	8	26	10	1	4	6	2 964
06:00	172	239	120	17	345	464	21	74	8	4	14	3	2 1483
07:00	359	393	228	72	746	928	61	148	15	21	32	14	9 3026
08:00	531	573	346	172	798	905	59	220	25	20	41	22	26 3738
09:00	721	733	437	226	974	1102	142	331	76	36	38	96	79 4991
10:00	934	892	505	156	1059	1191	179	426	82	33	40	101	90 5688
11:00	1092	859	555	140	1130	1241	210	483	53	18	19	68	62 5930
12:00	1102	856	583	173	1165	1189	236	499	56	15	15	60	56 6005
13:00	1142	903	600	207	1123	1253	267	499	74	31	13	86	80 6278
14:00	1137	889	591	151	1107	1277	238	483	77	14	23	84	75 6146
15:00	1241	943	649	58	1025	1207	219	457	37	9	10	48	49 5952
16:00	1292	1023	632	27	1100	1250	196	453	29	3	6	20	20 6051
17:00	1255	993	653	26	1013	1155	200	460	29	5	3	12	17 5821
18:00	1332	1025	648	21	1127	1240	168	401	9	1	2	8	18 6000
19:00	1243	996	576	17	1173	1290	175	354	11	0	2	10	15 5862
20:00	904	825	446	14	1147	1236	99	254	9	4	4	5	10 4957
21:00	631	659	342	8	874	912	90	182	3	4	0	3	8 3716
22:00	690	744	404	21	795	841	91	195	6	2	1	5	7 3802
23:00	865	862	521	15	762	771	87	214	9	0	3	6	9 4124
24:00	967	1028	562	10	730	750	92	183	9	4	1	4	9 4349

Approach 1 AM peak 6005 11:00 - 12:00 PM peak 6343 12:30 - 13:30 Daily
Total 101255

Friday, 08 November 2013

TCS 3033 Traffic Counts.txt

approach - detector(s)...	1	2	3	4	5	6	7	8	9	10	11	12	13
Approach 1	1	2	3	4	5	6	7	8	9	10	11	12	13
01:00	224	343	212	5	134	148	14	39	14	0	8	2	5 1148
02:00	118	219	96	2	83	76	9	28	3	0	2	5	2 643
03:00	86	192	95	1	81	91	1	11	4	4	7	0	0 573
04:00	62	172	66	1	124	128	3	16	5	2	3	0	2 584
05:00	97	189	80	6	185	237	11	35	8	11	13	5	1 878
06:00	237	274	159	45	537	752	30	139	19	14	23	9	2 2240
07:00	656	551	370	175	1134	1396	75	289	14	23	61	15	14 4773
08:00	957	777	560	167	1306	1482	108	449	49	43	58	33	31 6020
09:00	968	715	473	226	1092	1127	96	433	48	29	63	92	92 5454
10:00	954	784	473	273	1055	1108	127	477	66	33	55	116	103 5624
11:00	955	773	482	166	1057	1187	169	384	53	28	23	74	80 5431
12:00	941	863	541	179	1017	1171	181	407	76	19	38	63	64 5560
13:00	1027	807	581	275	1053	1164	199	409	112	35	37	106	118 5923
14:00	1078	825	610	220	887	1037	183	432	111	32	41	100	101 5657
15:00	1223	961	738	118	919	1049	187	439	78	14	22	70	73 5891
16:00	1176	921	695	63	1027	1191	230	505	67	14	29	49	48 6015
17:00	1261	974	724	54	1040	1233	196	481	68	7	15	39	35 6127
18:00	1266	934	741	27	1077	1273	256	518	68	7	10	38	48 6263
19:00	1314	954	693	38	1098	1248	178	448	36	3	3	20	44 6077
20:00	1009	780	573	34	1021	1154	124	319	13	2	5	12	20 5066
21:00	710	666	471	23	667	702	95	215	18	3	1	8	9 3588
22:00	756	728	470	19	627	653	76	213	20	3	5	13	24 3607
23:00	837	822	589	16	557	555	86	189	12	2	4	9	9 3687
24:00	701	800	478	10	476	463	76	137	8	4	2	2	7 3164

Approach 1 AM peak 6020 07:00 - 08:00 PM peak 6277 16:45 - 17:45 Daily
Total 99993

APPENDIX D

SIDRA RESULTS

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD AM EX OPT NO OPT

New Site

Signals - Fixed Time Cycle Time = 150 seconds (User Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3506	4.0	0.638	11.0	LOS A	31.9	230.6	0.56	0.52	57.9
3	R2	60	4.0	0.086	59.7	LOS E	1.8	13.0	0.85	0.72	31.2
Approach		3566	4.0	0.638	11.8	LOS A	31.9	230.6	0.56	0.52	57.1
East: JAMES CRAIG											
4	L2	24	4.0	0.031	31.7	LOS C	1.0	7.2	0.61	0.68	39.7
6	R2	34	4.0	0.049	58.2	LOS E	1.0	7.2	0.84	0.69	30.7
Approach		58	4.0	0.049	47.2	LOS D	1.0	7.3	0.75	0.69	33.9
North: THE CRESCENT											
7	L2	58	4.0	0.065	7.0	LOS A	0.4	2.9	0.11	0.61	56.7
8	T1	2354	4.0	0.867	39.0	LOS C	54.4	393.9	0.94	0.89	40.2
Approach		2452	4.0	0.867	37.7	LOS C	54.4	393.9	0.91	0.88	40.6
All Vehicles		6076	4.0	0.867	22.6	LOS B	54.4	393.9	0.70	0.67	45.8

Level of Service (LOS) Method: Delay (RTA NSW).

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

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

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

Gap-Acceptance Capacity: SIDRA Standard (Arcelik MSD).

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

Movement Performance - Pedestrians							
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued
P2	East Full Crossing	53	27.7	LOS C	0.1	0.1	0.61
All Pedestrians		53	27.7	LOS C			0.61

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.

Processed: Tuesday, 22 April 2014 12:26:26 PM

SIDRA INTERSECTION 6.0.20.4860

Project: F:\WORK\10\10026 - ROZELLE SUPER YACHT CLUB\MCDELL NGICRESC AND JAMES CRAIG REV

B.sp0

R002272 - TRANSPORT & TRAFFIC PLANNING ASSOCIATES, NETWORK / PC

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www.sidraclulim.com

**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD PM EX NO OPT

Now Site

Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	2915	2.0	0.492	6.5	LOS A	19.0	135.1	0.40	0.37	62.3
3	R2	22	2.0	0.043	66.5	LOS E	0.7	4.9	0.89	0.68	29.5
Approach		2938	2.0	0.492	7.0	LOS A	19.0	135.1	0.40	0.37	61.8
East: JAMES CRAIG											
4	L2	60	2.0	0.100	42.7	LOS D	3.0	21.4	0.73	0.73	35.6
6	R2	87	2.0	0.162	63.2	LOS E	2.8	19.9	0.91	0.74	29.1
Approach		147	2.0	0.162	55.6	LOS E	3.0	21.4	0.84	0.73	31.4
North: THE CRESCENT											
7	L2	32	2.0	0.020	5.8	LOS A	0.1	0.7	0.09	0.60	56.8
8	T1	2915	2.0	0.859	25.4	LOS B	58.3	415.4	0.90	0.84	46.6
Approach		2947	2.0	0.859	25.2	LOS B	58.3	415.4	0.89	0.83	46.6
All Vehicles		6032	2.0	0.859	17.6	LOS B	58.3	415.4	0.65	0.60	52.3

Level of Service (LOS) Method: Delay (RTA NSW)

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

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

Gap-Acceptance Capacity: SIDRA Standard (Akcelik MSD).

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	19.3	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		53	19.3	LOS B			0.51	0.51

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

Processed: Tuesday, 22 April 2014 12:26:28 PM

SIDRA INTERSECTION 6 0.20.4663

Project: F:\WORK\1010028 - ROZELLE SUPER YACHT CLUB\MODELLING\CRFSC AND JAMES CRAIG REV R.spc

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

B Site: THE CRESCENT/JAMES CRAIG WE MD EX NO OPT

New Site

Signals Fixed Time Cycle Time = 100 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3199	1.0	0.525	4.0	LOS A	13.7	97.0	0.39	0.36	65.1
3	R2	33	1.0	0.100	53.2	LOS D	0.3	5.4	0.95	0.69	33.1
Approach		3232	1.0	0.525	4.5	LOS A	13.7	97.0	0.40	0.36	64.4
East: JAMES CRAIG											
4	L2	25	1.0	0.056	37.0	LOS C	0.9	6.6	0.80	0.70	37.9
6	R2	49	1.0	0.148	52.7	LOS D	1.2	8.1	0.95	0.71	32.8
Approach		74	1.0	0.148	47.4	LOS D	1.2	8.1	0.90	0.71	34.3
North: THE CRESCENT											
7	L2	59	1.0	0.038	7.0	LOS A	0.2	1.3	0.13	0.61	56.7
8	T1	2633	1.0	0.737	12.9	LOS A	30.0	212.1	0.73	0.67	56.2
Approach		2758	1.0	0.737	12.7	LOS A	30.0	212.1	0.72	0.67	56.2
All Vehicles		6054	1.0	0.737	8.8	LOS A	30.0	212.1	0.55	0.61	59.8

Level of Service (LOS) Method: Delay (RTA NSW)

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.

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

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	13.0	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		53	13.0	LOS B			0.51	0.51

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.

Processed: Tuesday, 22 April 2014 12:26:29 PM

SIDRA INTERSECTION 6 0.20.4600

Project: F:\WORK\13\10026 - ROZELLE SUPER YACHT CLUB\MOD\ILLINGWORTH AND JAMES CRAIG REV

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Project: F:\WORK\13\10026 - ROZELLE SUPER YACHT CLUB\MOD\ILLINGWORTH AND JAMES CRAIG REV

**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD AM EX OPT

New Site

Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3345	4.0	0.509	10.5	LOS A	29.2	21.6	0.53	0.50	58.3
3	R2	101	4.0	0.145	60.5	LOS F	3.1	22.2	0.87	0.74	31.0
Approach		3446	4.0	0.509	12.0	LOS A	29.2	21.0	0.54	0.50	56.6
East: JAMES CRAIG											
4	L2	49	4.0	0.064	32.2	LOS C	2.1	14.9	0.62	0.70	39.5
6	R2	64	4.0	0.092	58.9	LOS E	2.0	13.8	0.85	0.72	30.6
Approach		113	4.0	0.092	47.3	LOS D	2.1	14.9	0.75	0.71	33.9
North: THE CRESCENT											
7	L2	157	4.0	0.114	7.1	LOS A	0.8	6.0	0.12	0.62	56.6
8	T1	2224	4.0	0.866	38.8	LOS C	54.2	392.5	0.93	0.88	40.2
Approach		2451	4.0	0.866	36.6	LOS C	54.2	392.5	0.87	0.87	41.0
All Vehicles		6020	4.0	0.866	22.7	LOS B	54.2	392.5	0.68	0.66	48.6

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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 Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	27.7	LOS C	0.1	0.1	0.61	0.61
All Pedestrians		53	27.7	LOS C			0.61	0.61

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

Processed: Tuesday, 22 April 2014 12:26:31 PM

SIDRA INTERSECTION 6.0 20.4860

Project: F:\WORK\10\10026 - RD2711 F SUPER YACHT CLUB\MODELLING\CRESCENT JAMES CRAIG REV 3.sld6

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD PM EX OPT

Now Site

Signals Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Variable Sequence Analysis applied The results are given for the selected output sequence

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3124	2.0	0.527	6.8	LOS A	21.3	151.5	0.42	0.39	62.0
3	R2	17	2.0	0.033	66.3	LOS E	0.5	3.8	0.89	0.67	29.6
Approach		3141	2.0	0.527	7.1	LOS A	21.3	151.5	0.42	0.39	61.6
East: JAMES CRAIG											
4	L2	68	2.0	0.114	42.9	LOS D	3.4	24.3	0.73	0.73	35.6
6	R2	86	2.0	0.160	66.2	LOS E	2.8	19.5	0.91	0.74	29.1
Approach		154	2.0	0.160	55.9	LOS D	3.4	24.3	0.83	0.73	31.6
North: THE CRESCENT											
7	L2	27	2.0	0.017	6.8	LOS A	0.1	0.6	0.08	0.60	56.8
8	T1	2941	2.0	0.865	26.8	LOS B	59.2	421.7	0.90	0.84	46.3
Approach		2968	2.0	0.865	26.6	LOS B	59.2	421.7	0.90	0.84	45.4
All Vehicles		6263	2.0	0.865	17.6	LOS B	59.2	421.7	0.66	0.61	52.3

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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

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

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	East Full Crossing	53	19.3	LOS B	0.1	0.1	0.51	0.51	
All Pedestrians		53	19.3	LOS B			0.51	0.51	

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.

Processed: Tuesday, 22 April 2014 12:25:33 PM

SIDRA INTERSECTION 6.0.20.4680

Project: F:\WORK\10\10028 - ROZELLE SUPER YACHT CLUB\MODELLING\CRESC AND JAMES CRAIG REV

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WE MD EX OPT

New Site

Signals - Fixed Time Cycle Time = 100 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3142	1.0	0.516	3.9	LOS A	13.3	94.1	0.38	0.35	55.1
3	R2	44	1.0	0.133	53.5	LOS D	1.0	7.3	0.95	0.71	53.0
Approach		3186	1.0	0.516	4.6	LOS A	13.3	94.1	0.39	0.36	54.3
East: JAMES CRAIG											
4	L2	74	1.0	0.167	35.1	LOS C	2.9	20.3	0.83	0.75	37.4
6	R2	166	1.0	0.500	54.9	LOS C	4.1	28.7	0.99	0.77	32.1
Approach		240	1.0	0.500	49.7	LOS D	4.1	28.8	0.94	0.76	33.6
North: THE CRESCENT											
7	L2	207	1.0	0.133	7.1	LOS A	0.8	5.8	0.16	0.63	56.6
8	T1	2545	1.0	0.751	12.8	LOS A	31.1	219.6	0.72	0.67	56.3
Approach		2852	1.0	0.751	12.3	LOS A	31.1	219.6	0.68	0.66	56.3
All Vehicles		6278	1.0	0.751	9.9	LOS A	31.1	219.6	0.55	0.51	58.5

Level of Service (LOS) Method: Delay (RTA NSW)

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.

SIDRA Standard Delay Models Used. Control Delay includes Geometric Delay

Gap Acceptance Capacity: SIDRA Standard (Akcelik MOD)

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	East Full Crossing	53	13.0	LOS B	0.1	0.1	0.51	0.51	
All Pedestrians		53	13.0	LOS B			0.51	0.51	

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.

Processed: Tuesday, 22 April 2014 12:26:34 PM

SIDRA INTERSECTION 6.0-20-4000

Project: F:\WOPK10\10028 - ROZELLE SUPER YACHT CLUB\MODELLING\CRESC AND JAMES CRAIG REV

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD AM COMP

New Site

Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3415	4.0	0.621	10.7	LOS A	30.3	219.7	0.54	0.51	58.1
3	R2	106	4.0	0.153	60.6	LOS E	3.2	23.3	0.87	0.75	31.0
Approach		3521	4.0	0.621	12.2	LOS A	30.3	219.7	0.55	0.51	56.6
East: JAMES CRAIG											
4	L2	68	4.0	0.085	32.5	LOS C	2.9	21.0	0.63	0.71	39.3
6	R2	83	4.0	0.119	59.2	LOS E	2.6	18.0	0.86	0.73	30.5
Approach		151	4.0	0.119	47.2	LOS D	2.9	21.0	0.76	0.72	33.9
North: THE CRESCENT											
7	L2	189	4.0	0.129	7.1	LOS A	0.9	6.9	0.12	0.62	56.6
8	T1	2314	4.0	0.880	41.3	LOS C	57.0	412.9	0.93	0.91	39.2
Approach		2503	4.0	0.880	38.7	LOS C	57.0	412.9	0.87	0.88	40.1
All Vehicles		6175	4.0	0.880	23.8	LOS B	57.0	412.9	0.69	0.57	47.9

Level of Service (LOS) Method: Delay (RTA NSW).

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.

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

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M30).

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	East Full Crossing	53	27.7	LOS C	0.1	0.1	0.61	0.61	
All Pedestrians		53	27.7	LOS C			0.61	0.61	

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.

Processed: Tuesday, 22 April 2014 12:26:36 PM

SIDRA INTERSECTION # 9 20.4668

Project: F:\WORK\1011\028 - ROZELLE SUPER YACHT CLUB\MODELLING\CRESC AND JAMES CRAIG REV

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WD PM COMP

New Site

Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence

Movement Performance - Vehicles											
Mov ID	OD Mov	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 per veh	Average Speed km/h
South: THE CRESCENT											
2	T1	3224	2.0	0.544	7.0	LOS A	22.5	159.8	0.43	0.40	61.8
3	R2	22	2.0	0.043	66.5	LOS E	0.7	4.9	0.89	0.68	29.5
Approach		3246	2.0	0.544	7.4	LOS A	22.5	159.8	0.43	0.40	61.3
East JAMES CRAIG											
4	L2	98	2.0	0.164	43.6	LOS D	5.0	35.8	0.75	0.75	35.3
6	R2	89	2.0	0.166	66.2	LOS E	2.9	20.3	0.91	0.74	29.1
Approach		187	2.0	0.166	54.4	LOS D	5.0	35.8	0.83	0.74	32.0
North: THE CRESCENT											
7	L2	86	2.0	0.054	5.5	LOS A	0.3	1.9	0.09	0.61	56.8
8	T1	3028	2.0	0.924	40.3	LOS C	77.7	553.5	0.96	0.96	39.6
Approach		3114	2.0	0.924	39.4	LOS C	77.7	553.5	0.93	0.95	39.9
All Vehicles		5607	2.0	0.924	24.1	LOS B	77.7	553.5	0.68	0.67	47.6

Level of Service (LOS) Method: Delay (RTA NSW)

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

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

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

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

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop Queued	Effective Stop Rate per ped
P2	East Full Crossing	53	19.3	LOS B	0.1	0.1	0.51	0.51
All Pedestrians		53	19.3	LOS B			0.51	0.51

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.

Processed: Tuesday, 22 April 2014 12:26:37 PM

SIDRA INTERSECT ON 5 0 20 4600

Project: F:\WORK\101\0028 - ROZELLE SUPER YACHT CLUB\MODELLING\CRESC AND JAMES CRAIG REV B.sip5

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**SIDRA
INTERSECTION 6**

MOVEMENT SUMMARY

Site: THE CRESCENT/JAMES CRAIG WE MD COMP

New Site

Signals - Fixed Time Cycle Time = 100 seconds (User Given Phase Times)

Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: THE CRESCENT											
2	L1	3445	1.0	0.566	4.2	LOS A	15.7	110.6	0.41	0.38	64.8
3	R2	109	1.0	0.330	54.8	LOS D	2.6	18.5	0.98	0.75	32.6
Approach		3554	1.0	0.588	5.8	LOS A	15.7	110.6	0.43	0.39	62.9
East JAMES CRAIG											
4	L2	99	1.0	0.224	38.7	LOS C	3.9	27.6	0.84	0.76	37.2
6	R2	186	1.0	0.560	55.3	LOS D	4.6	32.5	1.00	0.78	32.0
Approach		285	1.0	0.560	49.5	LOS D	4.6	32.5	0.95	0.77	33.6
North: THE CRESCENT											
7	L2	347	1.0	0.228	7.3	LOS A	1.8	12.8	0.19	0.64	56.5
8	T1	2765	1.0	0.811	14.3	LOS A	36.3	256.4	0.77	0.72	55.0
Approach		3112	1.0	0.811	13.5	LOS A	36.3	256.4	0.70	0.71	55.2
All Vehicles		6951	1.0	0.811	11.0	LOS A	36.3	256.4	0.57	0.55	57.3

Level of Service (LOS) Method: Delay (RTA NSW)

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.

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

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

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

Movement Performance - Pedestrians									
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped	
P2	East Full Crossing	53	13.0	LOS B	0.1	0.1	0.51	0.51	
All Pedestrians		53	13.0	LOS B			0.51	0.51	

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.

Processed: Tuesday, 22 April 2014 12:26:39 PM

SIDRA INTERSECT ON 6.0.20.4882

Project: F:\WDH\11010026 - ROZELLE SUPER YACHT CLUB\MODELLING\CRESC AND JAMES CRAIG REV

3.snp6

8050272, TRANSPORT & TRAFFIC PLANNING ASSOCIATES, NETWORK / IPC

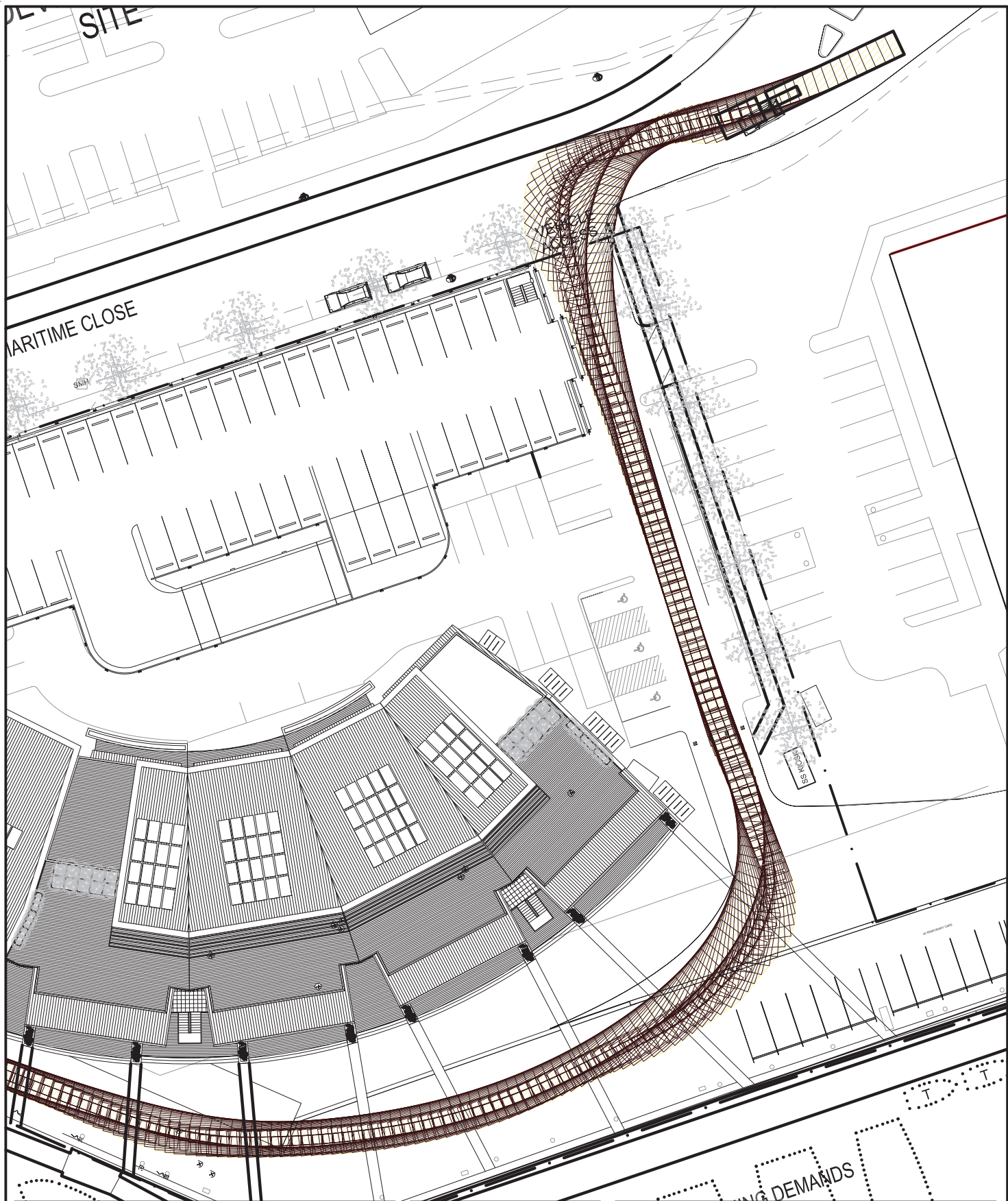
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**SIDRA
INTERSECTION 6**

APPENDIX E

TURNING PATH ASSESSMENT



LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V9.21 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.

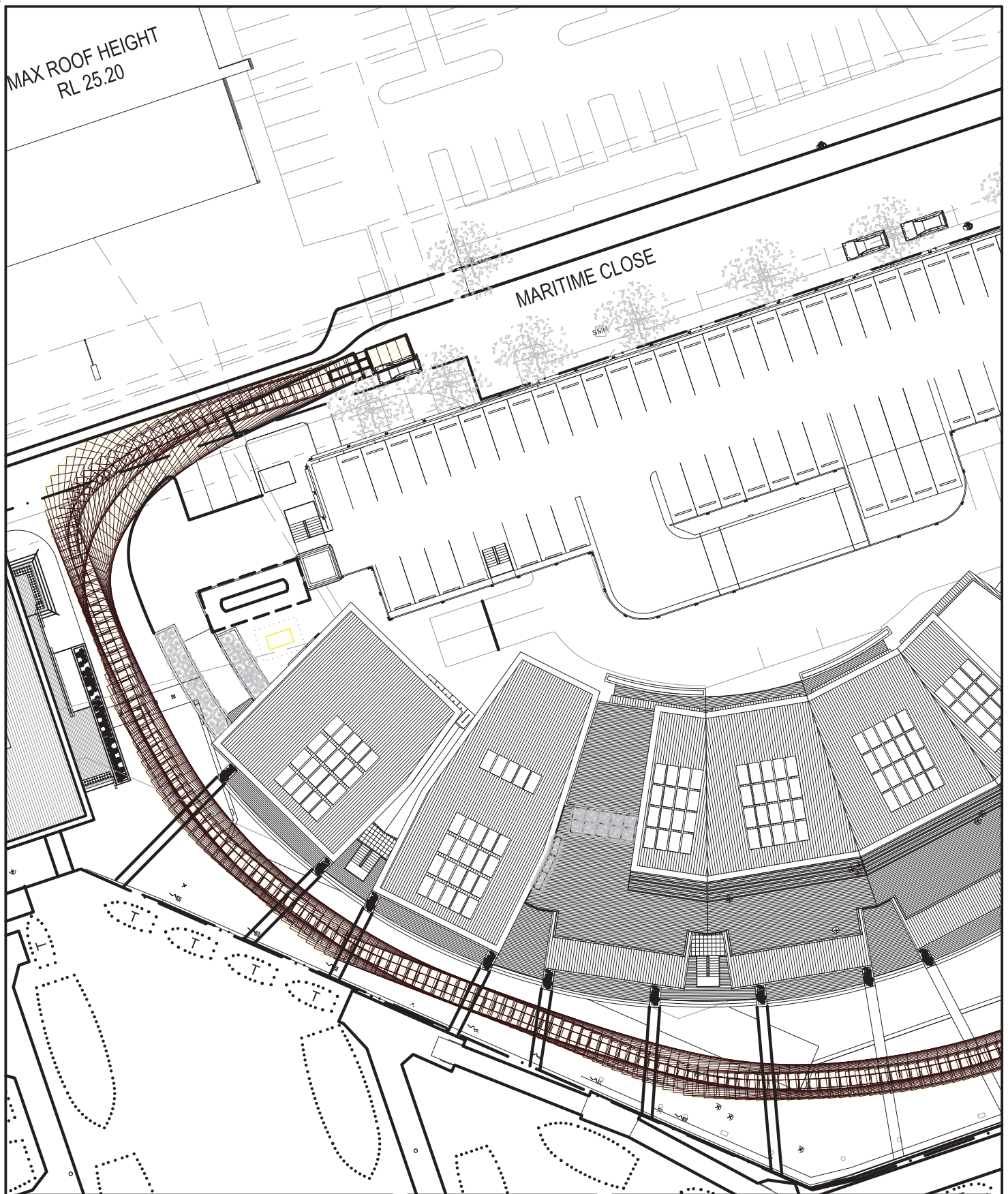


**SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE ENTERING THE SITE**

SP 1

MAX ROOF HEIGHT
RL 25.20

MARITIME CLOSE



LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V9.21 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.



**SWEPT PATH ANALYSIS
OF A 19m ARTICULATED
VEHICLE ENTERING THE SITE**

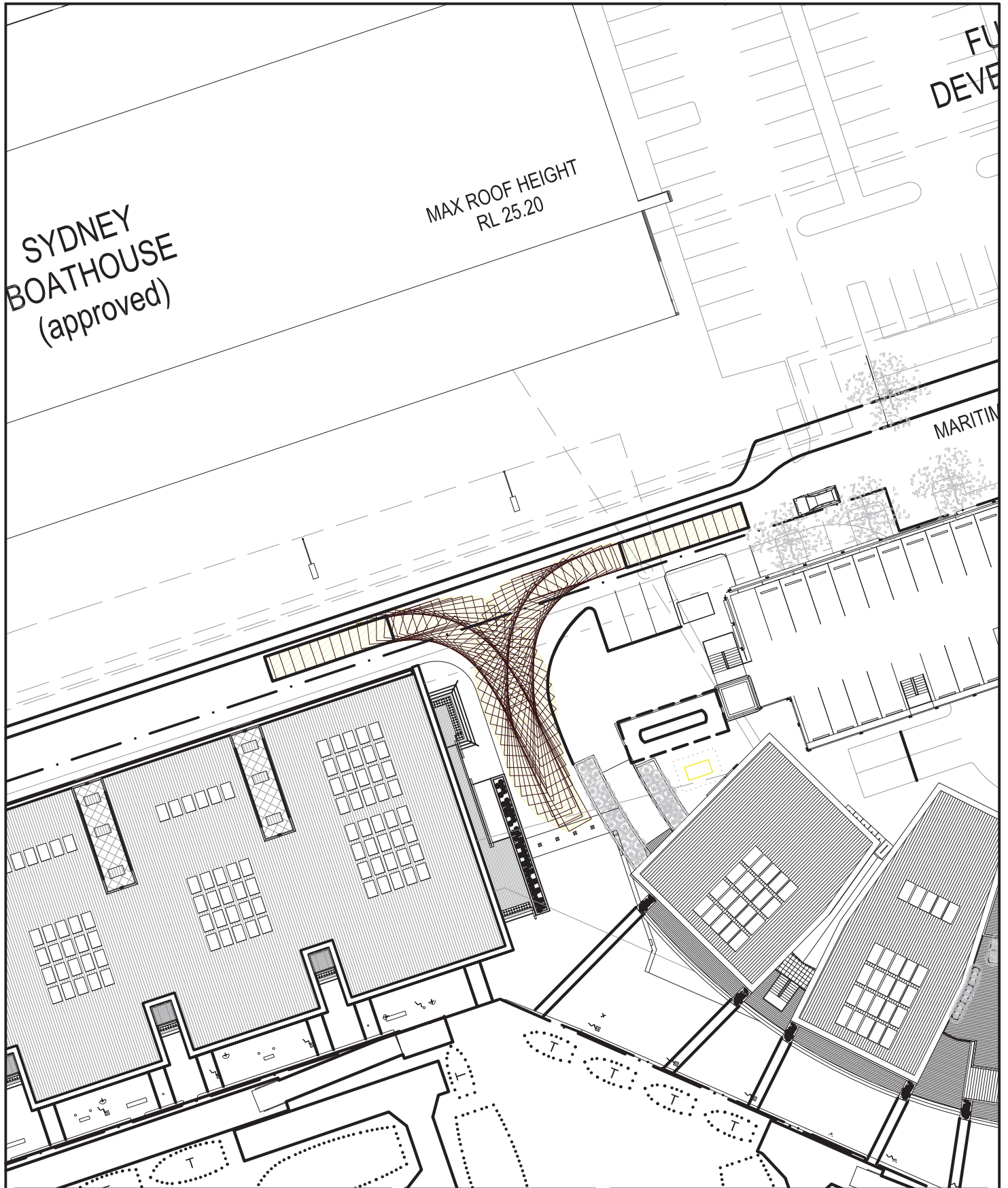
SP 2

SYDNEY
BOATHOUSE
(approved)

MAX ROOF HEIGHT
RL 25.20

FU
DEVE

MARITIM



LEGEND

This drawing has been prepared using vehicle modelling computer software AutoTrack V9.21 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.



**SWEPT PATH ANALYSIS
OF A 12.5m RIGID
VEHICLE**

SP 3