PLANNING PROPOSAL FOR ADDITIONAL RESIDENTIAL DEVELOPMENT

10 MARTIN AVENUE & 47 - 49 BONAR AVENUE ARNCLIFFE

Traffic Impact Assessment

November 2014

Reference 14259

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1. INTRODUCTION

This report has been prepared to accompany a Planning Proposal to Rockdale City Council to permit increased residential apartment development on the consolidated industrial site at 10 Martin Avenue and 47-49 Bonar Avenue, Arncliffe (Figure 1).

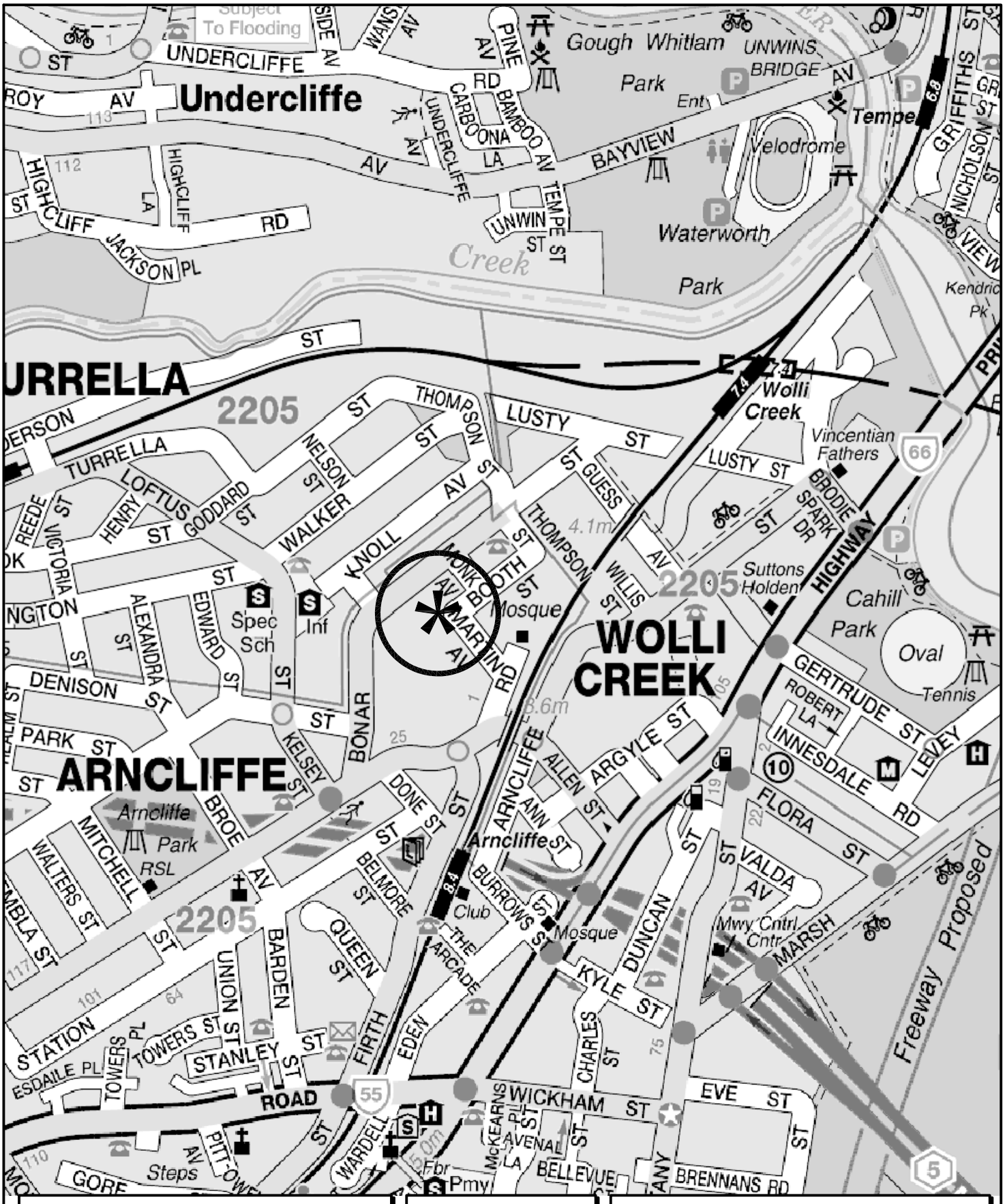
The Bonar Street Precinct at Arncliffe comprises an area of largely former industrial lands located to the north of Arncliffe Railway Station. The precinct, which extends along the eastern side of the railway line, has already been the subject of some significant redevelopment activity for residential apartment buildings.

The areas to the north and east have also been subject to redevelopment activity and include the prominent 'Discovery Point' site which surrounds the Wolli Creek Railway Station.

The current planning controls would permit the construction of some 88 residential apartments on the site, however, the Planning Proposal seeks to increase the permitted FSR in order to provide some 152 apartments on the site.

The purpose of this report is to:

* describe the site and the Planning Proposal
* describe the road network serving the site and the prevailing traffic conditions
* describe the planned future changes for the road network and traffic management in the area
* assess the potential traffic implications of development under the Planning Proposal
* assess the vehicle access, pedestrian, cyclist and public transport issues



LEGEND

LOCATION

FIG 1

2. PROPOSED DEVELOPMENT SCHEME

2.1 SITE AND PLANNING CONTEXT

The Bonar Street Precinct is a consolidation of numerous land holdings spanning a number of roadways and occupying a total area of some 70,000 m^2. The irregular shaped area extends from the Illawarra Railway Line in the east to Edward Street in the west and is bordered by Wollongong Road and Hirst Street to the south. The distance between the various 'reaches' of the site and the Arncliffe and Turrella Railway Stations ranges between 250 and 400 metres and accordingly the precinct has very convenient access to public transport services.

The precinct was formerly zoned Light Industrial 4(b) except for the Arncliffe Scots Recreational Club site, which was zoned Private Recreational 6(b), and a number of residential lots in the north-eastern sector. The immediate surrounding area comprises largely older style single residential dwellings with some new medium density complexes. Schools are located on either side of Loftus Street and a Mosque/School is located at the eastern end of Wollongong Road which also has a small 'strip' of shops. The area to the east of the railway line comprises some remaining industrial/service uses while the new Wolli Creek mixed use precinct is developing around that Railway Station.

The development site (Figure 2) is located towards the centre of the Bonar Street Precinct occupying an irregular shaped area of some 3691m^2 with frontages to the Martin Avenue and Bidjigal Road. The site comprises a consolidation of lots which contain industrial buildings.

The surrounding uses comprise:-

- new apartment buildings to be south and west
- residential dwellings to the north and east
- the Mosque and School on the eastern side of Martin Avenue

LEGEND

SITE

FIG 2

The Bonar Street Precinct is included within the Special Precinct provisions of Rockdale DCP and the Structure Plan is reproduced from the DCP overleaf identifying the indicative buildings, roads, parks and 'central square'. The existing planning controls specify on FSR outcome of 1.8:1 for new development in the precinct.

2.2 POTENTIAL DEVELOPMENT WITH EXISTING PLANNING CONTROLS

Development of the site for residential apartments under the existing planning controls would permit:

$$3691m^2 \text{ @}1.8:1 – 6643.8m^2$$

This floor space with an appropriate apartment mix (ie bedrooms) would equate to a yield of some 88 apartments.

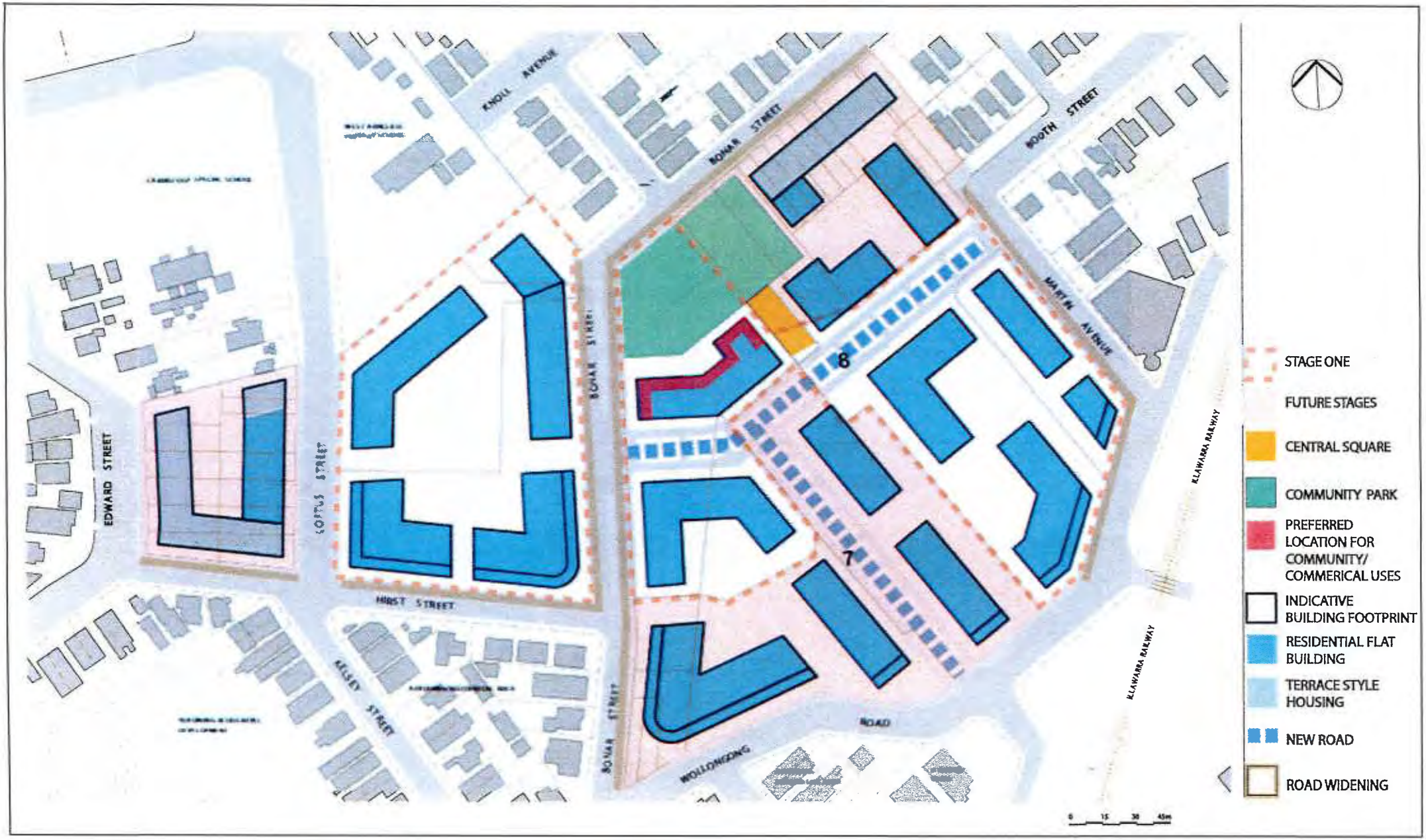
2.3 POTENTIAL DEVELOPMENT WITH PLANNING PROPOSAL

The Planning Proposal seeks to increase the permitted FSR for redevelopment on the site to 3.1:1 with an outcome as follows:

$$3{,}691m^2 \text{ @ } 3.1:1 – 11{,}442.1m^2$$

This floor space with a similar apartment mix would equate to a yield of some 152 apartments.

Details of the envisaged development are provided on the plans prepared by Mode Architects which are reproduced in part in Appendix A.



Structure plan

3. ROAD NETWORK AND TRAFFIC CIRCUMSTANCES

3.1 ROAD NETWORK

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

- the *M5 East* Motorway which passes in tunnel beneath Arncliffe with portals located to the east of West Botany Street and an off-load ramp to the Princes Highway

- the *Princes Highway* arterial route which crosses Cooks River just to the east of Discovery Point

- the State Road and arterial route of *Forest Road, Wickham Street and Marsh Street*

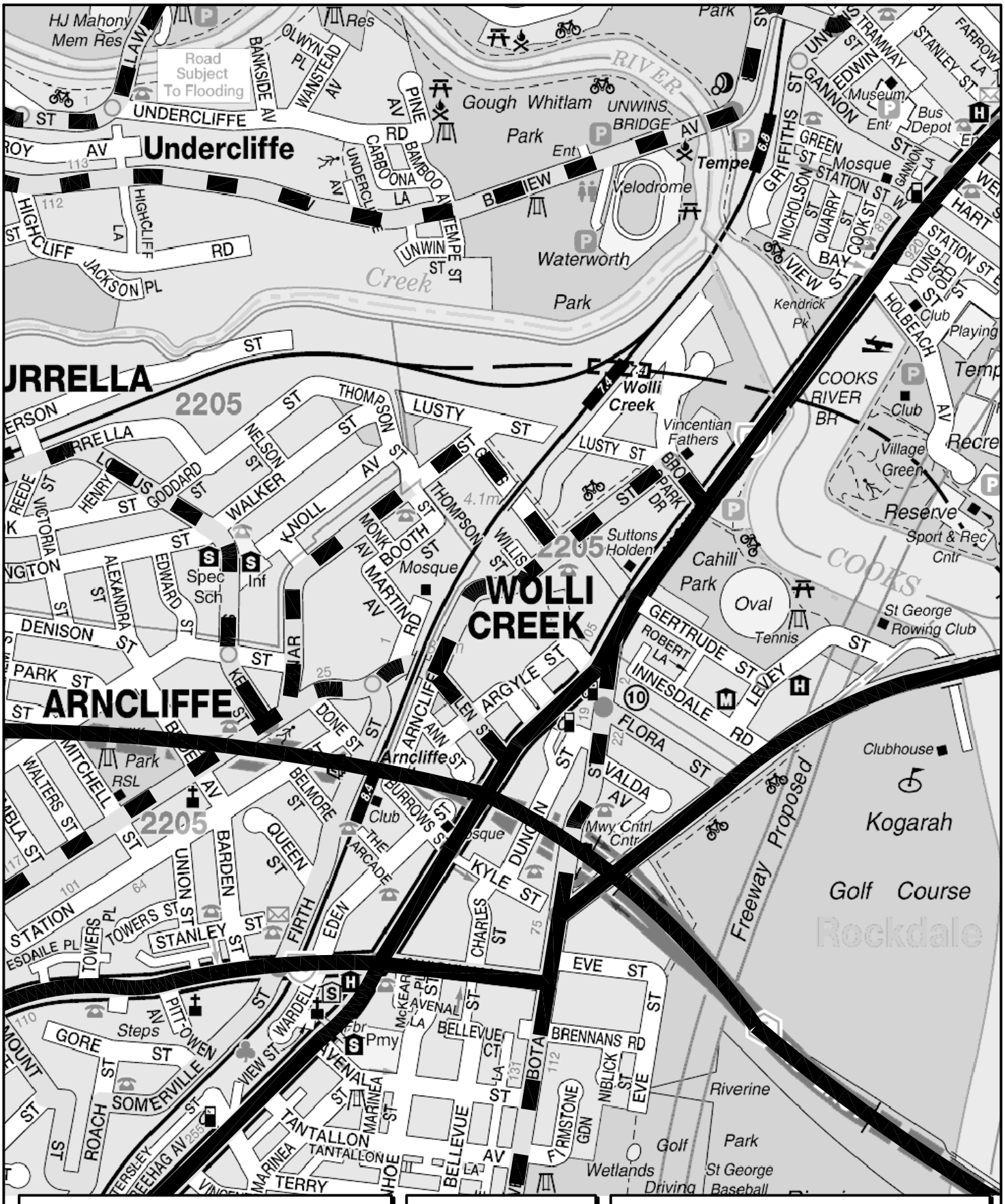
- the Regional Road and sub-arterial route of *West Botany Street*

- the Regional Road and collector route of *Wollongong Road, Arncliffe Street and Brodie Spark Drive* between *Forest Road and Princes Highway*

- the minor collector road route linking through Turrella and connecting to *Wollongong Road via Lotus Street and Kelso Street*

- *the minor collector road route along Bonar Street and Guess Avenue*

Martin Avenue is a local access road while Bidjidal Road is a new local access road which is being established as part of the precinct development. The road system in the area is constrained to some extent by the railway lines as well as the Cooks River and Wolli Creek systems.



LEGEND

- ARTERIAL
- SUB-ARTERIAL
- COLLECTOR

N

ROAD NETWORK

FIG 3

3.2 TRAFFIC CONTROLS

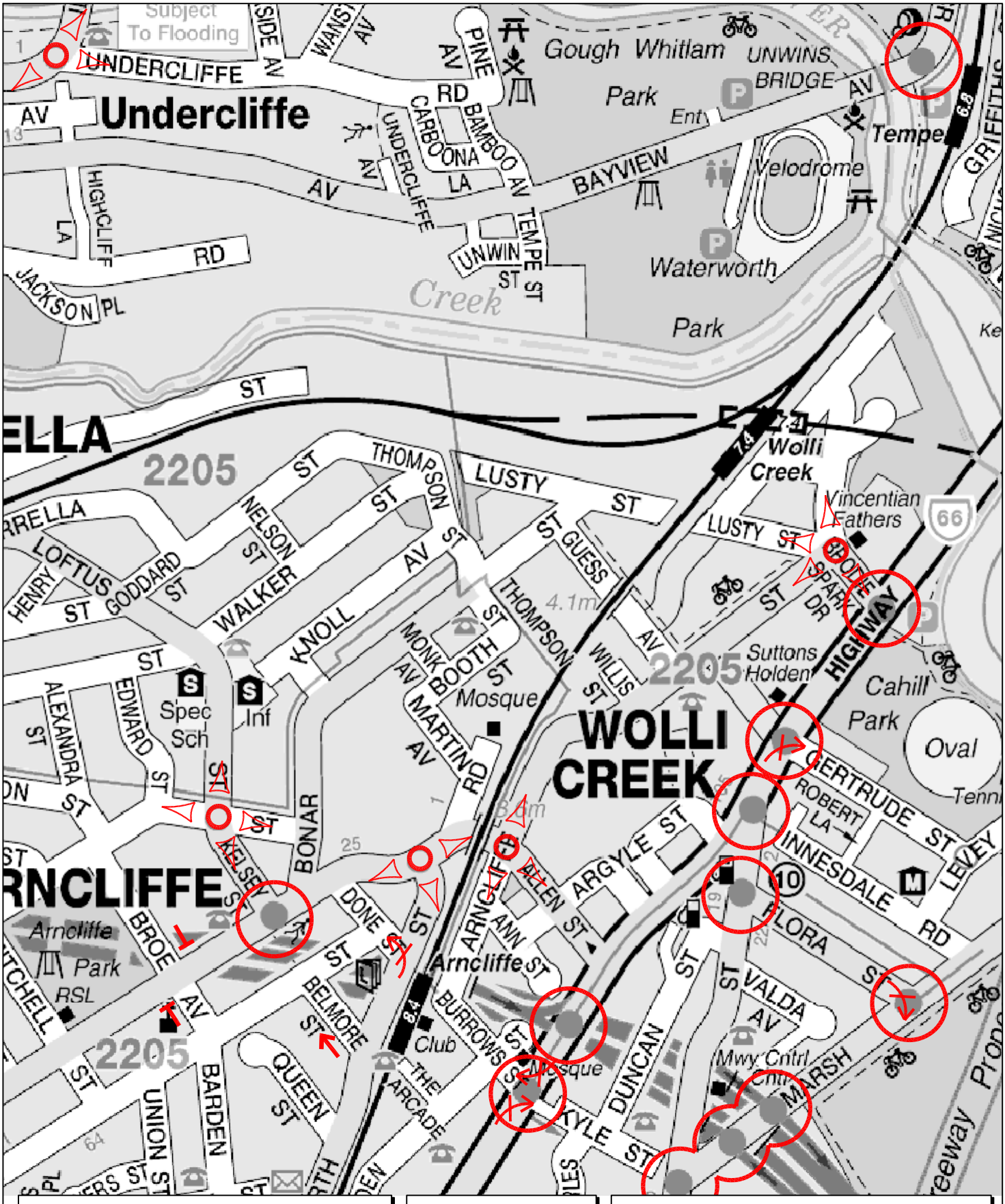
The existing traffic controls which have been applied to the road system in the vicinity of the site (Figure 4) comprise:

- the traffic signals at the Princes Highway and Brodie Spark Drive intersection
- the other traffic signals along the Highway at the Gertrude Street, West Botany Street, M5 Ramp, Burrows Street and Forest Road intersections
- the CLEARWAY and NO STOPPING restrictions along the Highway
- the large roundabout at the Brodie Spark Drive/Arncliffe Street/Magdalene Terrace intersection
- the roundabouts at the Allen Street/Arncliffe Street and Wollongong Road/Firth Street intersections
- the traffic signals at the Wollongong Road/Kelsey Street intersection
- the roundabout at the Hirst Street/Lotus Street/Kelsey Street and intersection
- the 60 kmph speed restriction on the Highway and 50 kmph restriction on the local and collector roads

3.3 TRAFFIC CONDITIONS

An indication of the existing traffic conditions on the road system in the vicinity of the site provided in data[1] published by the RMS and available traffic surveys.

[1] *Traffic Volumes for Sydney Region*
Roads and Maritime Services



LEGEND

- TRAFFIC SIGNAL CONTROL
- ROUNDABOUT
- RESTRICTED TURNING MOVEMENT

N

TRAFFIC CONTROLS

FIG 4

The data provided by the RMS is expressed in terms of Annual Average Daily Traffic (AADT) and the latest recordings in the vicinity of the site are provided in the following:

	AADT
Princes Highway south of Allen Street	37,901
Forest Road west of Princes Highway	20,186
Wollongong Road east of Wolli Creek Road	7,535

Councils recent Traffic Study for the area* identified the following existing traffic flows in the morning and afternoon peak periods (2012).

Arncliffe Street @ Allen Street

	AM	**PM**
NB	115	515
SB	457	202

Wollongong Road @ Arncliffe Street

	AM	**PM**
EB	1050	411
WB	424	1391

Bonar Street @ Guess Ave

	AM	**PM**
EB	351	165
NB	150	324

Arncliffe Street @ Guess Street

	AM	**PM**
NB	527	206
SB	186	576

* *Wolli Creek and Bonar Street Precinct*
Traffic Study
Bitzios August 2013

Traffic conditions in the area are generally quite satisfactory apart from some queuing and congestion on the highway, Forest Road and in the M5 Tunnel during the commuter peak periods.

3.4 TRANSPORT SERVICES

The area is well served by the public transport services comprising:

* Arncliffe Station which is on the Illawarra line

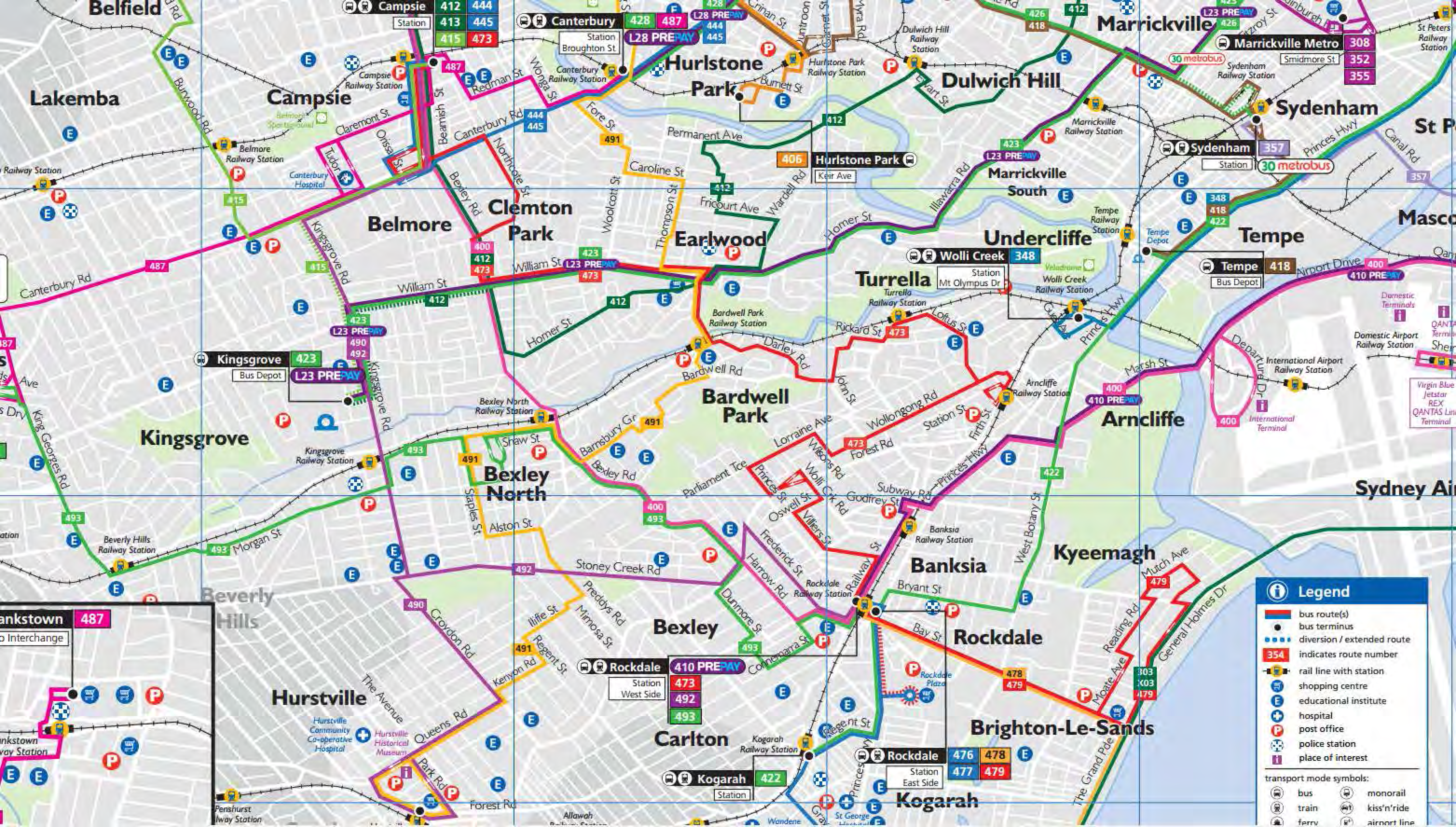
* Wolli Creek Railway Station which accesses the East Hills, Illawarra and New Southern rail lines

* the State Transit Route 348 bus service which runs between Wolli Creek Railway Station and Bondi Junction with a 30 minute frequency between 7.00am and 7.00pm Monday - Friday

* the State Transit Route 473 bus service which runs along Wollongong Road, Bonar Street/Loftus Street and the Princes Highway connecting between Rockdale and Five Dock

* the State Transit Route 422 service which runs along the Highway connecting between Rockdale and Dulwich Hill via Sydenham

Details of the available public transport services are provided on the diagram overleaf.


Legend
bus route(s)
bus terminus
diversion / extended route
354 indicates route number
rail line with station
shopping centre
educational institute
hospital
post office
police station
place of interest
transport mode symbols:
bus
train
ferry
monorail
kiss'n'ride
airport line
Belfield
Lakemba
Campsie
Campsie Station
Campsie Railway Station
Canterbury
Canterbury Station Broughton St
Canterbury Railway Station
Hurlstone Park
Hurlstone Park Railway Station
Dulwich Hill
Dulwich Hill Railway Station
Marrickville
Marrickville Metro
Smidmore St
Marrickville Railway Station
Sydenham
Sydenham Railway Station
Sydenham Station
30 metrobus
St Peters Railway Station
Belmore
Belmore Railway Station
Canterbury Hospital
Clemton Park
Earlwood
Marrickville South
Undercliffe
Tempe
Tempe Bus Depot
Tempe Railway Station
Tempe Depot
Wolli Creek Station
Mt Olympus Dr
Wolli Creek Railway Station
Turrella
Turrella Railway Station
Bardwell Park
Bardwell Park Railway Station
Kingsgrove
Kingsgrove Bus Depot
Kingsgrove Railway Station
Bexley North
Bexley North Railway Station
Arncliffe
Arncliffe Railway Station
Domestic Airport Railway Station
International Airport Railway Station
International Terminal
Virgin Blue Jetstar REX QANTAS Link Terminal
Sydney Airport
Beverly Hills
Beverly Hills Railway Station
Bexley
Banksia
Banksia Railway Station
Kyeemagh
Rockdale
Rockdale Railway Station
Rockdale Station West Side
Rockdale Station East Side
Rockdale Plaza
Brighton-Le-Sands
Carlton
Kogarah
Kogarah Station
Kogarah Railway Station
Hurstville
Hurstville Community Co-operative Hospital
Hurstville Historical Museum
Penshurst Railway Station
Bankstown
Canterbury Rd
King Georges Rd
Kingsgrove Rd
William St
Homer St
Bexley Rd
Stoney Creek Rd
Croydon Rd
Queens Rd
The Avenue
Forest Rd
Wollongong Rd
Princes Hwy
West Botany St
General Holmes Dr
The Grand Pde
Airport Drive
Departure Dr
Marsh St
Illawarra Rd
Morgan St
Burwood Rd

4. FUTURE CIRCUMSTANCES

The prescribed upgrading of the road network and traffic controls to suitably accommodate redevelopment in the Arncliffe/Wolli Creek area are identified in the diagram overleaf reproduced from Rockdale Council's DCP.

The construction of Magdalene Terrace and part of Brodie Spark Drive have already been largely completed, however other major elements which are unlikely to be achieved for many years (due to reliance on redevelopment of sites) include:

* construction of Gertrude Street between Princes Highway and Arncliffe Street (New Road 2)

* construction of a new access road parallel to and between the Highway and Arncliffe Street (New Roads 5 and 6)

* widening of the Highway and Arncliffe Street

Council's recent consultant Traffic Study for the area (see Appendix B extracts) provided recommendations which Council has drafted into a Strategic Implementation Plan. Details of these proposals are provided overleaf with the principal measure being the proposed introduction of a one way "circuit" along Arncliffe Street, Guess Avenue and Mount Olympus Boulevard.

This noted that Council have since deleted the proposal to remove the Brodie Spark Drive/Arncliffe Street roundabout. It is also noted that Councils study had regard for:

* the traffic generation implications of development and employment in the area

* an envisaged travel made shift to public transport

7.1.5 Road Network and Vehicular Access

Road Network and Vehicular Access

A series of well integrated new streets are proposed to facilitate movement and access around the precinct. Wolli Creek is to be unified with a legible district link road running east-west between Marsh Street, along Gertrude Street and through to Arncliffe Street. The new road will provide a direct connection between Arncliffe and the proposed Cooks Cove development. Gateways to Wolli Creek will be located at Marsh Street and on the Princes Highway to assist in orientation and way finding.

To assist vehicular movement, vehicular access to development sites will be restricted on main traffic routes.

Objectives

A. To create a permeable road network that facilitates efficient vehicular access to and circulation within the area which can be conveniently used by all modes of transport

B. To encourage use of public transport and alternative transport modes to help prevent further congestion of the regional road system

ROCKDALE
CITY COUNCIL
On Historic Botany Bay

Wolli Creek Traffic and Transport Study

Strategic Implementation Plan

October 2013

TRIM 13/78075

Item	Action Description	Cost	Funding	Term of Timing	Dependencies-Triggers	Responsible
1. Infrastructure						
1.1 Arncliffe Street, Guess Avenue and Mount Olympus Boulevard	Implement clockwise one-way circuit Arncliffe Street, Guess Avenue and Mount Olympus Boulevard (Magdalene Terrace maintains two-way traffic). Consider provision of separated cycleways, additional pedestrian crossings and speed threshold devices.	$ 5,217,000.00	Contributions Plan	Short-Medium	Staging of works required.	MTS
1.2 Allen St / Arncliffe St underpass	Upgrade Allen St / Arncliffe St underpass to provide improved pedestrian/cycle amenity.	$5 mil Initial Allocation	State Government Grant	Short *		MTS
1.3 Allen Street / Wollongong Road	Consider central median.	$21,000	Contributions Plan	Short		MTS
	Convert to "left-in/left-out" arrangement	$ 33,000.00	Contributions Plan	Short	Allen Street Underpass works	MTS
1.4 Wollongong Road / Firth Street	Install traffic signals at the Wollongong Road / Firth Street intersection.	$ 2,054,000.00	Contributions Plan	Medium-Long	Development at New Road South	MTS
1.5 Brodie Spark Drive / Arncliffe Street	Convert intersection to a give-way arrangement	TBD	Contributions Plan	Long	One Way Circuit completion	MTS

Item	Action Description	Cost	Funding	Term of Timing	Dependencies-Triggers	Responsible
1. Infrastructure						
1.6 Bonar Street / Thompson Street	Install roundabout	$162,000.00	Contributions Plan		Linked to One way system,	MTS
1.7 Bonar Street / Guess Avenue and Bonar Street / Wollongong Road	Install splitter islands at the Bonar Street/Guess Avenue and Bonar Street/Wollongong Road intersections.	$ 35,000.00	Contributions Plan	Medium	Linked to One way system.	MTS
1.8 Guess Avenue Underpass	Provide improved pedestrian and cycle facilities	$ 309,000.00	Contributions Plan-	Short*	Clarify Resourcing Costs	MTS
1.9 Turella Street cycleways	Provide on-street cycleways along Turella Street together with traffic calming devices	$ 198,000.00	Internal	Long	Cycling Strategy	MTS
1.10 Wollongong Road -/Bonar Street	Ban right turn from Bonar Street onto Wollongong Road.	$20,000.00	Contributions Plan	Medium	One way circuit	MTS

NB: Short * - High priority

5. TRAFFIC

TTPA undertook the Traffic Impact Assessment for the Bonar Street Master plan in 2004 and the peak traffic generation for the residential apartment outcome was based on the then RTA Development Guideline criteria of 0.29 vtph per apartment. TTPA also undertook the 1990's study for the former RTA which established this traffic generation criteria however that study assessed sites across the Metropolitan Area which:

- included sites remote from rail services (eg 2 sites at Sans Souci)

- involved sites which did not have the "constrained" parking provisions which are now applied in most contemporary DCP controls for residential apartment development

It is understood that Councils recent Traffic Study for the area also adopted this former RTA criteria to project future traffic generation from development in the precinct. RMS have however been undertaking a process of updating the Guide to Traffic Generating Development and have published Technical Direction TDT 2013-4b.

This document contains new criteria for the peak traffic generation of high density residential apartments located in convenient proximity to railway stations. That criteria is follows:

vtph per Apartment	
AM Peak	**PM Peak**
0.19	0.15

Thus the new RMS criteria indicates contemporary peak traffic generation rates for precincts such as Arncliffe and Wolli Creek which are some 50% of that which has been applied in the planning for development in the area.

The existing industrial floor space on the site would appear to be round 6,000m^2 and if the RMS criteria for industrial use is applied this would indicate the following peak traffic generation.

	vtph
Factory @1.0 per 100m^2	60
Warehouse @0.5 per 100m^2	30

If the former RTA generation rate for apartments is applied to the development yield under the current planning provisions this would indicate the following:

88 Apartments @0.29	26 vtph

If the new RMS traffic generation rates are applied to the development yield under the Planning Proposal this would indicate the following:

	AM (@ 0.19)	PM (@ 0.15)
152 Apartments	29 vtph	23 vtph

It is apparent that the peak traffic generation of the envisaged apartment yield under the Planning Proposal will:

- be no different to that of the lowest form of industrial use in the existing floor space
- be almost identical to that of the yield under the current planning provisions if assessed on the same basis as that adopted for the Master plan and Councils recent traffic study

It is also apparent therefore that the traffic outcome under the Planning Proposal will not present any new heightened traffic circumstance or any adverse traffic implications.

6. ACCESS, PEDESTRIANS AND CYCLISTS

ACCESS

Vehicle access for the basement carpark areas will involve a combined ingress/egress driveway on the Bidjigal Road frontage. This vehicle access will have sight distances which will accord with the requirements of AS2890.1 and will:

* be approximately located away from Martin Avenue and the proposed Central Square
* suitably distribute vehicles to/from the east and west

PEDESTRIANS

The envisaged development will make provision for pedestrians with:

* a high level of surveillance, lighting and urban design/landscaping
* minimal conflicts at the vehicle access
* access integration with public open space and the external pedestrian network

CYCLISTS

The envisaged development will make provision for cyclists with:

* the bicycle lane connection to local and regional bicycle network
* basement bike parking for residents and visitors

PUBLIC TRANSPORT

The envisaged development will make provision for public transport services by:

* provision of footways and internal links to facilitate travel to/from the convenient bus and rail services

* reducing the need for residents to travel by car in order to shop for essential needs (ie residents will be more inclined to travel to/from work by public transport when they are not reliant on car travel in order to shop as part of the work trips)

7. CONCLUSION

This Traffic Impact Assessment has considered the potential traffic related implications of envisaged increased residential apartment yield under a Planning Proposal for a site in the Bonar Street Precinct. The assessment has concluded that the proposal will not have any adverse traffic implications for the site access, for the immediate access road or for the wider road network. The proposal will also not have any adverse impacts for pedestrians, cyclists or public transport services.

APPENDIX A

PLANS OF ENVISAGED DEVELOPMENT

mode

URBAN DESIGN
MASTER PLANNING
ARCHITECTURE
INTERIOR DESIGN
LANDSCAPE
GRAPHIC DESIGN

BRISBANE
SYDNEY
MELBOURNE
PERTH
DARWIN
CAIRNS
GOLD COAST
SUNSHINE COAST
AUCKLAND

SITE INFORMATION		
Site Address:	10 Martin Avenue, Arncliffe	
Site Area:	3691m²	
Zoning:	High Density Residential (R4)	
PROPOSED DEVELOPMENT SUMMARY		
Allowable FSR Total:	1.8:1	6643.8m²
Allowable FSR Residential Component:	3.1:1	11442.1m²
BUILDING 1		
L1 (Ground) GFA:	632m²	
L2 GFA:	707m²	
L3 GFA:	707m²	
L4 GFA:	707m²	
L5 GFA:	715m²	
L6 GFA:	715m²	
L7 GFA:	715m²	
L8 GFA:	715m²	
L9 GFA:	697m²	
TOTAL GFA:	6310m²	
UNIT NUMBERS:	07 x 3 BED UNITS 29 x 2 BED UNITS 44 x 1 BED UNITS	
SUB-TOTAL UNITS:	80 UNITS	
BUILDING 2		
L1 (Ground) GFA:	642m²	
L2 GFA:	663m²	
L3 GFA:	663m²	
L4 GFA:	663m²	
L5 GFA:	670m²	
L6 GFA:	670m²	
L7 GFA:	670m²	
L8 GFA:	670m²	
L9 GFA:	652m²	
TOTAL GFA:	5963m²	
UNIT NUMBERS:	00 x 3 BED UNITS 43 x 2 BED UNITS 29 x 1 BED UNITS	
SUB-TOTAL UNITS:	72 UNITS	
OPTION 3 - DEVELOPMENT TOTALS		
TOTAL GFA:	12237m²	3.32:1
UNIT NUMBERS:	07 x 3 BED UNITS 72 x 2 BED UNITS 73 x 1 BED UNITS	
TOTAL UNITS:	152 UNITS	
TOTAL resident CARS :	161 CARS	
TOTAL visitor CARS :	31 CARS	

PROPOSED MULTI-UNIT DWELLING DEVELOPMENT
10 Martin Place, Arncliffe

NORTH

Sydney
Shop 1 35 Buckingham St
Surry Hills NSW 2010
Tel +61 2 8396 9500 Fax +61 2 8396 9555
E-mail sydney@modedesign.com.au
Architect R P O'Brien Registration No 7176
Brisbane Sydney Melbourne Darwin Perth Sunshine Coast Gold Coast Auckland
www.modedesign.com.au

PROJECT No:	14390SYD
DATE:	SEP 2014
SCALE:	1:1000@A3
DRAWING No:	SK001_D

mode
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INTERIOR DESIGN
LANDSCAPE
GRAPHIC DESIGN
BRISBANE
SYDNEY
MELBOURNE
PERTH
DARWIN
CAIRNS
GOLD COAST
SUNSHINE COAST
AUCKLAND

OPTION 3 - PRELIMINARY MASSING - VIEW FROM BONAR STREET

OPTION 3 - PRELIMINARY MASSING - VIEW FROM NORTH WEST

PROPOSED MULTI-UNIT DWELLING DEVELOPMENT
10 Martin Place, Arncliffe

Sydney
Shop 1 35 Buckingham St
Surry Hills NSW 2010
Tel +61 2 8396 9500 Fax +61 2 8396 9555
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PROJECT No:	14390SYD
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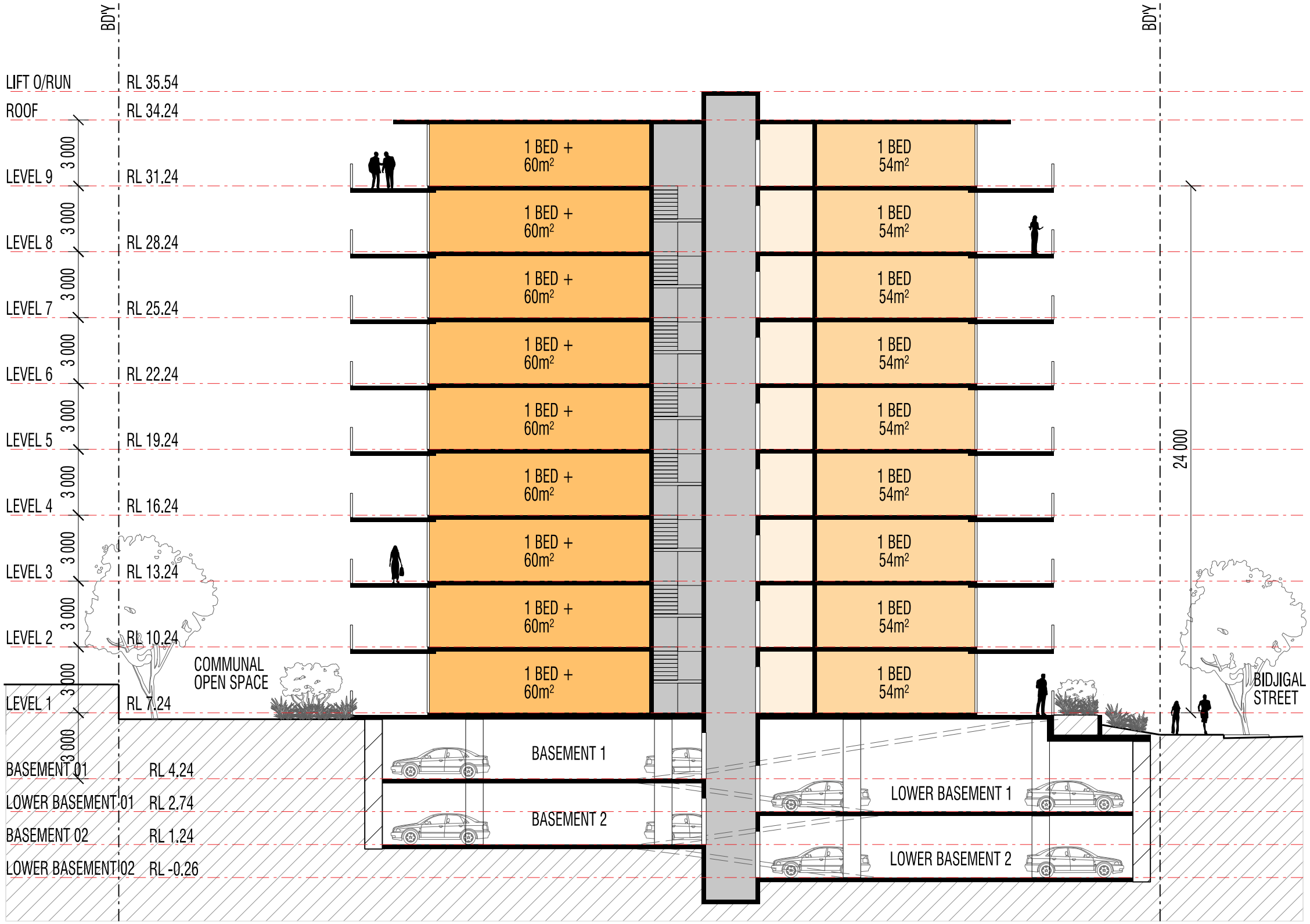
SCALE:	nts
DRAWING No:	SK006_D



INDICATIVE SECTION

mode

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Allowable FSR Residential Component:	3.1:1	11442.1m²

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DRAWING No:	SK005_E

mode

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L4 GFA:	663m²
L5 GFA:	670m²
L6 GFA:	670m²
L7 GFA:	670m²
L8 GFA:	670m²
L9 GFA:	652m²
TOTAL GFA:	5963m²
UNIT NUMBERS:	00 x 3 BED UNITS 43 x 2 BED UNITS 29 x 1 BED UNITS
SUB-TOTAL UNITS:	72 UNITS

OPTION 3 - DEVELOPMENT TOTALS

TOTAL GFA:	12237m²
UNIT NUMBERS:	07 x 3 BED UNITS 72 x 2 BED UNITS 73 x 1 BED UNITS
TOTAL UNITS:	152 UNITS
TOTAL resident CARS :	161 CARS
TOTAL visitor CARS :	31 CARS

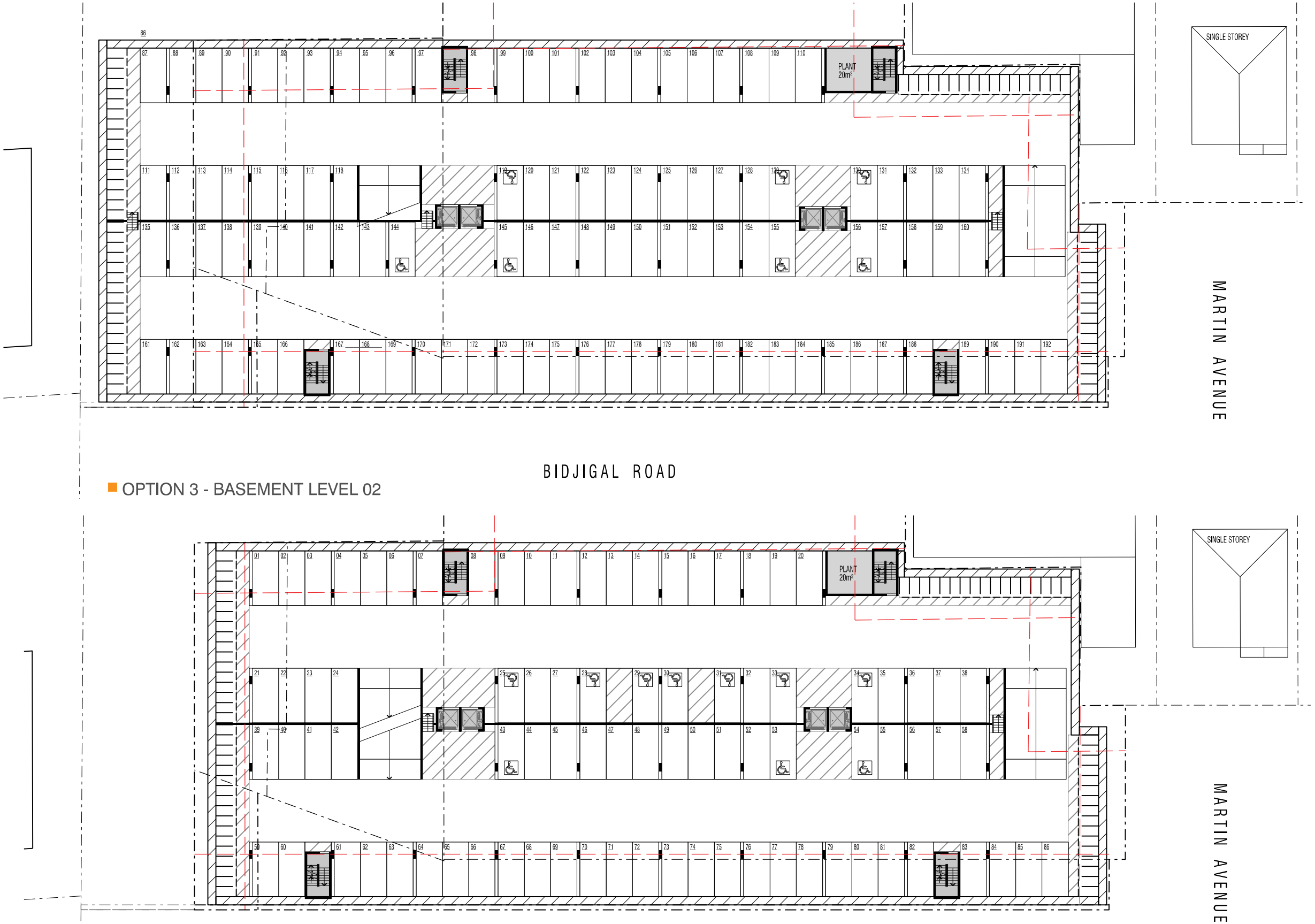
PROPOSED MULTI-UNIT DWELLING DEVELOPMENT

10 Martin Place, Arncliffe

NORTH

Sydney
Shop 1 35 Buckingham St
Surry Hills NSW 2010
Tel +61 2 8396 9500 Fax +61 2 8396 9555
E-mail sydney@modedesign.com.au
Architect R P O'Brien Registration No 7176
Brisbane Sydney Melbourne Darwin Perth Sunshine Coast Gold Coast Auckland

PROJECT No:	14390SYD
DATE:	SEP 2014
SCALE:	1:400@A3
DRAWING No:	SK003_F



■ OPTION 3 - BASEMENT LEVEL 02

■ OPTION 3 - BASEMENT LEVEL 01

mode

URBAN DESIGN
MASTER PLANNING
ARCHITECTURE
INTERIOR DESIGN
LANDSCAPE
GRAPHIC DESIGN

BRISBANE
SYDNEY
MELBOURNE
PERTH
DARWIN
CAIRNS
GOLD COAST
SUNSHINE COAST
AUCKLAND

SITE INFORMATION

Site Address:	10 Martin Avenue, Arncliffe
Site Area:	3691m²
Zoning:	High Density Residential (R4)

PROPOSED DEVELOPMENT SUMMARY

Allowable FSR Total:	1.8:1	6643.8m²
Allowable FSR Residential Component:	3.1:1	11442.1m²

BUILDING 1

L1 (Ground) GFA:	632m²
L2 GFA:	707m²
L3 GFA:	707m²
L4 GFA:	707m²
L5 GFA:	715m²
L6 GFA:	715m²
L7 GFA:	715m²
L8 GFA:	715m²
L9 GFA:	697m²
TOTAL GFA:	6310m²
UNIT NUMBERS:	07 x 3 BED UNITS 29 x 2 BED UNITS 44 x 1 BED UNITS
SUB-TOTAL UNITS:	80 UNITS

BUILDING 2

L1 (Ground) GFA:	642m²
L2 GFA:	663m²
L3 GFA:	663m²
L4 GFA:	663m²
L5 GFA:	670m²
L6 GFA:	670m²
L7 GFA:	670m²
L8 GFA:	670m²
L9 GFA:	652m²
TOTAL GFA:	5963m²
UNIT NUMBERS:	00 x 3 BED UNITS 43 x 2 BED UNITS 29 x 1 BED UNITS
SUB-TOTAL UNITS:	72 UNITS

OPTION 3 - DEVELOPMENT TOTALS

TOTAL GFA:	12237m²	3.32:1
UNIT NUMBERS:	07 x 3 BED UNITS 72 x 2 BED UNITS 73 x 1 BED UNITS	
TOTAL UNITS:	152 UNITS	
TOTAL resident CARS :	161 CARS	
TOTAL visitor CARS :	31 CARS	

■ PROPOSED MULTI-UNIT DWELLING DEVELOPMENT
10 Martin Place, Arncliffe

NORTH

Sydney
Shop 1 35 Buckingham St
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Tel +61 2 8396 9500 Fax +61 2 8396 9555
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Architect R P O'Brien Registration No 7176
Brisbane Sydney Melbourne Darwin Perth Sunshine Coast Gold Coast Auckland

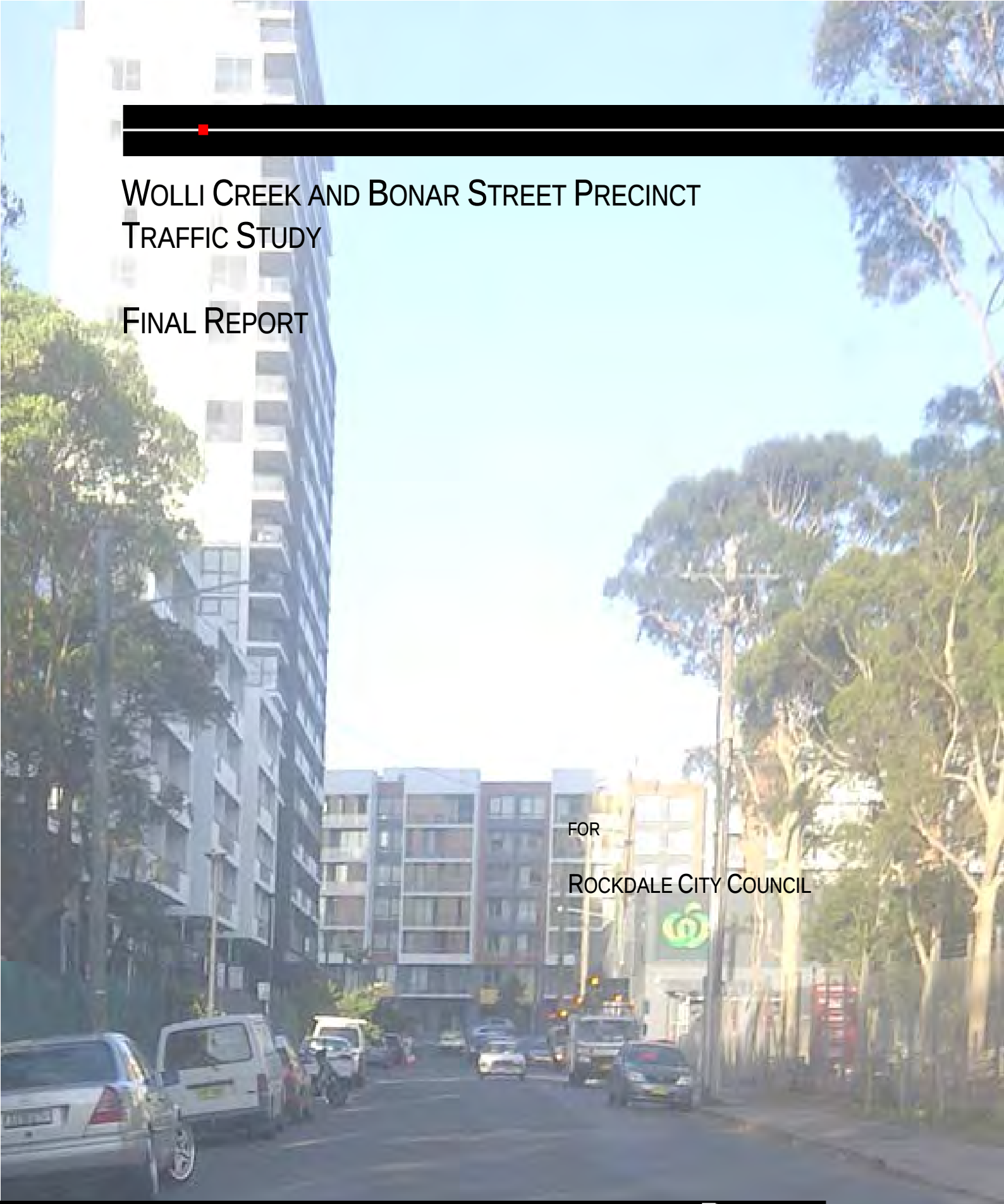
PROJECT No:	14390SYD
DATE:	SEP 2014
SCALE:	1:400@A3
DRAWING No:	SK002_D

APPENDIX B

EXTRACT FROM COUNCILS TRAFFIC STUDY

WOLLI CREEK AND BONAR STREET PRECINCT TRAFFIC STUDY

FINAL REPORT



FOR

ROCKDALE CITY COUNCIL

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Project No: P1124 Version No: 001 Issue date: 13th August 2013

EXECUTIVE SUMMARY

Bitzios Consulting have been commissioned by Rockdale City Council to undertake the Wolli Creek and Bonar Street Precinct Traffic and Transport Study to resolve existing and future transport related issues affecting the area. The primary consideration of this study was to respond to increasing concerns regarding the perceived level of 'through traffic' in Wolli Creek and the subsequent effects it would have on pedestrian and cycle amenity as the centre develops.

There is currently a strong shift in mode choice in the precinct towards walking. As the town centre continues to develop it is important that sufficient pedestrian and cycle treatments are implemented to support their movement. The current infrastructure plan does not reflect these needs and this is required to be addressed as part of this study. The high level of re-development forecast for the Bonar Street and Wolli Creek precincts is likely to bring forward the need to implement more pedestrian and cycle oriented treatments.

The key existing issues in the study area predominantly related to a poor provision of pedestrian and cycle facilities and greater priority given to the private motor vehicle. Current perceptions are that there is a high volume of 'through traffic' using Arncliffe Street. Based on traffic data obtained in October 2012, 10% to 30% of traffic using Arncliffe Street is 'through traffic' with a large proportion of this traffic likely to be generated by residents within the Rockdale local government area (ie Bexley, Bexley North and Kingsgrove). This is considered to be within reasonable tolerances for a regional road / main street.

As part of assessing solutions to address future traffic growth, four options were considered for the year 2031 horizon, testing different road network configurations and transport mode choice scenarios, listed as follows:

1. *Current DCP Improvements;*
2. *DCP Improvements with a reduction in private vehicle mode share;*
3. *Scenario 2 with Allen St open to Right Turn 'In'; and*
4. *Scenario 3 with Arncliffe Street Closed south of Guess Avenue.*

The assessment of the above scenarios highlighted that the reduction of private motor vehicle use contained the greatest benefit to the traffic network. This assisted with determining the preferred option for the Wolli Creek and Bonar Street precincts. Option 3 assisted with alleviating traffic through Arncliffe Street, but became an attractive alternative for right turners at the Forest Road / Princes Highway intersection. In addition, the additional southbound traffic along the Princes Highway began to introduce some congestion as a result of cars weaving/manoeuvring into correct lanes in the vicinity of the West Botany Street / Princes Highway intersection. Option 4 forced all of the westbound traffic down towards Allen Street and Forest Road and the Princes Highway was not able to cater for this additional traffic. The level of queuing was unacceptable and this option could only proceed if additional capacity was provided along the Princes Highway which is unlikely to be justified financially.

The Preferred Option was based on creating a series of "one-way street sections" along Arncliffe Street, Guess Avenue and Mount Olympus Boulevard to provide more space for pedestrians and cyclists. This creates urban design opportunities for a much improved amenity for pedestrians and cyclists within the town centre. The Preferred Option is expected to support an increasing pedestrian and cycle mode share, with the aim to retain private motor vehicle usage to existing levels.

The Preferred Option is schematically shown in Figure 1 below. The main roundabout in the town centre at the Brodie Spark Drive / Arncliffe Street intersection has been shown to be removed. It may be possible to either retain, or signalise, this intersection treatment as an alternative to the Preferred Option. This would be subject to further detailed community consultation. Currently the Brodie Spark Drive access has been restricted to 'left in and left out' movements only to simplify the intersection and improve its safe operations. As a result, traffic from Brodie Spark Drive wanting to head down Arncliffe Street will be required to travel to Spark Lane and then Magdalene Terrace to be able to travel in that direction.

Figure 1: Preferred Traffic Configuration – Wolli Creek Town Centre

The traffic management solution for the Bonar Street is less problematic and is partially realted to the need to manage traffic routes through to the Princes Highway. The recommended road configuration adopted was consistent across all options tested and is shown in Figure 2 below.

Figure 2: Preferred Traffic Configuration – Bonar Street Precinct

1. INTRODUCTION

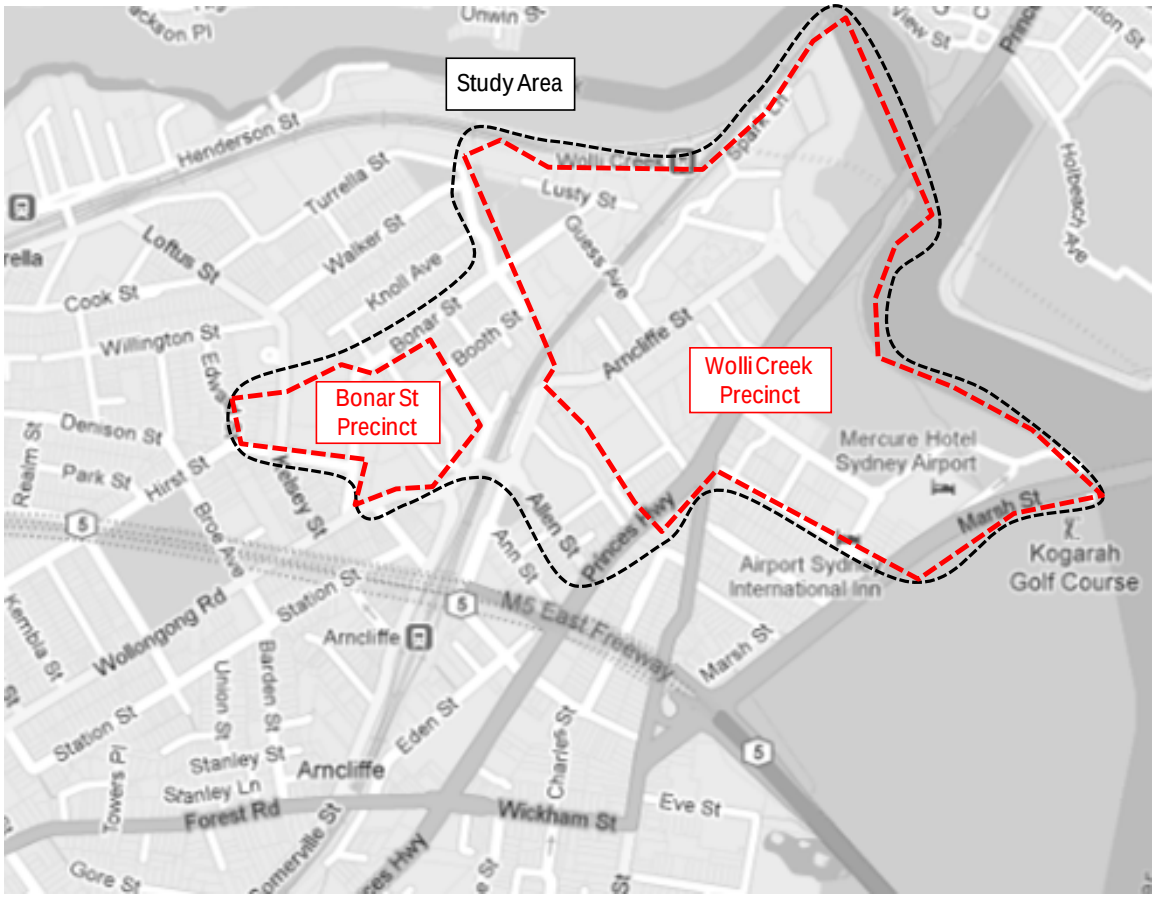
1.1 PURPOSE

Bitzios Consulting has been commissioned by Rockdale City Council to prepare a "traffic and transport study" for the Wolli Creek and Bonar Street precincts to address a number of items, such as:

- the increasing pressure on the local road system;
- issues associated with through traffic;
- opportunities to improve walking, cycling and public transport access; and
- updating the current Section 94 development contributions plan.

1.2 BACKGROUND

The study area contains two precincts that correlate to the Rockdale Development Control Plan 2011 (DCP) area for the Wolli Creek and Bonar Street precincts. Wolli Creek Village, previously known as North Arncliffe, is transforming from an industrial area into a high quality urban precinct with a town centre focused around the Wolli Creek rail interchange. The Bonar Street precinct has also experienced significant redevelopment recently and is expected to continue its transition into a more modern and active area. While this study focuses on the Wolli Creek and Bonar Street precincts, it also considers external vehicle movements relating to significant road corridors and land uses adjacent to the study area.



Source: Google Maps

Figure 1.1: Study Area

9. FUTURE YEAR OPTIONS ASSESSMENT

9.1 OPTION DEVELOPMENT

A total of four options were developed for the year 2031 horizon, testing different road network configurations and trip generation figures. Each option is discussed in detail below.

9.1.1 Option 1 – Current DCP Improvements

The first scenario developed for the 2031 horizon (Option 1) corresponds to the road network and traffic demands based on the full implementation of the DCP. The road infrastructure was maintained as per the existing configuration, except for those locations where the DCP or other planning documents clearly identify any modifications to be added.

Option 1 includes the full development of the Discovery Point site, including the respective access points, internal roads identified in the approved concept plan and resultant trips to and from the site (in accordance with the proposed yields). The approved concept plan identifies the proposed location for a bus stop near the rail station. This bus stop was also added to the model and the bus routes were amended.

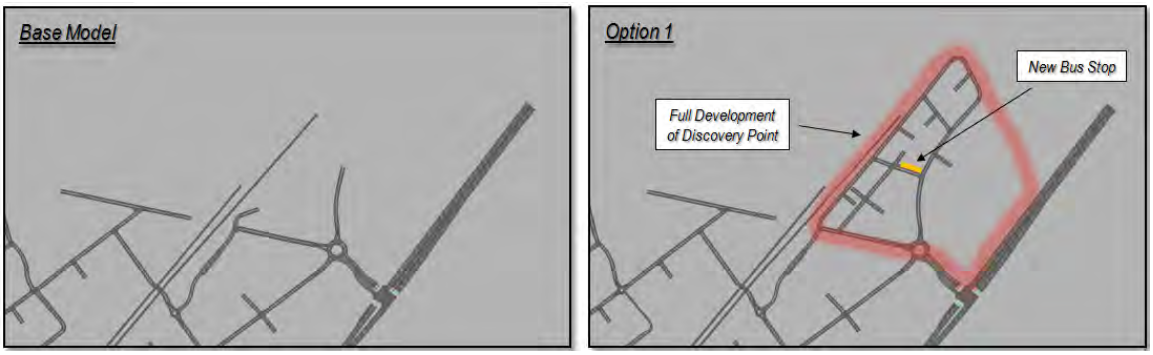


Figure 9.1: Discovery Point Fully Developed as part of Option 1

Further south, some modifications were added to the Bonar Street precinct road network. Two new internal roads were added to the modelled network (road 7 and road 8), in accordance to the PDP. The Wollongong Road / Firth Street intersection (currently a three leg roundabout) was converted to a signalised intersection with "Road 7" (therefore a four leg intersection). The implementation of traffic signals at this location effectively converts Wollongong Road to a 4 lane link from just west of the intersection with Kelsey Street until just east of the intersection with Firth Street. The right turns at the Wollongong Road / Allen Street intersection were banned, converting this intersection to a "left in – left out" arrangement.

Figure 9.2: Modifications near the Bonar Street Precinct as part of Option 1

Contra-flow measures were added to the Forest Road / Wickham Street / Princes Highway intersection after the development of the base models, and are therefore not included in those models. These arrangements were, however, incorporated in all 2031 models, including Option 1.

The 2031 development yields (residential, commercial, etc.) were obtained from RCC and the trip generation figures for Option 1 were calculated based on typical RMS rates, based on the assumption that the current transport mode shares would generally remain the same.

All through trips using the modelled area (trips between "external" zones) were increased at a rate of 0.5% per annum (compounding). This is in accordance with historical traffic data for the area.

The signal phasing operation was optimised based on the network and demands developed for Option1. Typically, this corresponded to minor adjustments to the green time for specific movements.

9.1.2 Option 2 – DCP Improvements with Mode Share Reduction

The road network used for Option 2 is the same of that described for Option 1. The only modifications correspond to the transport mode choice assumed to be in place in the study area by 2031. More specifically, Option 2 is based on the assumption that a higher proportion of residents and visitors to the Wolli Creek and Bonar Street precincts will use public transport and active transport modes compared to the current patterns, as intended for the area.

The target mode share adopted as part of Option 2 is shown in Table 9.1. It was developed in consultation with Council and TfNSW.

Table 9.1: 2031 Target Mode Shares for Option 2

Transport Mode	Current [1]	2031 Target
Train	51.0%	55.0%
Bus	0.8%	0.5%
Taxi	0.3%	1.0%
Car (driver)	33.3%	27.6%
Car (passenger)	2.8%	3.0%
Bicycle	0.2%	1.0%
Walk	1.7%	2.0%
Other	9.9%	9.9%

[1]: Source: Australian Bureau of Statistics – 2011 Census

The trip generation used for all traffic going to or from the modelled area was therefore adjusted to match the assumptions listed above. Overall, this resulted in an average reduction of 11% on the total traffic demands in the modelled area, when compared to Option 1. The background 'through traffic' was not adjusted with the mode share reduction.

The signal phasing operation was modified for this option to optimise the system for the observed traffic conditions.

To achieve the mode share targets suggested, a number of initiatives would need to be implemented such as:

- improve active transport facilities (footpaths, road crossings, cycleways, etc);
- upgrade public transport facilities; and
- encourage appropriate street level land uses to encourage walking and cycling.

9.1.3 Option 3 – DCP with Mode Share Reduction with Allen St open to Right Turn 'In'

Option 3 was developed with the specific intent of assessing the impacts / benefits of allowing right turn movements from the Princes Highway (southbound) onto Allen Street. This has been requested by stakeholders and members of the local community, and in response Council decided to investigate this option as part this study. The demands used in Option 3 are as per those described for Option 2 (target 2031 transport mode share).

The detailed configuration of the proposed scheme involves converting Lane 3 (the median side lane) on the Princes Highway southbound carriageway to a right turn only bay at the intersection with Allen Street.

The remaining two southbound lanes are proposed to operate "unopposed" (the right turn out of Allen Street is not permitted and no pedestrian crossing of the Princes Highway is included in the modified arrangement).

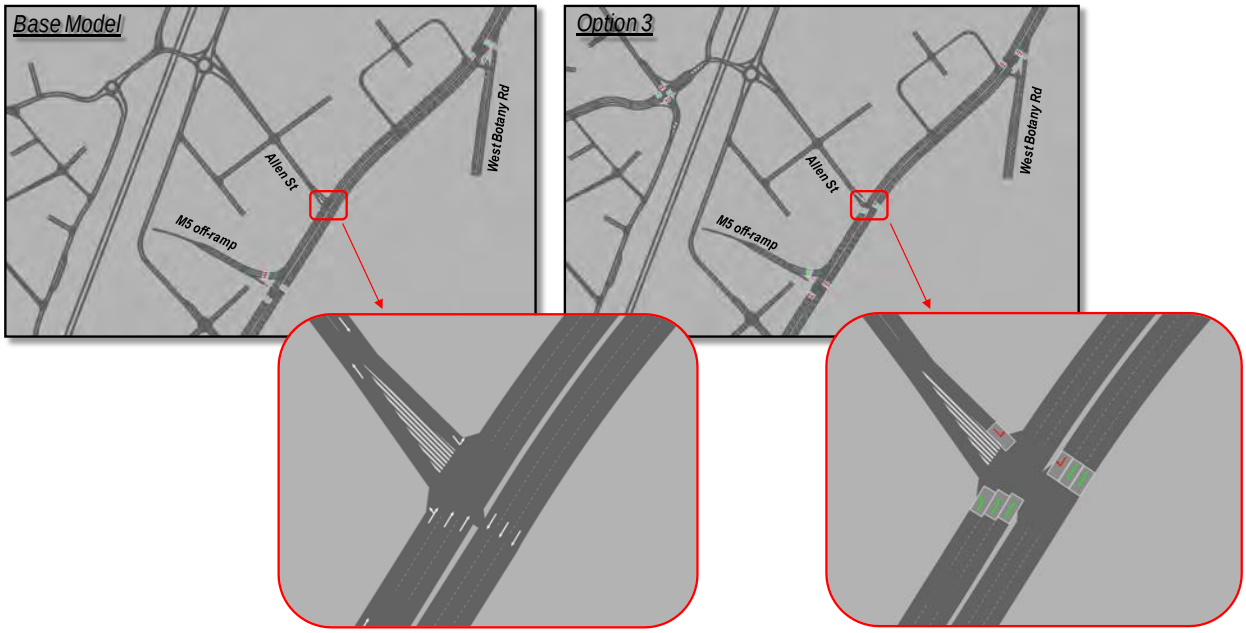


Figure 9.3: Right Turn onto Allen Street Permitted as part of Option 3

The signal phasing operation was adjusted as necessary within the modelled area to reflect modified traffic conditions.

9.1.4 Option 4 – DCP with Mode Share Reduction and Allen St Right Turn and Arncliffe Street Closed to "through traffic" south of Guess Avenue

Option 4 maintains the traffic demands used in Options 2 and 3 (target 2031 transport mode share) and also maintains the right turn from the Princes Highway onto Allen Street, as described for Option 3. Option 4 includes a number of modifications to the road network near the Wolli Creek and Bonar Street precincts, as follows:

- Arncliffe Street converted to a "cul de sac" south of Guess Avenue;
- Implementation of a clockwise one-way circuit along Arncliffe Street, Guess Avenue, Mount Olympus Boulevard and Magdalene Terrace (only Magdalene Terrace maintains two-way traffic);
- Removal of the Brodie Spark Drive / Arncliffe Street roundabout and conversion of this intersection to a give-way arrangement;
- Access to/from Discovery Point converted to "left in / left out" at the Brodie Spark Drive / Arncliffe Street intersection; and
- Right turn from Bonar Street onto Wollongong Road removed.

Similar to other options, the signal phasing for Option 4 was also adjusted as necessary to ensure that the operation of all signalised intersections correctly matched the modified traffic conditions and patterns.

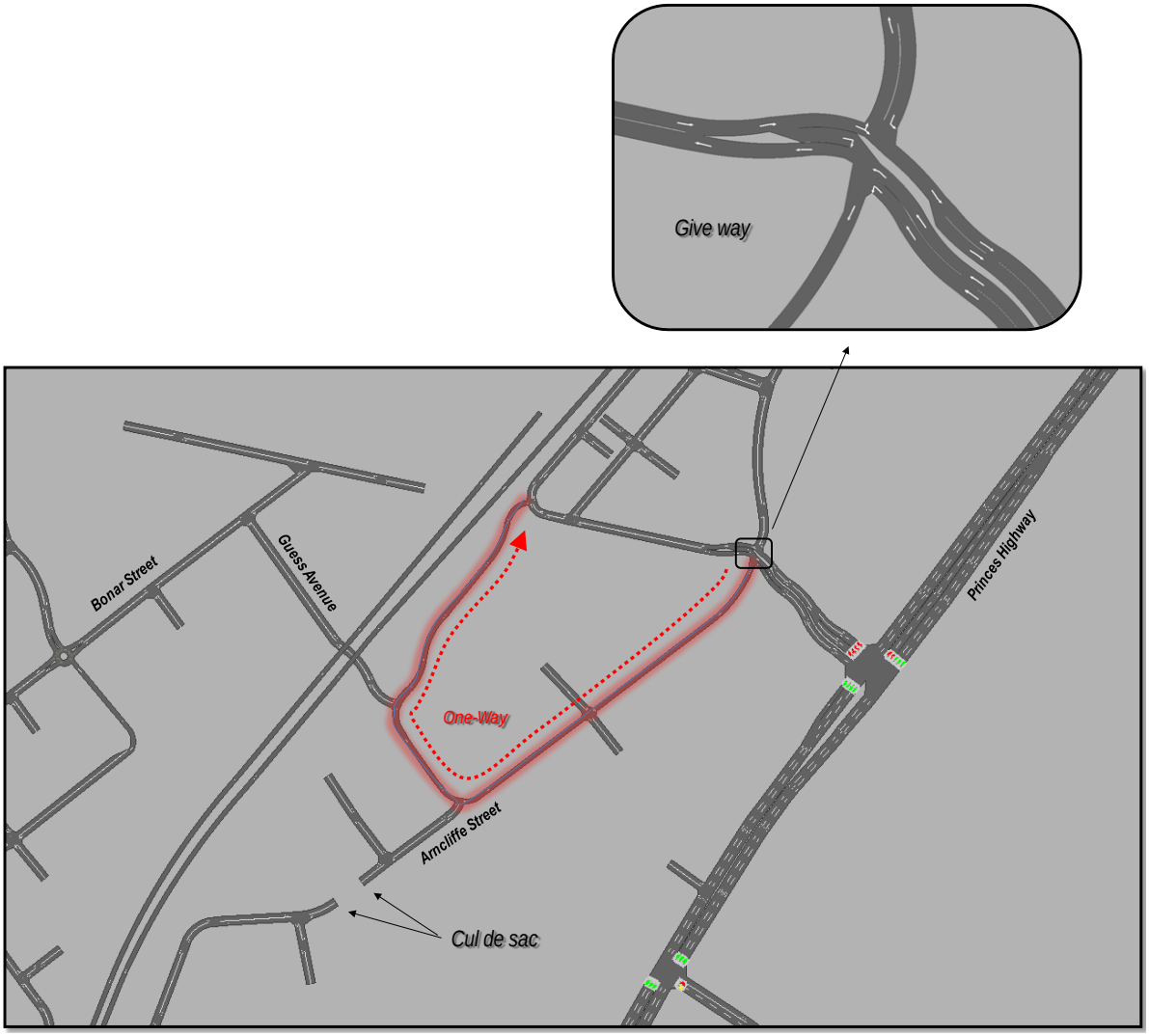


Figure 9.4: Road Network Modifications near the Wolli Creek Town Centre as part of Option 4

9.2 2031 MODELLING RESULTS

To better understand and compare how each option operates, a series of outputs was extracted from the morning and afternoon peak models. The 2012 base models were also included in the comparison to help put some of the results in perspective.

Eight specific output categories were selected to conduct a comparative assessment of the performance of each of the options tested. The output categories were as follows:

- Total Demands
  - Provides an indication on the number of vehicles attempting to enter the network on each option and each hour;
  - Puts in perspective the different trip generation scenarios;
- Vehicle Hours Travelled (VHT)
  - Performs a multiplication between the number of vehicles on the network and the hours required to travel between their respective origin and destination;
  - Provides an indication of network performance levels and possible congestion issues or ineffective routing;
- Number of Vehicles on the Network
  - Identifies the total number of vehicles on the network (by minute);
  - Demonstrates how each option operates over time, its stability and how it responds to the peak conditions;
  - Shows how effective each option is in allowing vehicles to complete their trips;
- Unreleased Vehicles
  - Identifies the number of vehicles that were unable to enter the modelled network in each hour, due to queues extending past the modelled area;
- Eastbound Queues on Forest Road (AM peak only)
  - Illustrates the maximum queue on Forest Road (eastbound) during the morning peak for all options;
  - Provides a detailed comparison on how one of the key congestion hotspots in the modelled area varies with the different scenarios;
- Travel Times Along the Princes Highway
  - Measures the average time required to complete a trip between the southern and northern extremities of the model (and vice-versa) along the Princes Highway;
  - Allows an assessment of the impacts associated with each scenario on the operation of trough traffic along the Princes Highway;
- Key Hourly Volumes
  - Identifies the average hourly volumes on key points of the network
  - Helps compare the average traffic volumes anticipated to use the key parts of the network under each option;
- Route Choice Analysis
  - Compares the routes chosen by vehicles to travel between the northern extremity of the Princes Highway and the western extremity of Forest Road (near the intersection with Wollongong Road) and vice-versa;
  - Provides an indication of how vehicles modify their routes depending on the network modifications included in each option;
  - Assesses the proportion of “rat running” traffic travelling along Wollongong Road, Arncliffe Street, Bonar Street, etc.

9.2.1 Total Demands

The 2012 origin destination demands used in the base model were modified to reflect estimated demands in 2031 for each scenario. Option 1 established a background traffic growth of 0.5% per annum (compound). This growth was applied only to trips between "external zones" (i.e. through trips that use part of the modelled network). This growth rate was adopted after reviewing historical traffic growth rate figures for the area. The external traffic growth was 2%, but 15yrs of growth was assumed to be reduced based on the benefits of Westconnex. This resulted in a 2% growth per annum applied over a five year period, which equates to an average rate of 0.5% over a 20 year period.

The trips going to or from "internal zones" (i.e. traffic travelling to/from the modelled area) were calculated based on the yields provided by RCC. As described in Section 8.1, Option 1 is based on typical RMS trip generation rates while Options 2, 3 and 4 adopt revised transport mode share figures. These targets are shown in Table 8.1. The reduction in total demands between Option 1 and the other options is typically in the order of 11%.

Figure 9.5 illustrates the total traffic demands used in all periods for all 2031 options and 2012 base scenario.

It is interesting to note that the adoption of the "2031 mode share targets" in Options 2, 3 and 4 results in the total demands being very similar to those used in the 2012 calibrated and validated models. In other words, should those modifications to the transport mode share be achieved and the background traffic growth rate over the next 20 years be in the order of 0.5% per annum, the total demands in 2031 would be comparable to those currently using the modelled area.

9.2.2 Vehicle Hours Travelled (VHT)

The vehicle hours travelled for each scenario help understand impact associated with the combination of demands used in each option and respective network modifications. Higher "VHT" statistics typically indicate factors such as higher number of vehicles in the model (higher demands), higher congestion levels and delays, longer routes adopted for the same origin-destination trips, etc.

Table 9.2 and Figure 9.6 document the "VHT" for each 2031 option and compare them with the 2012 results.

Table 9.2: Vehicle Hours Travelled

Scenario	AM Peak	PM Peak
2012 Base	1647	2276
2031 Option 1	2257	4167
2031 Option 2	1742	3026
2031 Option 3	1724	3053
2031 Option 4	1862	3457

10. PREFERRED OPTION DEVELOPMENT

The modelling outputs from the options assessment allowed each scenario to be assessed in detail and compared to the alternative concepts and current operation. The key findings were as follows:

- The current transport mode share is not compatible with the forecast growth in the Wolli Creek and Bonar Street precincts. The gradual re-development of these two precincts will exacerbate current network deficiencies and put more pressure on a road network that is already operating beyond its practical capacity unless a shift towards public transport and active transport occurs within the study area;
- The part of the network that would experience the most significant impacts corresponds to the eastbound carriageway of Forest Road during the morning peak period. Currently, queues typically extend for approximately 750m, and these would increase to just under 2000m under a "do nothing" scenario;
- Allowing right turn movements from the Princes Highway onto Allen Street has a marginal impact on through traffic route choice. That is, in the afternoon peak period, under 4% of the southbound through trips would use this route. However, allowing right turn movements at this location is highly beneficial for local trips, resulting in over 200 vehicles turning right at this location as opposed to Brodie Spark Drive and therefore bypassing the Arncliffe Street and the Wolli Creek precinct centre. Furthermore, the conversion of the Princes Highway from three lanes to two lanes in the southbound direction (required as part of the provision of the right turn onto Allen Street) is sufficient to cater for the southbound traffic; and
- Option 4 effectively removes all through traffic from Arncliffe Street. However, it is important to point out that during the morning peak period, the northbound "through traffic" along Bonar increases to approximately three times the volumes currently observed. In effect, all "rat run" trips are moved to the Bonar Street corridor. In the afternoon peak period, practically no through trips occur along Bonar Street. A significant number of trips is therefore "transferred" to the Princes Highway. This increase in traffic volumes, together with the removal of one southbound lane near Allen Street and weaving issues occurring at this location, contribute to an extremely poor level of operation and southbound queues extending beyond the modelled area.

Taking into consideration the modelling results, a "Preferred Option" was developed and discussed with Council.

The options assessment revealed that the greatest level of benefit was obtained by reducing the 'car mode share'. The preferred option is subsequently based on developing a traffic network that provides the greatest opportunity to improve the pedestrian and cycling environment.

The Preferred Option configuration addresses many of the 'existing issues' summarised in Section 7 and removes many of the flow-on implications associated with previous tested options. The network adopted as the Preferred Option mostly corresponds to Option 4, however with Arncliffe Street re-opened to 'through traffic', and the Allen Street intersection returned to its existing configuration.

Figure 10.1 illustrates the Preferred Option configuration.

Figure 10.1: Preferred Option

The Preferred Option allows significant improvements to the active transport facilities to be implemented near the Wolli Creek town centre. The most significant upgrade occurs along the "one-way sections" adopted at Arncliffe Street, Guess Avenue and Magdalene Terrace. Since these links require one traffic lane only, the remaining width can be used to provide cycle lanes, good quality footpaths, street furniture and other schemes that encourage active transport.

Overall, the network performance associated with the Preferred Option is very similar to that described for Option 2 (mode share reduction), with most of the statistics showing some marginal improvements.

The proposed one-way circuit has little impact of traffic distribution, however enables greater opportunity to design high quality pedestrian and cycle facilities to encourage 'non-car based' travel. Importantly, the existence of managed 'through traffic' will assist with ensuring a vibrant and active town centre for extended periods of the days.

The provision of the one-way arrangement addresses many existing issues such as:

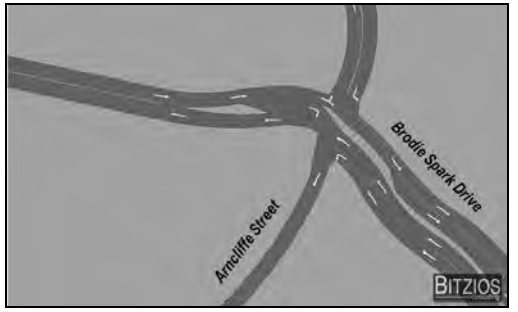
- *the existing Woolworths access;*
- *the ability to include on-street cycle facilities;*
- *provision of additional on-street parking;*
- *passive surveillance along Mount Olympus Boulevard;*
- *wider footpath areas; and*
- *improved pedestrian / cycle safety at key intersection conflict points (eg Brodie Spark Drive roundabout).*

The key network performance measures for the Preferred Option are discussed below:

- The Preferred Option results in the lowest VHT statistics out of all of the options tested;
- The total number of unreleased vehicles with the preferred option is lower than all other scenarios;
- The Preferred Option contributes to a reduction of approximately 10% of the morning peak eastbound queue along Forest Road when compared to Option 2 (the best performer of other options);
- The southbound "rat run" volume along Arncliffe Street is slightly reduced with the Preferred Option when compared to the previously tested scenarios. In the northbound direction, the "rat run" volume along Arncliffe Street increases approximately 21 vehicles per hour when compared to Option 2 which is negligible. However, that is an indication that the longer route required to be adopted by "rat runners" via the one-way section does not contribute to a reduction of "rat running" in the northbound direction.
- Detailed results for the Preferred Option are shown in Appendix B which also helps compare its performance with all other configurations tested and discussed above.

Table 10.1 provides a detailed description of all the network modifications required to fully implement the "Preferred Option" concept.

Table 10.1: Preferred Option Detailed Description

Item	Description	Figure
1	Wollongong Road / Firth Street roundabout converted to a signalised intersection and localised widening on Wollongong Road to four lanes.	
2	Right turn from Allen Street onto Wollongong Road banned.	
3	Construction of "Road 7" and "Road 8" within the Bonar Street Precinct, in accordance with the Public Domain Plan.	
4	Arncliffe Street / Brodie Spark Drive roundabout converted to a "give-way" intersection with improved walking and cycling facilities.	
5	Access to/from the Discovery Point site near the intersection with Arncliffe Street and Brodie Spark Drive converted to a "left-in/left-out arrangement".	
6	Arncliffe Street converted to one way southbound (one lane only) between Brodie Spark Drive and Guess Avenue, with improved cycling and pedestrian facilities and a slow speed environment.	
7	Guess Avenue converted to one way wesbound (one lane only) between Arncliffe Street and Mount Olympus Boulevard with improved cycling and pedestrian facilities and a slow speed environment.	
8	Mount Olympus Boulevard converted to one way northbound (one lane only), with improved cycling and pedestrian facilities and a slow speed environment.	
9	Guess Avenue / Mount Olympus Boulevard roundabout removed. This junction is converted to a T- intersection configuration and its alignment modified so that the priority movement is that going from Guess Avenue (eastern leg) to Mount Olympus Boulevard and vice versa. The eastern leg of the intersection would have to give way to the dominant flow of traffic running along Mount Olympus Boulevard and Guess Avenue.	

10	Right turn from Bonar Street onto Wollongong Road removed, with consideration to further increase the restrictions at this location to allow 'left out' movements only. This will remove any future possible "rat run' through Bonar Street / Guess Avenue and onward towards Brodie Spark Drive.