Traffic Impact Assessment

Proposed Mixed-Use Development
2-14 Tennyson Road, Gladesville

Reference: 16.560r01v02 TRAFFIX TIA
Date: December 2016

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Document Verification

Job Number:	16.560			
Project:	Proposed Leisure Centre Expansion 2-14 Tennyson Road, Gladesville			
Client:	Grimshaw Architects Pty Ltd (Sydney)			
Revision	Date	Prepared By	Checked By	Signed
v01DRAFT	13/12/2016	Alexandra Kavanagh	Alexandra Kavanagh	
v02DRAFT	13/12/2016	Alexandra Kavanagh	GP	

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Appendices

1. Introduction

TRAFFIX has been commissioned by Grimshaw Architects Pty Limited to undertake a Traffic Impact Assessment of a Planning Proposal for the proposed Tennyson Village Development. The planning proposal seeks to rezone the light industrial site to mixed residential and commercial uses with a view to accommodating growth in the region.

The property is situated in Ryde Council Local Government Area and has been assessed under that Council's controls. The report documents the findings of our investigations and should be read in the context of the Planning Proposal, prepared separately.

The objective of this report is to test the traffic impacts of the concept plan that has been adopted for assessment purposes. In this regard, further detailed investigations will be undertaken at the future development application stage/s, at which time changed to the land use mix and intensity would be reasonably expected.

The report is structured as follows:

- Section 2: Describes the site and its location;
- Section 3: Documents existing traffic conditions;
- Section 4: Describes the proposed development;
- Section 5: Assesses the parking requirements;
- Section 6: Assesses traffic impacts;
- Section 7: Discusses access and internal design aspects;
- Section 8: Presents the overall study conclusions.

2. Location and Site

The site is located within the Gladesville business area and adjoins Gladesville Town Centre which lies generally to the east and southeast of the site, along the Victoria Road corridor. It is located to the east of Tennyson Road generally opposite Searle Street. The site currently comprises two separate Lots known as 2-12 Tennyson Road and 14 Tennyson Road. These Lots currently comprise light industrial, warehouse and commercial land uses with a total combined site area of 23,690m^2.

The site has an irregular configuration with a northern boundary of approximately 296 metres to a neighbouring commercial development, a southern boundary of approximately 169 metres to multiple residential developments, an eastern boundary of approximately 66 metres to multiple residential developments and a western frontage of approximately 140 metres to Tennyson Road.

There are currently two driveway crossings serving the site located immediately adjacent one another approximately 35 metres north of the Tennyson Road intersection with Potts Street. The northern driveway is 6.5 metres wide and currently serves the Lot 2-12 Tennyson Road and the southern driveway is 6.5 metres wide and serves the Lot 14 Tennyson Road.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**. Reference should also be made to the Photographic Record presented in **Appendix A**, which provides an appreciation of the general character of roads and other key attributes in proximity to the site.

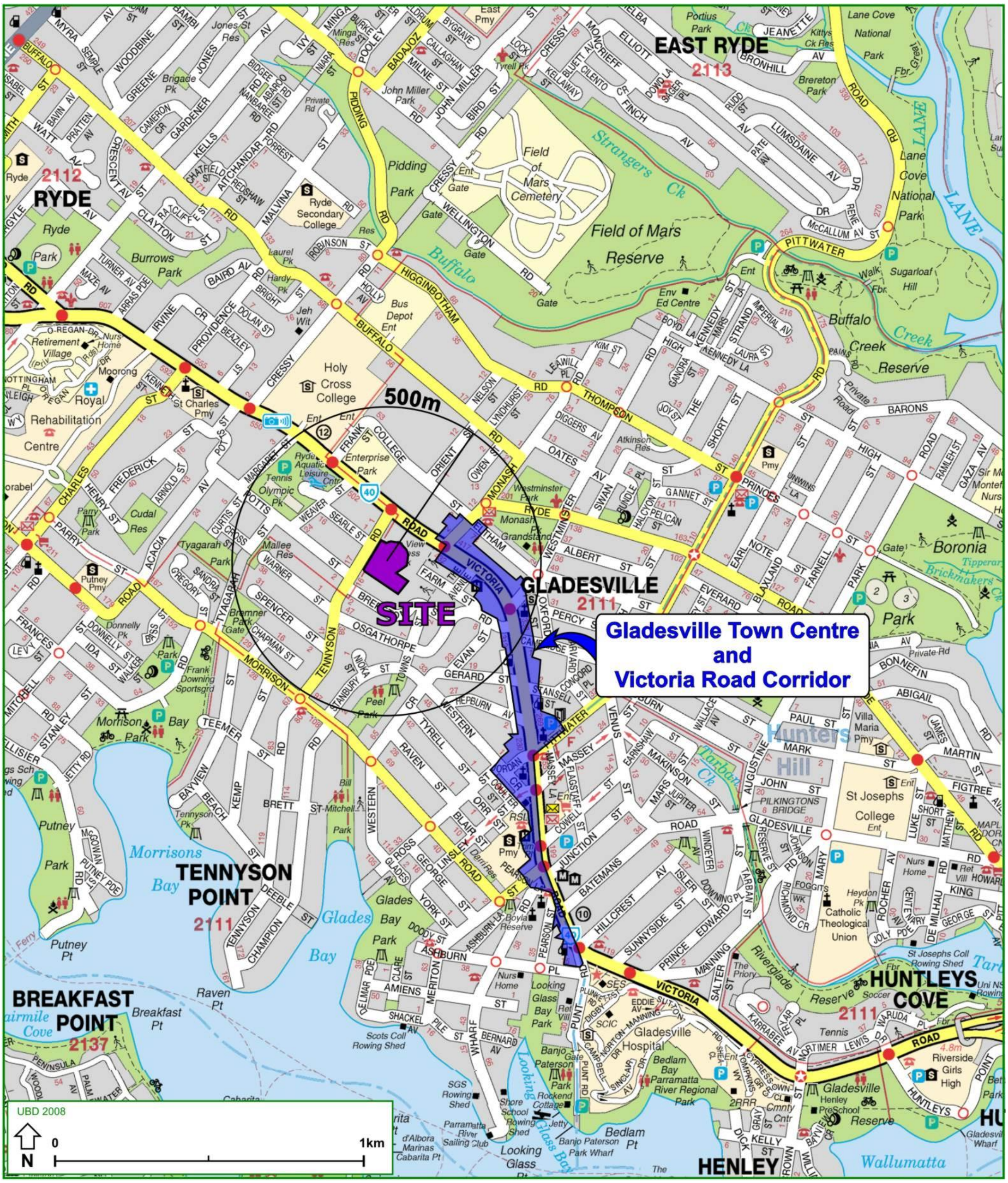


Figure 1: Location Plan

Figure 2: Site Plan

3. Existing Traffic Conditions

3.1 Road Network

The road hierarchy in the locality is shown in **Figure 3** with the following roads of particular interest:

- Victoria Road: an RMS Main Road (MR 165) that generally runs in an east-west direction between Parramatta in the west and Pyrmont and the Western Distributor in the east. Victoria Road is subject to clearway restrictions and does not provide any on-street parking. In the vicinity of the site Victoria Road is subject to a 60km/h speed zoning and generally carries two lanes of traffic and two bus lanes, one in each direction, within a divided carriageway.

- Tennyson Road: a local collector road that generally runs in a north-south direction from Victoria Road in the north to its termination just to the south of its intersection with Champion Road. It generally permits unrestricted kerbside parallel parking and is subject to a 50km/h speed zoning. Tennyson Road carries a single lane of traffic in either direction along an undivided carriageway. Access to the subject site is provided via Tennyson Road.

- Searle Street: a local road that runs in an east-west direction between Tennyson Road in the east and Weaver Street in the west. Searle Street is subject to a 50km/h speed zoning and carries a single lane of traffic in either direction.

- Morrison Road: a local collector road that generally runs in an east-west direction between Church Street in the west and Pyrmont and Victoria Road in the east. Morrison Road intersects with Tennyson Road in the form of a roundabout about 500 metres southwest of the subject site. In the vicinity of the roundabout, Morrison Road is subject to a 50km/h speed zoning, carries two lanes of traffic (one in each direction) and provides unrestricted parking on both sides.

It can be seen from **Figure 3** that the site is conveniently located with respect to the arterial and local road systems serving the region, in particular the Victoria Road corridor to the north of the site and the Morrison Road corridor to the south of the site. It is therefore able to effectively distribute traffic onto the wider road network, minimising traffic impacts. Indeed, the site is a logical extension of the existing Gladesville Town Centre.

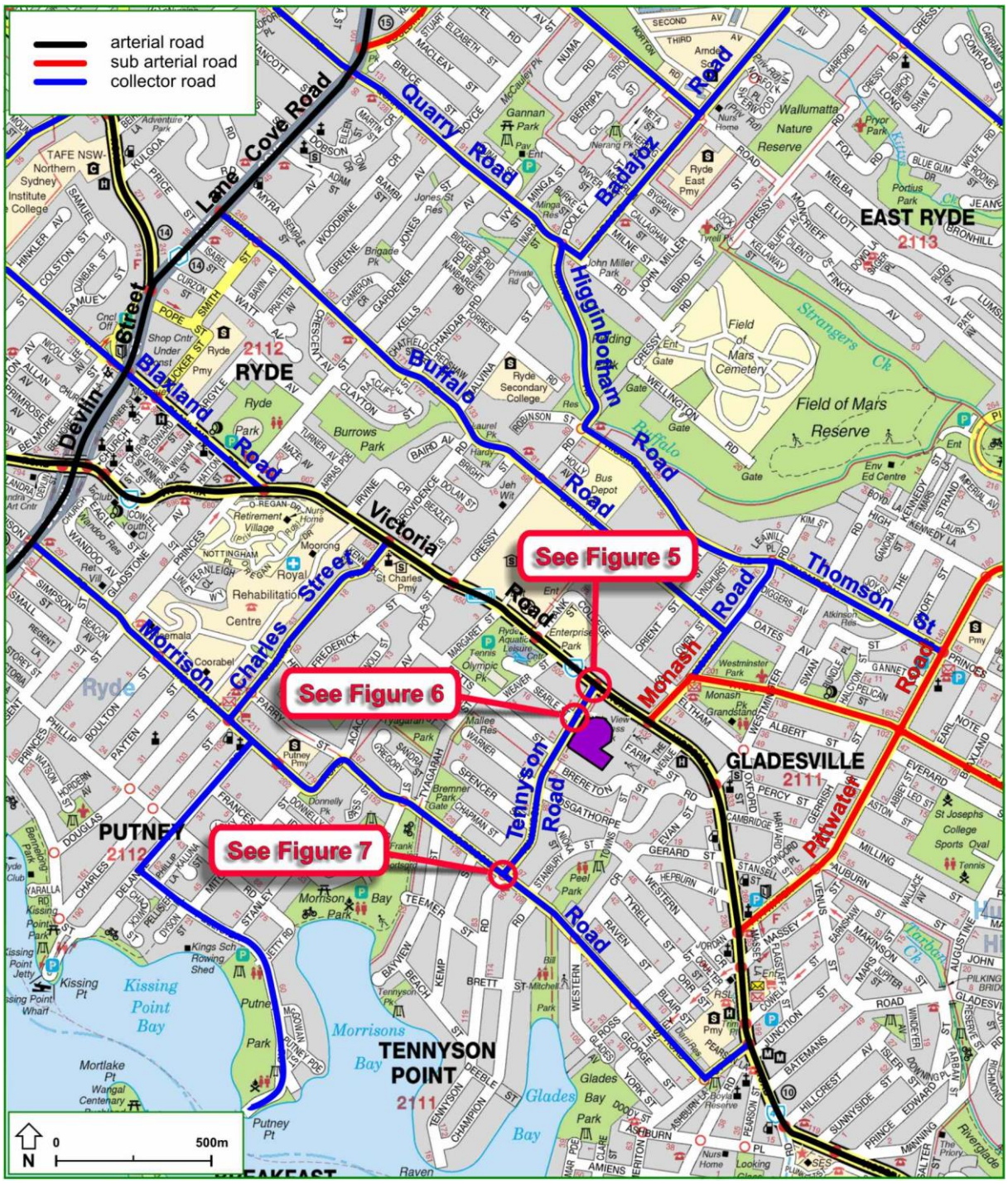


Figure 3: Existing Road Hierarchy

3.2 Public Transport

3.2.1 Bus Services

Numerous bus services operate along Victoria Road as shown on **Figure 4**. It is noteworthy that the target walking distance to bus stops is 400 metres. In this regard, two bus stops (one in each direction) are located within this 400 metre target walking distance as shown on Figure 4. Bus routes servicing these stops are summarised as follows:

- M52 – Metrobus Parramatta to Circular Quay via Drummoyne;
- x00,500 – Ryde to City;
- 501, 510, 515 – Ryde to City;
- 507, X18, 518 – Macquarie University to City;
- 520 – Parramatta to City via West Ryde.

The weekday frequencies of the more significant services are summarised in **Table 1**.

Table 1: Bus Routes and Service Attributes

Route Number	via	AM Peak Hour	Off-Peak Hour	PM Peak Hour
M52	Victoria Road	12	8	12
X,00,500	Victoria Road	4	1	2
501	Victoria Road	7	3	3
510	Victoria Road	13	0	5
515	Victoria Road	2	2	2
X18,518	Victoria Road	4	2	2
520	Victoria Road	2	1	0

Table 1 shows that the site is well serviced by buses along Victoria Road, with (on average) more than one bus service every two (2) minutes during the morning peak hour.

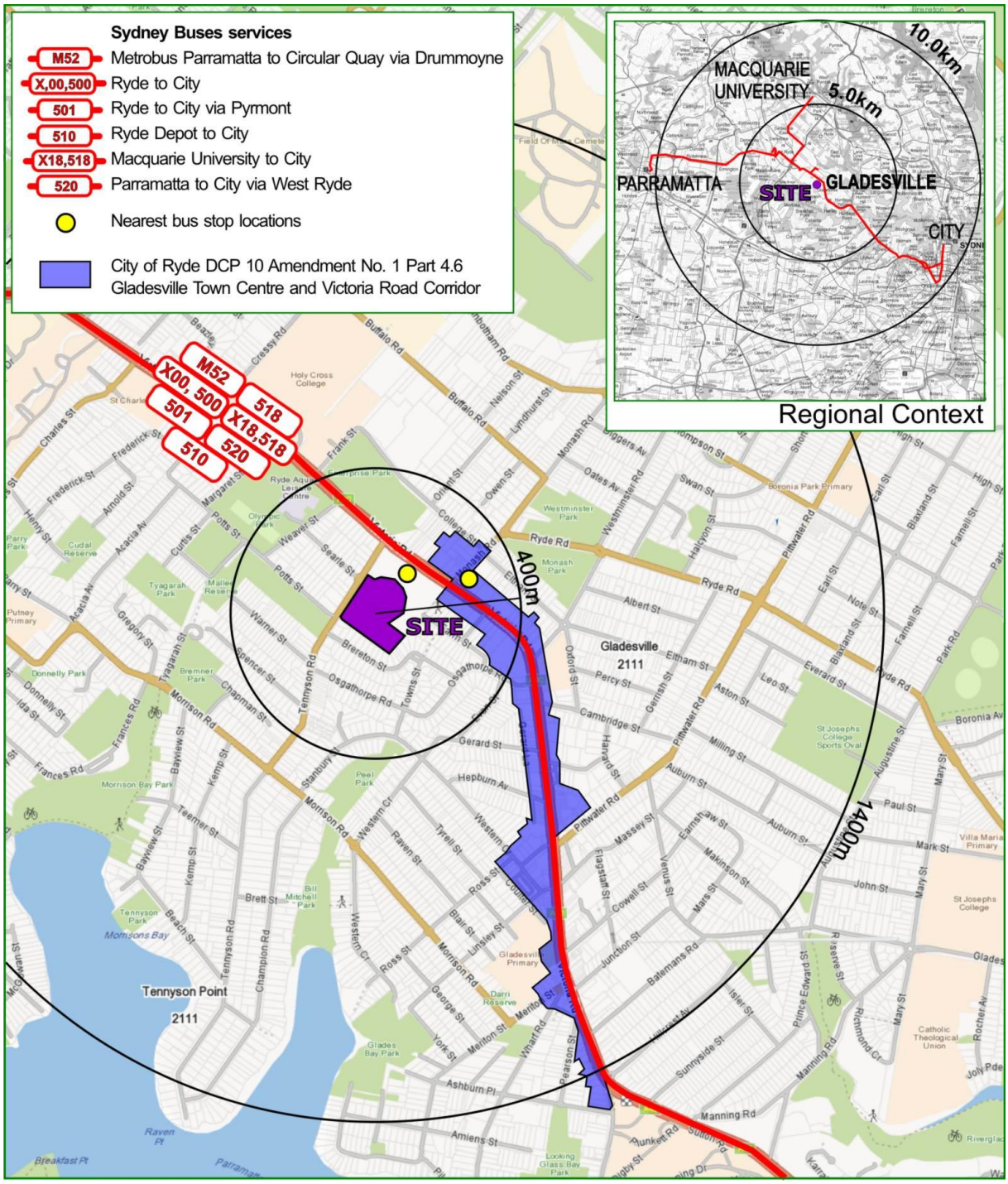


Figure 4: Existing Public Transport Services

3.3 Walking and Cycling

The site is located just on the outskirts of the Gladesville town centre footprint which itself is a growing retail and commercial centre. Its close proximity to the town centre means walking and cycling are viable forms of transport for commuting purposes. The nearest marked on-street cycling route is located to the south of the site along Morrison Road this links into the larger cycleway network providing routes to the Sydney CBD and Parramatta in the west. Footpaths are provided along both sides of Tennyson and Victoria Road providing safe pedestrian travel corridors.

3.4 Key Intersections

The key intersections in the vicinity of the site are shown below and provide an understanding of the existing road geometry and alignment:

Figure 5: Intersection of Victoria Road & Tennyson Road

It can be seen from **Figure 5** that Victoria Road carries two lanes of traffic in either direction and an additional bus lane in either direction in the vicinity of the site. Tennyson Road forms a 'T' intersection with Victoria Road, providing adequate sightlines in both directions. Pedestrian crossings are provided on all approaches except the Victoria Road east approach.

Figure 6: Intersection of Tennyson Road & Searle Street

It can be seen from **Figure 6** that Searle Street forms a roundabout intersection with Tennyson Road which is located immediately adjacent the subject site. Both Morrison Road and Tennyson Road carry a single lane of traffic in either direction.

Figure 7: Intersection of Tennyson Road & Morrison Road

It can be seen from **Figure 7** that Morrison Road forms a roundabout intersection with Tennyson Road which is located approximately 450 metres from the subject site. It is evident from the above figure that both Morrison and Tennyson Road carry a single lane of traffic in either direction.

3.5 Existing Intersection Performances

For the purposes of assessing the traffic impacts of the proposed rezoning, traffic surveys which were undertaken by R.O.A.R Data in 2013 have been reviewed. The traffic surveys were undertaken at the following intersections during a typical evening peak period in a previous assessment undertaken by TRAFFIX:

- The signalised intersection of Victoria Road with Tennyson Road;
- The roundabout intersection of Tennyson Road with Searle Street; and
- The existing site accesses to 2-12 Tennyson Road and 14 Tennyson Road.
- The priority controlled roundabout intersection of Tennyson Road with Morrison Road.

To establish the traffic conditions for this planning proposal TRAFFIX undertook a survey of the most critical intersection, being the signalised intersection of Victoria Road with Tennyson Road. This was undertaken to determine whether conditions had changed since the 2013 surveys, with the intention that significant changes would have triggered the need for more comprehensive surveys. That is, this methodology aimed to establish the growth on the network over the last three years. The results of the 2013 and 2016 survey are presented in **Figure 8** and **9** below.

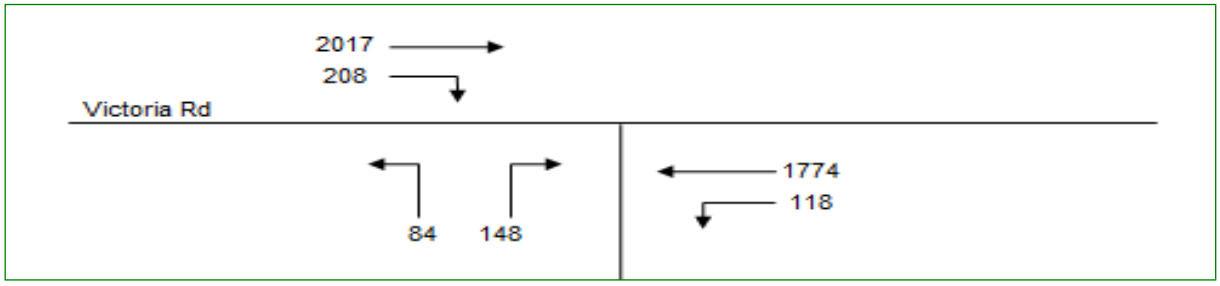


Figure 8: 2013 PM Peak Surveyed Traffic Counts

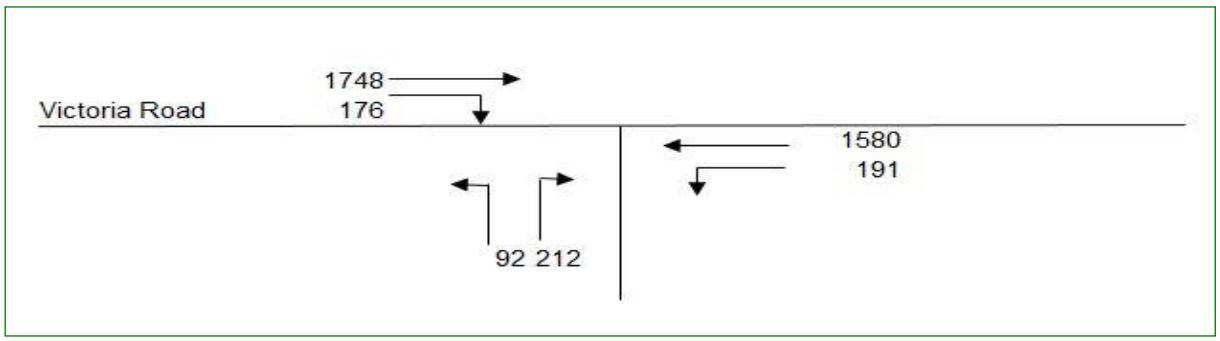


Figure 9: 2016 PM Peak Surveyed Traffic Counts

It is evident from Figures 8 and 9 that the volumes of traffic over the three (3) year period decreased for all manoeuvres on Victoria Road with the exception of the left turn from Victoria Road to Tennyson Road. Similarly, the left out and right out manoeuvres from Tennyson Road onto Victoria Road have also increased in volume during the PM peak period.

Based on the higher volumes for the critical turns associated with this development, the 2016 surveys were adopted as a worst case scenario. These turning counts were analysed using the SIDRA computer program to determine their performance characteristics under existing traffic conditions. The SIDRA model produces a range of outputs, the most useful of which are the Degree of Saturation (DOS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LOS) criteria. These performance measures can be interpreted using the following explanations:

DOS – the DOS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DOS approaches 1, it is usual to attempt to keep DOS to less than 0.9. When DOS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. In this regard, a practical limit at 1.1 can be assumed. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DOS of 0.8 or less.

AVD – the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system)..3

LOS – this is a comparative measure which provides an indication of the operating performance of an intersection as shown below:

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
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

A summary of the modelled results are provided in Table 2 for the 2013 survey of all intersections and the 2016 survey results of the critical Victoria Road and Tennyson Road intersection. Reference should also be made to the SIDRA outputs attached at **Appendix B**, which provide detailed results for all approaches.

Table 2: Existing Intersection Performance

Intersection Description	Survey Year	Peak Period	Control Type	Degree of Saturation(DOS)	Average Delay(sec)	Level of Service
Victoria Road x Tennyson Road	2016	PM	Signalised	0.763	8.2	A
	2013	PM		0.786	8.8	A
Tennyson Rd x Searle St	2013	PM	Roundabout	0.239	9.8	A
Tennyson Rd x Morrison Rd	2013	PM	Roundabout	0.620	13.3	A

The results in Table 2 show that in terms of delays, all intersections currently operate well with a Level of Service of A.

4. Description of Concept Development

4.1 Development Schedule

The Planning Proposal adopts a concept development for assessment purposes which is intended to secure Ryde Council support for the proposed 'Tennyson Village' residential development. A detailed description of the proposal is provided in the Planning Report prepared separately and the key aspects are summarised below:

- To establish for site 2-12 Tennyson Road a residential development comprising:
  - 288 residential units, consisting of:
    - 90 one-bed units;
    - 176 two-bed units;
    - 22 three- bed units.
  - 1,329m^2 GFA commercial component.
- To establish for site 14 Tennyson Road a residential development comprising:
  - 104 residential units, consisting of:
    - 28 one-bed units;
    - 50 two-bed units;
    - 26 three- bed units.
  - 685m^2 GFA commercial component.

Reference should be made to the architectural plans issued separately, which are attached to this report at reduced scale in **Appendix D**.

4.2 Vehicular Access

The proposed site access arrangement is premised on the assumption that the two-lot site will be developed in one stage. Under this scenario, two accesses would be constructed, as follows:

- Northern Site Access – consisting of a new fourth arm on to the existing roundabout of Tennyson Road with Searle Street, this direct access in to 2-12 Tennyson Road would provide access for the servicing vehicles and the loading requirements of the site.

- Southern Site Access – connecting to the road network via a priority (Give Way) T-intersection with Tennyson Road, this access would be located generally on the boundary of Lot 2-12 and Lot 14 Tennyson Road and would provide access to up to 659 car parking spaces for both Lot 2-12 and 14 Tennyson Road.

The design requirements of these proposed vehicular accesses would be compliant with AS2890.1 and AS2890.2 as well as Austroads Guidelines, as appropriate. Detailed design of the two access points will be confirmed in a subsequent Traffic Impact Assessment to accompany a development application/s for the site.

5. Parking Requirements

Parking requirements of the concept development adopted for the site for planning proposal purposes are subject to Ryde Council's Development Control Plan. This incorporates parking requirements for residential and commercial developments within the LGA as per **Table 4** below.

Table 4: Car Parking Rates and Provision

Type	No. / Area	Ryde Council DCP Parking Rate	Minimum Spaces Required	Maximum Spaces Required
One-bedroom unit	90	0.6 to 1 space	54	90
Two-bedroom unit	176	0.9 to 1.2 spaces	158	211
Three-bedroom unit	22	1.4 to 1.6 spaces	31	35
Visitor	288	1 space per 5 dwellings	58	58
		Total:	301	394
GFA	1,508m^2	1 space per 40m^2	38	
		Total:	38	
One-bedroom unit	28	0.6 to 1 space	17	28
Two-bedroom unit	50	0.9 to 1.2 spaces	45	60
Three-bedroom unit	26	1.4 to 1.6 spaces	36	42
Visitor	104	1 space per 5 dwellings	21	21
		Totals:	119	151
GFA	685m^2	1 space per 40m^2	18	
		Total:	18	
		Totals:	**476**	**601**

The site is capable of accommodating this range of parking supply and this will be assessed in further detail at subsequent development stage, when the proposed uses and yields will be further considered and refined.

6. Traffic Impacts

6.1 Traffic Generation

The proposed (concept) development will provide 392 residential apartments and 2,355 m^2 of commercial gross floor area. The trip generation calculate from the RMS Guide to Traffic Generating Developments is set out below.

Table 5: RMS Guide to Traffic Generating Developments

Development Type	Peak Period	RMS Rate	Indicative Development Yield	Calculated Trip Generation
Residential Trips	AM peak period	0.19 trips per unit	392 apartments	75
	PM peak period	0.15 trips per unit		59
Commercial Trips	AM peak period	1.2 trips per 100m^2 of GFA	2,355 m^2	29
	PM peak period	1.6 trips per 100m^2 of GFA		38

Application of the rates presented in Table 5 results in 104 vehicle trips in the AM peak period and 97 vehicle trips in the PM peak period. When an '80 out / 20 in' directional split is applied to the residential trips and a '20 out / 80' in directional split is applied to the commercial component is applied to these rates, the following traffic generation results:

- 104 vehicle trips during the AM peak period (38 in, 66 out)
- 97 vehicle trips in the PM peak period (55 in, 42 out)

It is noted that this is a very moderate level of generation compared with previous schemes for the site, which had a high proportion of non-residential uses, including higher retail component. In this regard, the predominant residential uses now sought are low traffic generating uses. Specifically, the previous scheme resulted in unacceptable queuing in Tennyson Road. To ensure that the revised Planning proposal does not have the same impact our distributions for the revision has been assessed with 100% of development traffic utilising the intersection of Tennyson Road and Victoria Road. Our assessment is discussed in further detail below.

6.2 Traffic Distribution

The above generations are a net increase over and above existing conditions. The AM and PM peak increase of 104 and 97 vehicle trips, respectively. The additional trips will be split in both directions (in / out) and distributed to the north and south along Tennyson Road, However, to maintain a conservative assessment on the development 100% of traffic has been assumed to travel through the critical intersection of Victoria Road and Tennyson Road. The distribution of this traffic is as follows:

- 40% of development traffic westbound towards Parramatta via Victoria Road
- 60% of development traffic eastbound toward the City via Victoria Road.

The same distribution has been applied to both the AM and PM Peak above the surveyed 2016 conditions. The results are provided in **Table 6** below.

Table 6: AM & PM Peak Hour Intersection Performances

Intersection Description	Development Stage	Control Type	Period	Intersection Delay (sec)	Level of Service	Degree of Saturation
Victoria Road / Tennyson Road	Existing	Signals	AM	9.2	A	0.743
			PM	12.3	A	0.796
	Existing + Development		AM	13.0	A	0.814
			PM	15.8	B	0.859

It is evident from the SIDRA modelling results included in Table 6 that the proposed development will have negligible impacts on the performance of both key intersections in the vicinity of the site. Indeed, the results confirm that all intersections modelled will continue to operate with existing Levels of Service A and B and that only very minor increases in delays would be experienced. Furthermore the right hand turn movements at the critical intersection have also been compared for:

- Existing Conditions
- The 2013 Planning Proposal Scenario; and
- The 2016 (current) Planning Proposal Scenario.

Table 7: Right Turn Movement Performance Summary

Leg/ Movement	Scenario	Period	Lane Delay (sec)	Level of Service	Degree of Saturation
Western Leg; Victoria Road	Existing	AM	27.8	B	0.661
		PM	36.9	C	0.669
	2013 Planning Proposal	AM	Not assessed		
		PM	89.6	F	1.031
	2016 Planning Proposal	AM	43.0	D	0.699
		PM	50.1	D	0.724
Southern Leg; Tennyson Road	Existing	AM	73.1	F	0.738
		PM	70.8	F	0.795
	2013 Planning Proposal	AM	Not assessed		
		PM	115.1	F	0.992
	2016 Planning Proposal	AM	71.4	F	0.809
		PM	71.6	F	0.841

As can be seen from Table 7 above, the previous 2013 planning proposal saw significant delays on the right turn movements at the intersection of Victoria Road and Tennyson Road. The results show the revised 2016 Planning Proposal will result in increases in delay for the western leg of Victoria Road's right turn to Tennyson Road during the AM and PM peak period. However, an acceptable Level of Service of D will be experienced for the movement. During the AM and PM peak, the right turn movement from Tennyson Road onto Victoria Road will continue to experience a Level of Service F with delays considered comparable to existing conditions.

The traffic impacts of the proposed (concept) development are therefore considered acceptable and will be accommodated by the existing road network, with no external improvements required. Notwithstanding, this is a matter that will be further considered at development application stage when the development will need to be assessed on its merits.

8. Conclusions

In summary:

- This report has been structured and is intended as a 'high level' assessment report, which is considered sufficient for achieving Council approval. The proposal primarily seeks to rezone a light industrial site to a mixed residential and commercial use in close proximity to the Gladesville Town Centre and Victoria Road Corridor. The revised proposal
- Vehicular Access
  - Northern Site Access – consisting of a new fourth arm on to the existing roundabout of Tennyson Road with Searle Street, this direct access in to 2-12 Tennyson Road would provide access for the servicing vehicles and the loading requirements of the site.
  - Southern Site Access – connecting to the road network via a priority (Give Way) T-intersection with Tennyson Road, this access would be located generally on the boundary of Lot 2-12 and Lot 14 Tennyson Road and would provide access to up to 659 car parking spaces for both Lot 2-12 and 14 Tennyson Road.
- The proposed development will be require a provision of 476 to 601 parking spaces under Ryde Council's Development Control Plan (DCP) 2011.
- Traffic Generation
  - Based on the latest RMS Guidance, the development is forecast to generate an additional 104 vehicle trips and 97 vehicle trips in the AM and PM peak periods, respectively.
- Network Performance Testing
  - Intersection of Victoria Road with Tennyson Road:
    - Under all scenarios tested, the intersection is forecast to operate with an acceptable delays and Levels of Service of A or B;
- Internal Design
  - The internal access arrangements, including car parking ,will be designed in accordance with the Australian Standard requirements of AS2890.1 (2004) *Part 1: Off-street car parking*,

AS2890.2 (2002) *Part 2: Off-street commercial vehicle facilities,* AS2890.6 (2009) *Part 6: Off-street parking for people with disabilities* and AS4299 (1995) *Adaptable housing*.

This report demonstrates that the proposed rezoning is supportable on traffic planning grounds, based on the concept plan that has been adopted for assessment purposes, recognising that further detailed investigations will be undertaken at the future development application stage. It is therefore concluded that the Planning Proposal is supportable on traffic and transport planning grounds, subject to further detailed traffic and transport modelling as part of a subsequent detailed assessment and consultation process.

Appendix A

Photographic Record

View looking east towards the site at the current site accesses to 2-12 Tennyson Road and 14 Tennyson Road

View looking south along Tennyson Road from the proposed southern site access location

View looking north along Tennyson Road from the proposed southern site access location

View looking north along Tennyson Road towards its roundabout intersection with Searle Street

View looking south along Tennyson Road towards its roundabout intersection with Searle Street

View looking north along Tennyson Road towards its signalised intersection with Victoria Road

View looking west along Victoria Road towards its signalised intersection with Tennyson Road

View looking east along Victoria Road towards its signalised intersection with Tennyson Road

Appendix B

Survey Results

R.O.A.R. DATA

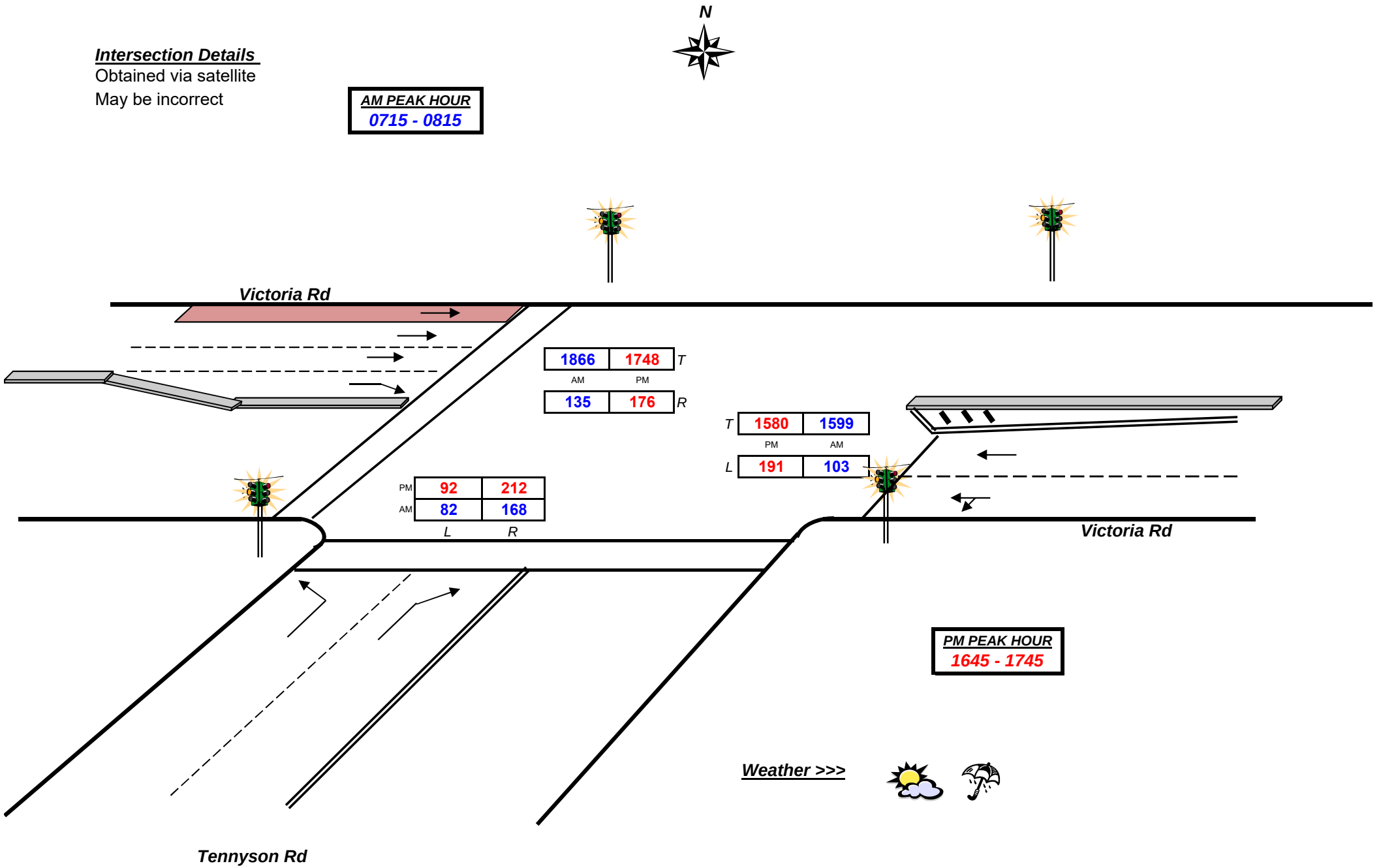
Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Client : Traffix
Job No/Name : 6301 GLADESVILLE Tennyson Rd
Day/Date : Wednesday 23rd November 2016

Intersection Details
Obtained via satellite
May be incorrect

AM PEAK HOUR
0715 - 0815



PM PEAK HOUR
1645 - 1745

Weather >>>

Appendix C

SIDRA Outputs

MOVEMENT SUMMARY

Site: 1 [2013 Existing (PM Peak)]

INT: Victoria x Tennyson
SCENARIO: 2013 Existing Traffic (Existing Layout)
PERIOD: Evening Peak Hour
Signals - Fixed Time Coordinated Cycle Time = 144 seconds (User-Given Cycle Time)

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: Tennyson Rd											
1	L2	88	2.0	0.160	43.4	LOS D	4.5	31.9	0.77	0.74	19.2
3	R2	156	2.0	0.691	72.1	LOS F	10.9	77.5	1.00	0.83	11.9
Approach		244	2.0	0.691	61.7	LOS E	10.9	77.5	0.92	0.80	14.0
East: Victoria Rd											
4	L2	124	5.0	0.878	20.7	LOS B	45.4	331.6	0.70	0.69	30.6
5	T1	1867	5.0	0.878	15.3	LOS B	46.5	339.6	0.70	0.68	37.8
Approach		1992	5.0	0.878	15.7	LOS B	46.5	339.6	0.70	0.68	37.4
West: Victoria Rd											
11	T1	2123	5.0	0.729	0.9	LOS A	5.1	37.1	0.08	0.07	58.1
12	R2	219	5.0	0.689	52.8	LOS D	11.6	84.8	1.00	0.98	17.0
Approach		2342	5.0	0.729	5.7	LOS A	11.6	84.8	0.16	0.16	48.9
All Vehicles		4578	4.8	0.878	13.0	LOS A	46.5	339.6	0.44	0.42	39.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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
P1	South Full Crossing	53	13.8	LOS B	0.1	0.1	0.44	0.44
P4	West Full Crossing	53	66.3	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		105	40.0	LOS E			0.70	0.70

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.

MOVEMENT SUMMARY

Site: 1 [2016 Existing (AM Peak)]

INT: Victoria x Tennyson
SCENARIO: 23rd November 2016
PERIOD: AM
Signals - Fixed Time Coordinated Cycle Time = 145 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tennyson Rd											
1	L2	86	0.0	0.180	48.8	LOS D	4.7	32.8	0.81	0.75	17.8
3	R2	177	0.0	0.738	73.1	LOS F	12.6	88.2	1.00	0.85	11.8
Approach		263	0.0	0.738	65.1	LOS E	12.6	88.2	0.94	0.82	13.4
East: Victoria Rd											
4	L2	201	0.0	0.743	12.4	LOS A	21.8	152.7	0.37	0.43	39.0
5	T1	1663	0.0	0.743	7.2	LOS A	23.3	163.3	0.38	0.40	46.5
Approach		1864	0.0	0.743	7.8	LOS A	23.3	163.3	0.38	0.40	45.8
West: Victoria Rd											
11	T1	1840	0.0	0.616	0.7	LOS A	3.2	22.4	0.06	0.05	58.4
12	R2	185	0.0	0.661	27.8	LOS B	10.1	70.7	1.00	0.91	25.4
Approach		2025	0.0	0.661	3.2	LOS A	10.1	70.7	0.14	0.13	53.1
All Vehicles		4153	0.0	0.743	9.2	LOS A	23.3	163.3	0.30	0.29	43.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
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	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	11.2	LOS B	0.1	0.1	0.39	0.39
P4	West Full Crossing	53	65.8	LOS F	0.2	0.2	0.95	0.95
All Pedestrians		105	38.5	LOS D			0.67	0.67

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.

MOVEMENT SUMMARY

Site: 1 [2016 Existing (PM Peak)]

INT: Victoria x Tennyson
SCENARIO: 2013 Existing Traffic (Existing Layout)
PERIOD: Evening Peak Hour
Signals - Fixed Time Coordinated Cycle Time = 144 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

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: Tennyson Rd											
1	L2	97	0.0	0.173	43.5	LOS D	4.9	34.5	0.77	0.74	19.2
3	R2	223	0.0	0.795	70.8	LOS F	15.8	110.8	1.00	0.89	12.1
Approach		320	0.0	0.795	62.5	LOS E	15.8	110.8	0.93	0.84	13.8
East: Victoria Rd											
4	L2	201	0.0	0.796	17.1	LOS B	32.6	228.1	0.56	0.58	33.6
5	T1	1663	0.0	0.796	12.0	LOS A	33.9	237.6	0.57	0.56	40.8
Approach		1864	0.0	0.796	12.5	LOS A	33.9	237.6	0.57	0.56	40.2
West: Victoria Rd											
11	T1	1840	0.0	0.645	0.8	LOS A	3.4	24.0	0.06	0.06	58.2
12	R2	185	0.0	0.669	36.9	LOS C	9.6	66.9	1.00	0.92	21.6
Approach		2025	0.0	0.669	4.1	LOS A	9.6	66.9	0.15	0.13	51.5
All Vehicles		4209	0.0	0.796	12.3	LOS A	33.9	237.6	0.39	0.38	40.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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
P1	South Full Crossing	53	13.8	LOS B	0.1	0.1	0.44	0.44
P4	West Full Crossing	53	60.6	LOS F	0.2	0.2	0.92	0.92
All Pedestrians		105	37.2	LOS D			0.68	0.68

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.

MOVEMENT SUMMARY

Site: 1 [2016 Existing + Development (AM Peak)]

INT: Victoria x Tennyson
SCENARIO: 23rd November 2016
PERIOD: AM
Signals - Fixed Time Coordinated Cycle Time = 142 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tennyson Rd											
1	L2	114	0.0	0.201	42.9	LOS D	5.7	40.1	0.78	0.75	19.3
3	R2	219	0.0	0.809	71.4	LOS F	15.5	108.6	1.00	0.90	12.0
Approach		333	0.0	0.809	61.6	LOS E	15.5	108.6	0.92	0.85	14.0
East: Victoria Rd											
4	L2	225	0.0	0.814	17.7	LOS B	34.7	243.0	0.60	0.62	32.9
5	T1	1663	0.0	0.814	12.6	LOS A	36.1	253.0	0.61	0.59	40.1
Approach		1888	0.0	0.814	13.2	LOS A	36.1	253.0	0.60	0.59	39.4
West: Victoria Rd											
11	T1	1840	0.0	0.642	0.8	LOS A	3.4	23.5	0.06	0.06	58.2
12	R2	201	0.0	0.699	43.0	LOS D	10.4	73.1	1.00	0.95	19.6
Approach		2041	0.0	0.699	5.0	LOS A	10.4	73.1	0.15	0.14	50.1
All Vehicles		4262	0.0	0.814	13.0	LOS A	36.1	253.0	0.41	0.40	39.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	14.0	LOS B	0.1	0.1	0.44	0.44
P4	West Full Crossing	53	60.6	LOS F	0.2	0.2	0.92	0.92
All Pedestrians		105	37.3	LOS D			0.68	0.68

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.

MOVEMENT SUMMARY

Site: 1 [2016 Existing + Development (PM Peak)]

INT: Victoria x Tennyson
SCENARIO: 2013 Existing Traffic (Existing Layout)
PERIOD: Evening Peak Hour
Signals - Fixed Time Coordinated Cycle Time = 142 seconds (Optimum Cycle Time - Minimum Degree of Saturation)

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	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Tennyson Rd											
1	L2	115	0.0	0.186	39.8	LOS C	5.5	38.8	0.75	0.74	20.3
3	R2	249	0.0	0.841	71.6	LOS F	17.9	125.6	1.00	0.92	12.0
Approach		364	0.0	0.841	61.6	LOS E	17.9	125.6	0.92	0.86	14.0
East: Victoria Rd											
4	L2	236	0.0	0.859	22.0	LOS B	43.2	302.1	0.73	0.73	29.2
5	T1	1663	0.0	0.859	16.9	LOS B	44.4	311.0	0.73	0.71	36.2
Approach		1899	0.0	0.859	17.5	LOS B	44.4	311.0	0.73	0.71	35.5
West: Victoria Rd											
11	T1	1840	0.0	0.661	1.1	LOS A	4.2	29.1	0.07	0.07	57.7
12	R2	208	0.0	0.724	50.1	LOS D	10.6	74.2	1.00	0.96	17.7
Approach		2048	0.0	0.724	6.0	LOS A	10.6	74.2	0.17	0.16	48.4
All Vehicles		4312	0.0	0.859	15.8	LOS B	44.4	311.0	0.48	0.46	36.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
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	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	53	15.8	LOS B	0.1	0.1	0.47	0.47
P4	West Full Crossing	53	57.8	LOS E	0.2	0.2	0.90	0.90
All Pedestrians		105	36.8	LOS D			0.69	0.69

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

Appendix D

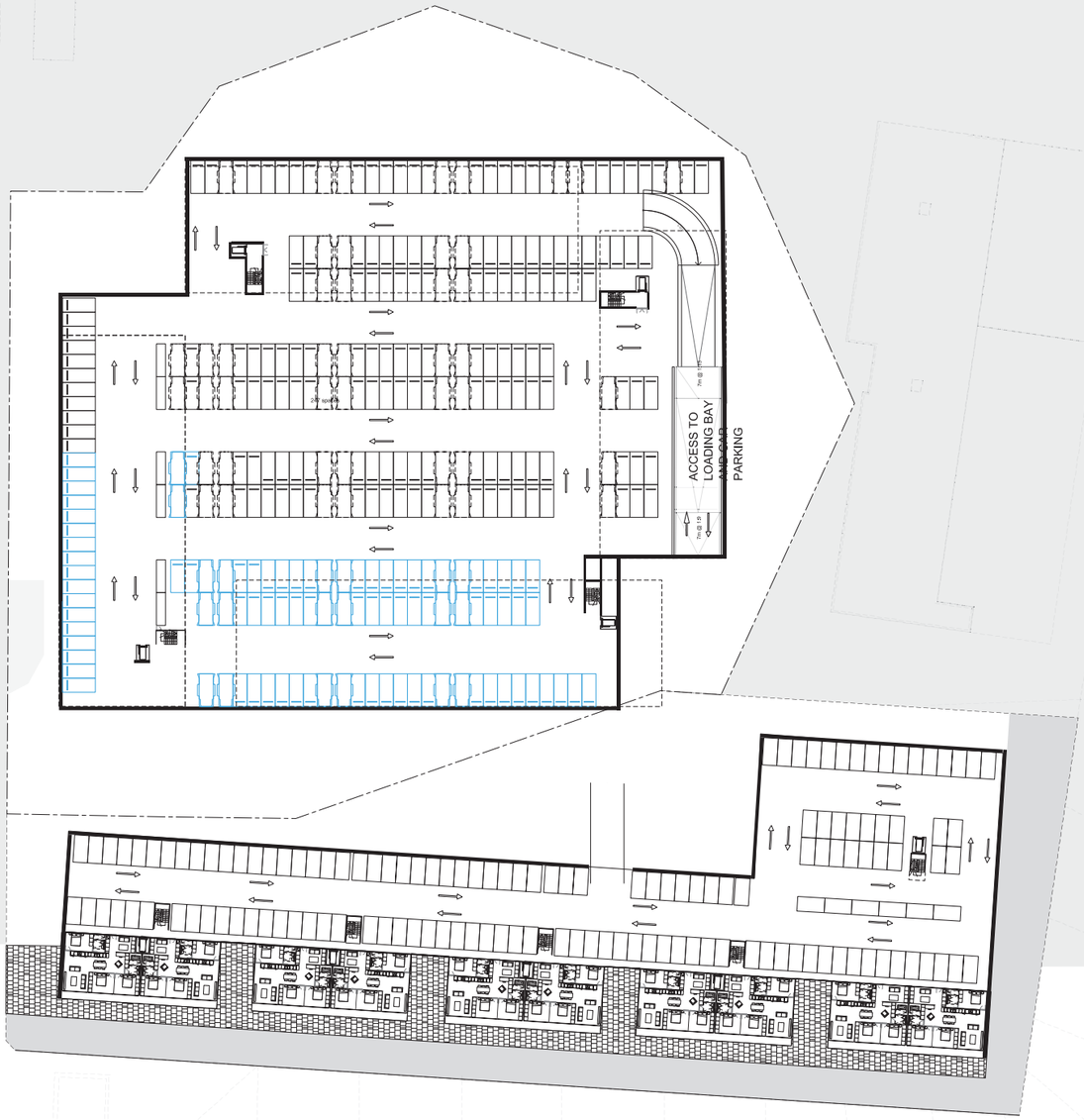
Reduced Architectural Plans

2-12 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 0,00m²
L GROUND	= 1595.00m²
GROUND	= 4328,00m²
LEVEL 01	= 4404,00m²
LEVEL 02	= 4404,00m²
LEVEL 03	= 4404,00m²
LEVEL 04	= 4404,00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²

14 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 1215,00m²
L GROUND	= 2890.00m²
GROUND	= 2890.00m²
LEVEL 01	= 2156,00m²



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REV.	DATE	FOR
A	03-08-2016	CLIENT APPROVAL

CONSULTANT
JOANDARC KHOUZAME
1, 17/90-96 BOURKE ROAD
ALEXANDRIA, NSW 201

DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD
GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

DRAWING
BASEMENT

DRAWN	CHECKED	AUTHORISED
RP	MG	—

DRAWING NUMBER
A01_1001

REVISION
A

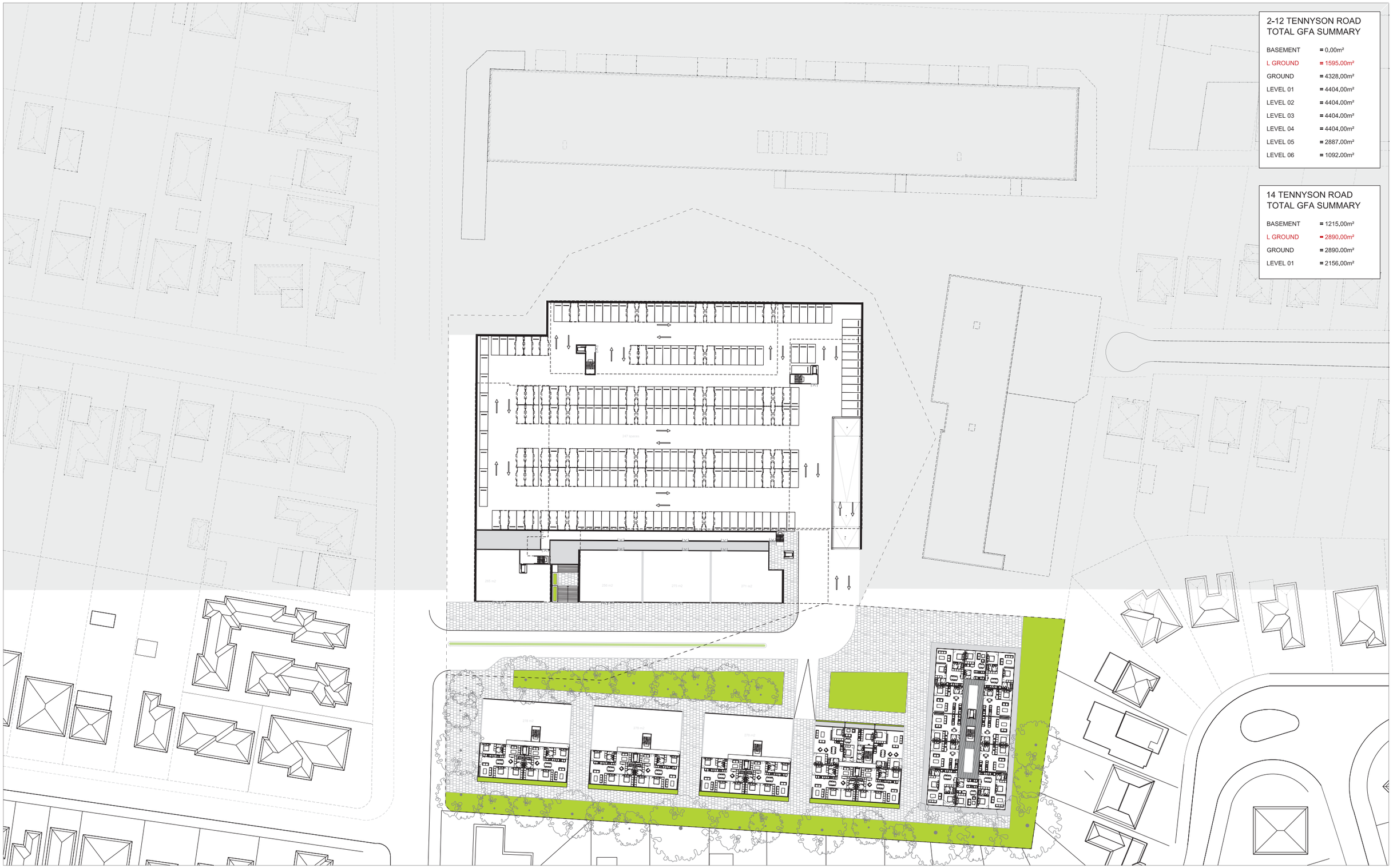
SHEET INFOS

2-12 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 0.00m²
L GROUND	= 1595.00m²
GROUND	= 4328.00m²
LEVEL 01	= 4404.00m²
LEVEL 02	= 4404.00m²
LEVEL 03	= 4404.00m²
LEVEL 04	= 4404.00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²

14 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 1215.00m²
L GROUND	= 2890.00m²
GROUND	= 2890.00m²
LEVEL 01	= 2156.00m²



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CONSULTANT
JOANDARC KHOUZAME
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ALEXANDRIA, NSW 201

DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

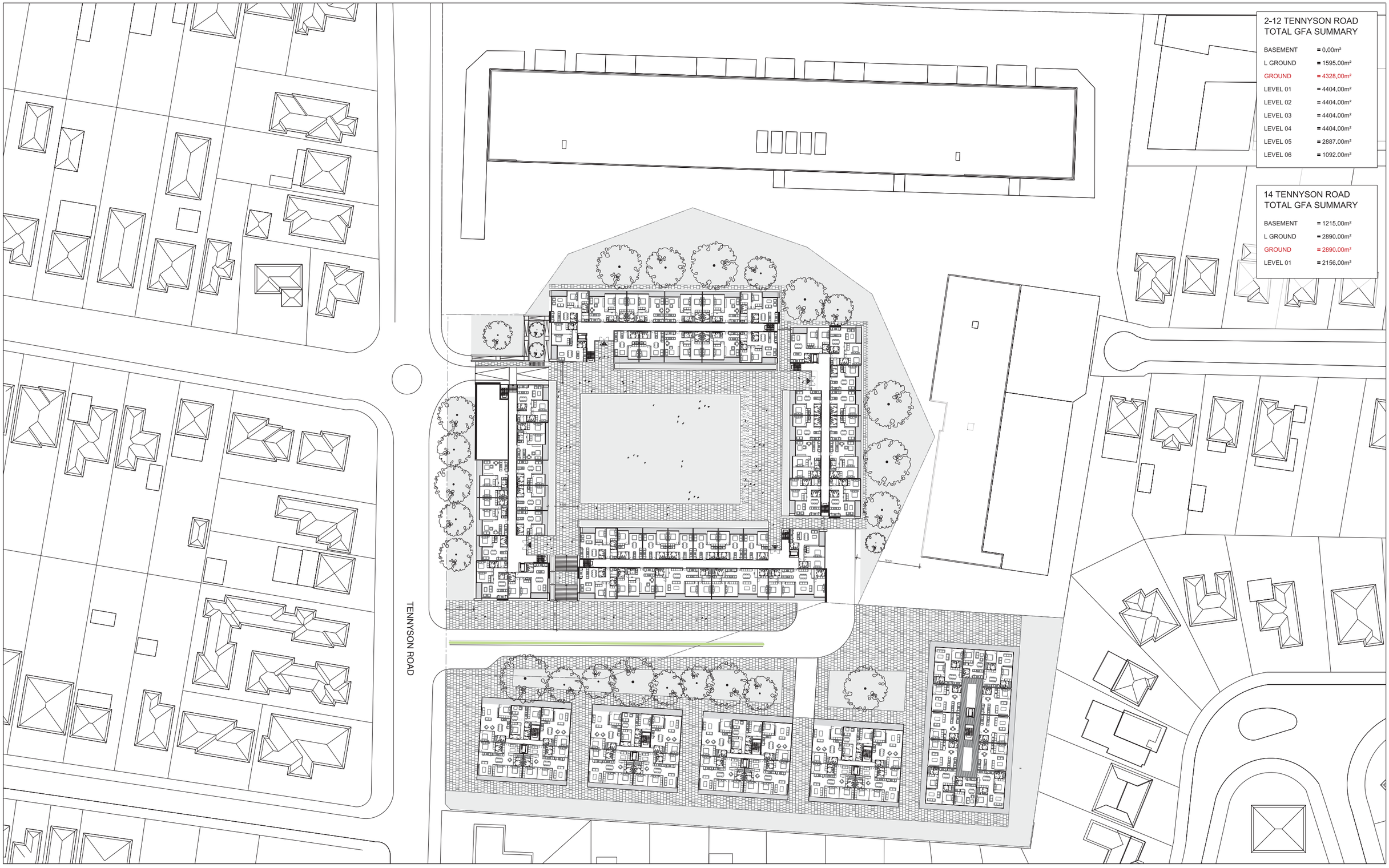
DRAWING
LOWER GROUND

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

DRAWING NUMBER
A01_1002

REVISION
A

SHEET@POS



2-12 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 0.00m²
L GROUND	= 1595.00m²
GROUND	= 4328.00m²
LEVEL 01	= 4404.00m²
LEVEL 02	= 4404.00m²
LEVEL 03	= 4404.00m²
LEVEL 04	= 4404.00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²

14 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 1215.00m²
L GROUND	= 2890.00m²
GROUND	= 2890.00m²
LEVEL 01	= 2156.00m²

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DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

DRAWING
GROUND FLOOR

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

DRAWING NUMBER
A01_1003

REVISION
A

SSW3STDP05

2-12 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 0.00m²
L GROUND	= 1595.00m²
GROUND	= 4328.00m²
LEVEL 01	= 4404.00m²
LEVEL 02	= 4404.00m²
LEVEL 03	= 4404.00m²
LEVEL 04	= 4404.00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²

14 TENNYSON ROAD TOTAL GFA SUMMARY

BASEMENT	= 1215.00m²
L GROUND	= 2890.00m²
GROUND	= 2890.00m²
LEVEL 01	= 2156.00m²

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CONSULTANT
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DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

DRAWING
TYPICAL FLOOR

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

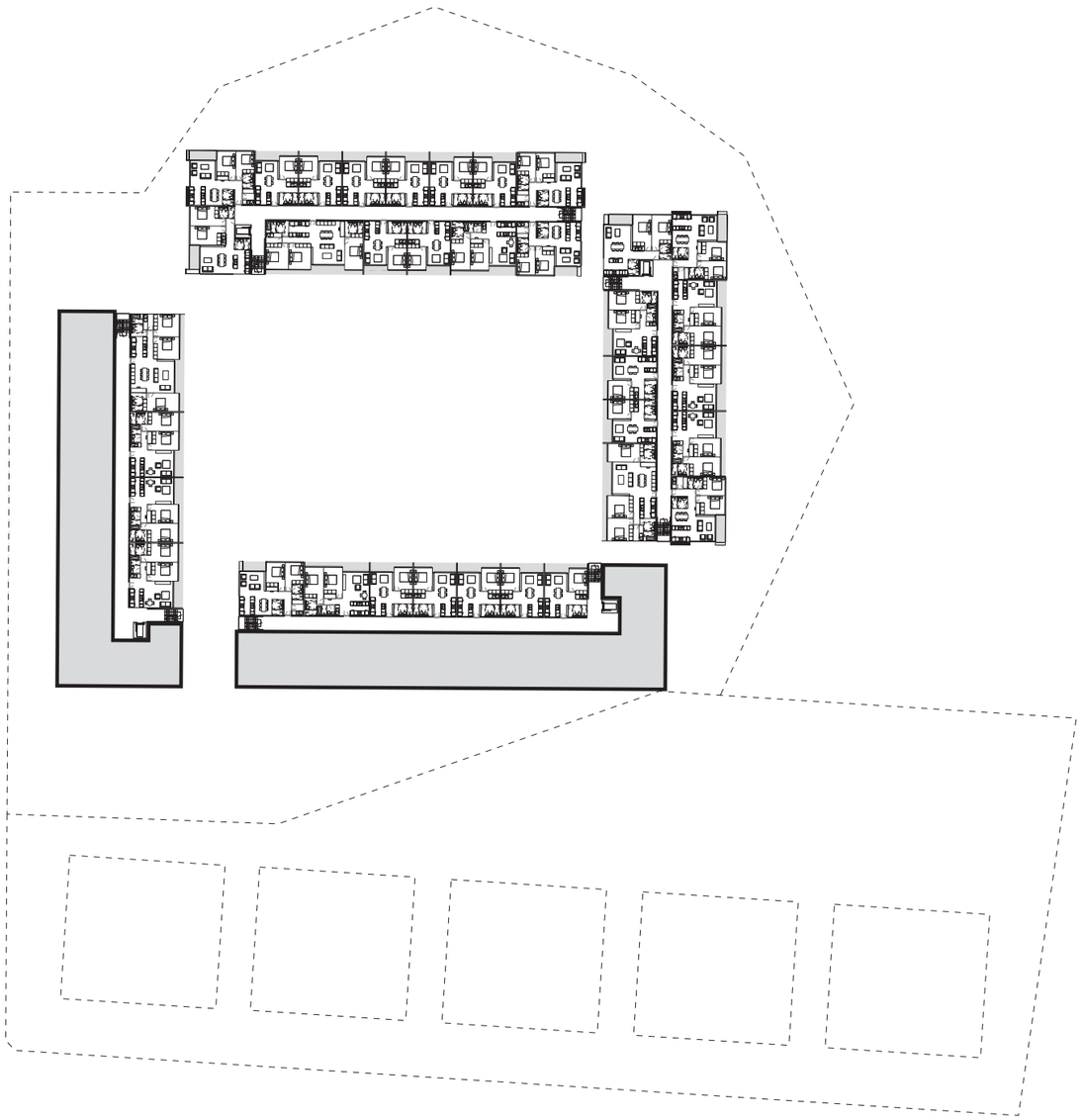
DRAWING NUMBER
A01_1004

REVISION
A

SHEET INFOS

2-12 TENNYSON ROAD
TOTAL GFA SUMMARY

BASEMENT	= 0.00m²
L GROUND	= 1595.00m²
GROUND	= 4328.00m²
LEVEL 01	= 4404.00m²
LEVEL 02	= 4404.00m²
LEVEL 03	= 4404.00m²
LEVEL 04	= 4404.00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²



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ALEXANDRIA, NSW 201

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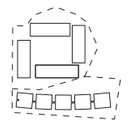


PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD
GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

DRAWING
LEVEL 05

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

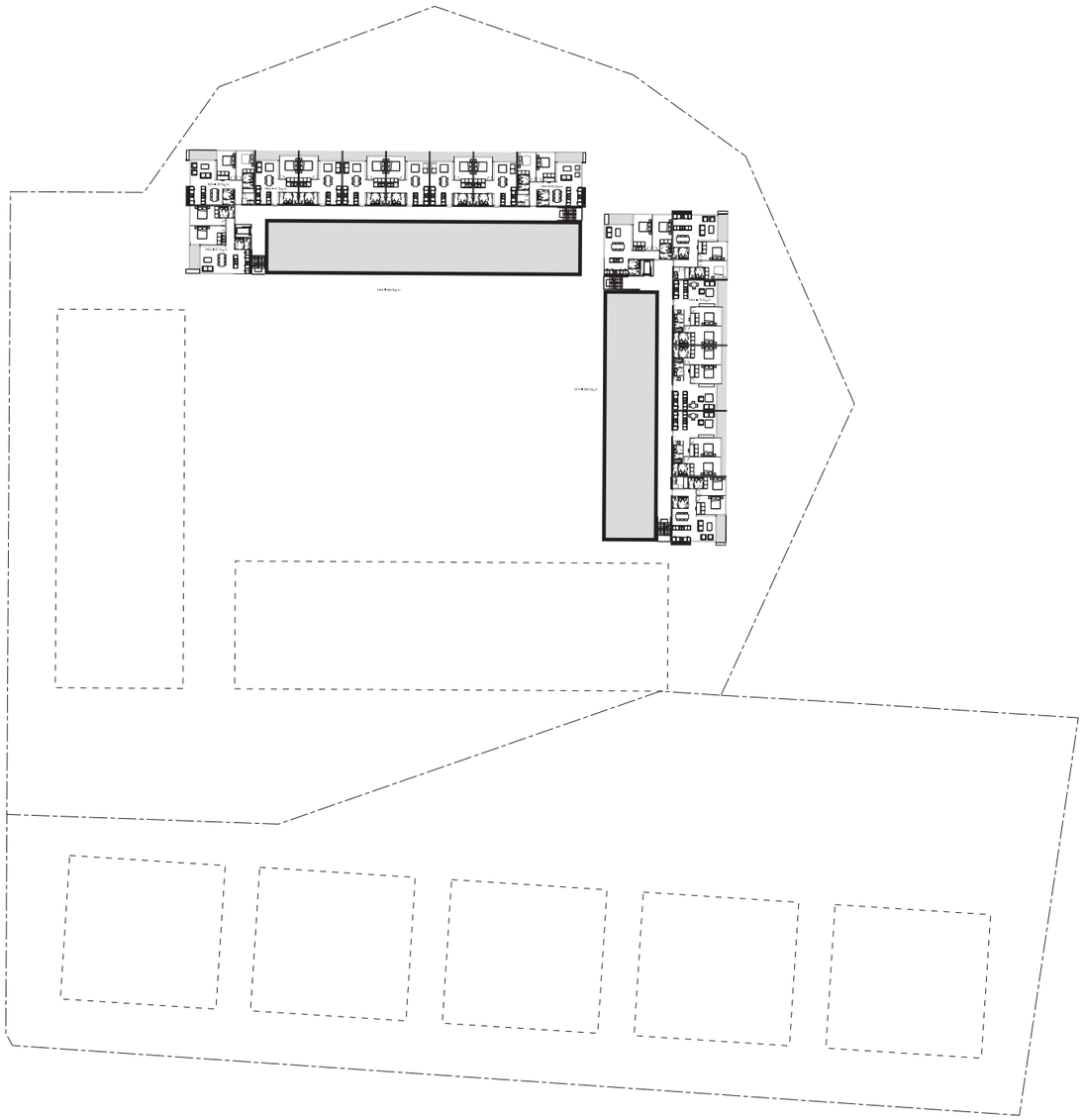
DRAWING NUMBER
A01_1005

REVISION
A

SHEET INFOS

2-12 TENNYSON ROAD
TOTAL GFA SUMMARY

BASEMENT	= 0.00m²
L GROUND	= 1595.00m²
GROUND	= 4328.00m²
LEVEL 01	= 4404.00m²
LEVEL 02	= 4404.00m²
LEVEL 03	= 4404.00m²
LEVEL 04	= 4404.00m²
LEVEL 05	= 2887.00m²
LEVEL 06	= 1092.00m²



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ALEXANDRIA, NSW 201

DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD
GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:500 @ A1

STATUS
PLANNING PROPOSAL

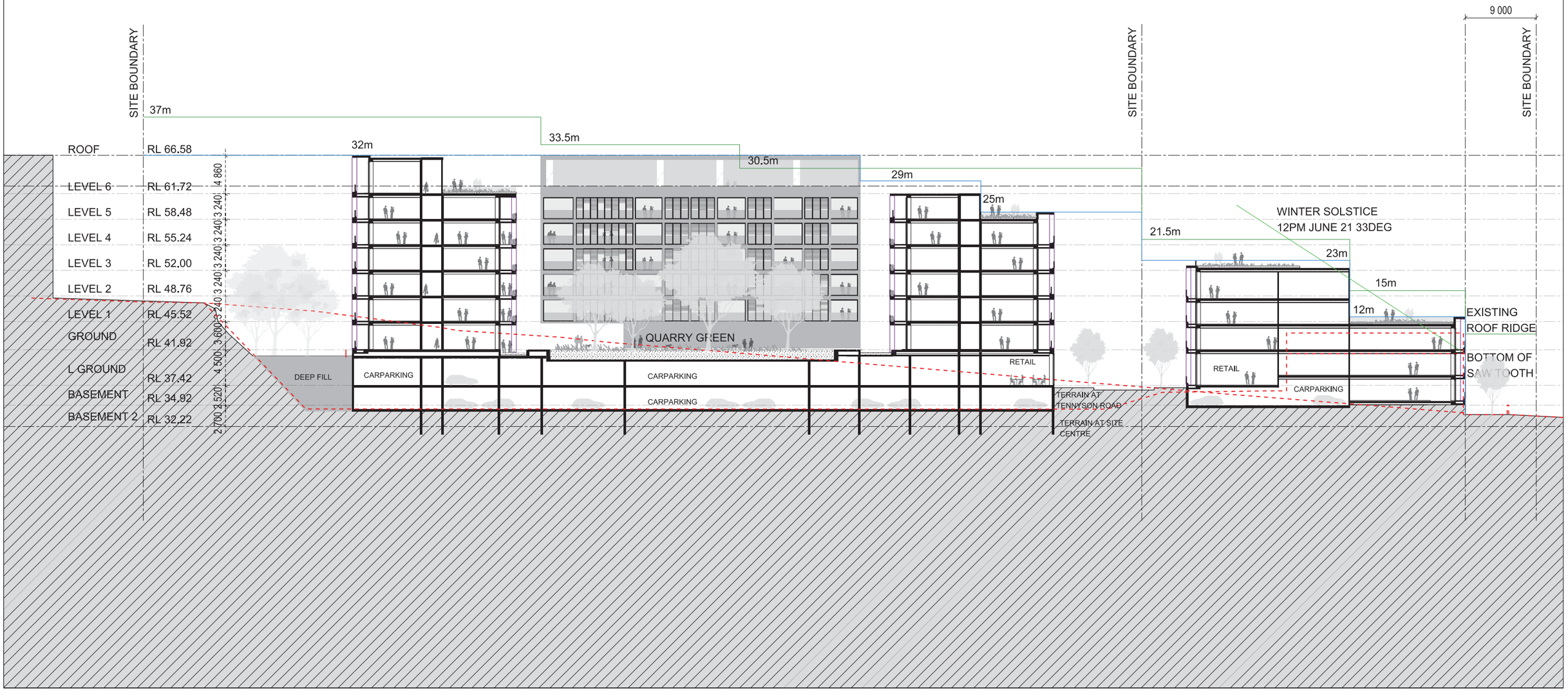
DRAWING
LEVEL 06

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

DRAWING NUMBER
A01_1006

REVISION
A

SSHEETSIZE



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A	03-08-2016	CLIENT APPROVAL

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DRAWING KEY

PROJECT
TENNYSON ROAD

ADDRESS
2-14 TENNYSON ROAD
GLADESVILLE, NSW 2111

GRIMSHAW PROJECT NO.
12024

NORTH

SCALE
1:250 @ A1

STATUS
PLANNING PROPOSAL

DRAWING
SECTION A

DRAWN	CHECKED	AUTHORISED
RP	MG	AC

DRAWING NUMBER	REVISION
A04_1000	A

SCHEDTEMP05