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80 WOODS ROAD, TRUGANINA

PROPOSED RESIDENTIAL SUBDIVISION

TRAFFIC ENGINEERING ASSESSMENT

PREPARED FOR

80 WOODS ROAD PTY LTD

NOVEMBER, 2012

14398R#1

TRAFFIC ENGINEERING ASSESSMENT

PROPOSED RESIDENTIAL SUBDIVISION

AT

80 WOODS ROAD, TRUGANINA

Study Team:

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Our Reference: GRP14398R#1

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1. INTRODUCTION

Traffix Group has been engaged by 80 Woods Road Pty Ltd to undertake a traffic engineering assessment of a proposed residential subdivision at 80 Woods Road, Truganina.

This report provides a detailed traffic engineering assessment of parking and traffic issues associated with this proposal.

2. BACKGROUND

The site is located within an area identified as the Truganina Precinct Structure Plan (PSP 1090) by the Growth Areas Authority (GAA). At this stage no formal PSP have been finalised by the GAA, however it is expected that the subdivision and road alignment detailed within this report may be incorporated into a PSP prepared in the future.

For the purposes of this report, guidance has been taken from PSP's recently development from areas towards the south and north-east in addition to the *Growth Areas Authority Engineering Design and Construction Manual (April 2011)* and Clause 56 of the Wyndham Planning Scheme.

3. THE PROPOSAL

The proposal is to develop the subject land at 80 Woods Road, Truganina for the purpose of 515 standard residential lots and 59 medium density residential lots. The development will occur in stages as follows:

Stage 1-2

- 417 standard residential lots, and
- 52 medium density lots.

Stage 3

- 98 standard residential lots, and
- 7 medium density lots.

A large conservation area is to be located in the eastern portion of the site and includes a retarding basin.

Vehicle access to the subject site will be provided via a number of new connections/intersections to Leakes Road and Woods Road. We note that adequate setbacks have been provided for the future upgrades of these roads.

A copy of the development plans which form the subject of this assessment, as prepared by Hellier McFarland-Cityplan (Revision 7) is attached at Appendix A.

4. EXISTING CONDITIONS

4.1. DEVELOPMENT SITE

The development site is located on the north side of Leakes Road and to the east of Woods Road, Truganina. A locality plan is provided at Figure 1.

The site is a combination of two separate allotments which for the purpose of this report have been referred to as 80 Woods Road.

The combined site is an L-shaped parcel of land with a total area of 57.77 hectare. The site has a frontage to Leakes Road of approximately 540m and a frontage to Woods Road of approximately 560m. The subject site is currently vacant.

The site is located within an Urban Growth Zone (UGZ) under the Planning Scheme, as presented at Figure 2. Land-use in the immediate vicinity of the site is predominantly residential to the south, with additional Urban Growth Zones to the north.

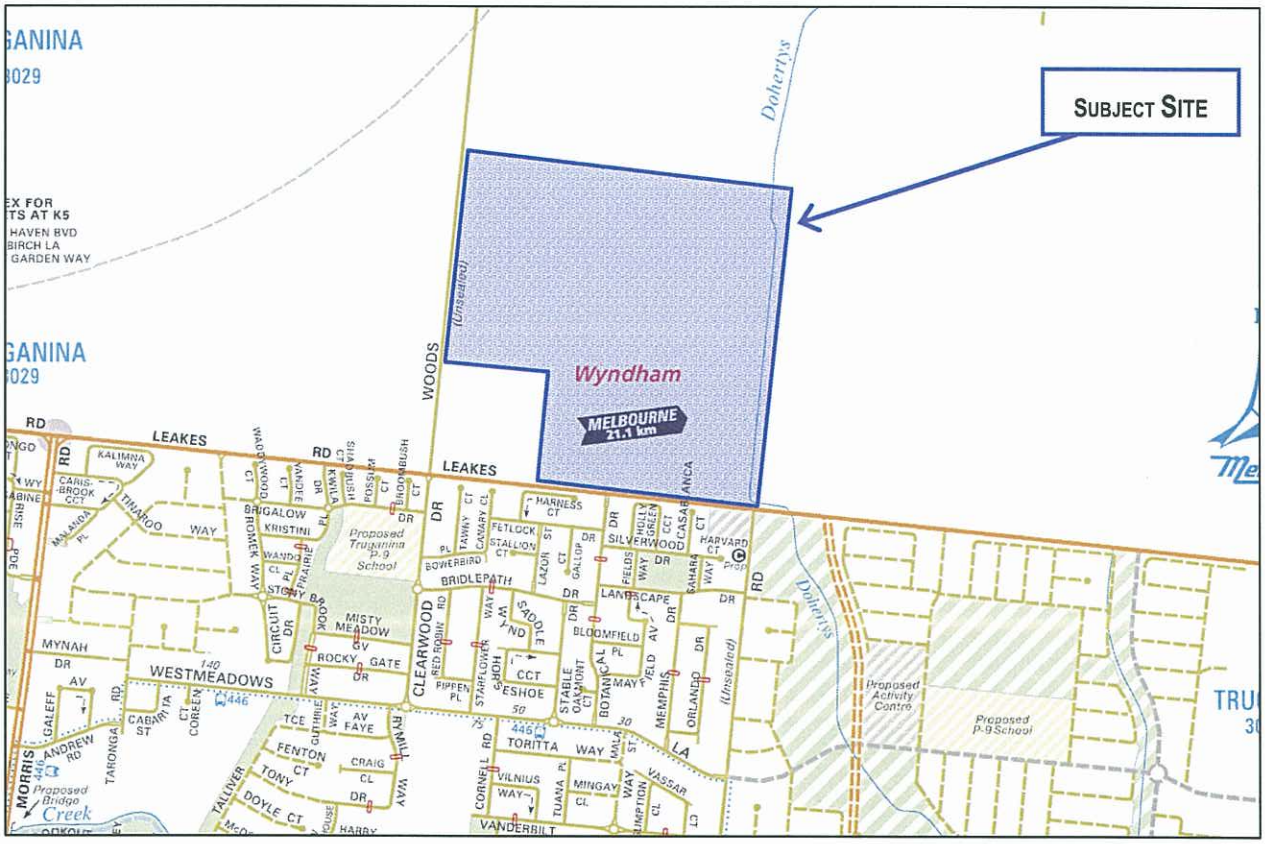

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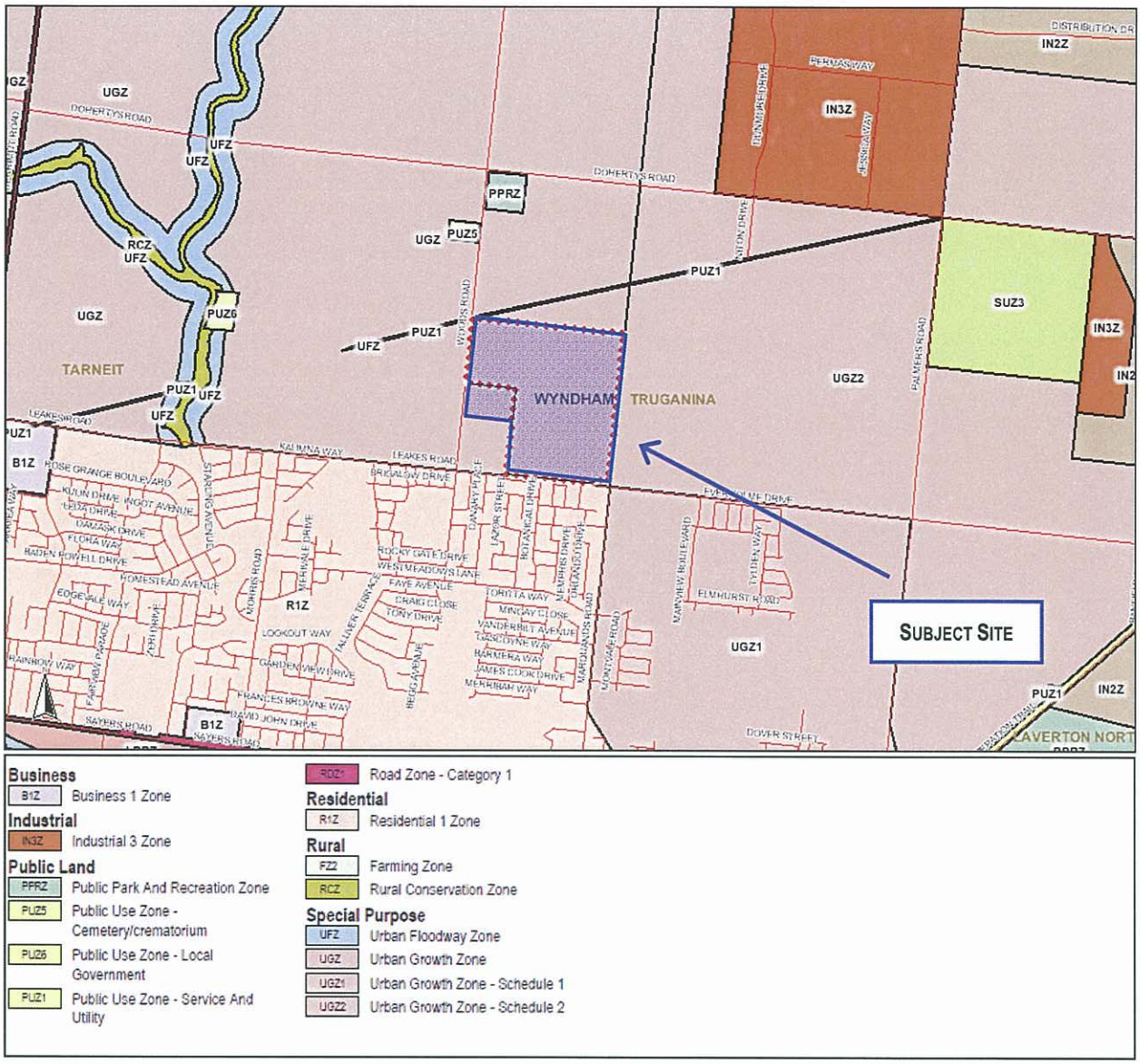
Figure 1. Locality Plan



Planning Maps Online: www.land.vic.gov.au

Figure 2. Land Use Zoning Map

4.2. ROAD NETWORK

Leakes Road is classified as a Council Arterial Road and is generally aligned in an east-west direction between Shanahans Road in the west and Fitzgerald Road in the east, where it continues as Kororoit Creek Road.

In the vicinity of the site, Leakes Road is configured with a single carriageway which provides for a through lane of traffic and bicycle lane in each direction. Central turn lanes are provided where access to adjacent residential subdivisions is provided.

A signposted speed limit of 70km/h applies to Leakes Road.

Woods Road is classified as a Local Road and is generally aligned in a north-south direction between Leakes Road in the south and Boundary Road in the north.

In the vicinity of the site, Woods Road has a 6.8m wide unmade carriageway which provides for a through lane of traffic in each direction.

The intersection of Woods Road and Leakes Road is currently controlled by a stop sign and linemarking.

The signposted speed limit of 60km/h applies to Woods Road.

Photographs of the surrounding road network are presented in Figure 3 to Figure 6.

Figure 3. Leakes Road (view east adjacent to site)

Figure 4. Leakes Road (view west adjacent to site)

Figure 5. Woods Road (view north from Leakes Road)

Figure 6. Woods Road (view south towards Leakes Road)

4.1. FUTURE ROAD NETWORK

As a result of numerous works in the nearby area the higher order road network is expected to undergo a number of upgrades and modifications. The higher order roads which are located in close proximity to the site include:

- Leakes Road – located along southern boundary,
- Woods Road – Located along western boundary, and
- 'Water Easement Connector' – located north of the site.

The location of these roads in relation to the development site is presented in Figure 7. A description of the future conditions of each of these roads is provided in the following sections.

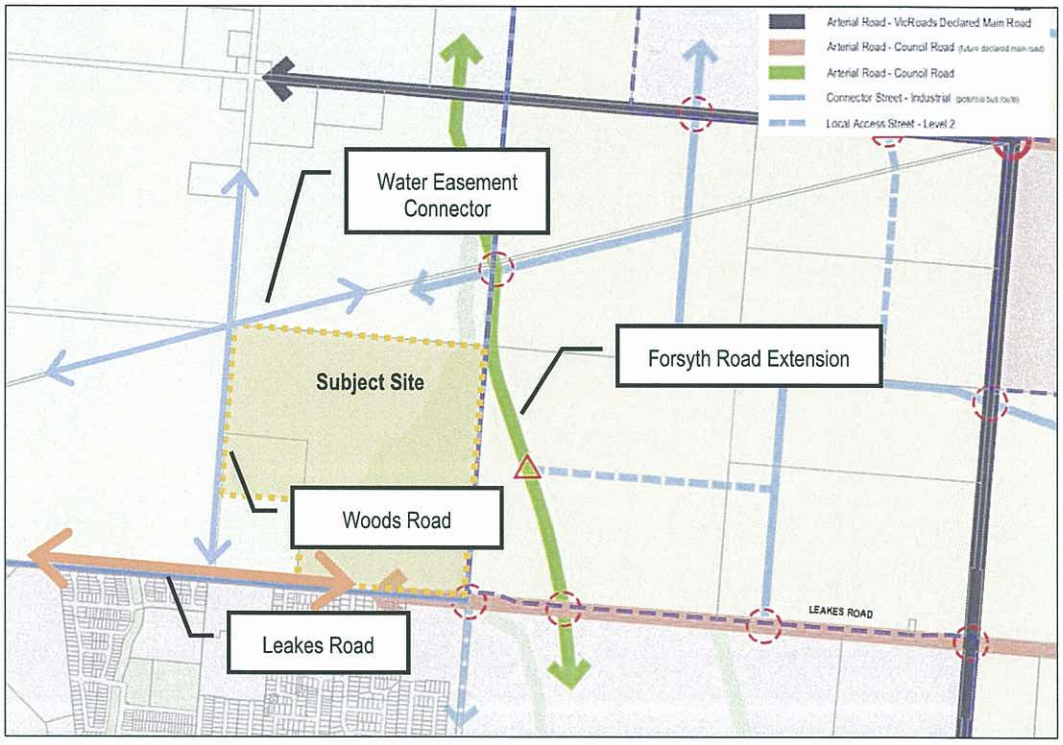


Figure 7. Future Arterial Road Network in Relation to Nearby Areas[1]

4.1.1. Leakes Road

Discussions with Growth areas Authority have identified that adjacent to the subject site Leakes Road will function as an Arterial Road (Council control under short term, however ultimately, it will become a declared road under the control of VicRoads). It is expected to accommodate over 12,000 vehicles per day.

The road will be configured with 3 through lanes in each direction separated by a central median. We understand that along the section of Leakes Road which extends along the site's frontage a minimum road reserve of 41m has been nominated to accommodate the required carriageway and various easements.

Access to this road will be minimised and it is noted that the proposed subdivisions includes a single access location to this road which will be restricted to left-in and left-out traffic movements under the ultimate arrangements (note, may accommodate right-in and right-out in interim stages).

4.1.2. Woods Road

Woods Road will be upgraded and will function as a Connector Street and it is expected to carry between 3,000-7,000 vehicles per day.

1 Source: *Amendment C124 to the Wyndham Planning Scheme, Truganina Employment Precinct Structure Plan, December 2009*

A 25.5m road reserve will accommodate a through traffic lane and indented parking lanes in each direction as presented in Figure 8. The road will also include a 3m two-way cycle path along the east or west side (to be determined) and footpaths along either side.

The various services provided within the carriageway generally accord with the requirements for a standard connector street as presented in the *Growth Areas Authority Engineering Design and Construction Manual (April 2011)*.

It is expected that the intersection between Woods Road and Leakes Road will be signalised with all vehicle movements accommodated.

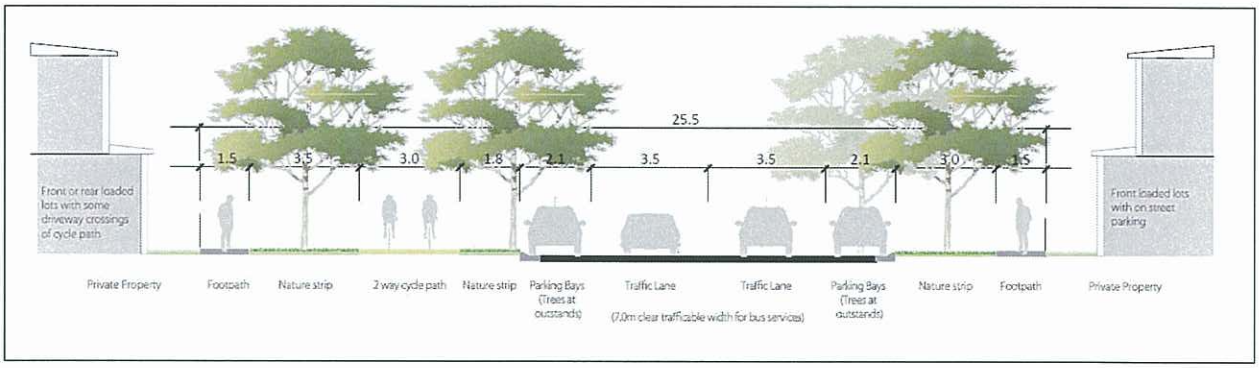


Figure 8. Proposed Connector Street Cross-Section[2]

4.1.3. Water Easement Connector

The Truganina Employment Precinct Structure Plan identifies the provision of a Council Connector Street between Woods Road and the Forsyth Road Extension. We understand that the intent of this link is to provide improved connectivity between the Employment Precinct and recently development residential areas located to the south of the site.

Importantly a Melbourne Water Easement is located along this alignment which needs to be taken into account in designing this link. For efficiency purposes it is proposed that the easement is incorporated into the new road reserve. Preliminary advice from GAA has identified that a carriageway easement of 35.6m should be provided for this road which includes:

- 5m easement, including 1.5m footpath,
- 2.3m indented parking bay,
- 3.5m traffic lane,
- 14m central median, including:
  - 2 x 2m tree planting areas, and
  - 10m water easement (2m shared path provided centrally within easement),
- 3.5m traffic lane,
- 2.3m indented parking bay, and
- 5m easement, including 1.5m footpath.

This road would satisfy the objectives of the *Growth Areas Authority Engineering Design and Construction Manual* for a Connector Street accommodating between 3,000-7,000 vehicles per day.

It is expected that the intersection between Woods Road and the Water Easement Connector would be signalised or controlled by a roundabout.

[2] The cross-section shown here is sourced from the Black Forrest Road South PSP.

5. TRAFFIC ENGINEERING ASSESSMENT

The following traffic engineering assessment of the subdivision proposal has been undertaken with particular regard to the GAA Engineering Design and Construction Manual and Clause 56 of the Wyndham Planning Scheme and good engineering practice.

5.1. TRAFFIC GENERATION & IMPACTS

Residential Allotments

The RTA Guide to Traffic Generating Developments (RTA Guide, 2002) sets out traffic generation rates for a range of developments, based on survey data collected in New South Wales, and is generally regarded as a standard for metropolitan development characteristics.

The RTA Guide sets out the following rates for standard dwelling houses, based on surveys conducted where new subdivisions are being built:

daily vehicle trips = 9 per dwelling

weekday peak hour vehicle trips = 0.85 per dwelling

Adopting the above rates, the 515 standard residential lots are expected to generate 4,635 vehicle trip-ends per day, which includes 437 vehicle trip-ends during each of the peak hours.

Each dwelling provided as part of the medium density lots of the development is expected to generate in the order of 6 trips per household per day, with 10% of these occurring in each of the peak hours (0.6 trip per dwelling per peak hour). Based on the proposal to develop 59 medium-density dwellings, this represents a daily traffic generation of 354 vehicle trip-ends per day, which includes 35 vehicle trip-ends during each of the peak hours.

Overall, the residential lots are expected to generate up to 4,989 vehicle trip ends per day, which includes 472 vehicle trip-ends during each of the peak hours.

Local Convenience Centre

The development includes a local convenience centre in the north-west corner of the site, it can be reasonably assumed that this convenience centre would accommodated a variety of local retail uses and assuming the parking requirements are accommodated on-site a total floor area of approximately 2,000m^2 could be accommodated in this area.

The RTA Guide to Traffic Generating Developments, October 2002 provides traffic generation rates for retail/commercial uses as follows.

Retail (Specialty Shops)

- *Daily vehicle trips = 555 per 1,000m^2 of gross floor area,*
- *Average Peak hour vehicle trips (Thursday) = 46 per 1,000m^2 gross floor area*

Based on the above, the small convenience centre could be expected to generate up to 1,110 vehicle trip ends per day, which includes 92 vehicle trip-ends during each of the peak hours.

For the purpose of the assessment it is considered that approximately 40% of the traffic to and from the local convenience centre will occur internally within the proposed subdivision. The remainder of traffic (666 vehicle trip ends per day) is considered to occur via the northern connection to Woods Road.

5.2. Traffic DISTRIBUTION

All residential traffic from the subdivision will be required to travel along either Leakes Road or Woods Road to access the wider road network. Leakes Road provides additional connections to the south and direct access to the Princes Freeway in the east, while Woods Road links with Dohertys Road which provides access to the Westgate Freeway (via Grieve Parade) or the Western Freeway (via Palmers Road).

Ultimately traffic volumes will be distributed amongst the two access points to Woods Road and the single access point to Leakes Road. Each of these is described as follows:

- Woods Road – Northern Access: Access Street 2 access to Woods Road, it is noted that this road will include a tree lined 'gateway' treatment which includes landscaping within a central median. All traffic movements will be accommodated at this intersection.
- Woods Road – Southern Access A: Access Street 1 access to Woods Road. All traffic movements will be accommodated at this intersection.
- Woods Road – Southern Access B: Access Street 1 access to Woods Road. All traffic movements will be accommodated at this intersection.
- Leakes Road Access: Access Street 1 access to Leakes Road. Due to the central median which is proposed under the ultimate conditions along Leakes Road, vehicle access will be limited to left-in and left-out movements only.

It is noted that additional connections to Woods Road may occur as a result of the development of land located to the west of the development site. In the event these occur, the impacts on the connections provided as part of this development may decrease.

For the purpose of this assessment, the traffic distribution has been assessed as:

- 50% of traffic to areas towards the south/east of the site (includes Princes Highway and Williams Landing Town Centre),
- 20% of traffic from areas towards the west of the site (includes Truganina Railway Station and Shopping Centre), and
- 30% of traffic to and from areas towards the north of site (includes Trugnanina Employment Precinct and Western Freeway/Western Ring Road).

The percentages of vehicles using the various access points under each scenario have been estimated based on the locations of the lots and the shortest and most efficient routes to/from the development and takes into consideration some access limitations (i.e. left-in/left-out to Leakes Road only).

The likely traffic distribution across each of the access points is summarised above is presented in Table 1.

Table 1: Distribution of Daily Traffic Across Access Points (Residential)

Direction	Daily Traffic	North Access to Woods Road		Southern Accesses to Woods Road A & B		Access to Leakes Road	
		% of Trips	No. of Trips	% of Trips	No. of Trips	% of Trips	No. of Trips
South/East (50%)	2,495	35%	873	20%	499	45%	1,123
West (20%)	998	45%	449	45%	449	10%	100
North (30%)	1,496	60%	898	25%	374	15%	224
Total	**4,989**	**2,220**		**1,322**		**1,447**	

It is noted that in addition to the residential traffic 666 vehicles per day are expected to occur in association with the local convenience centre located in the north-west corner of the site. This assessment that approximately 40% of the traffic to and from the local convenience centre will occur internally within the proposed subdivision. The remainder of traffic associated with the local convenience centre occurs via the North Access to Woods Road.

Based on the traffic generation rates outlined above, the following daily traffic volumes are expected:

- Woods Road – Northern Access: 2,886 vehicles per day (inc. 666 associated with neighbourhood activity centre),
- Woods Road – Southern Access A: 661 vehicles per day,
- Woods Road – Southern Access B: 661 vehicles per day and
- Leakes Road Access: 1,447 vehicles per day.

Figure 9 identifies the traffic volumes expected on each of the internal access roads.

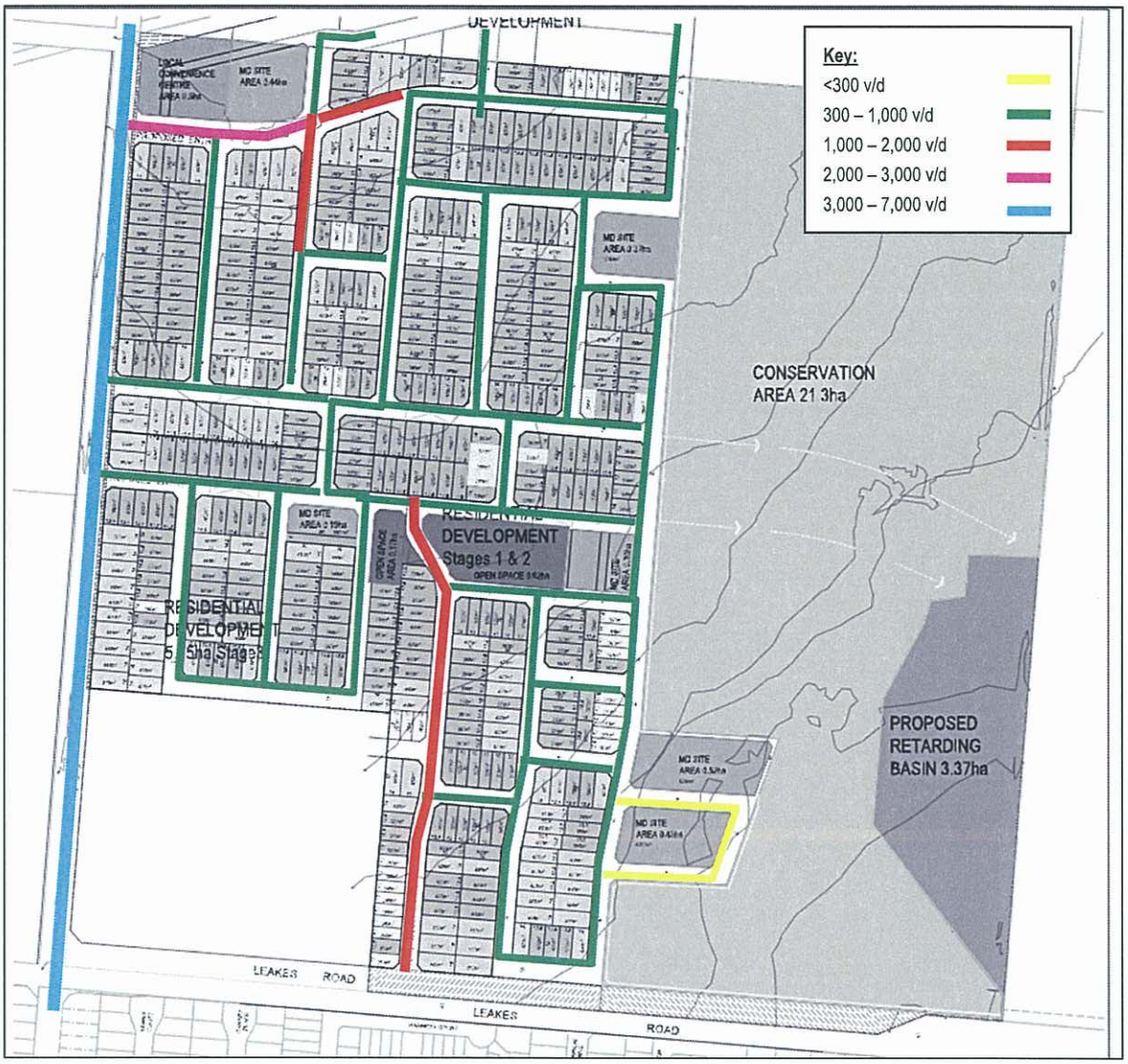


Figure 9. Expected Daily Traffic Volumes

5.1. ROAD HIERARCHY

An indicative road hierarchy for the subject site is presented in Figure 10. It is noted that no major roads are proposed within the subject site.

The road hierarchy has been produced in line with Figure 9, which indicates the traffic volumes within the subject site.

As can be seen, the highest order internal road is proposed to be an Access Street 2, being the east-west road extending from the Woods Road to the roundabout adjacent to the local convenience centre.

The remaining streets within the subject site will operate as local streets, and are defined broadly as 'Access Streets' and 'Access Lanes' (Access Lanes will provide vehicle access to medium density sites only).

An Access Street is defined under Clause 56.06-8 as being *'a street providing local residential access where traffic is subservient, speed and volume are low and pedestrian and bicycle movements are facilitated'.*

An Access Lane is defined under Clause 56.06-8 as being *'a side or rear lane principally providing access to parking on lots with another street frontage'.*

The adopted hierarchy is in-line with the GAA Engineering Design and Construction Manual and Clause 56 of the Wyndham Planning Scheme.

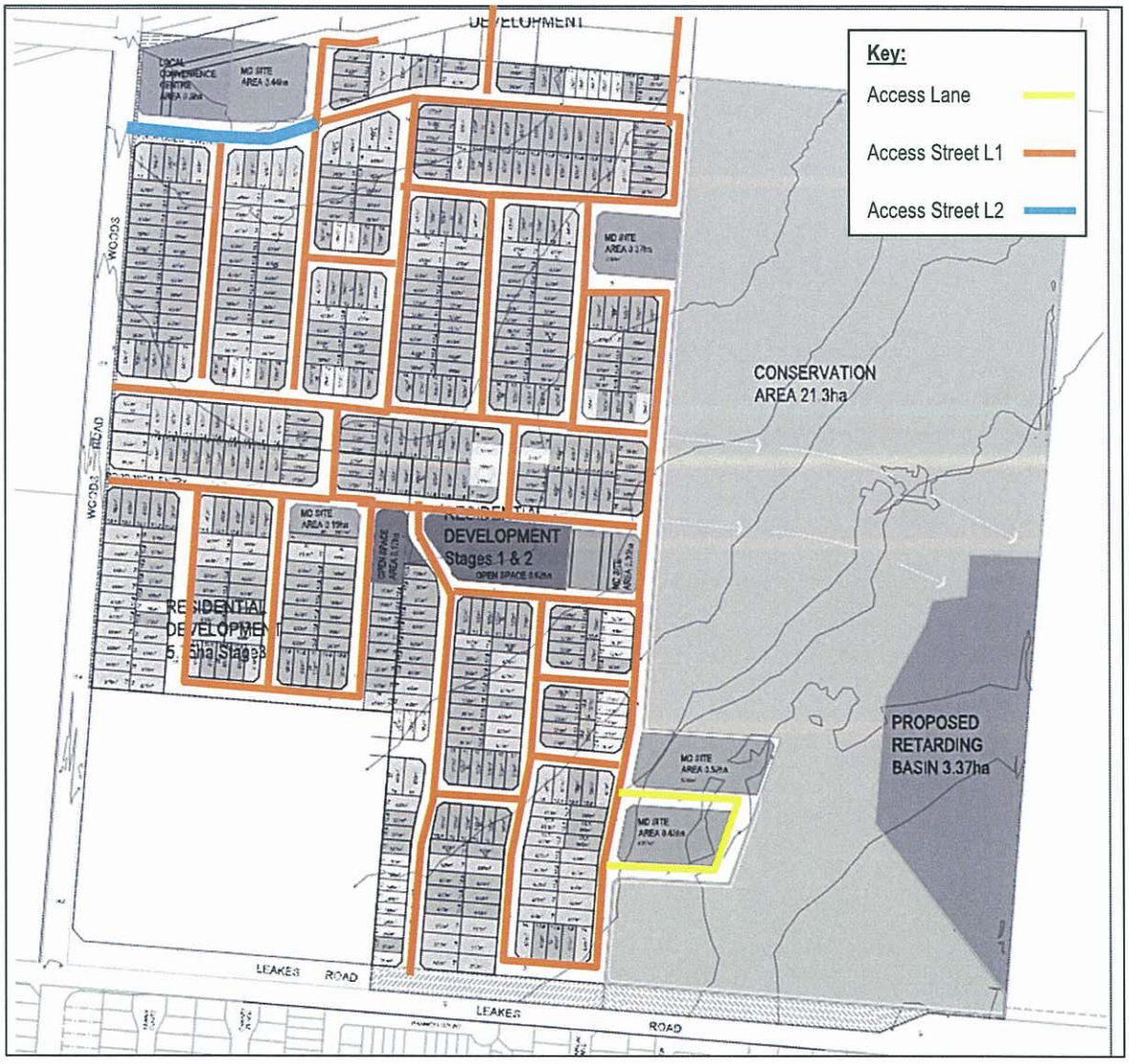


Figure 10. Indicative Road Hierarchy

5.2. INTERNAL SUBDIVISION CROSS SECTIONS

Road cross sections have been developed for all roads within the subject site in conjunction with the cross-sections specified in Table C1 of Clause 56 of the Wyndham Planning Scheme and the cross sections specified in the GAA Engineering Design and Construction Manual. A summary of the adopted cross sections and the minimum requirements of the various standard/codes are presented at Table 2.

5.2.1. Access Street 2 – Local Roads

A higher order road is proposed adjacent to the loca convenience centre in the north-west corner of the site.

In order to develop a tree lined 'gateway' treatment a 3.0m wide median has included within a total 24m road reservation. No central turn lanes are provided along this section with any access to this section of road limited to a left-in and left-out arrangement.

Whist this street has been treated as a 'gateway' in practice the traffic volumes accommodated will be in accordance with a classification as an Access Street 2 (2,000-3,000 vehicles per day). Based on the expected traffic volumes we are satisfied that no separate bicycle provision is required.

The following cross-section has been adopted for the east west entry street which is generally in-line with the GAA Engineering Design and Construction Manual (2011):

- 4.7m – verge including 1.5m footpath,
- 2.3m – indented parking,
- 3.5m – traffic lane,
- 3.0m – median (accords with minimum width required for minor street tree planting),
- 3.5m – traffic lane,
- 2.3m – indented parking, and
- 4.7m – verge including 1.5m footpath.

The treatment of this road exceeds the minimum requirements for a Access Street 2 and is similar in configuration to a Connector Street (indented parking and median).

5.2.2. Access Street 1 – Local Roads

The GAA 'Engineering Design and Construction Manual' dated April 2011, specifies a minimum 16m road reserve for a Access Street Level 1 with a 7.3m carriageway (with parking both sides), a 4.5m verge on one side of the road a 4.2m verge on the other side of the road.

A 16m wide road reserve has been adopted for the access streets within the proposed subdivision in-line with the GAA Engineering Design and Construction Manual (given the predicted traffic volumes). The standard cross-section adopted within the proposed subdivision is shown in Figure 11.

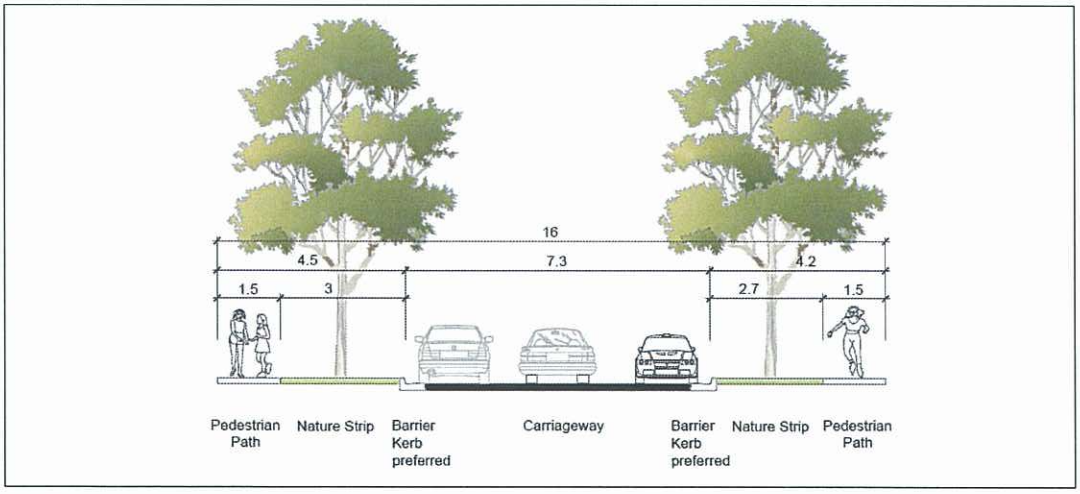


Figure 11. Carriageway Configuration – Access Street 1

It is noted that the access street adjacent to open space areas, have a reduce road reserve width, due to a nominal verge being adopted on the non-residential side of the road. This approach is common place and is considered to be an acceptable arrangement. A similar arrangement which has been adopted in the Truganina South PSP area is identified in Figure 12.

It is noted that the proposed development includes a 14m road reserve which would allow for a 2.5m shared path to be provided along the frontage of the conservation area and additional service space (where required) adjacent to the internal open space.

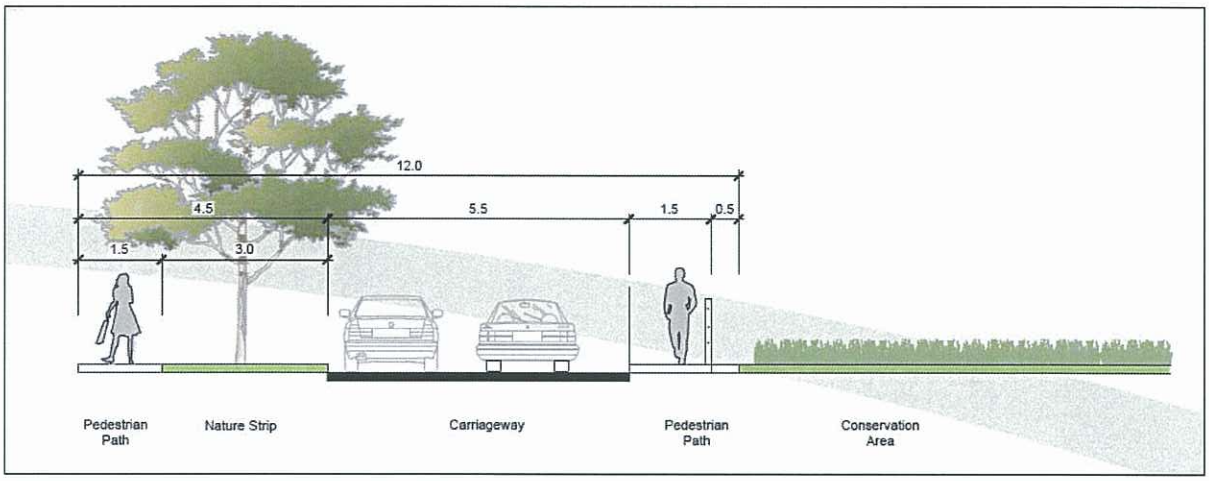


Figure 12. Carriageway Configuration – Access Street 1 Adjacent to Conservation Area

Ultimately, the majority of access places and access streets within the subdivision are likely to carry up to 1,000 vehicles per day, with a small number of the access streets likely to carry between 1,000 vehicles per day and 2,000 vehicles per day.

Overall, the predicted traffic volumes are well within acceptable limits for the relevant streets as suggested in the Planning Scheme and the GAA Engineering Design and Construction Manual and no adverse traffic impacts are expected as a result.

5.2.3. Local Access Lanes

Access lanes will be provided for the medium density lots only.

The GAA Engineering Design and Construction Manual specifies a minimum 6m carriageway (within 7m reserve). Clause 56 specifies a minimum carriageway width of 5.5m for an Access Lane.

A minimum access lane width of 8m has been adopted for the purpose of the subject site. This provision exceeds the requirements of Clause 56 and the GAA Engineering Design and Construction Manual.

A summary of the road network configuration for all roads proposed against the requirements of Clause 56 and the GAA Engineering Design and Construction Manual has been presented in Table 2.

Table 2: Subdivision Adopted Road Cross Section Elements

Road Classification	Target Volume (veh/day)	Design Speed (km/h)	Carriageway width (m), parking provision & bus provision within street reservation	Verge width (m)	Footpath Provision	Cycle Path Provision
ACCESS LANES – Medium density sites only.						
Cl 56: Access Lane	300	10	5.5m minimum	No Verge Required	None	None
GAA Engineering Design and Construction Manual – Access Lane	300	10	6.0m minimum	Only if required for servicing	None	None
Proposed Development: 'Access Lane'			**8m road reserve**	**N/A**	**N/A**	**N/A**
ACCESS STREETS - Level 1						
GAA Engineering Design and Construction Manual – Access Street Level 1	1,000 to 2000	30	7.3m wide carriageway, unmarked parking within street	4.5m on one side and 4.2m on the other	1.5m minimum to be provided both sides	Dedicated facilities not required
Cl 56: Access Street – Level 1	*1,000 to 2,000*	*30*	*5.5m wide with 1 hard standing verge parking space per 2 lots*	*4m minimum each side*	*1.5m wide footpaths both sides widened to 2m in the vicinity of schools, offset min. 1m from kerb*	*Carriageway designed as a shared zone and appropriately signed*
Proposed Development: 'Access Street – Level 1'			**7.3m wide carriageway including parking on both sides**	**4.5m verges on one side and 4.2m verge on the other side**	**1.5m minimum to be provided both sides**	**No dedicated facilities**
GAA Engineering Design and Construction Manual – Access Street Level 2	*2,000 to 3,000*	*40*	6.0m carriageway width 2.3m parking lane provided on both sides	*4.7m minimum each side*	1.5m minimum to be provided both sides	*Optional*
Cl 56: Access Street – Level 2	*2,000 to 3,000*	*40*	*7-7.5m with parking on both sides of carriageway*	*4.5m minimum each side*	*1.5m wide footpaths both sides widened to 2m in the vicinity of schools, offset min. 1m from kerb*	*Carriageway designed as a shared zone and appropriately signed*
Proposed Development: 'Access Street – Level 2'			**3m median (minimum for street tree planting)** **3.5m traffic lane in each direction** **2.3m indented parking lane in each direction**	**4.7m verges on either side**	**1.5m minimum to be provided both sides**	**No dedicated facilities**
CONNECTOR STREETS						
GAA Engineering Design and Construction Manual – Connector Street	3,000 to 7,000	50	7.0m carriageway width 1.7m on-road marked cycle lane in each direction 2.3m parking lane provided on both sides	5m minimum each side	1.5m minimum to be provided both sides	1.7m on-road bicycle lane in each direction
Cl 56: Connector Street – Level 2	*3,000 to 7,000*	*60 or 50 reduced to 40 at schools*	*3.5m minimum lane width in each direction of travel* *7.0m minimum carriageway width in each direction of travel where there are two lanes in each direction separated by a non-trafficable central median* *Increase by 1.7m where a dedicated bicycle lane is provided on carriageway* *Provide an additional 2.3m lane for parking within carriageway, or provide within verge* *Bus stops provided kerbside, not indented within verge*	*6m minimum each side (plus central median)*	*1.5m wide footpaths both sides widened to 2m in the vicinity of schools, offset min. 1m from kerb* *2.5m wide shared foot and cycle path on both sides and no dedicated bicycle lanes marked on the carriageway*	*Facility provided within carriageway – 0.7m extra for single carriageway with no dedicated lane, 1.5m extra for divided carriageway with no dedicated lane and 1.7m extra for dedicated lane*
Woods Road: 'Connector Street'			**7.0m carriageway width** **1.7m on-road marked cycle lane in each direction** **2.3m parking lane provided on both sides**	**5m each side of the road**	**1.5m minimum to be provided both sides**	**1.7m on-road bicycle lane in each direction.**

5.3. INTERNAL ROAD LAYOUT

The internal road layout is generally provided in accordance with principles outlined in Clause 56 of the Whyndham Planning Scheme. A permeable network has been provided which provides multi-path vehicle access routes to the external road network. This permeability will be further improved with the development of areas surrounding the subject site (particularly land to south-west of site).

It is acknowledged that due to the Conservation Area no vehicle connectivity through areas to the east will be available.

Some notable details of the internal road network are outlined below.

5.3.1. Access Street 2 Cross Intersection

The Access Street 2 provided at adjacent to the local convenience centre contains a 3m wide median that will restrict property access along this section of road. A roundabout has been provided at the first internal intersection to facilitate U-turn movements, to ensure property access along the collector road.

The arrangement is considered to be acceptable and consistent with current practice.

5.3.2. Traffic Management

Under Standard C17 of Clause 56 of the Wyndham Planning Scheme, the development plan requires an appropriate level of traffic management to provide for the safety and convenience of all road users. Under Standard C20 the design of streets and road should provide street blocks that are generally between 120m to 240m in length and generally between 60m to 120m in width to facilitate pedestrian movement and control traffic speed.

The proposed layout generally accords with these guidelines for street block lengths and widths, however there are a number of streets that exceed the suggested lengths. IN particular the east west streets which connect between Woods Road and the conservation area.

Given the number of T-intersections along the long lengths of road, we are satisfied that appropriate opportunities exist to incorporate traffic management devices (i.e. modified t-intersections) at the detailed design stage. Alternately, horizontal deviation treatments could be incorporated.

A roundabout is provided at the cross intersection located at the eastern end of the Access Street 2 road located adjacent to the local convenience centre. This treatment is considered appropriate for this intersection.

It is considered that no other traffic management is required within the subdivision.

5.3.3. Waste Collection

Council's garbage vehicles will be able to access all collector roads and local access streets and appropriately manoeuvre through all intersections.

5.3.4. Pedestrian Facilities

Footpaths are proposed on both sides of the access streets within the residential subdivision. These arrangements are considered appropriate and acceptable.

Footpaths have been located to ensure good 'connectivity' within the subdivision by providing connections across streets. In addition, footpath connections are provided to public open space areas.

5.3.5. Bicycle Facilities

Given the ultimate traffic volumes and classification of the internal roads separate bicycle paths have not been provided. Rather cyclists would be accommodated on-street within the carriageway provided. This arrangement is consistent with the requirements for Access Street 1 classified roads under the requirements of Clause 56.

To ensure good connectivity through the site for cyclists, direct east-west links are provided between Woods Road and the conservation area. It is noted that Wood Road will include a 2-way bicycle path under the ultimate conditions which will provide for goof connections to areas towards the north and south of the site.

Overall, we are satisfied that adequate cyclist links will be available within the proposed subdivision.

5.4. WHYNDHAM PLANNING SCHEME (CLAUSE 56)

The proposed layout of the subdivision has been reviewed with specific reference to the provisions of Clause 56 of the Whyndham Planning Scheme.

The subdivision layout has been found to generally comply with the objectives and standards set out in Clause 56 in relation to the street network and design. Additional comments are provided below.

Standard C2, C7, C16

Whilst details of future public transport routes are not available it is considered that public transport services will operate along Leakes Road, Woods Road and the Water Easement Connector.

New services along these routes will ensure that new lots proposed are located no more than approximately 500m from public transport services.

Standard C3

The subject site's pedestrian and bicycle networks (bicycles accommodated on-street) will provide connections to the proposed Local Convenience Centre proposed within the development in the north-east corner of the site.

In is noted that connections via shared paths and formal on-road bicycle lanes will be available to the activity centres in the wider area.

Standard C5

The built environment provides for a range of road cross-sections and integrated public spaces which provide for a functional and safe urban area. The variety of road cross-sections helps to provide identity and character to different areas within the overall development.

Standard C6

The development provides a neighbourhood character from a roads perspective in-line with the *GAA Engineering Design and Construction Manual* and residential subdivisions which have been developed within areas located towards the south. The proposed layout and cross-sections provide for a safe and defined environment which will be integrated with Woods Road, Leakes Road and the future surrounding urban environment.

Standard C10 & C13

The development provides lots which front roads and streets and avoid the side or rear of lots being orientated to connector streets and arterial roads where possible.

Roads and streets have been provided along all public open space boundaries. An exception is a number of medium density lots which abut the conservation areas located within the eastern half of the site.

Standard C12

The development provides for walking and cycling facilities which link with the public open space areas with the residential dwellings. Footpaths are to be provided along both sides of the access streets and a 2.5m shared path is could potentially be provided along the frontage of the conservation area.

Standard C15 & C18

The walking and cycling network has been designed in-line with the *GAA Engineering Design and Construction Manual* and provides safe and accessible networks linking the residential areas with public open space, and future commercial and community facilities. The proposed network will provide an interconnected and continuous network of safe, efficient and convenient footpaths and cycle lanes.

The development provides lots which front all roads and streets which provide an appropriate level of surveillance and interaction of the pedestrian and cyclist facilities.

Cross-section elements were discussed previously and were shown to meet the requirements of the GAA Engineering Design and Construction Manual and Table C1 of Clause 56.

Standard C17

The streets within the subdivision will provide safe and efficient access for all vehicles, including service and emergency vehicles, and have incorporated appropriate traffic management treatments.

The proposal provides an interconnected and continuous network of streets within and between neighbourhoods for use by pedestrians, cyclists and vehicles and provides for an appropriate level of

local traffic dispersal. The proposed cross-sections aid in indicating the 'type' of street and provide for appropriate and safe speed environments.

Opportunities exist to accommodate traffic management treatments at the detailed design stage along a selected number of local streets.

Standard C20 & C21

This standard primarily relates to carriageway widths, verge widths and parking provision within the road reservation. The proposed cross-sections were discussed previously and were shown to meet the requirements of the GAA Engineering Design and Construction Manual and Table C1 of Clause 56 and be-in line with the objectives of Standard C20.

Appropriate splays have been provided at intersections to ensure sight lines to traffic on intersecting roads are achieved.

Appropriate measures have been incorporated to provide a low-speed environment while allowing road users to proceed without unreasonable inconvenience or delay. Intersection layouts clearly indicate the travel paths and priority of movements.

The safe and efficient collection of waste and recycling materials has been allowed for in the design of all streets.

5.5. Parking Provision

Each future residential allotment should provide off-street parking to accommodate residents to the satisfaction of the responsible authority.

Visitor parking can be accommodated on-street within the carriageway of the internal roads proposed within the site. Clause 56.06 typically requires that on-street parking is available at *'1 hard standing verge parking space per 2 lots'.*

The 7.3m wide carriageway proposed for the majority of local roads will be sufficient for parking to readily occur on both sides of the road whilst maintaining a single through lane (two-way) for traffic. Additionally, the 5.5m wide carriageway (provided along frontage to Conservation Area) will be sufficient to accommodate kerbside parking along one side. These areas will easily accommodate the required parking provisions and hard standing verge parking spaces are not considered necessary in this development.

The Access Street 2 road provided adjacent to the local convenience centre will include 2.3m wide indented parking lanes along each side of the road to allow for on-street parking clear of through traffic.

We recommend that double crossovers be provided to adjoining lots wherever possible in order to maximise the provision of on-street parking spaces and also maximise manoeuvring areas into and out of the proposed lots.

The parking provision for the local convenience centre will be subject to Council's approval at the detailed design stage and it is considered that parking should be provided in accordance with the requirements of Clause 52.06 of the Planning Scheme.

5.6. Public Transport Considerations

The site has limited access to public transport under existing conditions. However it is expected that bus services will operate along Leakes Road, Woods Road and the Water Easement Connector.

New services along these routes will ensure that new lots proposed are located no more than approximately 500m from public transport services.

It is noted that Tarneit Railway station is proposed to be developed approximately 2.5km west of the site. It is expected that the public transport routes would provide direct links to this location.

This level of public transport will ensure that all future dwellings in the development are within an acceptable walking distance of a bus route at a level that is consistent with current objectives.

5.7. ACCESS FOR SERVICE AND EMERGENCY VEHICLES

The 5.5m and 7.3m wide local road carriageways and the 3.5m lanes along the Access Street 2 as detailed at Section of this report will adequately facilitate relevant service and emergency vehicles and are consistent with the typical CFA requirements.

Specifically, the CFA 'Requirements for Water Supplies and Access for Subdivisions in Residential 1 and 2 and Township Zones' document (dated 9th October, 2006) indicates the following in relation to access for fire trucks:

> *'The road width must allow room for safe passage of a fire truck with additional margins for human error and safe clearances. A 3.5 metre clearance is required horizontally and 4 metres vertically for access by a fire truck. A road at least 7.3 metres wide will allow for parking on both sides of the road and still enable access by a fire truck. A road 5.5 metres wide will allow parking on one side of the road only. Widths in between these may encourage parking on both sides of the road so that access by a fire truck is not possible.'*

The carriageway easements/widths proposed throughout the development will ensure that these requirements can be satisfied. The radii provided at changes in direction will also accord with the requirements of the CFA and accommodate the required service vehicles.

Further to the above, no 'dead-end' roads are proposed as part of the subdivision and accordingly, all vehicles (including service vehicles) will not be required to undertake turn around manoeuvres within the site.

6. CONCLUSIONS

Having undertaken a detailed traffic engineering assessment for the proposed 574 lot development at 80 Woods Road, Truganina, we are of the opinion that:

a) proposed road reservations are consistent with what is required to accommodate appropriate carriageways, footpaths, services, etc. in accordance with the relevant standards,

b) public transport, on-street parking, pedestrian and cycle provisions is identified in a manner that is consistent with the typical requirements of relevant standards,

c) all relevant vehicles will be able to adequately access the site including service and emergency vehicles,

d) the likely volume on the proposed internal road network will be consistent with the volumes suggested in Clause 56 of the Planning Scheme,

e) the proposed intersections between the internal and external road network are appropriate and will provide for safe and convenient access arrangement to the site,

f) each future dwelling should provide adequate parking for resident and the local convenience centre should provide parking in accordance with the requirements of Clause 52.06 of the Planning Scheme,

g) traffic predicted to be generated by the proposed development will easily be accommodated on the surrounding road network and intersections without any adverse impacts (subject to future upgrades identified within this report), and

h) there are no traffic engineering reasons why a permit should not be granted for the proposed residential subdivision at land located at 80 Woods Road, Truganina, subject to appropriate conditions.

APPENDIX A
DEVELOPMENT PLANS

LEGEND:

- Property Boundary
- Development Boundary
- Local Convenience Centre
- Conservation Area
- Proposed Retarding Basin
- MD Site
- Public Open Space
- Lots 200-300m2
- Lots 301-400m2
- Lots 401 and over
- 1m Contours
- Pedestrian Link
- Leakes Road Widening from Developable Area
- Leakes Road Widening from Conservation Area
- Woods Road widening

LOT SIZES AND HOUSING TYPOLOGY:

Lots 200-300m2, with not less than 10m frontage could potentially accommodate terrace houses, double storey townhouses and semi-detached dwellings with up to 3 bedrooms.

Lots 301-400m2, with 10-12m frontage could potentially accommodate affordable single house on a lot, semi-detached dwellings, one or two storey house with up to 3 bedrooms.

Lots 401m2 and over, could potentially accommodate for standard residential dwelling on the lot with up to 3 to 4 bedrooms.

DEVELOPMENT ANALYSIS		
(121031/Plan Revision Rev7 Stages 1&2)		%TSA
Total Site Area	**52.02 ha**	
Encumbered Land	**24.67 ha**	**47%**
Proposed Retarding Basin	3.37 ha	
Conservation Area	21.30 ha	
Arterial Roads	**1.13 ha**	**2%**
Leakes Road Widening (from conservation area)	0.59 ha	
Leakes Road Widening (from developable area)	0.43 ha	
Woods Road Widening + North Boulevard	0.11 ha	
Gross Developable Area	**26.22 ha**	
Community Facilities	**0.58 ha**	
Local Convenience Centre	0.58 ha	
Public Open Space	**0.64 ha**	**2.44%**
Passive Open Space	0.64 ha	
Net Developable Area	**25.08 ha**	**%NDA**
Roads	**7.25 ha**	**29%**
Local & Connector Streets	7.25 ha	
Net Residential Area	**17.83 ha**	**71%**
Conventional Density Housing (10-15 Dwellings/ha)	15.75 ha	
Medium Density Housing (16-30 Dwellings/ha)	2.08 ha	
Estimated Standard Lots Yield	417 lots	
Average Lot Size	378 m2	
Estimated MD Lots Yield	52 lots	

DEVELOPMENT ANALYSIS		
(121031/Plan Revision Rev7 Stage 3)		%TSA
Total Site Area	**5.75 ha**	
Encumbered Land	**0.00 ha**	**0%**
Arterial Roads	**0.05 ha**	**1%**
Woods Road Widening	0.05 ha	
Gross Developable Area	**5.70 ha**	
Public Open Space	**0.17 ha**	**2.97%**
Passive Open Space	0.17 ha	
Net Developable Area	**5.53 ha**	**%NDA**
Roads	**1.50 ha**	**27%**
Local & Connector Streets	1.50 ha	
Net Residential Area	**4.03 ha**	**73%**
Conventional Density Housing (10-15 Dwellings/ha)	3.84 ha	
Medium Density Housing (16-30 Dwellings/ha)	0.19 ha	
Estimated Standard Lots Yield	98 lots	
Average Lot Size	392 m2	
Estimated MD Lots Yield	7 lots	

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SCP Rev7 Date 31/10/2012