PLANNING AND DEVELOPMENT ACT 2007

APPROVAL GRANTED

PURSUANT TO SECTION 165

Delegate name JOHANNA DUCK

Date 27/6/2013

Note: Only works on 'TAMS Land' (Territory Land) are subject to this approval. All works on 'NCA designated land' are subject to NCA works approval.

LEGEND

- NCA DESIGNATED LAND
- STROMLO FOREST PARK
- TAMS LAND
- S211 BOUNDARY
- DESIGNATED LAND BOUNDARY

N

STROMLO RURAL BLOCK No. 403

MOLONGLO VALLEY BLOCK No. 18

MOLONGLO VALLEY BLOCK No. 23

MOLONGLO VALLEY BLOCK No. 24 (ACTEW WATER EASEMENT)

MOLONGLO VALLEY BLOCK No. 25

STROMLO RURAL BLOCK No. 447 (SPECIAL PURPOSE RESERVE)

STROMLO RURAL BLOCK No. 447 (STROMLO FOREST PARK)

COPPINS CROSSING ROAD

URIARRA ROAD

URIARRA ROAD CYCLE PATH

JOHN GORTON DRIVE LINK ROAD

JOHN GORTON DRIVE

INTERSECTION 1 (REFER INSET 1)

INTERSECTION 2 (REFER INSET 2)

INTERSECTION 3 (REFER INSET 3)

INSET 1

INSET 2

INSET 3

FILE: H:\C11000\C11150\drawing\Development Application\C11150-DA004+BOUNDARY & APPROVALS PLAN.dwg 25th-Feb-2013 9:17AM USER: Victor van bovene
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FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE
	TDP	VVB			18/12/12

AMENDMENTS		AMENDMENT DETAILS
	A	
	B	
	C	
	D	
	E	
	F	

A3 PLOT SCALE (METRES) A1 PLOT

1:10000 100 50 0 100 200 1:5000

IWAE No. .....

PROJECT No. .....

CONSULT AUSTRALIA

Quality Endorsed Company ISO 9001:2008 Lic. 4004

CLIENT ACT Government Economic Development; ACT Government Environment and Sustainable Development; ACT Government Treasury

PROJECT
URIARRA ROAD INTERSECTIONS AND LINK ROAD FROM JOHN GORTON DRIVE

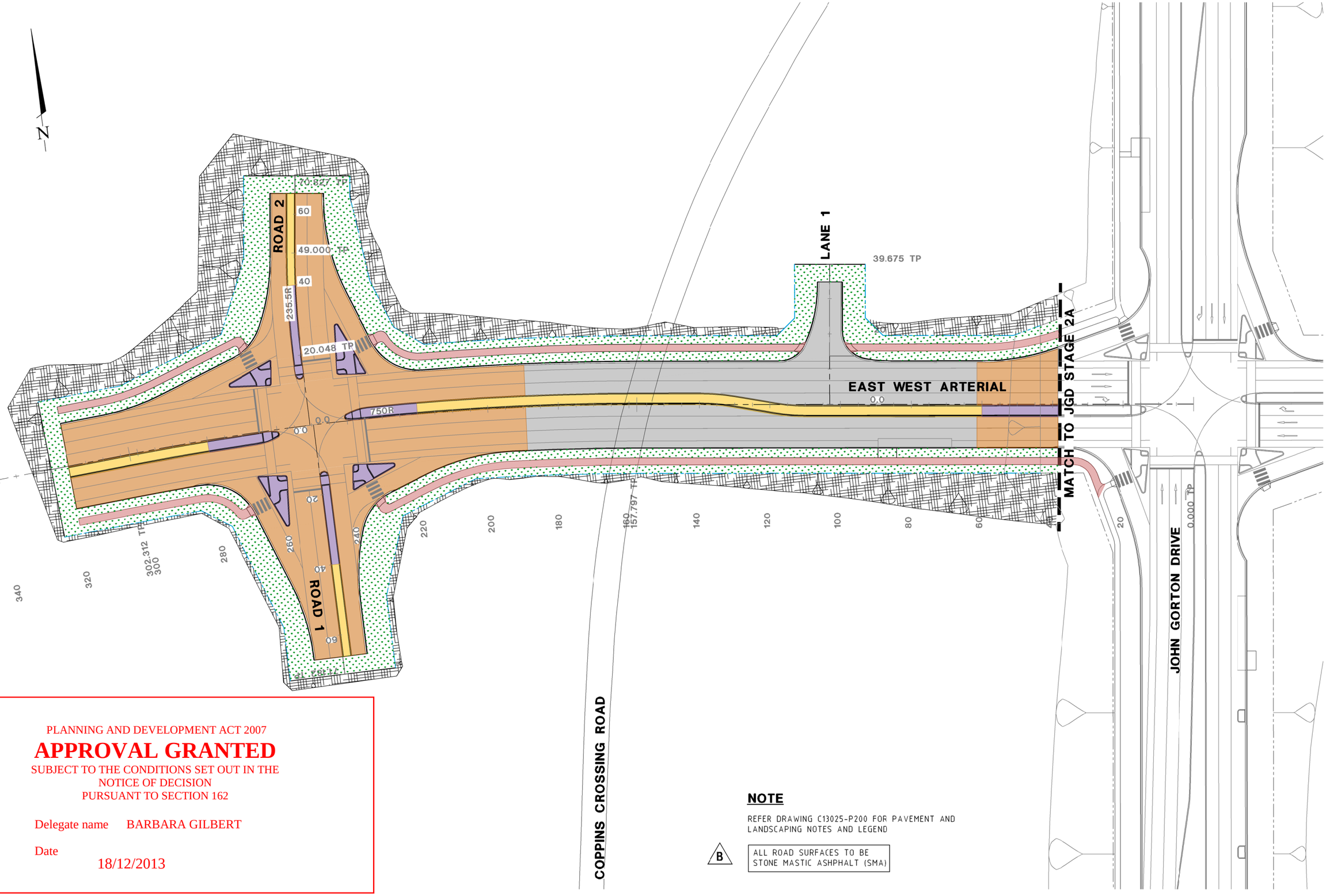
BROWN Smart Consulting

www.brownconsulting.com.au

DRAWING TITLE
BOUNDARY & APPROVALS PLAN

DRAWING NUMBER
C11150-DA004+

AMEND.



PLANNING AND DEVELOPMENT ACT 2007

APPROVAL GRANTED

SUBJECT TO THE CONDITIONS SET OUT IN THE NOTICE OF DECISION PURSUANT TO SECTION 162

Delegate name BARBARA GILBERT

Date 18/12/2013

NOTE

REFER DRAWING C13025-P200 FOR PAVEMENT AND LANDSCAPING NOTES AND LEGEND

B ALL ROAD SURFACES TO BE STONE MASTIC ASHPHALT (SMA)

FIRST ISSUE		DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
		TDP	LAG			28/06/13	
AMENDMENTS	A	TDP	TDP			22/07/13	SHRUB BED PLANTING AND PAVEMENT DETAILS AMENDED
	B	TDP	TDP			01/10/13	STONE MASTIC ASPHALT NOTE ADDED
	C						
	D						
	E						
	F						

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IWAE No.

PROJECT No.

CONSULT AUSTRALIA

Quality Endorsed Company ISO 9001 Lic 4084

CLIENT ACT Government Economic Development

PROJECT EAST WEST ARTERIAL STAGE 1

BROWN

 www.brownconsulting.com.au

DRAWING TITLE PAVEMENT AND LANDSCAPING PLAN

DRAWING NUMBER C13025-P201+ AMEND. B

FILE: H:\C13000\C13025\drawing\PSP Set\C13025-P200-PAVEMENT PLAN.dwg 11h-Oct-2013 1:59PM USER: Tim de Put
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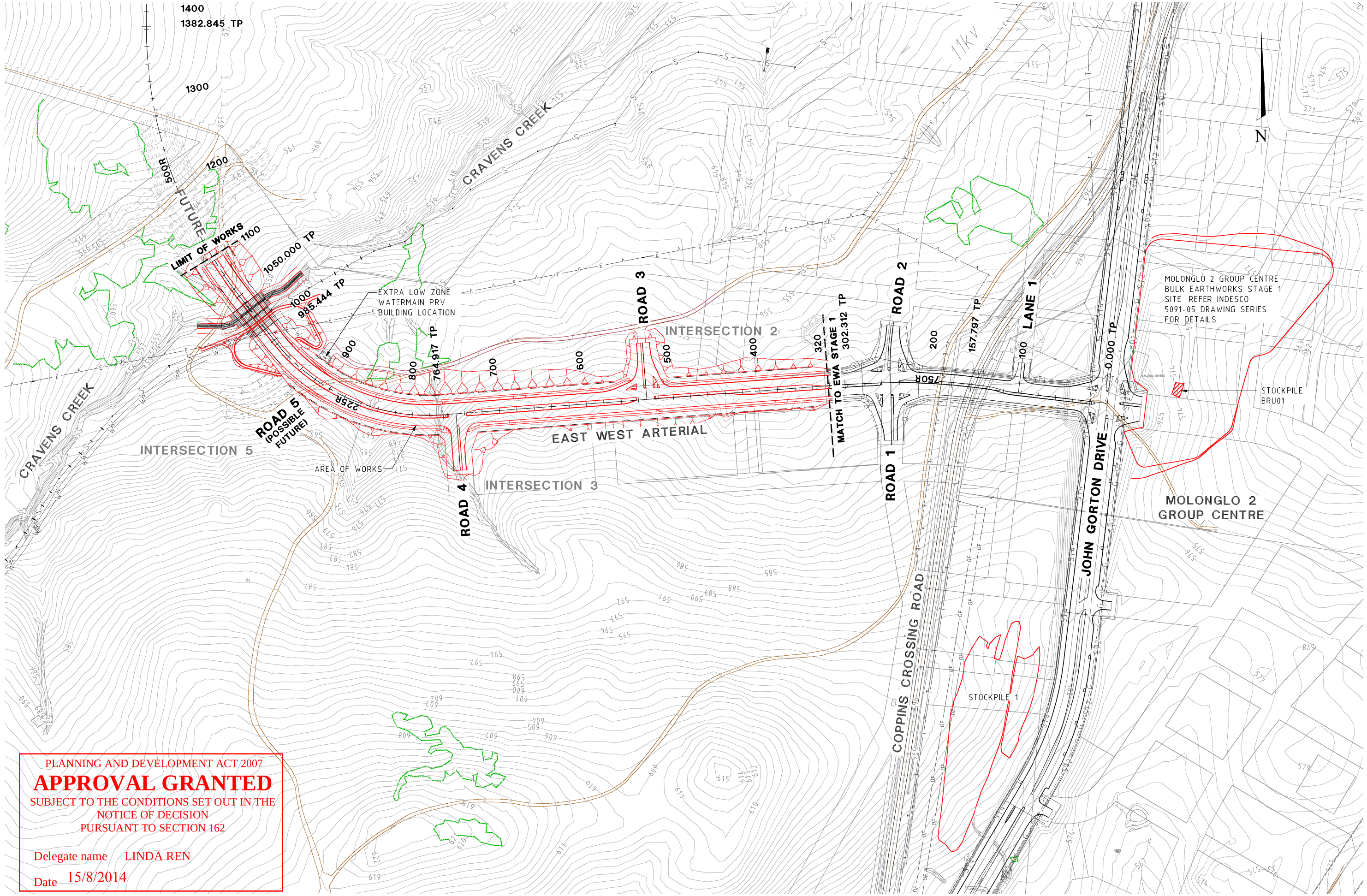

PLANNING AND DEVELOPMENT ACT 2007

APPROVAL GRANTED

SUBJECT TO THE CONDITIONS SET OUT IN THE NOTICE OF DECISION PURSUANT TO SECTION 162

Delegate name LINDA REN

Date 15/8/2014

FIRST ISSUE	DESIGN	DRAWN	CHECK	APPROVED	DATE	AMENDMENT DETAILS
	TDP	LAG			11/03/14	
A	TDP	TDP			09/04/14	PRV LOCATION ADDED
B						
C						
D						
E						
F						

A3 PLOT SCALE (METRES) A1 PLOT
1.4000 20 10 0 20 40 60 80 100 1.2000

IWAE No. .....

PROJECT No. .....

CONSULT AUSTRALIA

Quality Endorsed Company ISO 9001 Lic 4064

CLIENT ACT Government Economic Development

PROJECT EAST WEST ARTERIAL STAGE 2

BROWN

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DRAWING TITLE GENERAL ARRANGEMENT

DRAWING NUMBER C13107-005+

AMEND. A

Cardno Eppell Olsen
Shaping the Future

Proposed Wright Estate Development Plan

Traffic Analysis and Road Hierarchy Report

Prepared for
ACT Land Development Agency

transportation | traffic | engineering | planning

May 10

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DOCUMENT CONTROL

Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
1	26/02/2010	Adrian Bateman	AB	George Lasek	GL
2	19/03/2010	Adrian Bateman	AB	Anissa Levy	AL
3	30/03/2010	Adrian Bateman	AB	Anissa Levy	AL
4	03/05/2010	Adrian Bateman	AB	Anissa Levy	AL

TABLE OF CONTENTS

List of Tables

List of Figures

Appendices

1 INTRODUCTION

Cardno was commissioned by the Land Development Agency (LDA) to undertake a Road Hierarchy and Traffic Analysis Report to assist in the formulation of the Wright Estate Development Plan for residential development within Stage 1 of the Molonglo Valley Development.

The proposed Wright Estate Development Plan consists of a predominantly residential development with the following mix of uses:

- High and medium density residential.
- Commercial mixed use.
- Public open spaces.

A number of previous traffic studies of relevance have been undertaken to identify the infrastructure requirements for the development within the Molonglo Valley. Key outputs from these studies have been included within these technical assessments where relevant. Previous traffic studies include:

- Molonglo Infrastructure Stage 1 Traffic Report December (GHD 2008).
- Final report on Molonglo Roads Feasibility Study (SMEC 2008).

This report builds upon the work undertaken previously. The focus of this study is an examination of the precinct internal road layout and appropriate definition of a road hierarchy. The operation of key internal intersections is also assessed to understand their likely operational performance.

1.1 SCOPE OF WORKS

The scope of this study comprises the following tasks:

- Determine an appropriate set of future year design traffic flows for the Wright Estate Development Plan.
- Undertake intersection analysis for a number of key internal intersections. These key internal intersections are considered to represent the connections of the higher order road network (arterial through to major collector).
- Identify an appropriate road hierarchy plan based upon traffic volumes, traffic composition, bus services and active transport (walk/cycle) considerations.
- Assess the environmental traffic capacity of the internal road network under the road hierarchy plan.
- Summarise the above into a Road Hierarchy and Traffic Analysis Report.

This study should appropriately assess the operational performance of the site access connections to the external road network system. However, it should be noted that further significant residential development is proposed directly opposite the subject site to the north. This area is known as Coombs. The Estate Development Plan for Coombs is currently being developed.

It is proposed that new intersection connections are constructed as part of the proposed John Gorton Drive which is a planned new major arterial road which will provide the major vehicular access connections to both the Coombs and Wright Plan areas. Intersection layouts have been developed by other consultants in the reports referenced above. However, due to the updated land use estimates contained herein and with a similar traffic study currently being undertaken for Coombs, there will be a need to re-evaluate the operational performance of these layouts. Operational performance needs to be considered for both sites jointly when the final land use

estimates for Coombs have been developed. This re-analysis will be reported within a further traffic analysis and road hierarchy plan for Coombs residential development to be prepared.

1.2 REFERENCE DOCUMENTS

- Report on Molonglo Infrastructure Stage 1 Traffic Report (GHD 2008).
- Final report on Molonglo Roads Feasibility Study (SMEC 2008).
- Updated traffic forecast produced by SMEC provided by TAMS via email to Cardno dated 11 January 2010.
- Guidelines for the preparation of Estate Development Plans (ACT Planning & Land Authority 2009).
- Territory Plan Wright Concept Plan (ACT Parliamentary Counsel 2008).
- Guide to Traffic Generating Developments (NSW RTA 2002).
- Road Hierarchy Plan for Coombs and Wright Estate Development Plan Drawing No. 292347-RHP-01, 02, 03 (Cardno 2010).
- TAMS Design Standards for Urban Infrastructure (Edition 1 issue 0).
- Parking and Vehicular Access General Code (ACTPLA 2008).

1.3 REPORT STRUCTURE

The remainder of the report is structured as follows:

- Chapter 2 describes the Concept Plan.
- Chapter 3 describes the derivation of the forecast traffic volumes associated with the masterplan.
- Chapter 4 outlines the proposed road hierarchy including its principles and identifies a road hierarchy.
- Chapter 5 provides a summary and concludes the study.

2 PROPOSED WRIGHT DEVELOPMENT

The Wright Estate Development Plan is to be provided one of the first stages of the proposed large scale land use changes within the Molonglo Valley.

The plan is indicated in Figure 2.1.

Figure 2.1 Site Location

2.1 PROPOSED ARTERIAL ROAD CONSTRUCTION TO ACCESS WRIGHT

Roads ACT are constructing a new arterial road to provide principal vehicular access to all proposed land release areas within the Molonglo Valley, which is named as John Gorton Drive. John Gorton Drive will connect Cotter Road in the south to Coulter Drive and Bindubi Street in the north. The road will cater for road vehicles and accommodate on road cycling and future Inter-town Public Transport (IPT).

It is proposed to construct John Gorton Drive in stages as the Molonglo Valley is being progressively developed. The first stage of construction is proposed to provide vehicular access to the Coombs and Wright areas. This will be constructed as far as the north western extent of the Wright Estate Development Plan area. It will then deviate through a left hand horizontal curve and connect into the existing Uriarra Road. Future stages of John Gorton Drive construction will be based upon an extension of the carriageway in the north-western direction to extend its initial alignment.

These future stages of John Gorton Drive construction will provide improved accessibility between the site and the existing urban areas to the north (Belconnen / Macquarie). Accordingly the potential traffic distributions between Wright Estate Development Plan area and the external road network will change as the road is progressively constructed.

The proposed Wright Estate Development Plan is shown in Appendix B.

3 TRAFFIC VOLUMES

To assist in the formulation of a functional road hierarchy for the proposed development and to ensure appropriate higher order internal road network intersection treatments are considered, assessments were undertaken to provide an appropriate set of design year traffic volumes. This section explains the derivation of the traffic volumes.

3.1 DETERMINATION OF TRAFFIC GENERATION

A forecast of the traffic generation potential of the Wright Estate Development Plan was undertaken based upon the potential lot yields identified within the masterplan. Traffic generation on the yields by adoption of the following traffic generation rates:

- Single dwellings 8 vehicle movements per day per dwelling.
- Multi-unit dwellings 6 vehicles per day per dwelling.
- Mixed use floorpsace 2 trips per 100 m^2 (based upon RTA Guide to traffic Generating Development commercial land uses)

For conservative assessment the upper range of high density dwelling was assessed. The following yields were assessed:

- 542 Single dwellings.
- 1194 multi-unit dwellings.
- 15,000 m^2 mixed use floorpsace

LDA anticipate that the mixed use floorspace would comprise as doctors surgeries, a small supermarket, hairdressers, laundries and small businesses etc. These uses will provide a local focus with the potential for a significant number of walk/cycle trips to be made from the surrounding areas. To account for this a 50% discount was made to represent this. The adoption of the residential trip rates will inherently include trips associated with local community centres so it is considered a reasonable basis on which to assess the likely traffic levels on the master plan road network.

Application of the above trip rates identifies that the development could generate some 1,430 two-way peak hour trips or 14,300 two-way daily trips.

3.2 TRAFFIC DISTRIBUTION

A traffic distribution for vehicles trips in/out from the plan area was assessed on the basis of the traffic distribution identified in Table 6-8 of Section 6.13 in the Molonglo Roads Feasibility Study (SMEC). Trips were assigned in proportion to the major attractors and generators for Molonglo traffic. The SMEC analysis identified a distribution of 65% to the south/east (to the city), 30% north/west (towards Belconnen) and 5% to the south to Stromlo Village. For a robust assessment a distribution of 70% to/from the south and 30% to/from the north was assessed consistent with SMEC forecasts.

3.3 TRAFFIC ASSIGNMENT

Traffic was assigned onto the internal precinct local road network on the basis of likely driver routes through the master plan area using routes seeking to minimise travel distances.

4 PROPOSED WRIGHT ESTATE DEVELOPMENT PLAN LAYOUT

4.1 ROAD CLASSIFICATIONS

The identification of a road hierarchy serves not only to identify the roads role to carry vehicles but should attempt to match the class of road to its use and the environmental needs of the community. The desire to separate through and local traffic should improve the general amenity of all areas within the development.

If roads are viewed as either purely for local access or purely for traffic movement then inconsistencies will arise. An example of this would be the situation where a main road passes through a shopping centre, here both local access and through traffic movement must be accommodated. Where road network design alone is unable to remedy this situation traffic management can be applied to minimise impacts and prioritise conflicting functions.

Traffic management objectives at a local level need to be consistent with government objectives for community planning and development. The levers which traffic management most closely affects are:

- Need to ensure cohesive precincts.
- Need to ensure accessibility of neighbourhood areas for all road users.
- Need to ensure the environmental integrity is respected.

The classification of roads in the ACT is based on a formal road hierarchy. The classification fundamentally relates to the predominant function of a road and to the extent it serves the two basic purposes of the road network, i.e. the movement of traffic and access to property. A road's physical characteristics and traffic volume will reflect its function and role in the network.

The road classifications used are:

- Arterial roads.
- Major collector roads.
- Minor collector roads.
- Access streets.

The definitions of each road classification are discussed in the following sections.

4.1.1 Arterial Roads

Arterial roads predominantly serve longer distance travel within a district and through traffic from one district to another, and form the principal avenues of communication for metropolitan scale traffic movements. They include limited access roads and parkways (or freeways) having full access control and grade separated inter-sections. A small number have higher levels of property access for urban design reasons, for example Northbourne Avenue, or reflect the planning and design parameters of the time of their construction, for example, Limestone Avenue. Traffic capacity is a function of the design of the road rather than being constrained by environmental objectives.

4.1.2 Major Collector Roads

Major collector roads collect and distribute traffic within residential, industrial and commercial areas. They form the link between the primary network and the roads within local areas and should carry only traffic originating or terminating within an area. The volume of traffic carried is constrained by environmental objectives - safety and traffic noise - rather than road geometry and reflects the limited area that they serve. Direct property access is still permissible but the level of traffic may dictate that access and egress arrangements should be such that vehicles can exit properties in a forward direction.

4.1.3 Minor Collector Roads

Minor collector roads collect and distribute traffic from access streets, linking to the major collector roads within the neighbourhood. They can also provide secondary connections direct to the external arterial road network. Traffic volumes are compatible with direct property access.

4.1.4 Access Streets

Access streets are generally streets where the residential environment is dominant. Traffic volumes and speed environment are low. They would generally connect only to a collector road.

4.1.5 Speed Environments

Typically the following speed limit are applicable:

- Access streets - 40km/h
- Minor collector roads - 50 km/h
- Major collector roads is 60 km/h
- Arterial roads is 60 km/h or above.

4.1.6 TAMS Classifications

In addition to the above coarse level definitions TAMS Design Standard for Urban Infrastructure identifies a road classification based upon the National Association of Australian State Road Authorities (now known as Austroads) and describes urban roads as follows:

- Class 6 - Those roads whose main function is to perform the principal avenue of communication for massive traffic movements.
- Class 7 - Those roads, not being Class 6, whose main function is to supplement the Class 6 roads in providing for traffic movements or which distribute traffic to local street systems.
- Class 8 - Those roads not being Class 6 or 7, whose main function is to provide access to abutting property.
- Class 9 - Those roads which provide almost exclusively for one activity or function and which cannot be assigned to Class 6, 7 or 8.

4.2 ROAD HIERARCHY PRINCIPLES

TAMS Design Standard for Urban Infrastructure also identifies a road hierarchy network to maximise road safety, amenity and legibility and to provide for all road users. Sections from this document are reproduced below.

A hierarchical road network is essential to maximise road safety, amenity and legibility and to provide for all road users. Each class of road in the network serves a distinct set of functions and is designed accordingly. The design should convey to motorists the predominant function of the road. Essentially there is a broad division between arterial and non arterial (or local) roads.

Arterial Roads

Servicing the individual residential areas are the major roads that are Class 6 and in some cases Class 7 roads. These are important transport routes that provide for the major traffic streams in terms of both volume and speed.

In the ACT, there are three distinct types of major road:

- Sub-Arterial.
- Arterial.
- Parkway.

Non-Arterial Roads

There are four distinct street types in residential areas:

- Access Places – Class 8.
- Access Streets – Class 8.
- Collector Street (Minor) – Class 7.
- Collector street (Major) – Class 7.

The lowest order of road (Access Place) having as its primary function, residential space / amenity features which facilitate pedestrian and cycling movements and where vehicular traffic is subservient in terms of speed and volume to those elements of space, amenity, pedestrians and cyclists.

The next level of road (Access Street) should provide a balance between the status of that street in terms of its access and residential amenity function. Residential amenity and safety are dominant but to a lesser degree than Access Places.

All collector Streets have a residential function but also carry higher volumes of traffic than the lower order streets. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and speeds, however amenity and safety do not have the same priority as Access Streets and Access Places.

Major Collector Streets provide the principal link between the residential street network and the arterial road system. These streets often require frontage access restrictions due to traffic volume

Road Network

The design features of each type of road convey to the driver its primary functions and encourage appropriate driver behaviour. This can be achieved by complying with the following requirements wherever possible:

- Traffic volumes and speeds on any road should be compatible with the residential functions of that road.
- The maximum length of an access street should ensure its status as a residential place is retained, where the traffic, in terms of speed and volume will enable the integration of pedestrian, bicycle and vehicular movements. This length will also ensure that residential convenience is not unduly impaired as a result of speed restraints. The need for any speed reducing treatments will be considered further during the detailed design process.
- The length of collector street (major) within a development should be minimised.
- The time required for drivers to travel on all streets within the development should be minimised.
- Where access streets form part of a pedestrian or bicycle network, access links should provide suitable connectivity with adjoining access streets or open space systems so as to ensure such pedestrian and bicycle networks are functionally efficient.
- The road network should ensure that no road links with another road which is more than two levels higher or lower in the hierarchy. In exceptional circumstances roads may link with others that are more than two levels apart, however, no access street or local street should have access to an access-controlled arterial road.
- Connections between internal roads should be T-junctions, roundabouts or where Austroads traffic flows thresholds are met crossroads.
- The road layout should conform to the requirements of the external road network and satisfy the transport provisions of an outline plan.
- The external road network should be designed and located to provide routes which are more convenient for potential through traffic within the network. Major roads should be provided at intervals of no more than 1.5km and should be complete and of adequate capacity to accommodate through network movements. The internal road system should not provide through routes that are more convenient than the external road network.
- It is preferred that the residential road network should be such that speed control is inherent in the layout design, ie. bends and some intersection types provide. Again, the need for speed reducing treatments will be considered further during the detailed design stages.

It is to be noted that NSW Roads and Traffic Authority (RTA) also provides a classification system for roads to determine their functional role within the road network. Roads are classified according to the role they fulfil and the volume of traffic they should appropriately carry. The NSW RTA guidelines provide the following traffic volumes associated with their road classification system:

- Arterial Road - typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour)
- Sub-arterial Road - defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day (500 to 2,000 vehicles per hour)
- Collector Road - provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vehicles per day (200 to 1,000 vehicles per hour). At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.
- Local Road - provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (200 vehicles per hour).

Peak hour volumes on roads are commonly assessed as being ten percent of the daily flows.

However, traffic volumes alone should not be the only criterion used in road classifications. Factors such as traffic compositions, bus service routes, pedestrian / cycle considerations and connections to other road categories should also inform the classification.

Intersection connections should be provided between roads of identical or adjacent classifications. As an example it is undesirable for a local road to connect directly to an arterial road. Closer spacing of intersections is also possible the further down the classification ranking.

4.2.1 Intersection Control Options

Austroads *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* identifies a range of intersection control options and selection criteria, suitability criteria and traffic management considerations in the type of treatment. These are reproduced below in Table 4.1 to Table 4.3.

The development of an appropriate intersection or crossing may require a traffic engineer or road designer to apply the following principles:

- recognise and understand the human, vehicle, road, and environmental factors that apply to the site
- provide adequate warning of the presence of the intersection or crossing through clear sight lines and/or appropriate signage
- provide adequate sight distances between conflicting road users
- ensure that the layout is easily recognised and that legal priorities are clear
- design to accommodate appropriate vehicle speeds
- where and when appropriate, give preference to major traffic movements and/or specific road users
- minimise the number of conflict points
- minimise the relative speed of conflicting movements
- provide adequate facilities for all road or rail users, including cyclists, pedestrians, pedestrians who have an impairment, public transport patrons, and to accommodate public transport vehicles and heavy vehicles
- ensure that traffic control devices can be satisfactorily accommodated within the road reservation, medians and traffic islands.

Table 4.1 Intersection control options and selection criteria

Type of control	Key traffic and safety selection factors	References
Road rules only	▪ apply in the absence of intersection traffic control devices ▪ common practice at T-intersections between local streets where traffic control devices may not be provided ▪ cross roads generally have traffic control devices, however, they need not be provided on very low volume roads in remote areas where a major/minor road hierarchy does not exist (Note that New Zealand requires all cross roads to be controlled).	Refer to Australian Road Rules and New Zealand Land Transport Rules
GIVE WAY lines only (Not in New Zealand)	▪ may be used at local street T-intersections to reinforce priority although an appropriate sign (STOP or GIVE WAY) may be required in these circumstances.	Refer to Australian Road Rules and New Zealand Land Transport Rules, and Parts 4 and 10 of the Guide to Traffic Management
STOP signs and GIVE WAY signs	▪ used at intersections other than those controlled by roundabouts or traffic signals ▪ used to reinforce road rules or to assign priority ▪ STOP signs must only be used when warrant is met ▪ advance warning signs may be necessary where there is a high approach speed or where approach sight distance is limited.	Refer to Part 10 of the Guide to Traffic Management and to AS1742.2
Roundabout	▪ Can be used at a wide range of sites and improve safety by simplifying conflicts, reducing speeds and providing clear indication of priority. ▪ Are useful where there is a high proportion of right turning traffic. ▪ Perform best when traffic flows are balanced. ▪ Cyclists (especially when turning right) and pedestrians find it more difficult to negotiate multi-lane roundabouts. An off-road facility may be required for cyclists in some cases.	Refer to Parts 4 and 10 of the Guide to Traffic Management and to AS1742.2
Traffic signals	▪ used where unsignalised intersection has a poor crash record or excessive delays for traffic using minor roads, and a roundabout is an unsuitable alternative to traffic signals ▪ suitable for high pedestrian movement including people who have an impairment ▪ numerical warrants may apply (refer signalised intersections in Table 2.4 below).	Refer to Parts 5 and 10 of the Guide to Traffic Management

Table 4.2 Suitability of types of traffic control to different road types

	Primary Arterial	Secondary Arterial	Collector & Local Crossing Road	Local Street
Traffic Signals				
Primary arterial	A	A	O	X
Secondary arterial	A	A	O	X
Collector & local crossing road	O	O	X	X
Local street	X	X	X	X
Roundabouts				
Primary arterial	O	O	X	X
Secondary arterial	O	O	O	X
Collector & local crossing road	X	O	A	O
Local street	X	X	O	A
STOP or GIVE WAY signs				
Primary arterial urban/(rural)	X / (O)	X / (O)	A	A
Secondary arterial urban/(rural)	X / (O)	X / (O)	A	A
Collector & local crossing road	A	A	A	A
Local street	A	A	A	A
Legend: A = Most likely to be an appropriate treatment O = May be an appropriate treatment X = Usually an inappropriate treatment				

Table 4.3 Key traffic management considerations in selection of intersection type

<table>
<tr><th>Type of intersection</th><th>Key traffic management selection considerations</th></tr>
<tr><td colspan="2">At-grade intersections</td></tr>
<tr><td>Unsignalised</td><td>
Capacity
Unsignalised intersections rely on gap selection for the entry of minor road traffic into or across the major road and for right turn movements from the major road.
Higher conflicting volumes result in increased delays and higher risk of crashes.
Intersection analysis can be undertaken to determine absorption capacity, delays and queue lengths.

Refer to Part 3 of the Guide to Traffic Management
Basic
▪ used at urban locations where low volumes and low speeds occur and at rural sites with low cross and turning volumes
▪ is designed to be compact and low cost, and can be used with any road surface
▪ offers no protection to turning traffic and causes through traffic to slow when such movements occur
▪ Y-junction layouts may have safety problems
▪ the capacity figures for uninterrupted flow generally apply (unless the intersection is located so close to signals that traffic arrives in platoons).
Refer to Part 4 of the Guide to Road Design
▪ The following table may be used as an initial guide to determine the need for a detailed traffic analysis in accordance with the procedure provided in Part 3 of the Guide to Traffic Management. When the volumes at an intersection are less than those shown, a detailed analysis to demonstrate that adequate capacity is available is unlikely to be necessary. Furthermore, flaring of the approaches is unlikely to be needed based on capacity. However, separate lanes for left or right-turning vehicles may be desirable on the major road for safety reasons.

<table>
<tr><th>Major road type[1]</th><th>Major road flow (vph)[2]</th><th>Minor road flow (vph)[3]</th></tr>
<tr><td rowspan="3">Two-lane</td><td>400</td><td>250</td></tr>
<tr><td>500</td><td>200</td></tr>
<tr><td>650</td><td>100</td></tr>
<tr><td rowspan="3">Four-lane</td><td>1000</td><td>100</td></tr>
<tr><td>1500</td><td>50</td></tr>
<tr><td>2000</td><td>25</td></tr>
</table>
Notes:
1. Major road is through road (i.e. has priority).
2. Major road flow includes all major road traffic with priority over minor road traffic.
3. Minor road design volumes include through and turning volumes.
</td></tr>
</table>

4.2.2 Proposed Road Hierarchy

In accordance with the principles identified above a potential road layout was formulated.

Principal direct connections to the external road network include:

- John Gorton Drive via a large traffic signal controlled intersection (road 1)
- A left in left out right turn in priority controlled intersection with John Gorton Drive (road 21)
- A priority controlled T-junction (road 19) and a roundabout connection to Cotter Road (road 3)
- Two roundabout connections with Uriara Road (roads 4 and 2)
- Left in left out service road which provide access to a number of road (road 31, 33, 18, 40, 41, 42, 43)

A highly permeable connective style grid iron layout is proposed in accordance with the latest planning directions.

Key features of the road hierarchy plan include:

- A short sub arterial road providing primary access to John Gorton Drive surrounded to the east and west by mixed use development.
- A central north –south major collector road linking between the sub arterial road in the north and Cotter Road to the south.
- An east - west major collector road linking Uriarra Road to the sub arterial road to the east and Uriarra Road to the west.
- An interconnected permeable network of lower order residential streets.
- Small section of shared driveways providing access to a limited number of plots (4 or less) which will not require truck access.

The proposed road hierarchy is shown on the figures included within Appendix B.

4.2.3 Proposed Road Cross Sections

It is proposed to provide the internal road network with varying cross sectional width requirements dependent upon the operational requirements, road safety and amenity. The proposed road cross sections are shown on the figures included within Appendix B. The road cross sections are described below:

- 40 m reserve – Major collector that provides a variable width median and adjacent 3.75 metre wide trafficable lane, 1.5m wide marked on road bicycle lane and 2.8m parking bay. On each side is proposed a variable width verge which can accommodate a 2 metre footpath.
- 34 m reserve type 1 – Minor Collector accommodating 3.75 metre wide trafficable lanes, 1.5m wide marked on road bicycle lane and 2.8m indented parking bay in both directions. On each side a 7.5 metre wide verge is proposed which can accommodate a 2 metre footpath.
- 34 m reserve type 2 – Minor Collector generally in keeping with the 34.0m reserve noted above with the exception that parking provision is not accommodated. For clarify the proposed cross section provides 3.75 metre wide trafficable lanes, 1.5m wide marked on road bicycle lane with a 11.35m wide verge on either side able to accommodate a 2 metre footpath.
- 29 m reserve – generally nominated as Local Access Street B configured to provide a 4.5 metre wide trafficable lane in both directions. On each side a 10 metre wide verge is proposed which can accommodate a 2 metre footpath.
- 28 m reserve – nominated as Minor Collector and configured to provide 3.5m wide trafficable lanes and 2.8m wide parking provision in both directions. A 7.7m wide verge able to accommodate a 1.5m wide footpath is provided on both sides.
- 22 m reserve – generally nominated as Local Access Street B and configured to provide a 3.75 metre wide trafficable lane in both directions. On each side a 7.25 metre wide verge is proposed which can accommodate a 1.5 metre footpath. It is noted that adjacent to open space the verge provision is reduced to a minimum of 2.0m within a 16.75m reserve.

4.2.4 Pedestrian / Cycle Facilities

Cycling and walking are supported by the ACT Government and are recognised as healthy, low cost and environmentally friendly forms of transport. The ACT Government has adopted the National Strategy for Ecologically Sustainable Development and the National Greenhouse Strategy. Both of these strategies support an increase in commuter cycling and walking in favour of private car use. Recreation policies also strongly support walking and cycling as a means of improving community health and fitness, and of helping to reduce greenhouse gas emissions and vehicle-produced noise and air pollution.

The ACT Sustainable Transport Plan (2004) aims to increase the mode share of walking and cycling from 4.1% and 2.3% respectively in 2001 to 7% each by 2021. Ensuring that greenfield developments are provided with high quality walking and cycling facilities is an integral part of achieving this target. It is recognised that encouraging walking and cycling as recreational pursuits can lead to increases in walking and cycling for commuting and other trip purposes.

Key features for Wright which encourage walking and cycling include:

- The provision of mixed use developments along the public transport spine (John Gorton Drive), facilitating multi-purpose trips involving public transport and walking.
- The provision of footpaths along both sides of all streets, facilitating safe walking environments for all walkers and less confident cyclists.
- The provision of on-road cycling facilities along key road links through the site, linking to the proposed Main Routes Network.
- Provision of an off-road link through the open space corridor in the south-east of the suburb, linking with the proposed Roads Main Routes Network at Cotter Road and with Coombs.

Design Standard 13, Drawing No. 11 (DS13-11) illustrates the ACT Government Main Routes Network and was last updated in June 2007 following preparation of the *Commuter Cycling Network: Priorities for Capital Works* report by CBRE. DS13-11 does not include the Molonglo area, however the infrastructure required in Molonglo was considered as part of the report. A review of the 2007 report is presently underway and it is anticipated that the Main Routes Network and DS13-11 will be updated accordingly. The provision of pedestrian and cycling facilities in Wright has been developed consistent with the links recommended in the *Pedestrian and Cycling Network: Priority Infrastructure for Capital Works Draft Report* (Cardno, November 2009).

Figure 4.1 shows the proposed pedestrian and cyclist facilities within Wright. It should be noted that the alignment of the off-road path through the open space corridor is indicative only and the final alignment will be determined at the detailed design phase. Locations where at-grade crossings, such as refuge islands, will be required have been identified. Specific crossing treatments will be determined during detailed design.

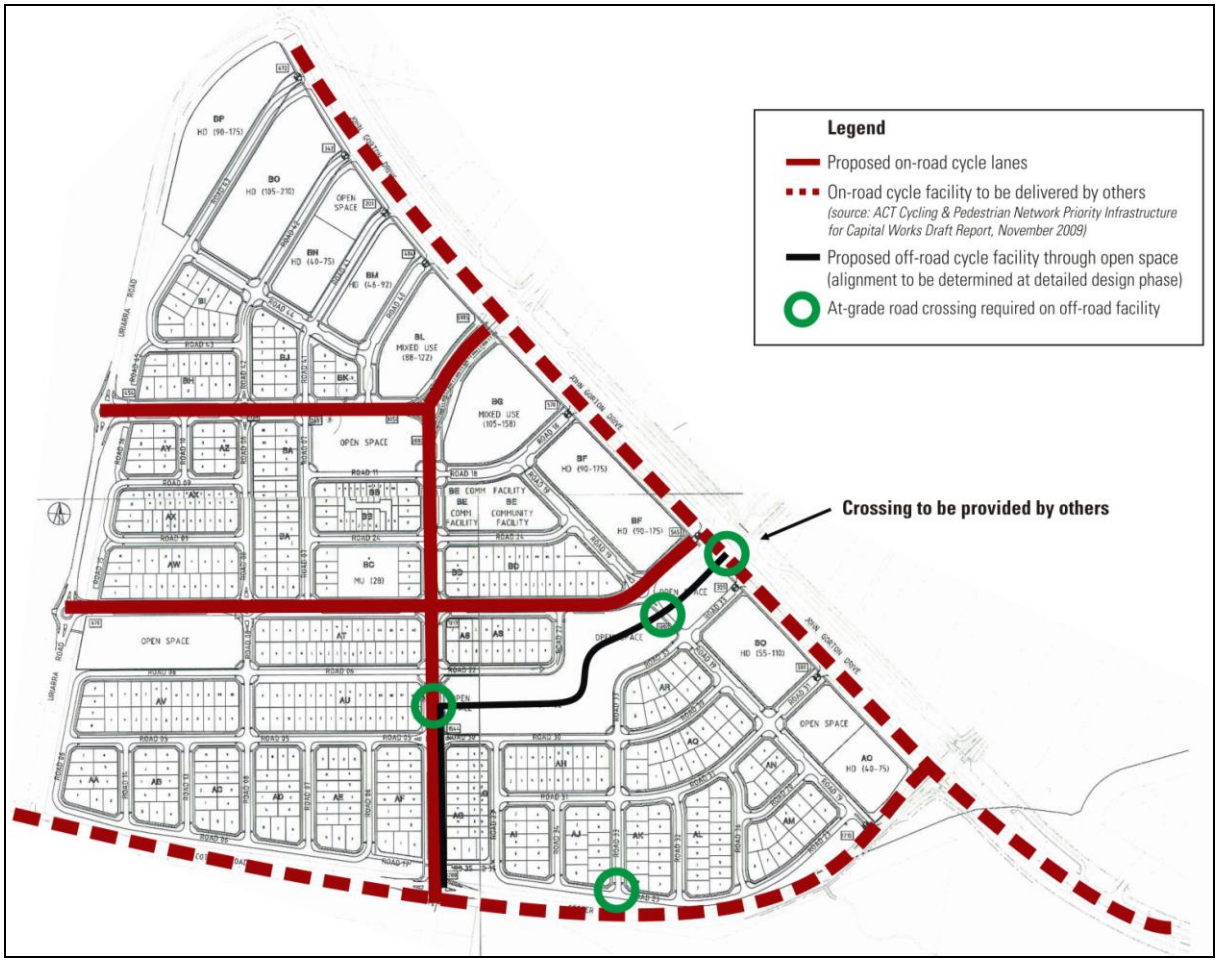
4.2.5 Public Transport Provision

In 2009, the ACT Government commissioned McCormack Rankin Cagney to prepare a strategic network plan for public transport in Canberra (*ACT Strategic Public Transport Network Plan & Service Design*, McCormack Rankin Cagney, June 2009) over the next 20 years. The strategy has produced a strategic network plan with appropriate service levels which will be used to guide land use planning in the future. As a part of this strategy, servicing the Molonglo urban release area was considered thoroughly and a strategy developed for five interim development phases and full development.

Wright, along with North Weston and Coombs, forms part of Phase 1 of the Molonglo release area. The recommended public transport services for Phase 1 include:

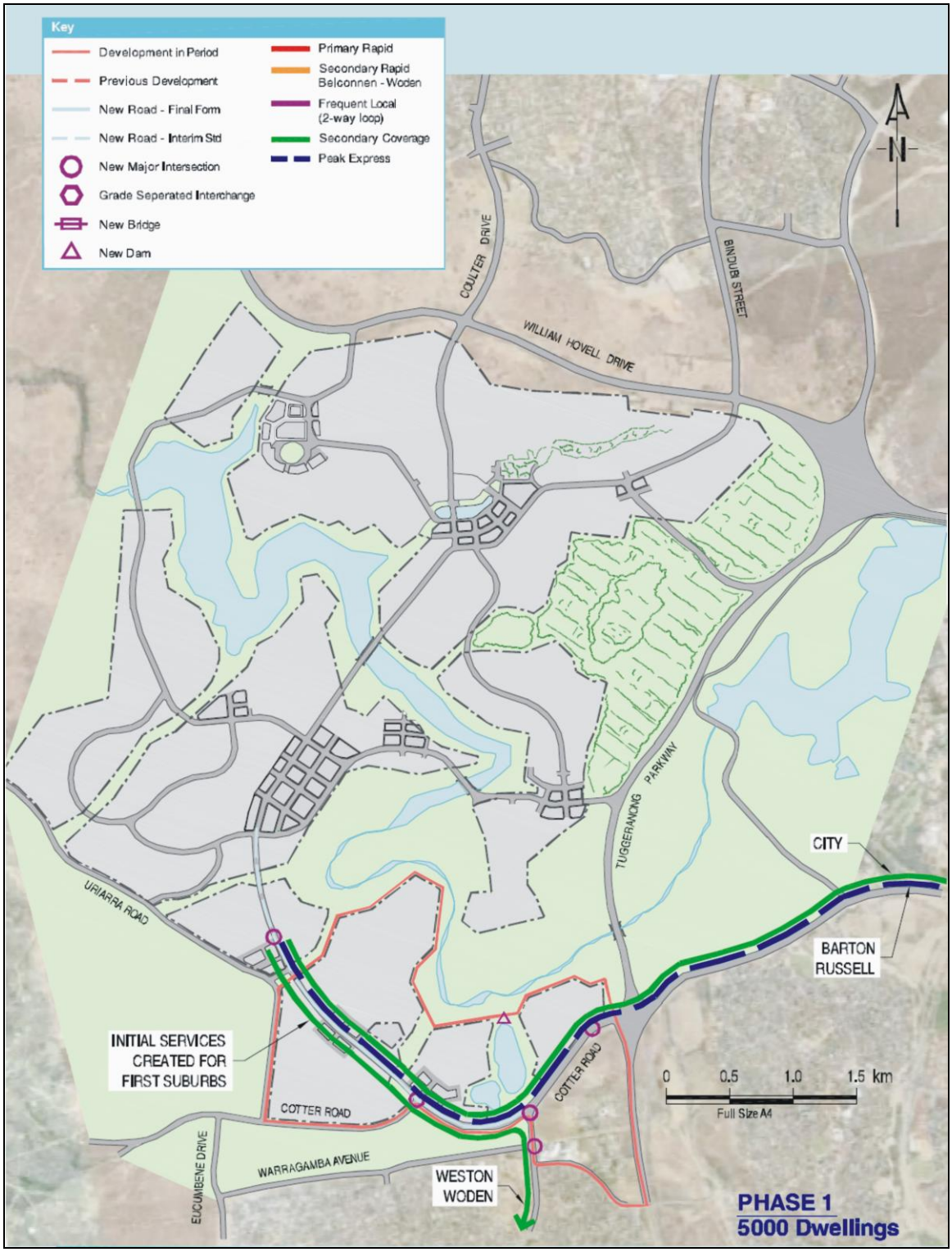
- An all-day service running from Coombs/Wright to City via John Gorton Drive, Cotter Road, Adelaide Avenue, and Commonwealth Avenue, generally at 30 minute headways. It is intended that this service grow into a 'Rapid' service running much more frequently throughout the day.
- A 'Peak Express' service from Coombs/Wright to Barton and Russell, running in the peak direction during peak periods only with a frequency to be determined by demand (initial service would probably be every 30 minutes across the two-hour peak).
- A 'Coverage' service from Coombs/Wright to Woden via Coleman Court.

Figure 4.1 Proposed Pedestrian and Cyclist Facilities in Wright



The recommended services for Phase 1 are shown in Figure 4.3. These services are shown routed along John Gorton Drive only. Dependent upon the final location of bus stops along John Gorton Drive it is likely that not all the of the proposed plan area will be within a convenient 400m walk distance of a bus service, however the majority of the area will be covered.

Figure 4.2 ACT STNP – Recommended Service Plan for Molonglo Phase 1

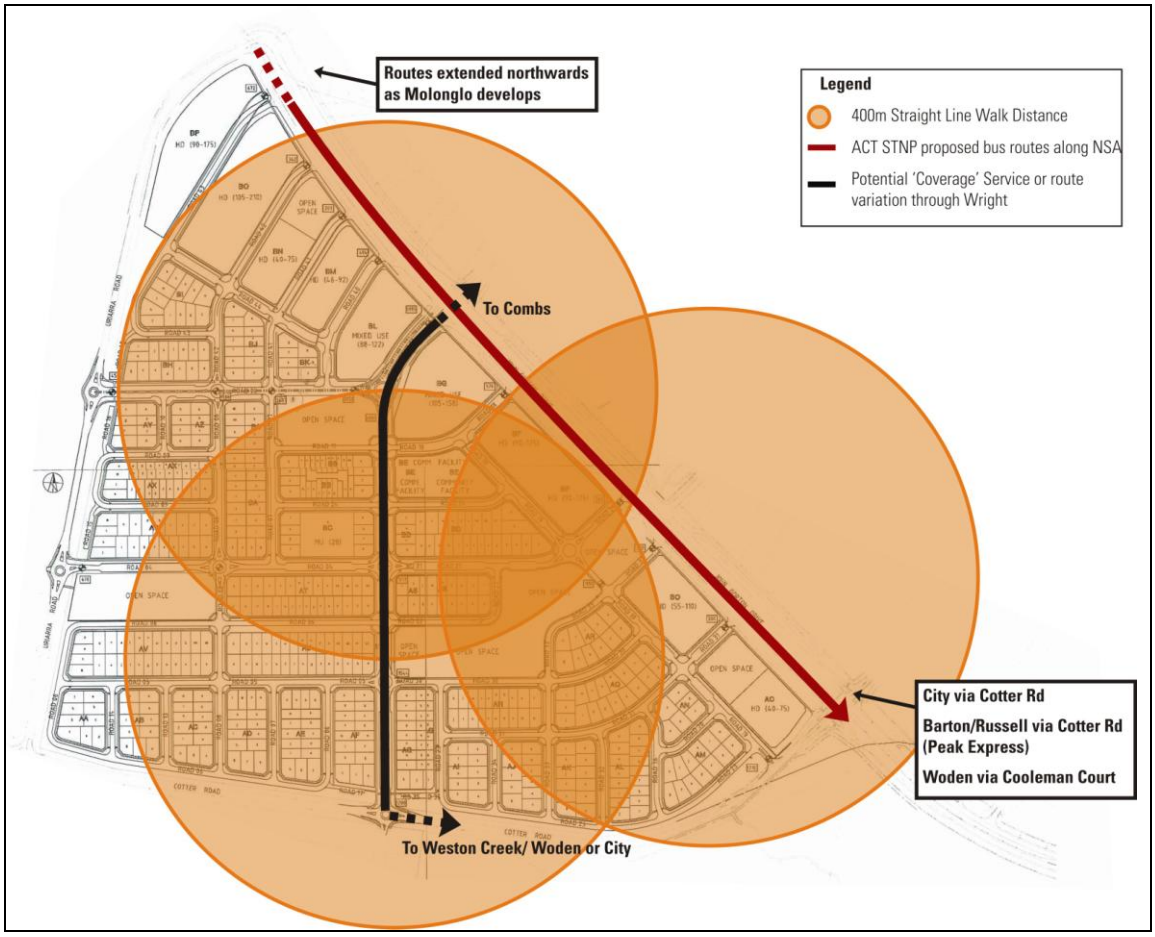


Source: ACT Strategic Public Transport Network Plan

The proposed road network and hierarchy has been designed to permit access by bus services as shown in Figure 4.3. The bus route utilises roads 2 and 3 with bus stop located at the following points:

- Northbound and southbound along road 3 between road 4 and 5. This should provide access for the public open space and surrounding residents.
- Eastbound and westbound along road 2 between road 40 and 41. This should provide access for the mixed use areas, public open space and surrounding residents.

Figure 4.3 Potential Bus Routes and 400m Straight Line Distance Catchments from Bus Stops



Also shown in Figure 4.3 are the potential plan area coverage of bus stop locations subject to ACTPLA and ACTION bus service planning objectives. Further discussion will be needed with the public transport stakeholders to confirm the suitability of the proposed internal route and service details. At this stage the location of the bus stop on John Gorton Drive is indicative only.

Roundabout intersections proposed along each of the bus routes should be appropriately designed to accommodate bus turning movements.

4.3 ROAD NETWORK OPERATIONAL PERFORMANCE

Assessments were undertaken to examine the road network operational performance on both a mid block basis and at the identified key intersections of the higher order road network.

4.3.1 ACT Classification of Residential Streets

Table 4.4 sets out the ACT Classification of Residential Streets.

Table 4.4 ACT Classification of Residential Streets

Residential Street level, type and function	Desirable speed environment (km/h)*	Indicative traffic volume (vehicles per day) **
LOCAL ACCESS STREETS		
Rear lane	25	Residents and service vehicles: 0–100
Local access A	40	0–300
Local access B	40	301–1000
Local access C	50	1001–2000
Local access streets are generally streets where the residential environment is dominant, traffic is subservient, speed and volume are low, and pedestrian and cycle movements are facilitated. Local access streets are categorised as A, B and C according to traffic volumes and width requirements for the road reservation as per Table 4. Rear lanes and Local Access A provide access to sites without any traffic generated by sites in other streets.		
COLLECTOR STREETS		
Minor collector	50	1000–3000
The collector street collects traffic from access streets and carries higher volumes of traffic. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and vehicle speeds. Vehicle speeds are controlled by street alignment, intersection design and, in some cases, by speed-control measures.		
Major collector	60	3000–6000
The major collector is generally short and connects the collector street with the corridor network. Fronting development should still be encouraged, but with siting conditions which ensure acceptable amenity and safety.		
* This is the intended maximum speed at which most drivers will travel given the inbuilt environmental speed controls created by the street layout and design. It is not a design speed for sight distance cornering or other geometric properties of the carriageway.		
** The indicative maximum traffic volume is a target volume that may be exceeded in a few cases where significant lack of economic or design quality would otherwise result.		

Based upon the traffic generation, distribution and assignment of the masterplan each street had a daily traffic volume identified such that it could be assessed against the ACT residential streets masterplan. Table 4.5 provides a summary of the assessment. It should be noted that the values are calculated based upon peak hours rounded up to the nearest whole number before factoring by ten to provide daily volumes.

Table 4.5 Proposed Masterplan Street Classification

Road Number[1]	ACT Classification	Midblock Two-way Daily Traffic Volumes (vehs/day)[2]	Comment
01	Major Collector Street	4,540	

Road Number[1]	ACT Classification	Midblock Two-way Daily Traffic Volumes (vehs/day)[2]	Comment
02 (part)	Major Collector Street	4,050	Section between Road 40 and Road 1
02 (part)	Minor Collector Street	2,480	Section between Road 40 and Uriarra Road
03	Minor Collector Street	1,140	
04	Local Access B	490	
05	Local Access B	750	
06	Local Access B	240	
07	Local Access B	80	
08	Local Access B	270	
09	Local Access B	130	
10	Local Access B	70	
11	Local Access B	60	
12	Local Access B	80	
13	Local Access B	70	
14	Local Access B	50	
15	Shared use access street	30	
16	Shared use access street	30	
17	Shared use access street	20	
18	Minor Collector Street	1,880	
19	Minor Collector Street	2,660	
20	Local Access B	20	
21	Local Access B	870	
22	Local Access B	50	
23	Local Access B	320	
24	Local Access B	140	
30	Local Access B	120	
31	Local Access B	250	
32	Local Access B	80	
33	Local Access B	80	
34	Local Access B	60	
35	Shared use access street	30	

Road Number[1]	ACT Classification	Midblock Two-way Daily Traffic Volumes (vehs/day)[2]	Comment
36	Local Access B	40	
40	Minor Collector Street	1,160	
41	Local Access B	620	
42	Minor Collector Street	1,090	
43 (part)	Minor Collector Street	2,320	North of Road 44
43 (part)	Local Access B	50	South of Road 44
44	Local Access B	310	
45	Shared use access street	20	

4.3.2 Intersection Performance

It is clear from Table 4.8 above that peak hour volumes (10% of those given within the table) on the internal road network are of a sufficiently small magnitude that does not require assessment under the Austroads guidelines identified in Table 4.3. However, there are intersections of the higher order road network where volume are slightly in excess of these. The results of peak hour intersection assessments are contained within Appendix B using a 'worst case' set of intersection assessment traffic volumes.

The result indicate that the proposed intersection assessed will all perform satisfactorily during peak hour periods.

5 SUMMARY & CONCLUSIONS

This road hierarchy and traffic analysis report is undertaken to assist in the formulation of residential development of Wright which is a precinct within Stage 1 of the Molonglo Valley Development.

The study is summarised as follows:

- The Wright Estate Development Plan is proposed as an initial stage of development of the wider Molonglo Valley development.
- Access to the proposed land release areas located along the Molonglo Valley will be via John Gorton Drive which will be constructed in stages as land is progressively developed.
- Stage 1 of the John Gorton Drive construction will provide the principal access route for the Wright Estate Development Plan area.
- The Wright Estate Development Plan envisages residential and commercial uses.
- Conservative forecast traffic volumes were estimated based upon likely permissible development yields.
- An assessment of the operational performance at a number of nominated key intersection locations was undertaken and identified acceptable levels of operation.
- Intersections within the lower order residential road network volumes are consistent with AUSTROADS minimum for acceptable operational performance. LATM measures could assist in reducing vehicle speeds to improve potential safety performance.
- No assessment was undertaken of the John Gorton Drive / site access intersection since assessments need to be include traffic from the proposed Coombs residential development located opposite on the other side of the John Gorton Drive. These assessments will be included within a traffic study for Coombs which is to be submitted soon.
- A set of road hierarchy principles were established.
- The proposed road hierarchy was described.
- Public transport routes and bus / cycle facilities within the internal precinct were described.

In summary the proposed internal road network will provide an acceptable level of peak hour road network operation and the road network will carry daily traffic volumes appropriate to their design geometry.

APPENDICES

Appendix A
Intersection Analysis

Assessments were undertaken of the future operational performance of the internal higher order road intersections. The intersection operating performance was assessed using the SIDRA software package to determine the Degree of Saturation (DS), Average Delay (AVD in seconds) and Level of Service (LoS) at each intersection. The SIDRA program provides Level of Service Criteria Tables for various intersection types. The key indicator of intersection performance is Level of Service, where results are placed on a continuum from 'A' to 'F', as shown in Table A1.based upon the NSW RTA level of service definitions.

Table A1 Intersection Level of Service

LoS	Traffic Signal / Roundabout	Give Way / Stop Sign / T-Junction control
A	Good operation	Good operation
B	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but accident study required
D	Operating near capacity	Near capacity & accident study required
E	At capacity, at signals incidents will cause excessive delays.	At capacity, requires other control mode
F	Unsatisfactory and requires additional capacity, Roundabouts require other control mode	At capacity, requires other control mode

The AVD provides a measure of the operational performance of an intersection as indicated below in Table A2, which relates AVD to LOS. The AVD's should be taken as a guide only as longer delays could be tolerated in some locations (i.e. inner city conditions) and on some roads (i.e. minor side street intersecting with a major arterial route). For traffic signals, the average delay over all movements should be taken. For roundabouts and priority control intersections (sign control) the critical movement for LoS assessment should be that movement with the highest AVD.

Table A2 Intersection Average Delay (AVD)

LoS	AVD (seconds/vehicle)
A	Less than 14
B	15 to 28
C	29 to 42
D	43 to 56
E	57 to 70
F	>70

The DS is another measure of the operational performance of individual intersections. For intersections controlled by traffic signals both queue length and delay increase rapidly as DS approaches 1. It is usual to attempt to keep DS to less than 0.9. DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceed 0.9 queues can be anticipated.

As identified in the Estate Development Plan the key intersections that have been assessed have been modelled as roundabouts with the exception of the intersection Cotter Road/Road 19 which is modelled as a priority controlled T-junction.

As described in Section 1, assessment of the John Gorton Drive / site access intersection will be provided as part of the Coomb traffic study.

The SIDRA outputs are provided later. A summary of the SIDRA assessment detailed in Table A3 shows the performance and type of traffic control for each intersection. The intersection numbering is shown at the start of the Appendix.

Table A3 Intersection Analysis

Intersection	Intersection	AM Peak Hour	PM Peak Hour

Number	Control	Degree of Saturation	Delays (s)	Level of Service	Degree of Saturation	Delays (s)	Level of Service
01	Roundabout	0.787	4.5	A	0.015	7.7	A
02	Roundabout	0.042	8.8	A	0.013	8.0	A
03	Roundabout	0.267	7.6	A	0.243	7.9	A
04	Roundabout	0.033	28.9	C	0.007	8.5	A
05	Roundabout	0.010	7.2	A	0.010	7.2	A
06	Roundabout	0.031	8.1	A	0.011	6.9	A
07	Roundabout	0.051	10.6	A	0.018	9.0	A
08	Roundabout	0.136	10.2	A	0.026	10.0	A
09	Priority T	0.323	17.8	B	0.061	12.0	A

* Average Delay is provided for the worst approach for unsignalised intersections.

The SIDRA results have shown that the internal road network higher order intersections will all operate at satisfactorily levels during both the AM and PM peak hour periods. All the roundabout intersections provide an acceptable level of peak hour operation.

Due to the proximity of Intersection 9 to the John Gorton Drive / Cotter Road intersection a sensitivity analysis of changes in demand flows was undertaken. Intersection 9 is proposed to be a priority controlled intersection. The intersection modelling has assumed all movements are permitted. However during sensitivity testing it was identified that there may be the potential for traffic queues to extend back as far as the John Gorton Drive / Cotter Road intersection. In this instance it may be prudent to restrict movements to left in / left out only at this intersection to prevent any potential interaction.

Therefore, it is recommended that during the detailed design process this be noted that there may be the potential to include a central carriageway median to prevent the right turn into the precinct from Cotter Road. It appears that any central carriageway median will not require additional widening to accommodate.

Other Internal Road Intersection Performance

The Austroads *Guide to Traffic Management Part 6 Intersections, Interchanges and crossing* 2007 identifies a range of traffic flow thresholds below which capacity assessment of priority controlled intersections are not required. A number of crossroads intersections are proposed within the road network. These intersections principally form connections between residential streets (access streets B or lesser). It is advised that the intersections types have been selected on the basis of improving vehicle accessibility and connectivity (new urban planning directions) and consideration to provide appropriate vehicle access to corner plots. There is

provision within the ACTPLA Future Urban Areas Residential Subdivision Development Code for four way intersections where intersection design and projected future traffic volumes meet AUSROADS recommended limits.

Due to the modest mid block traffic volumes on the residential road network capacity, the capacity performance of the proposed crossroads intersections should prove acceptable.

To improve the potential safety performance of the crossroad intersections there are a number of additional measures which could be considered to reduce vehicle speeds. These may include the provision of LATM measures such as gateway treatments, vertical (speed humps, speed cushions) or horizontal (chicanes, narrowing) displacement techniques or prohibition of conflicting turning movements.