

**WESTERN SYDNEY PARKLANDS
BRINGELLY ROAD BUSINESS HUB**

***Assessment of Potential Access and
Traffic and Transport Implications***

December 2014
(Rev G)

Reference 14103

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Transportation, Traffic and Design Consultants
Suite 502, Level 5
282 Victoria Avenue
CHATSWOOD 2067
Telephone (02) 9411 5660
Facsimile (02) 9904 6622
Email: ross@tpa.com.au

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	4
2. ENVISAGED DEVELOPMENT SCHEME	5
2.1 Site and Context.....	5
2.2 Envisaged Development	5
3. EXISTING ROAD NETWORK AND TRAFFIC CONDITIONS	7
3.1 Road Network.....	7
3.2 Traffic Controls	7
3.3 Traffic Conditions	8
3.4 Transport Services	8
4. FUTURE ROAD NETWORK AND TRAFFIC CIRCUMSTANCES.....	9
4.1 Road Network.....	9
4.2 Traffic Controls	10
4.3 Traffic Conditions	10
4.4 Transport Services	11
5. TRAFFIC	13
6. INTERNAL CIRCULATION AND PARKING.....	18
7. PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT	20
8. RESPONSE TO DGR'S	22
9. CONCLUSION	25
APPENDIX A	PROPOSED BRINGELLY ROAD UPGRADING
APPENDIX B	RMS PROPOSED BRINGELLY ROAD AND ACCESS INTERSECTION
APPENDIX C	EXTRACTS RELATIVE TO TRAFFIC GENERATION
APPENDIX D	EXTRACTS FROM RMS STUDIES
APPENDIX E	DRAFT WORKPLACE TRAVEL PLAN
APPENDIX F	EXAMPLE TRANSPORT ACCESS GUIDE
APPENDIX G	SIDRA RESULTS

LIST OF ILLUSTRATIONS

FIGURE 1	LOCATION
FIGURE 2	SITE
FIGURE 3	ROAD NETWORK
FIGURE 4	TRAFFIC CONTROLS
FIGURE 5	PROJECTED 2016 AND 2031 VOLUMES
FIGURE 6	PROJECTED DISTRIBUTION
FIGURE 7	PROJECTED 2031 VOLUMES WITH 100% DEVELOPMENT
FIGURE 8	PROJECTED 2026 VOLUMES WITH 80% DEVELOPMENT
FIGURE 9	PROJECTED 2026 VOLUMES (CVW)

EXECUTIVE SUMMARY

In December 2013 a Preliminary Environmental Investigation Report was submitted to the Department of Planning and Infrastructure for the “Bringelly Road Business Hub” (BRBH) with a request for acceptance of the proposal as a State Significant Development.

In April 2014 the Department provided Supplementary Director Generals Requirements for the Bringelly Road Business Hub (SSD 6324). Those requirements included the following:

8. Transport and Accessibility (Operation)

- *Provide a detailed traffic analysis of the proposal to the satisfaction of the Road and Maritime Services (RMS) and Transport for NSW (TfNSW), including:*
 - *the traffic generation potential of the proposed development, including total daily and peak hour trips with current and future daily vehicle movements*
 - *the traffic impacts on the safety and efficiency of the local road network (in particular Bringelly Road and Stuart Road fronting the site) and on intersection capacity, with a detailed intersection performance analysis on the Camden Valley Way / Cowpasture Road / Bringelly Road intersection*
 - *the potential need and associated funding for upgrading of the local road network and intersection/s, to ensure they operate with an acceptance level of service*
- *Detail the access and parking provisions associated with the proposed development including compliance with the requirements of the relevant Australian Standards and parking codes.*
- *Describe and detail measures to be implemented to promote sustainable means of transport including provision of facilities to increase the non-car mode share for travel to and from the site, including a draft Work Place Travel Plan.*
- *Ensure that opportunities for continuous regional cycle and pedestrian linkages can be maintained, including linkages between Western Sydney Parkland and Edmondson Regional Park.*

Relevant Policies and Guidelines:

- *Guide to Traffic Generating Developments (RTA);*
- *Planning Guidelines for Walking and Cycling; and*
- *EIS Guidelines – Road and Related Facilities (DoPI)*

The Western Sydney Parklands development site comprises an area of some 21 ha while there is an adjoining area to the west which has the potential for tourism, sports and active uses.

Assessment in relation to the provision for access roads, riparian corridor (including buffer zone) and lot layout has indicated that there will be some 185,000m² of developable land in the BRBH. There have been a number of landuse scenarios identified however the “highest order” (traffic) outcome comprises:

- *Large Format retail (50,000m² GFA)*
- *Light Industry (48,000m²)*
- *Service Centre (500m² GFA)*

There are also vehicle access options largely involving a potential connection to Stuart Road, however for the purposes of providing the most robust assessment of the potential traffic implications the “Large Format Retail/Light Industry/Service Centre” outcome with Access limited to a Bringelly Road intersection has been adopted.

The results of this assessment are:

** the proposed access intersection on Bringelly Road will satisfactorily accommodate the “highest order” traffic demand outcome for development for the circumstances of:*

- *projected 2026 traffic volumes and 80% “take up” of development with one right turn ingress lane*
- *projected 2031 traffic volumes and 100% development with two right turn ingress lanes*

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

- * *there will not be any adverse traffic implications for the Camden Valley Way, Bringelly Road and Cowpasture Road intersection*
- * *there will be suitable and appropriate provision for cyclists, pedestrians and public transport services relative to workers and visitors to the site*

1. INTRODUCTION

This report has been prepared to accompany a State Significant Development Application to the Department of Planning for development of the landholding known as the Bringelly Road Business Hub (BRBH) (Figure 1). The site, which is owned by Western Sydney Parklands, is located just to the west of Cowpasture Road and encompasses part of the existing Bringelly Road reservation.

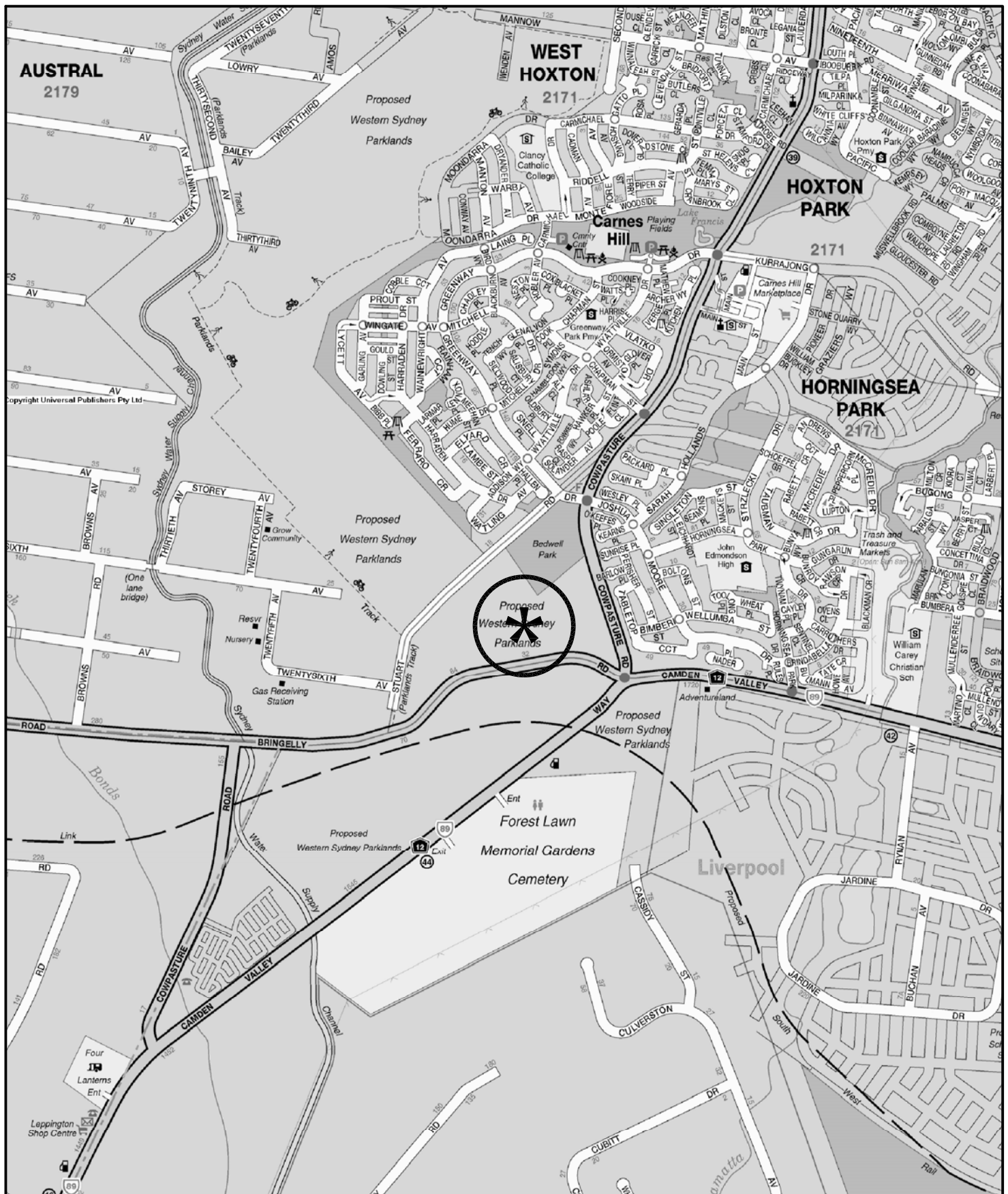
RMS are proceeding with a major upgrading project for Bringelly Road and this will include a realignment in part where the roadway along the site will move southwards and the existing reserve will become redundant to RMS needs but may need to be retained to maintain access to the adjoining Lot to the east. The proposed BRBH comprises a total area of some 21ha and the envisaged total developable area is some 185,000m². The potential highest order (traffic) development outcome has been identified namely:

Large Format Retail

Light Industry

Service Centre

There are also potential vehicle access options largely involving connection to Stuart Street, however for the purpose of this report is to provide the most robust assessment in relation to the potential access and traffic implications and this therefore adopts this development outcome with vehicle access limited to a traffic signal controlled intersection on Bringelly Road.



LEGEND



LOCATION

FIG 1

2. ENVISAGED DEVELOPMENT SCHEME

2.1 SITE AND CONTEXT

The site (Figure 2) is a consolidation of numerous lots occupying an irregular shaped total area of some 21ha incorporating some 8,000m² of the existing Bringelly Road reservation.

The site is located just to the west of Cowpasture Road and to the north of the new South West Rail Line being some 2.5 km to the east of the proposed Leppington Railway Station and commercial centre.

The site contains a number of rural residential dwellings (currently leased) with 'out buildings' having vehicle access to Bringelly Road while the surrounding uses comprise:

- * the rural and rural residential lands to the west and south
- * the Carnes Hill residential area and Western Sydney Parklands extending to the north
- * the adjoining rural residential property to the east and the Horningsea Park residential area on the eastern side of Cowpasture Road
- * the new Edmondson Park residential area to the south-east

2.2 ENVISAGED DEVELOPMENT

The existing buildings will be demolished and the site cleared with relatively minor earthworks to provide for the new access road system. It is envisaged that there will be 8 lots with an access road system which will:

- * connect to Bringelly Road



LEGEND		SITE
FIG 2		

- * largely retain the existing section of Bringelly Road (with some modification in the western part)
- * provide for a potential connection to another WSP landholding to the west which is envisaged to be developed for tourism, sporting and active hub uses
- * provide for a potential link to Stuart Road

Details of the envisaged lot layout and access road system are provided on the diagram overleaf prepared by Northrop.

It is envisaged that the Bringelly Road access intersection will be traffic signal controlled and that there will be supplementary turning lanes in Bringelly Road and in the access road. It is also envisaged that the principal intersection on the new access road (in from Bringelly Road) will have a roundabout control.

The potential development outcome is as follows:

DEVELOPMENT	SITE AREA	GFA	EXAMPLE(S)
Large Format Retail	105,800 m ²	50,000 m ²	IKEA, Masters, Bunnings
Service Centre (inc fast food)	13,600 m ²	500 m ²	BP, Shell, KFC, Nandos
Light Industrial	65,600 m ²	48,000 m ²	Warehousing, storage, distribution
Total:	185,000 m²	98,500 m²	

3. EXISTING ROAD NETWORK AND TRAFFIC CONDITIONS

3.1 ROAD NETWORK

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

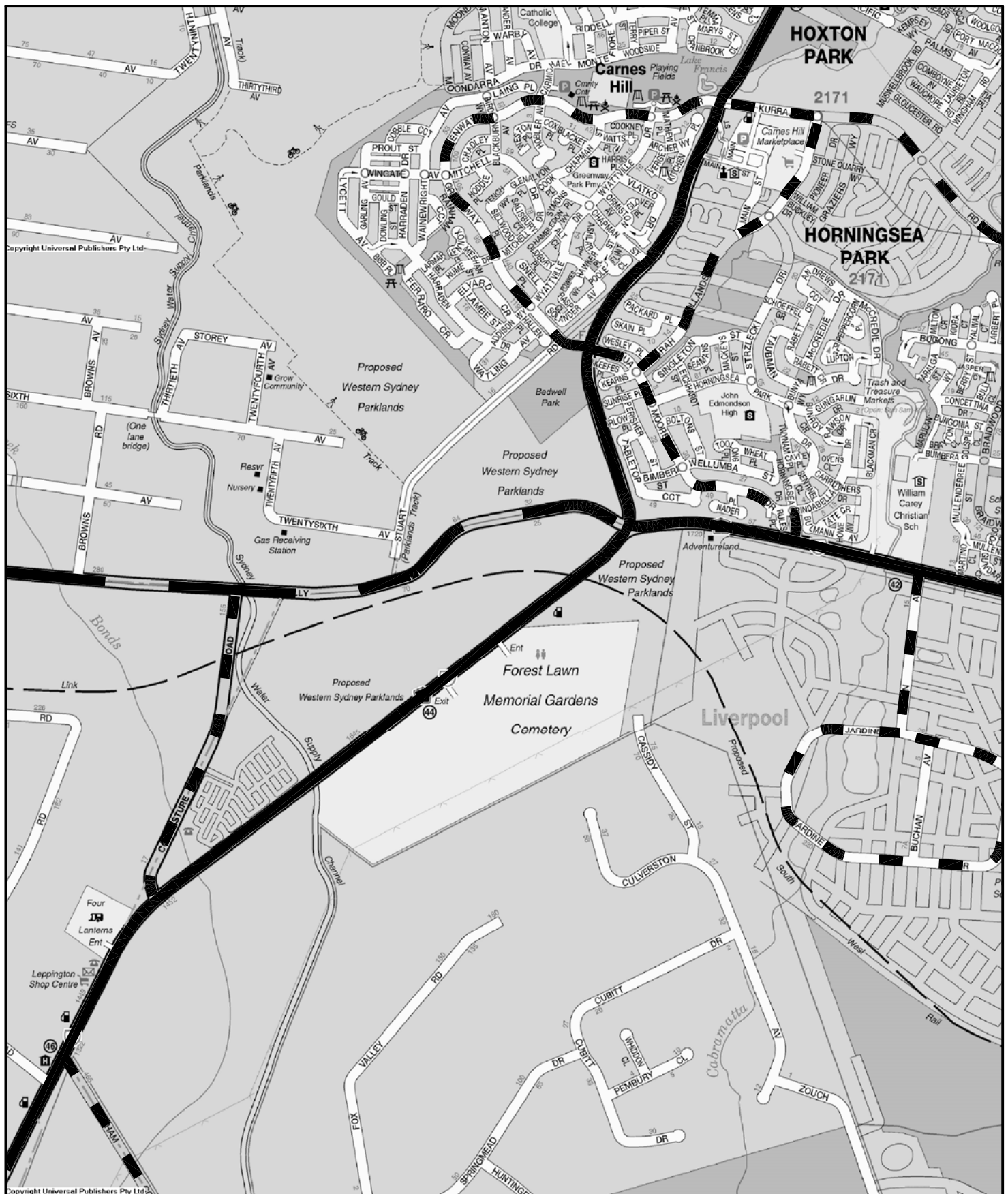
- * *Camden Valley Way* – a State Road and arterial route which connects between the Hume Highway at Casula and Camden
- * *Cowpasture Road* – a State Road and arterial route which connects between the Horsley Drive at Bossley Park and Camden Valley Way at Horningsea Park
- * *Bringelly Road* – a State Road and subarterial route which connects between Cowpasture Road/Camden Valley Way at Horningsea Park and The Northern Road at Bringelly
- * *Cowpasture Road (South)* – a State Road and Collector route which connects between Camden Valley Way and Bringelly Road
- * The collector road systems serving Horningsea Park, Carnes Hill and Edmondson Park
- * *Stuart Road* – a local access road, connecting to Greenway Drive

Bringelly Road is currently a two lane 2 way sealed road with gravel shoulders and no kerb/gutter while Stuart Road has a 2 lane rural pavement without kerb and gutter or footways.

3.2 TRAFFIC CONTROLS

The limited existing traffic controls on the road network (Figure 4) comprise:

- * the 70 kmph speed restriction on Bringelly Road east of Cowpasture Road (South) and 80 kmph to the west
- * the traffic signals at the Bringelly Road, Cowpasture Road and Camden Valley Way intersection



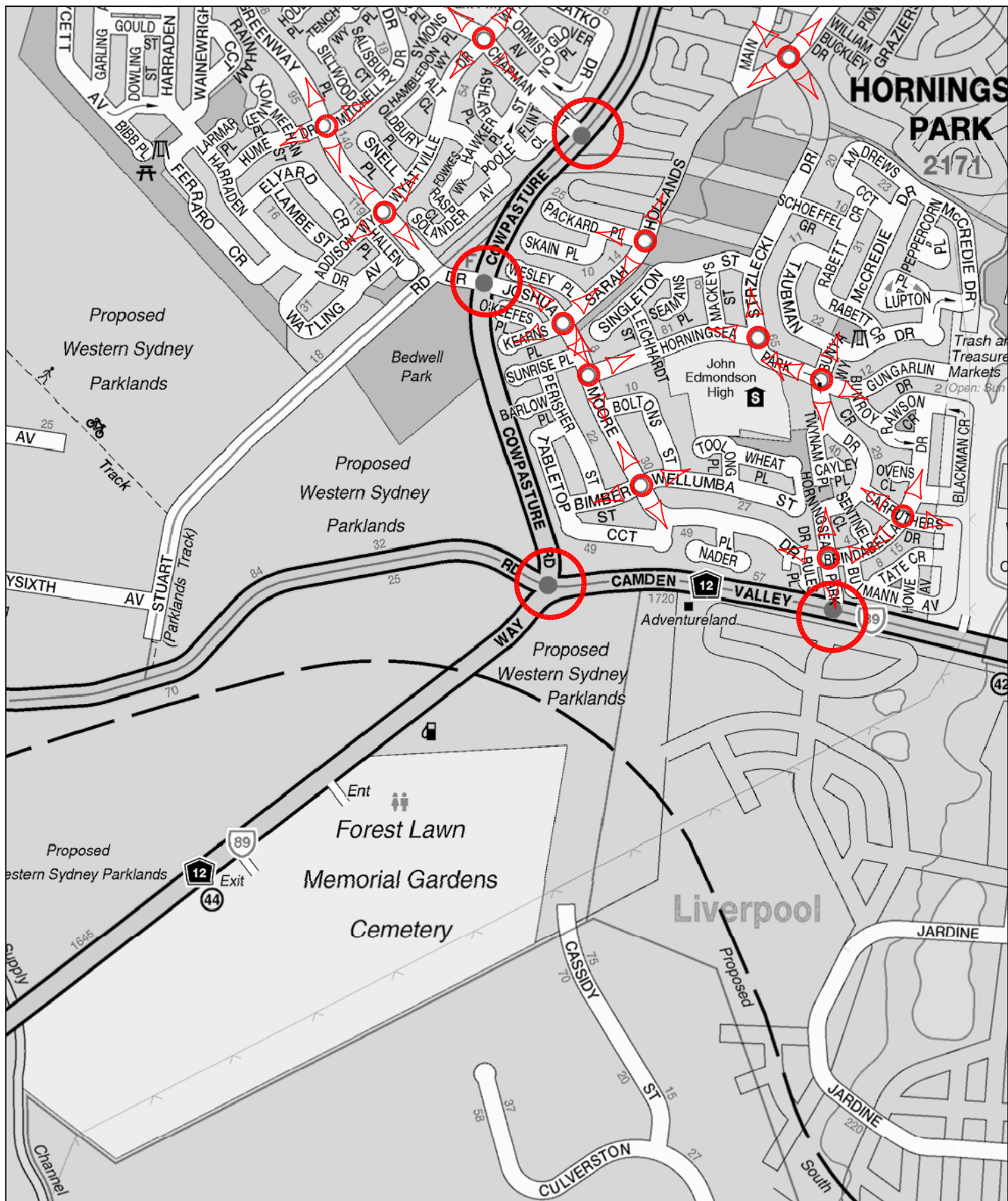
LEGEND

- ARTERIAL
- SUB-ARTERIAL
- COLLECTOR



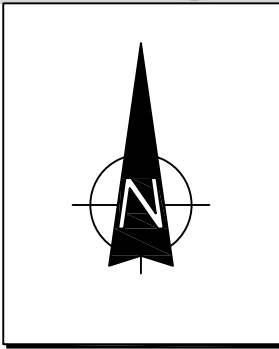
ROAD NETWORK

FIG 3



LEGEND

-  TRAFFIC SIGNAL CONTROL
-  ROUNDABOUT
-  RESTRICTED TURNING MOVEMENT



**TRAFFIC
CONTROLS**

FIG 4

- * the central median island along Cowpasture Road
- * the traffic signals at the Cowpasture Road, Greenway Drive and Joshua Moore Drive intersection

3.3 TRAFFIC CONDITIONS

The existing traffic volumes on Bringelly Road to the west of Camden Valley Way are as follows:

AADT	AM Peak	PM Peak
9,090	700	800

The operational performance of intersections in the vicinity of the site during the morning and afternoon peak periods is quite satisfactory at the present time without any undue queuing or congestion.

3.4 TRANSPORT SERVICES

There is currently only limited public transport provision in the vicinity of Bringelly Road corridor and there is no operating rail link to the suburbs immediately north or south. The nearest existing train stations are at Glenfield and Liverpool, which are serviced by the South, Airport and East Hills Lines and the Cumberland Line.

There are two Interline Bus Services routes currently operating along sections of Bringelly Road. Route 856 operates from Liverpool to Bringelly, via Bringelly Road, Ingleburn Road and Camden Valley Way with hourly during peak periods and infrequently during non-peak times. This bus service is timed to arrive at Liverpool Station to connect with onward rail services to the City.

Route 855 operates between Austral to Liverpool, via Fifteenth Avenue, Cowpasture Road and the Hume Highway with weekday services operating hourly between 06:00-10:00, however, only three services are provided in the afternoon.

4. FUTURE ROAD NETWORK AND TRAFFIC CIRCUMSTANCES

4.1 ROAD NETWORK

RMS propose to upgrade Bringelly Road over the 10km length between Camden Valley Way and The Northern Road and this work will complement the completed and current (planning and construction) for Camden Valley Way and The Northern Road as indicated on the diagram overleaf.

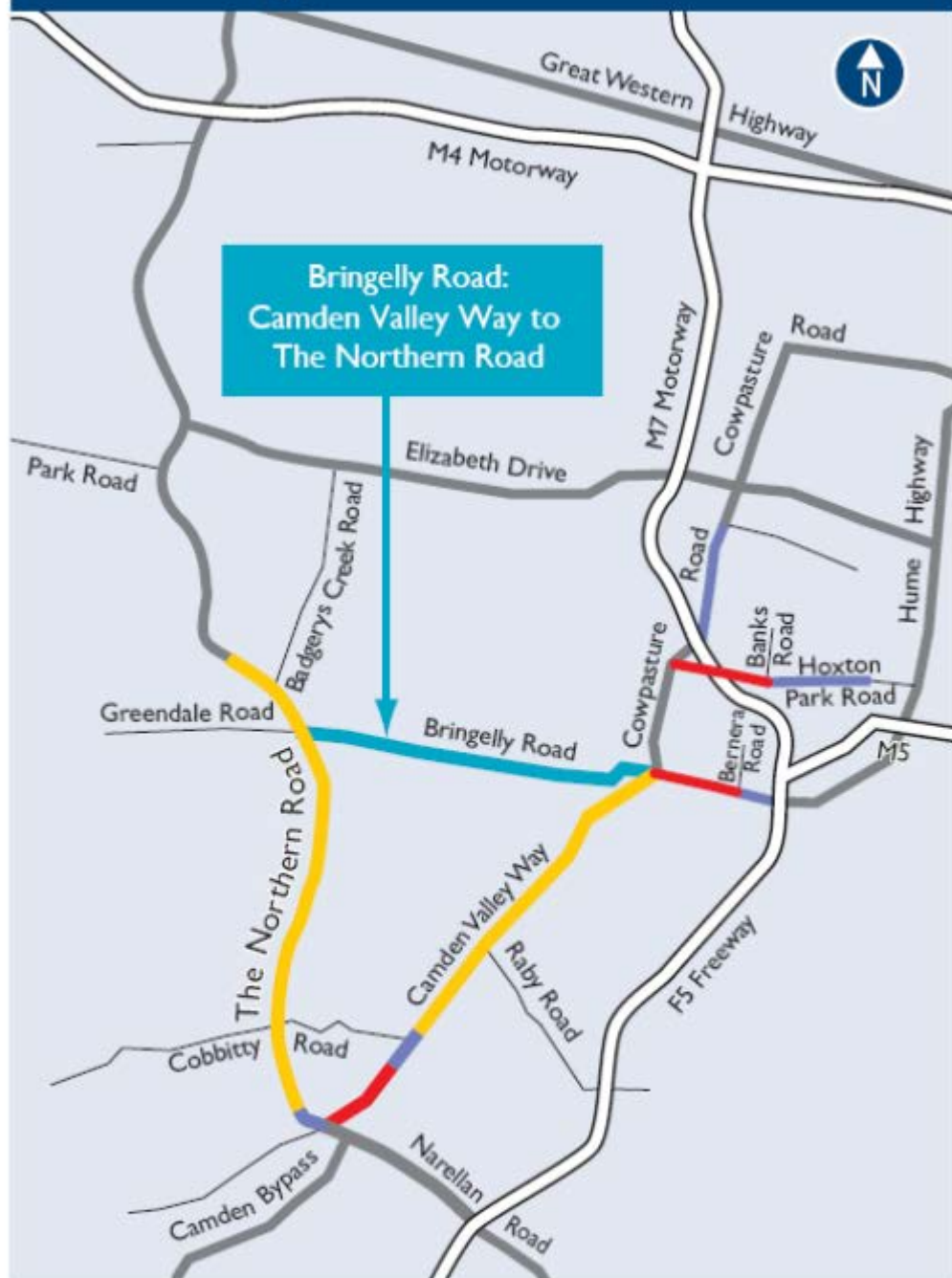
It is envisaged that the upgrade works on Bringelly Road will be staged with construction potentially being undertaken between 2016 and 2036 as suggested on the schedule reproduced overleaf from the AECOM Traffic and Transport Modelling Assessment undertaken for RMS. Diagrams indicating the staging of works particularly at the Cowpasture Road (South) intersection (and hence across the BRBH site frontage) are reproduced from the AECOM study in Appendix A.

The staging proposals indicate that Bringelly Road across the site frontage will be 2 lanes each way between 2016 and 2031 with supplementary turning lanes at intersections and 3 lanes each way after 2031.

Details of the proposed provision for access to the WSP lands are not provided in the AECOM document nor is the proposed treatment at the Camden Valley Way, Bringelly Road and Cowpasture Road intersection. However these details are provided on the concept plans prepared for RMS which are reproduced in Appendix B.

The plan for the access intersection indicates that only minor vehicle movements were foreseen for access into and out of the Parklands landholding at the time of assessment and concept design.

Location map



LEGEND

- █ UNDER CONSTRUCTION
- █ CURRENTLY BEING PLANNED
- █ CONSTRUCTION COMPLETED
- █ PROJECT UNDER CONSIDERATION

Table 1: Intersection upgrade staging

Intersection	2011	2016	2021	2026	2031	2036
The Northern Road	Existing layout	Extend turning bay lengths	Upgrade intersection - two lanes on Bringelly Road approaches	-	-	Ultimate layout
Kelvin Park Drive	Existing layout	-	Upgrade intersection - signalisation and two lanes on Bringelly Road approaches	-	-	Ultimate layout
Jersey Road	Existing layout	-	Upgrade intersection * - signalisation and two lanes on Bringelly Road approaches	-	-	Ultimate layout
Masterfield Street	Existing layout	-	Upgrade intersection - two lanes on Bringelly Road approaches (priority intersection)	-	Upgrade intersection - signalisation and two lanes on Bringelly Road approaches	Ultimate layout
North Avenue	Existing layout	-	Upgrade intersection *- signalisation and two lanes on Bringelly Road approaches	-	-	Ultimate layout
King Street	Existing layout	-	Upgrade intersection - signalisation and two lanes on Bringelly Road approaches	-	-	Ultimate layout
Eastwood Road	Existing layout	-	Upgrade intersection *- signalisation and three lanes on Bringelly Road approaches	-	-	Ultimate layout
Fourth Avenue	Existing layout	-	Upgrade intersection - signalisation and three lanes on Bringelly Road approaches	-	-	Ultimate layout
Edmondson Avenue	Existing layout	Upgrade intersection - signalisation and three lanes on Bringelly Road approaches	-	Ban northbound and southbound right turn movements	Ban eastbound right turn movement	Ultimate layout
Browns Road	Existing layout	-	Upgrade to T intersection - signalisation and three lanes on Bringelly Road approaches	-	-	Ultimate layout
Cowpasture Road	Existing layout	Upgrade intersection - signalisation and two lanes on Bringelly Road approaches	-	-	Upgrade intersection - three lanes on Bringelly Road approaches	Ultimate layout

Source: AECOM, 2011

*- including an interim U-turn facilities to assist with local access with the upgrade of Bringelly Road to a divided carriageway

4.2 TRAFFIC CONTROLS

The Bringelly Road upgrade project envisages the provision of traffic signals at the BRBH access intersection and the Cowpasture Road (South) intersection as well as other intersections to the west. The plans also indicate the provision of Bus Priority measures with bus stops located adjacent to the BRBH access intersection. There is also provision for pedestrians and cyclists with a shared pathway along the northern side of Bringelly Road and controlled crossings at the intersection signals.

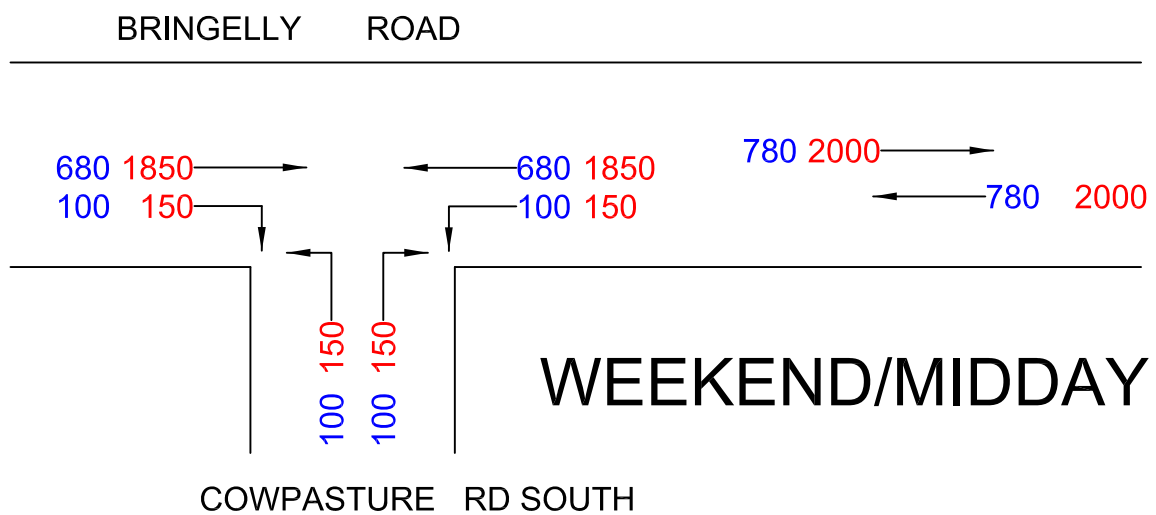
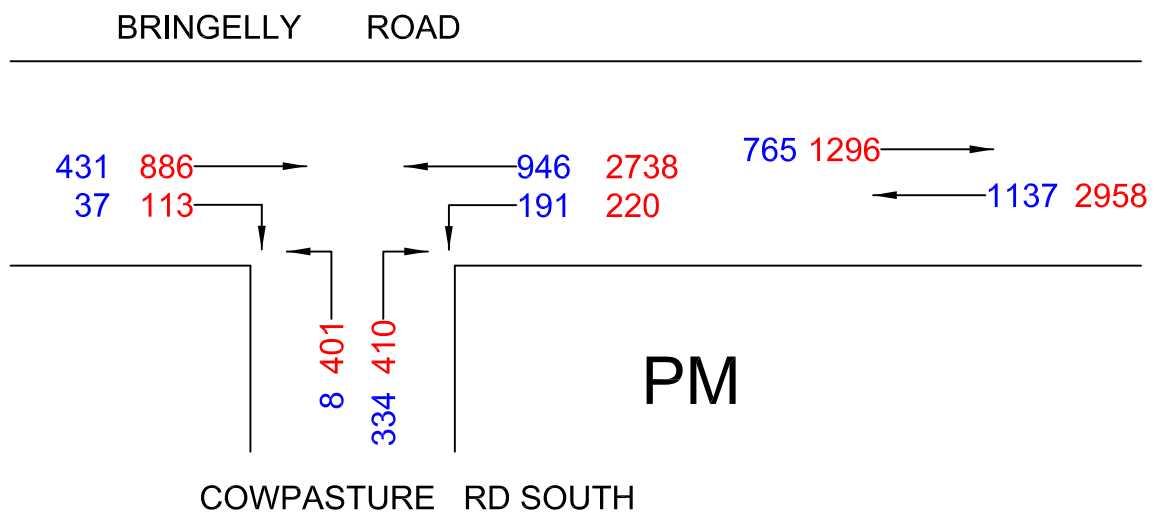
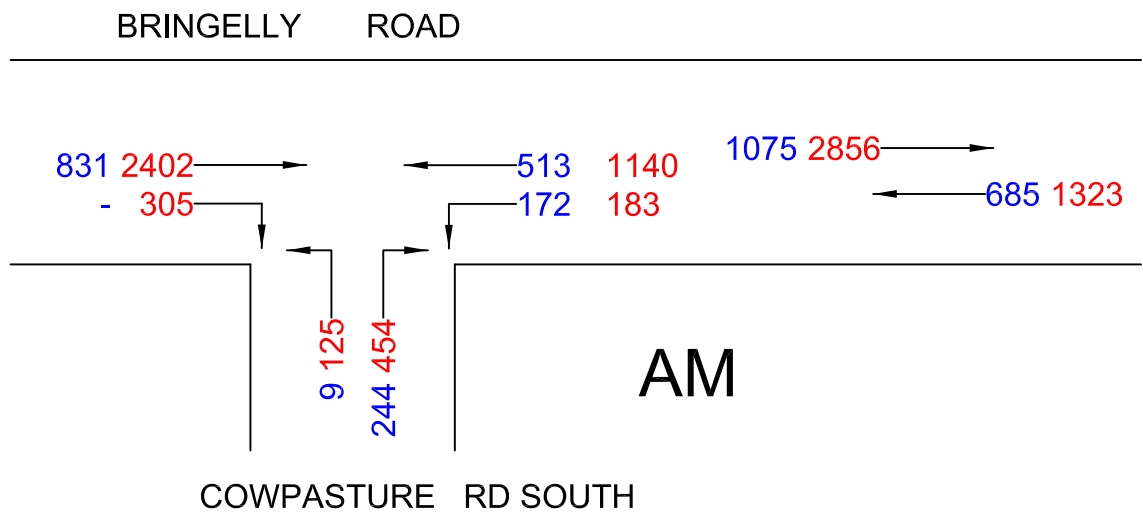
4.3 TRAFFIC CONDITIONS

The projected traffic volumes at the intersection along Bringelly Road are identified in the AECOM Study for 2016, 2021, 2026 and 2031 weekday morning and afternoon peak periods. Assessment of RMS published 7 day data reveals that the total 2 way flows on most main roads in the Metropolitan Area during the “weekend midday peak” are very similar to the total 2 way flows in the weekday peaks but split 50/50 each way (with lower side street volumes) whereas the weekday flows are “peak directional”. The projected flows past the site derived from the Cowpasture Road (south) intersection on this basis are provided in Figure 5.

The operational performance of access intersections as undertaken by AECOM having regard for the staging of the upgrade works and increasing traffic demands reveals the following operational performances for the Cowpasture Road (South) intersection.

	Level of Service	
	AM	PM
2016	A	A
2026	B	B
2031	B	C
2036	C	C

The criteria for interpreting SIDRA Level of Service output is reproduced overleaf.



LEGEND

2016 VOLUMES

2031 VOLUMES



**PROJECTED
2016 & 2031
TRAFFIC VOLUMES**

Criteria for Interpreting Results of SIDRA Analysis

1. Level of Service (LOS)

LOS	Traffic Signals and Roundabouts	Give Way and Stop Signs
'A'	Good	Good
'B'	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
'C'	Satisfactory	Satisfactory but accident study required
'D'	Operating near capacity	Near capacity and Accident Study required
'E'	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
'F'	Unsatisfactory and requires additional capacity	Unsatisfactory and requires other control mode

2. Average Vehicle Delay (AVD)

The AVD provides a measure of the operational performance of an intersection as indicated on the table below, which relates AVD to LOS. The AVD's listed in the table should be taken as a guide only as longer delays could be tolerated in some locations (ie inner city conditions) and on some roads (ie minor side street intersecting with a major arterial route).

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode

3. Degree of Saturation (DS)

The DS is another measure of the operational performance of individual intersections.

For intersections controlled by **traffic signals**¹ both queue length and delay increase rapidly as DS approaches 1, and it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 queues can be anticipated.

For intersections controlled by a **roundabout or GIVE WAY or STOP signs**, satisfactory intersection operation is indicated by a DS of 0.8 or less.

¹ the values of DS for intersections under traffic signal control are only valid for cycle length of 120 secs

4.4 TRANSPORT SERVICES

Precinct planning for release areas along Bringelly Road are aimed to ensure the provision of appropriate direct links for buses, pedestrians and cyclists enabling non-car trips both directly to adjacent suburbs and to connect with regional public transport services. The design for Bringelly Road addresses the need for supporting infrastructure including a shared pathway and bus priority measures that will enable the establishment of good bus service connections to employment and/or rail interchange nodes including Leppington, Liverpool, Campbelltown and Camden and connection to the open space network.

RAIL SERVICES

The new South West Rail Link (SWRL) from Glenfield to Leppington includes new stations at Edmondson Park and Leppington with bus interchanges, pedestrian and cyclist facilities as well as “kiss and ride” zones and commuter car parking.

The SWRL will offer a heavy rail transport option for the future residents of SWGC by providing frequent train services to Glenfield and the rest of the CityRail network providing a major opportunity for transit-oriented and sustainable development servicing the new communities and the broader SWGC.

It is proposed to initially provide four services per hour throughout the day with up to 12 trains per hour in peak periods. The frequency of service is likely to be increased over time as demand increases and service provision is influenced by patronage demand as well operating requirements of the network.

It is expected that Bringelly Road will be the main access arterial road to Leppington Station and its interchange. A total of 800 commuter car parking spaces and bus stops will be provided on both sides of the station on day of opening of services.

BUS SERVICES

The South West Sector Bus Servicing Plan provides a long-term bus servicing strategy to cater for the future urban growth in the SWGC.

The aim of the strategy is to ensure that new residents and workers in the area have a travel choice that includes public transport and that the staging of precinct releases is consistent from a public transport efficiency perspective. The strategy focuses on the SWGC but also gives consideration to suburbs and centres which are located adjacent and beyond in order to ensure integration of the bus networks within the wider South Western Sydney area.

The 'long-term' bus network proposal consists of seven regional, six district and three peak hour only bus routes to provide a network that links the proposed major centres (Liverpool, Campbelltown, Parramatta, Oran Park and Leppington) and supports accessibility to each of the SWGC precincts. The 'long-term' bus network plan is shown on the diagram reproduced for the AECOM document overleaf.

The South West Sector Bus Servicing Plan provides a guide to the potential bus networks that would be operating along Bringelly Road. Bringelly Road is seen as the most significant east-west bus corridor as the majority of proposed bus routes will be travelling on sections of Bringelly Road connecting Campbelltown, Oran Park, Leppington and Liverpool. Given its significance as a bus corridor, bus priority measures are planned for the corridor to cater for the increasing number of buses and shorter travel times for buses, with a particular focus into Leppington Town Centre and Station.

The likely peak hour headway will be 30 minutes for District Bus Routes and 15 minutes for Regional and Peak Bus Routes. There will be 26 planned bus routes serving Leppington Station in the long-term, with a peak hour bus flow of approximately 80 to 90 buses to Leppington Station via Bringelly Road.

Figure 20 Long-term 'South west sector' bus servicing plan



Source: AECOM, 2009

5. TRAFFIC

TTPA have undertaken extensive research in relation to traffic generation characteristics of various land uses and have had intense involvement with developments for Bunnings, IKEA, Service Stations, Fast Food, Warehouse/Distribution and light industrial projects.

The RMS Development Guidelines unfortunately do not provide a good guide to potential traffic generation of contemporary developments of this nature (despite the 2013 update). TTPA is progressively documenting these shortcomings with bulletins posted on its website.

Extracts from various documents relevant to the traffic generation of the uses envisaged for the development scenarios are reproduced in Appendix C including an ARRB publication in regard to “drop in trips”.

The projected traffic generation of the envisaged development is “constructed” on the schedule overleaf and it can be seen that significant influences are:

- Passing Trade (Drop In trips)
- Dual Use Visitation
- Low Morning Peak activity (Large Format Retail)

The projection traffic generation outcome (vtph) is:

	AM	PM	WEMD
Total IN/OUT	536	1,064	1,818
Passing Trade	128	287	550
Total Additional	508	977	1,518

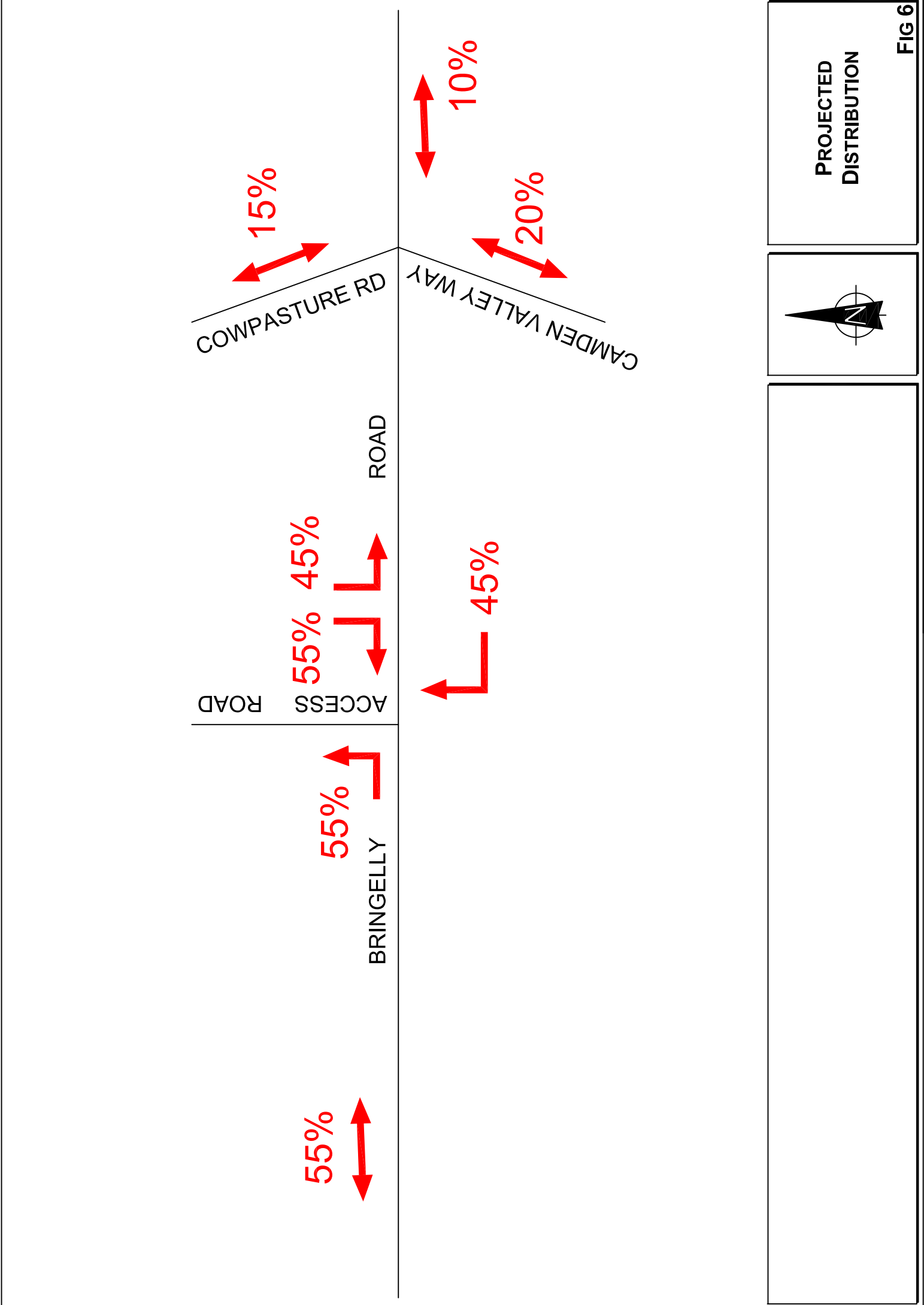
		AM		PM		WEMD	
Large Format Retail W/H	50,000m ²						
Hardware*	20,000m ²	@0.60/100m ²	120	@1.80/100m ²	360	@4.50/100m ²	900
Other**	30,000m ²		50	@ 1.50/100m ²	450	@3.50/100m ²	1,050
Dual Use	20%		136		648		1,560
P/T AM	20%		24	-	-		-
P/T PM & WE	27%		-		175		422
Light Industry	48,000m ²	@0.5/100m ²	36	@ 0.5/100m ²	240		50 (say)
Fast Food 2 outlets		@ 50vtph	100	@ 60vtph	120	@ 80vtph	160
Dual Use	20%		80		96		128
P/T	50%		40		48		64
Service Station	<i>Indicative</i>		100		100		100
Dual Use			80		80		80
P/T	80%		64		64		64
Total			536		1,064		1,818
P/T			128		287		550
Additional			408		777		1,268
Tourism, Sports, Active Hub	<i>Indicative</i>		100		200		250
TOTAL ADDITIONAL:			508		977		1,518

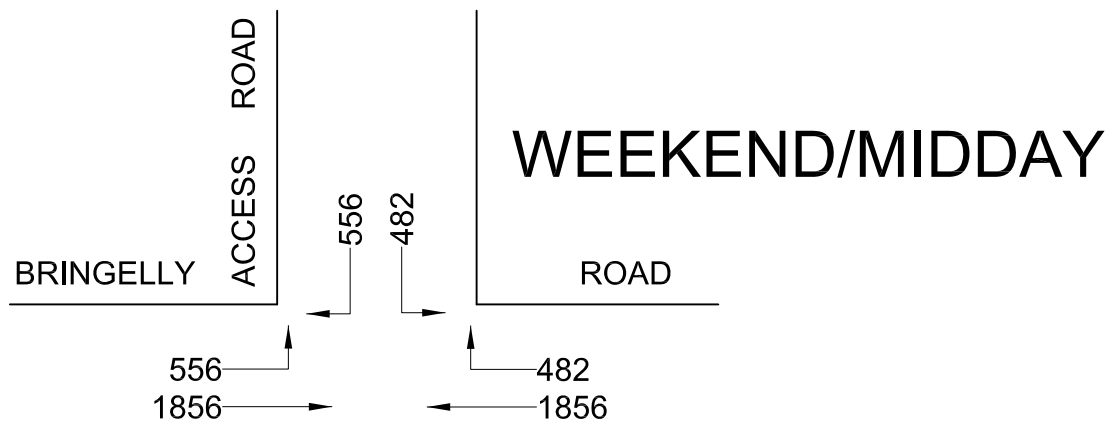
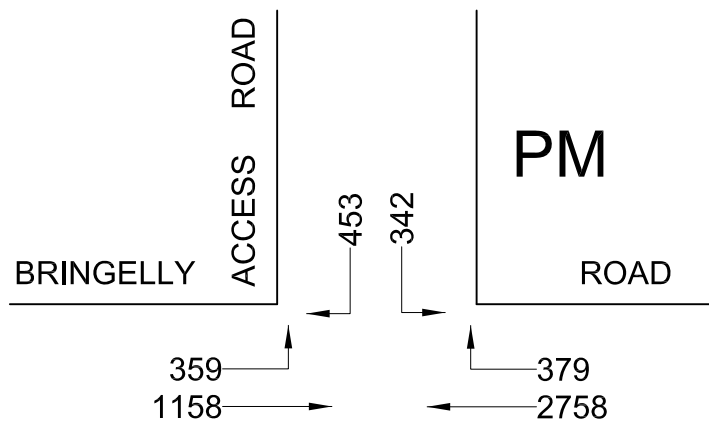
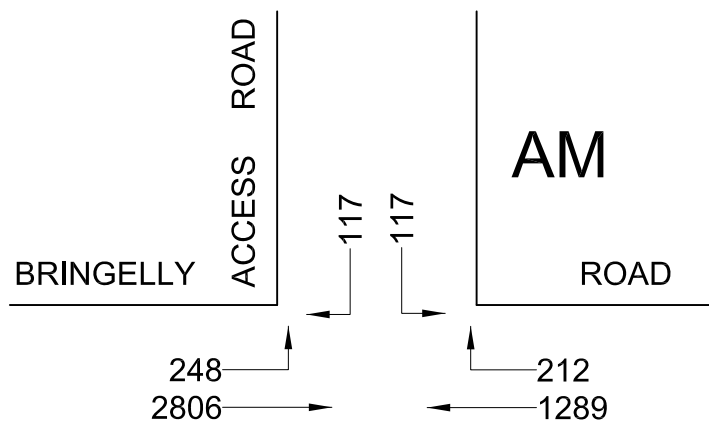
* High end use (eg. Bunnings, Masters)

** High end use (eg. IKEA) with no AM trade (staff/deliveries)

The projected distribution of generated traffic, which has been agreed with RMS, has a significant orientation to/from the west as indicated on Figure 6. The projected movements at the access intersection during the weekday morning and afternoon and weekend midday peak periods in 2031 is provided in Figure 7 having regard for:

- 100% take up (ie. development completed)
- the AECOM projection for Bringelly Road in 2031 (given that this is the projected timeframe for expansion from 4 lanes to 6 lanes)





LEGEND



**PROJECTED 2031
VOLUMES
WITH DEVELOPMENT
100% TAKE UP**

FIG 7

- some development of the WSP lands to the west for “tourism, sports, active hub” uses

The operational performance of the ultimate access intersection has been assessed using SIDRA for the design layout options of:

OPTION A Current RMS design with 4 lanes and 6 lanes with single RT lane and limited access road capacity

OPTION B Alternative (ultimate) design with 4 lanes and 6 lanes with two RT lanes and 3 egress lanes (two RT) and LT slip lanes

The results of the SIDRA assessments for these options with 100% development are summarised in the following:

	AM				PM				SAT			
	LOS	DS	AVD	RTQ	LOS	DS	AVD	RTQ	LOS	DS	AVD	RTQ
Option A (1 RT Lane)												
4 Lanes	1.03	47	D	141m	1.12	122.3	F	159m	1.21	163.8	F	196m
6 Lanes	0.86	17.9	B	95m	1.00	40.2	C	142m	1.03	65.3	E	196m
Option B (2 RT Lane)												
4 Lanes	1.02	42.4	C	61m	0.93	29.9	C	68m	1.00	51.1	D	150m
6 Lanes	0.72	11.1	A	56m	0.73	25.6	B	69m	1.00	48.7	D	122m

The results indicate that the current RMS design for the access intersection would not provide adequate capacity for the envisaged development outcome particularly in the period leading up to the expansion from 4 lanes to 6 lanes on Bringelly Road. It is also apparent that the geometry of the current design would not adequately provide for the large trucks, including B Doubles, which will access the site to serve the envisaged uses.

RMS has expressed concern in relation to the initial provision of 2 lanes to turn right into the site and requested that an assessment be provided for the provision of one right lane relative to:

- the projected 2026 traffic demands
- an 80% 'take up' of development on the site

The projected 80% traffic generation outcome (vtph) is:

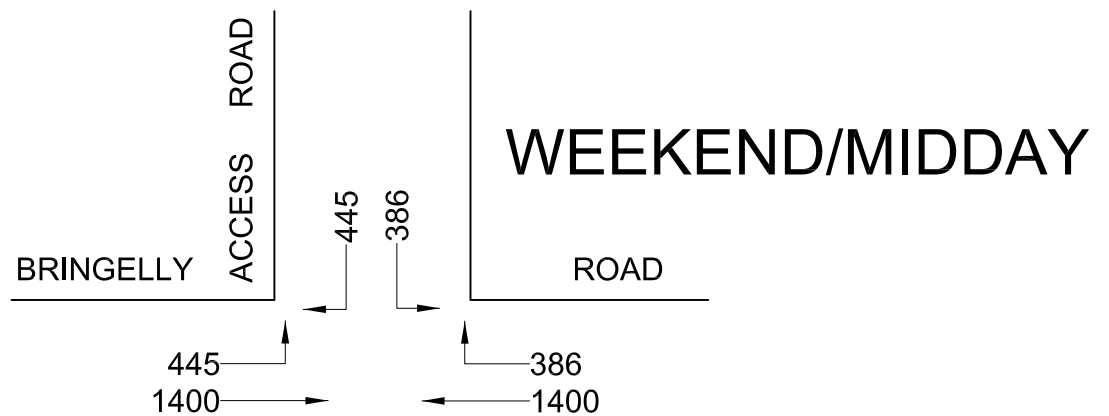
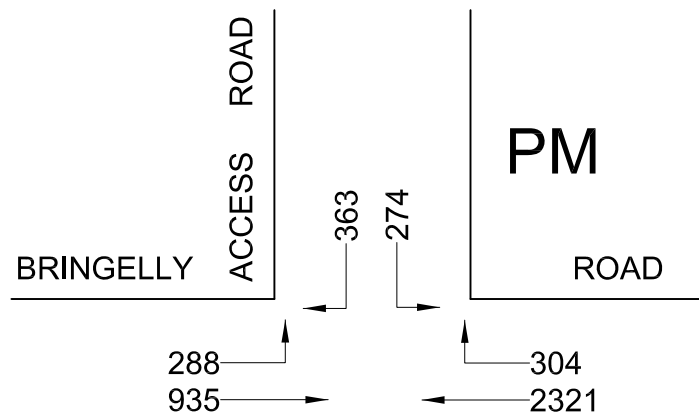
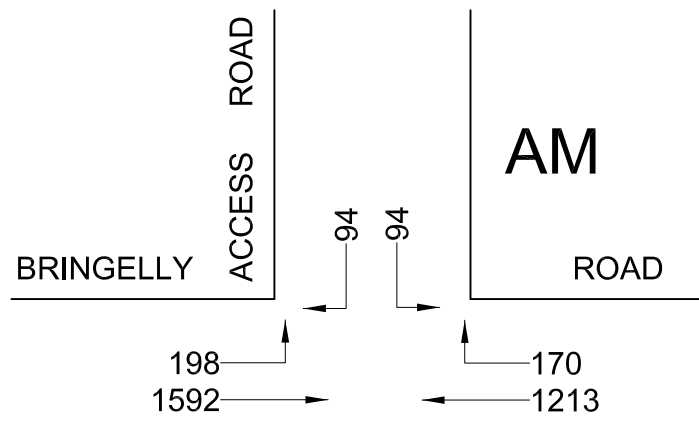
	AM	PM	WEMD
Total IN/OUT	429	852	1,455
Passing Trade	103	230	440
Total Additional	326	622	1,015

The projected 2026 volumes with 80% development are provided on Figure 8 and the results of the SIDRA modeling of this circumstance are summarised in the following:

	AM			PM			SAT		
	LOS	DS	AVD	LOS	DS	AVD	LOS	DS	AVD
4 Lanes	A	0.60	10.5	B	0.8	22.4	D	2.0	43.6
6 Lanes	A	0.40	11.2	B	0.60	22.9	C	0.8	39.3

It is apparent that under the projected 2026 volumes on Bringelly Road and 80% take up of development that the intersection will operate satisfactorily with one right turn ingress lane and 2 through lanes in each direction on Bringelly Road.

In relation to the potential provision of an access connection to Stuart Road it is presumed in this circumstance that a "light traffic" restriction would be applied to preclude trucks generated by the development from accessing via Stuart Road. It is also presumed that any "passing trade" emanating from Cowpasture Road would very largely use the Bringelly Road access. As such the worst case traffic potential for use of Stuart Road would reflect the projected 15% origin/destination of "additional" traffic as follows:



LEGEND



**PROJECTED 2026
VOLUMES
WITH DEVELOPMENT
80% TAKE UP**

FIG 8

AM
76 vtpb

PM
146 vtpb

WEMD
225 vtpb

This would be on the basis of all traffic generated to/from the north using Stuart Road, however this is a relatively unlikely outcome.

6. INTERNAL CIRCULATION AND PARKING

INTERNAL CIRCULATION

The proposed access road system will provide vehicle access to/from each of the envisaged subdivision lots suitable for vehicles up to and including B Double trucks. The “industrial standard” road system will have two cul-de-sac ends although:

- the western end can potentially connect to Stuart Road and the lands to the west
- the eastern end can potentially connect to Cowpasture Road

Indicative Lot access points are shown on the Concept Plan reproduced in Section 2.2, however details of these access and the internal lot circulation arrangements will be subject to resolution with the individual Development Applications having regard for the relevant standards and guidelines (eg. AS2890.1 and 2).

PARKING

Details of the parking provision for each lot will also be subject to resolution with the individual Development Applications although these will have regard for the relevant Development Standards as follows:

	RMS	Council
Large Format Retail	Not specified	1 space per 150m ² (Bulky Goods)
Light Industrial/ Factory	1.3 spaces per 100m ²	The greater of 1 space per 75m ² plus 1 space per 35m ² office Or 1 space per 2 staff
Warehouse	1.0 space per 300m ²	
Fast Food	1 space per 3 seats external and internal	1 space per 6 seats + queuing

Service Station	5 spaces per 100m ²	1 space per 20m ²
	convenience store	convenience store
	6 spaces per work bay	+ 1 space per staff
		+ 3 spaces per work bay

The Large Format Retail use covers a range of possibilities, however the development outcome could involve Masters or Bunnings and/or IKEA.

There has been significant recent experience with development projects for these particular uses and the experience in relation to parking demand/provision is as follows:

Masters/Bunnings	1 space per 50m ² GFA (see Appendix C)
IKEA	1 space per 25m ²

It is a normal requirement for development assessment that where parking provision for a proposed use is not specified in the relevant planning criteria or guidelines (or a variation is proposed) then it is incumbent for the parking assessment to demonstrate the suitability of the proposed parking provision by comparison with comparable existing developments. The provisions for design, accessible parking, car/trailer parking and bicycle parking etc will be in accordance with Council's DCP requirements and/or other relevant standards and guidelines (eg. AS2890.1 and 6).

If the development outcome comprised for instance the following use 'make up' the parking provision (without discount for dual use) could be as follows:

Large Format Hardware	20,000m ² @ 1 per 50m ²	400 spaces
Big Box	30,000m ² @ 1 per 25m ²	1,200 spaces
Warehouse	48,000m ² @ 1 per 300m ²	160 spaces
Fast Food	90 seats @ 1 per 3 seats	30 spaces
Service Station	160m ² @ 1 per 20m ²	8 spaces
Total:		1,798 spaces

7. PEDESTRIANS, CYCLISTS AND PUBLIC TRANSPORT

PEDESTRIANS

Footways will be constructed along the proposed access road connecting to the Bringelly Road access intersection where:

- connection will be made to the shared pathway running along the northern side of Bringelly Road linking to the region pedestrian network
- traffic signal controlled pedestrian crossing will be provided across Bringelly Road and across the access road (including the left turn “slip” lanes)

A footway connection will also be made at the western cul-de-sac bulb to Stuart Street and the existing shared path running through the Western Sydney Parklands.

Pedestrian access and circulation in the individual lots will be subject to resolution with the individual Development Applications having regard for the relevant standards and guidelines (eg. Austroads Part 13 Pedestrians).

CYCLISTS

One footway along the proposed access road will be constructed as a shared path providing access for cyclists to/from the individual lots. The shared path will connect to the Bringelly Road access intersection where:

- connection will be made to the shared pathway running along the northern side of Bringelly Road linking to the regional bicycle network
- traffic signal controller crossings with bicycle lanterns will be provided

Cyclist access, circulation and ‘end of trip’ facilities in the individual lots will be subject to resolution with the Individual Development Applications having regard for the relevant standards and guidelines (eg. Austroads Part 14 – Bicycles and AS2890.3).

PUBLIC TRANSPORT

A bus bay and associated facilities (eg. lighting, signage etc) will be provided on the Bringelly Road frontage adjacent to the access intersection and there will also be a reciprocal bay on the southern side of Bringelly Road. The proposed footways and traffic signal controlled crossings will facilitate access to/from the bus stops and these buses will provide connectivity to the Metropolitan rail and bus network (see Section 4 in relation to the planning for transport services).

If IKEA or similar develop on the site it is possible that provision will be made for tour coach access and parking in conjunction with that development.

A draft WORK PLACE TRAVEL PLAN and example TRANSPORT ACCESS GUIDE are provided in Appendix C.

8. RESPONSE TO DGR'S

DETAILED TRAFFIC ANALYSIS

Section 5 of this report contains a detailed traffic assessment including analysis of the projected traffic generation of a “high end” development outcome and the operational performance of the access intersection. In relation to the operation of the Camden Valley Way, Bringelly Road and Cowpasture Road intersection indications of the potential future traffic demands at this intersection are provided in the respective traffic assessments undertaken for REF's for upgrading of Bringelly Road¹ and Camden Valley Way².

Comparable projections are provided in the “link volume” diagrams for 2016 and 2026 reproduced from these reports in Appendix D and summarised in Figure 9. It can be seen that the projections for the morning and afternoon peaks are similar for 2016 but quite disparate for 2026 with up to 41% difference in total entering volumes.

The AECOM projection, which has some 9,000vph passing through the intersection representing some + 6% p.a. (2016 to 2026) and this would indicate the need for “grade separation” while the Camden Valley Way Study projection is assessed to be much more realistic at some + 2.5% p.a. However, the Camden Valley Way assessment (as with the AECOM Study) does not provide projected intersection movement volumes for this intersection.

The projected volumes at this intersection in 2026 for the AM, PM and Saturday MD peaks have been ‘constructed’ by assessment of the link volumes, surveys of current volumes and assessed changes resultant to urban development. The assessed movement volumes are also provided on Figure 9 along with the assessed “additional” movements generated by the envisaged development.

¹ *Bringelly Road Upgrade Review of Environmental Factor*
AECOM, Sept 2011

² *Camden Valley Way Upgrade*
Review of Environmental Factors

2016

2026

BRINGELLY ROAD STUDY

AM

PM

	1587	1269
1075		2011
685		896
1753		685

	1217	1682
765		919
1136		2046
693		1914

	2824	1777
2148		3384
1211		1429
3343		1179

	1791	2924
1257		1436
2320		3496
1234		3366

TOTAL
ENTERING

4993

5186

8597

8911

CAMDEN VALLEY WAY STUDY

	1693	1135
1083		1512
425		795
1770		1150

	1184	1813
594		859
1502		1714
1080		2105

	2068	1477
2252		2437
708		846
2374		980

	1410	2124
825		871
2200		2390
972		2445

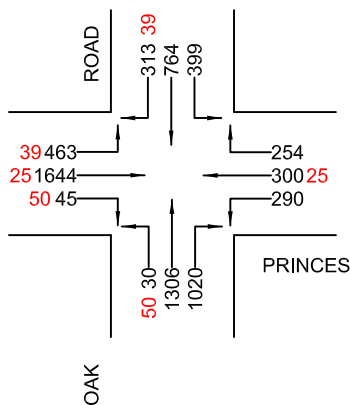
TOTAL
ENTERING

4783

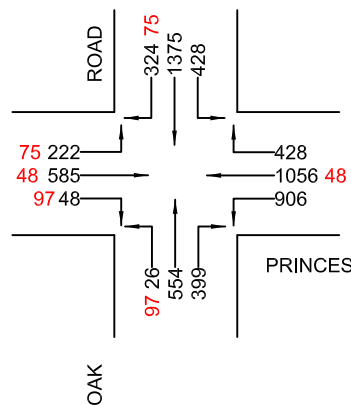
5201

6949

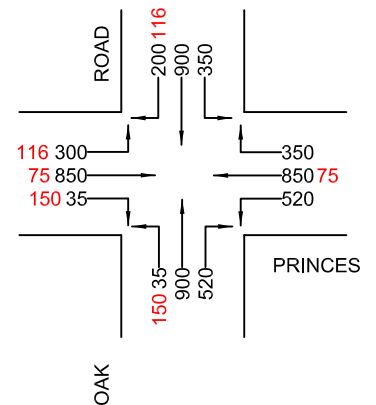
6311



AM



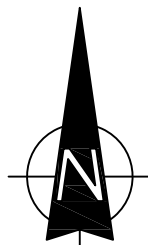
PM



SAT MD

LEGEND

123 - DEVELOPMENT "ADDITIONAL" VOLUMES



PROJECTED 2026
VOLUMES

FIG 9

The potential operational performance of the intersection with 2 through lanes on each approach plus turning lanes (as per the Appendix B plans) has been assessed using SIDRA and the results are summarised in the following:

	AM			PM			SAT		
	LOS	DS	AVD	LOS	DS	AVD	LOS	DS	AVD
2026	F	1.4	255.8	F	1.1	110.4	D	0.9	56.5
2026 + DEV	F	1.4	270.4	F	1.2	135.8	F	1.0	77.5

The results indicate that the intersections is LOS F even without the development traffic which slightly worsens the result. However, if the 3 lanes are provided for the through movements along with some addition length of storage for right turn lanes a relatively satisfactory outcome is achieved (in the context of a major arterial intersection) as follows:

	AM			PM			SAT		
	LOS	DS	AVD	LOS	DS	AVD	LOS	DS	AVD
2026	D	0.90	55.2	C	0.781	40.5	C	0.748	38.1
2026 + DEV	D	0.92	55.6	D	1.09	47.7	D	0.957	51.9

If the traffic growth to 2026 is not as great as projected for the RMS study then the result will be even better.

DETAILS OF ACCESS AND PARKING

Sections 2, 5 and 6 of this report provide relevant details of the envisaged vehicle access and parking and the relevant standards and guidelines which will be applicable for the individual lot development outcomes.

MEASURES TO PROMOTE SUSTAINABLE TRANSPORT

Section 7 of this report provides relevant details of the envisaged measures to promote a sustainable transport outcome and the provision of facilities to increase the non-car mode share for travel to/from the site. A draft Work Place Travel Plan is provided in Appendix E along with an example Transport Access Guide.

REGIONAL CYCLE AND PEDESTRIAN LINKAGES

The shared path to be provided along the envisaged new access road will provide linkage to:

- the existing shared path through the Western Sydney Parklands which presently terminates at Stuart Street
- the proposed shared path along Bringelly Road which will link to the existing regional shared path running along Cowpasture Road and Camden Valley Way (connecting to the Edmondson Regional Park)

9. CONCLUSION

This report provides a detailed assessment of the potential access, traffic and transport implications of the envisaged Bringelly Road Business Hub.

The assessment has had particular regard for the Director General's Requirements for State Significant Development (SSD6324).

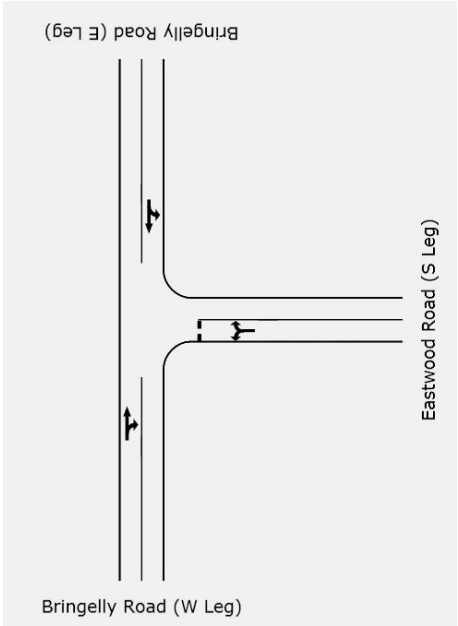
The assessment demonstrates that:

- * the proposed access intersection on Bringelly Road will satisfactorily accommodate the highest order traffic demand outcome for development for the circumstances of:
 - projected 2026 traffic volumes and 80% "take up" of development with one right turn ingress lane
 - projected 2031 traffic volumes and 100% development with two right turn lanes
- * there will not be any adverse traffic implications for the Camden Valley Way, Bringelly Road and Cowpasture Road intersection subject to the already envisaged upgrading works
- * there will be suitable and appropriate provisions for cyclists, pedestrians and public transport services

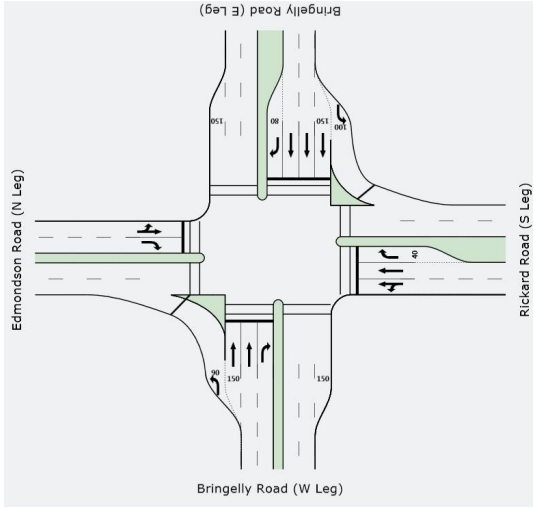
APPENDIX A

PROPOSED BRINGELLY ROAD UPGRADING

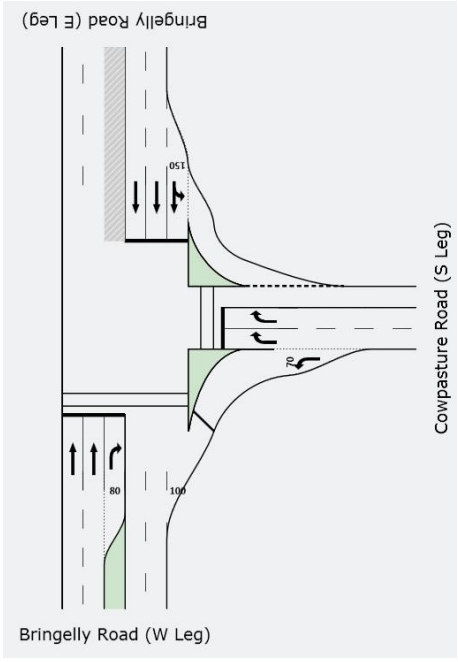
2016: Bringelly Road – Eastwood Road to Camden Valley Way



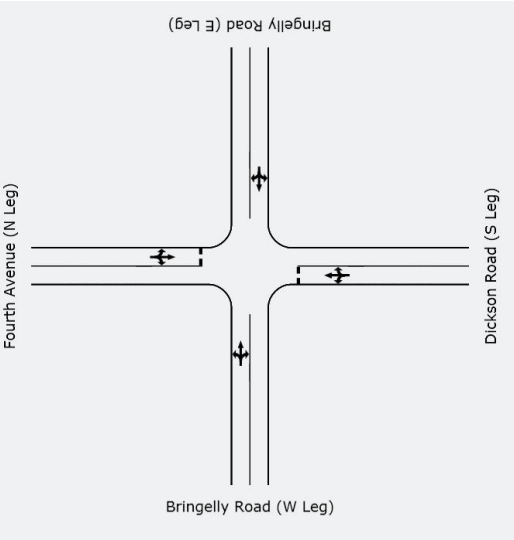
	Int. LoS	DoS	Worst Q	App
AM	A	0.476	43.6	EB T
PM	A	0.531	19.7	EB



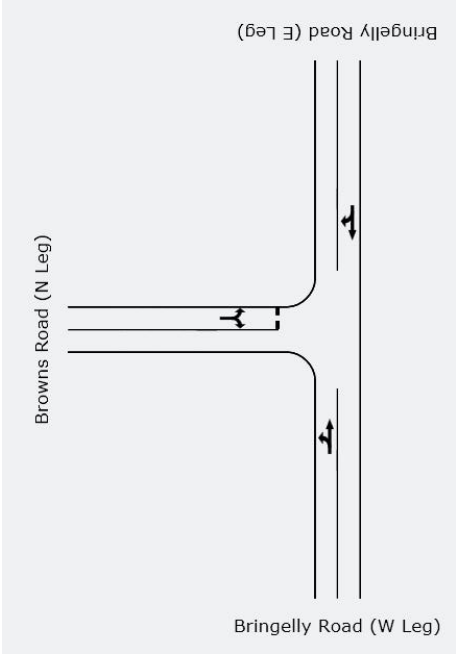
	Int. LoS	DoS	Worst Q	App
AM	C	0.867	269.1	EB T
PM	C	0.769	110.5	WBT



	Int. LoS	DoS	Worst Q	App
AM	B	0.554	74.0	EB T
PM	B	0.707	111.2	WBT



	Int. LoS	DoS	Worst Q	App
AM	A	0.808	54.3	EB
PM	A	0.806	46.8	NB



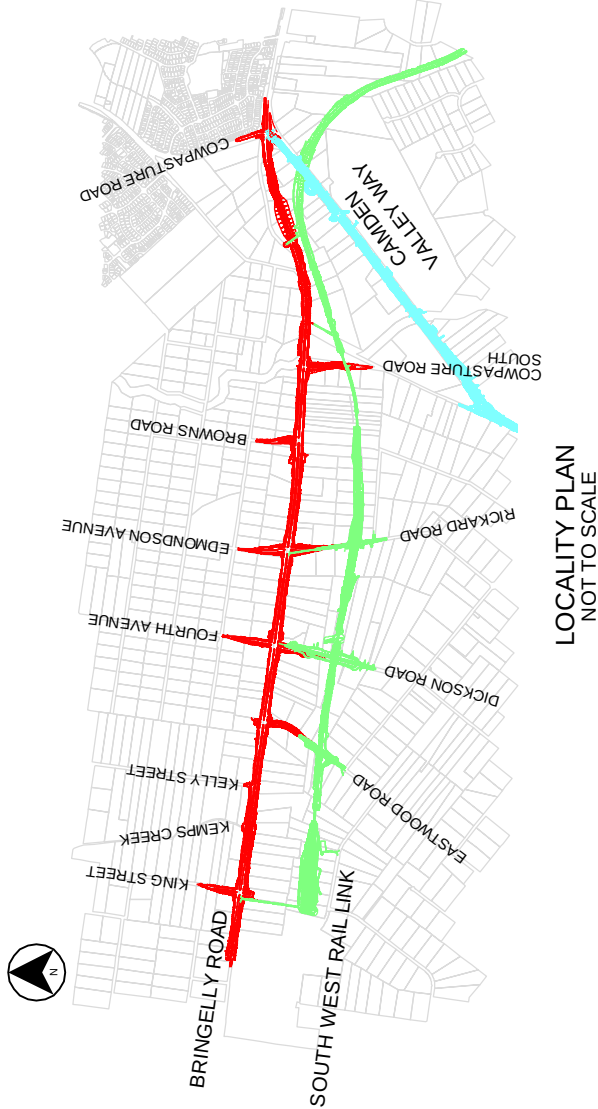
	Int. LoS	DoS	Worst Q	App
AM	A	0.427	35.2	WB
PM	A	0.490	67.1	WB

APPENDIX B

RMS PROPOSED BRINGELLY ROAD AND ACCESS INTERSECTION

ROADS AND MARITIME SERVICES

MR647 BRINGELLY ROAD UPGRADE KING STREET TO CAMDEN VALLEY WAY ROAD ALIGNMENT



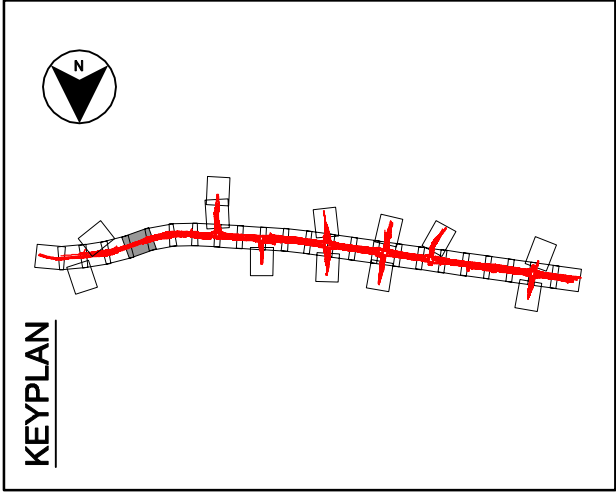
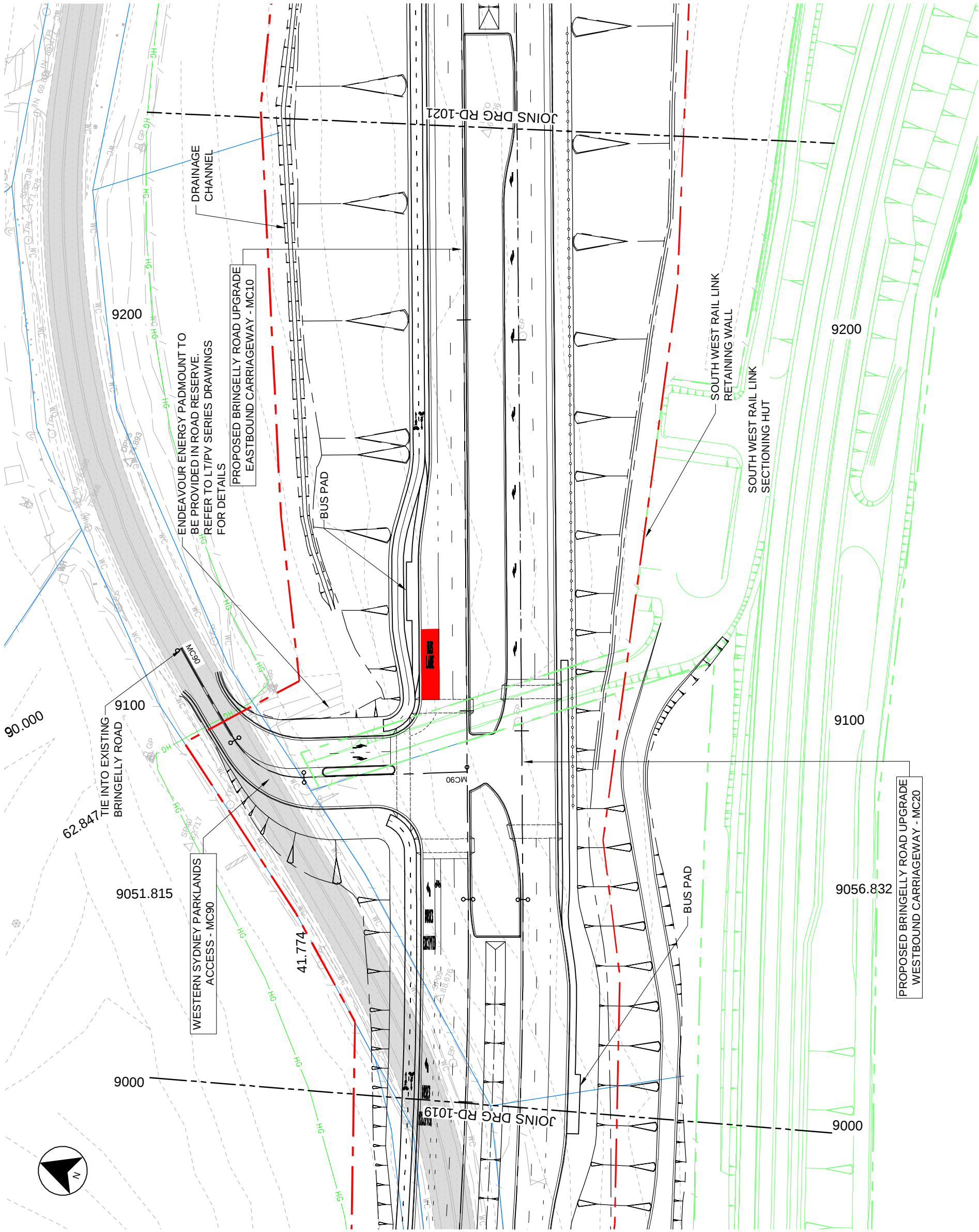
PREPARED BY



AECOM Australia Pty Ltd A.B.N. 20 093 846 925

NOT FOR CONSTRUCTION

ROADS AND MARITIME SERVICES				FILE No.		DRAWING		PRINTED DATE		SHEET No.	
CAMDEN AND LIVERPOOL COUNCIL AREA MR647 BRINGELLY ROAD UPGRADE KING STREET TO CAMDEN VALLEY WAY				AECOM AECOM Australia Pty Ltd A.B.N. 20 093 846 925		BRU-DRG-20-0000-RD-0001		20.12.2013		RD-0001	
ROAD ALIGNMENT - COVER SHEET				REGISTRATION NUMBER		DS2013/001152					
DESIGNED				REVIEWED							
Co-ordinate System: MGA Zone 56				Height Datum: A.H.D.							
This sheet may be prepared using colour and may be incomplete if copied											
No.		Amendment Description		Initials		Date		Lot Seq.			
04		ISSUED FOR FINAL DESIGN (FD)		SL		20.12.2013		014A			
03		ISSUED FOR SUBSTANTIAL DESIGN (100%)		SL		13.09.2013		014A			
02		ISSUED FOR DETAILED DESIGN (80%)		SL		21.06.2013		014A			
01		ISSUED FOR DETAILED DESIGN (60%)		SL		01.03.2013		014A			
A3 original											



DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
BRU-20-0000-RD-ROAD_20131220-FD_04

A3 original	05	ISSUED FOR FINAL DESIGN (FD)	SL	20.12.2013	0144
	04	ISSUED FOR SUBSTANTIAL DESIGN (100%)	SL	13.09.2013	0144
	03	ISSUED FOR DETAILED DESIGN (80%)	SL	21.06.2013	0144
	02	ISSUED FOR DETAILED DESIGN (50%)	SL	17.05.2013	0148
	01	ISSUED FOR CONCEPT DESIGN	SL	01.03.2013	0148
	No.	Amendment Description	Initials	Date	Lot Seq.

SCALES 0 10 20 30 40 50 SCALE 1:1000m	Co-ordinate System: MGA Zone 56	Height Datum: A.H.D.

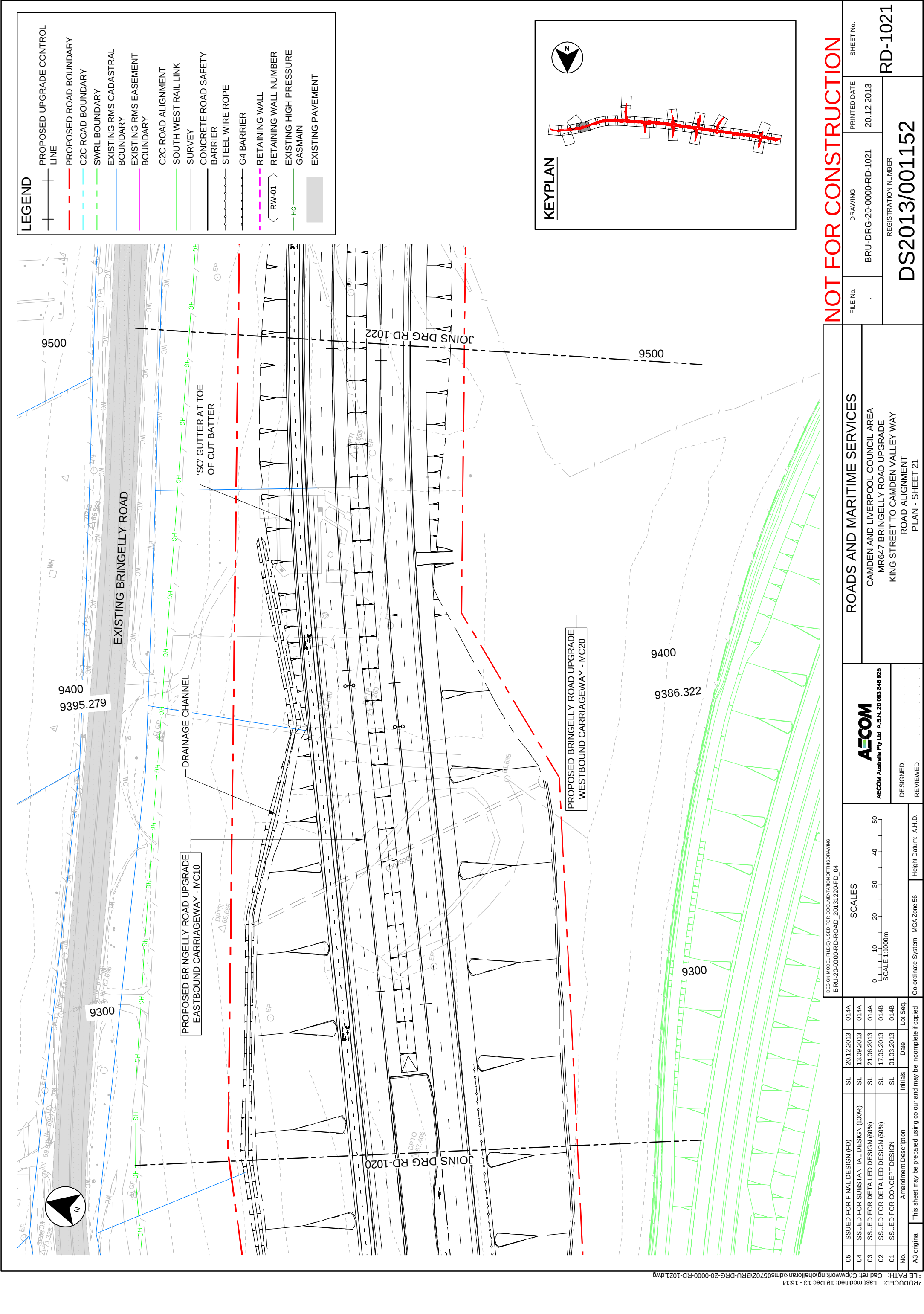
AECOM
AECOM Australia Pty Ltd A.E.N. 20 083 848 925

DESIGNED
REVIEWED

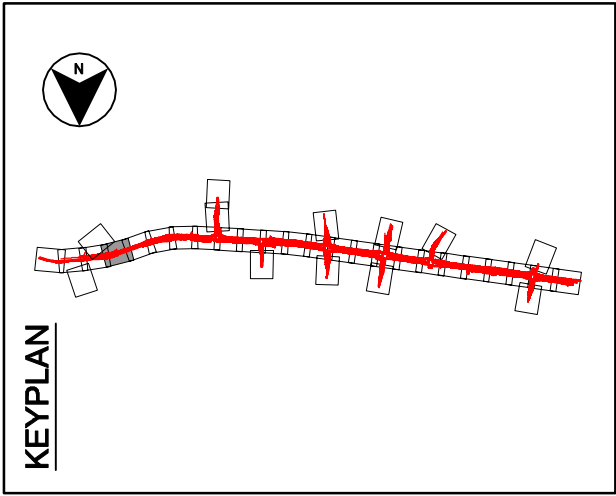
ROADS AND MARITIME SERVICES	CAMDEN AND LIVERPOOL COUNCIL AREA MR647 BRINGELLY ROAD UPGRADE KING STREET TO CAMDEN VALLEY WAY ROAD ALIGNMENT PLAN - SHEET 20
-----------------------------	---

NOT FOR CONSTRUCTION

FILE NO.	DRAWING	PRINTED DATE	SHEET No.
	BRU-DRG-20-0000-RD-1020	20.12.2013	
REGISTRATION NUMBER		RD-1020	
DS2013/001152			

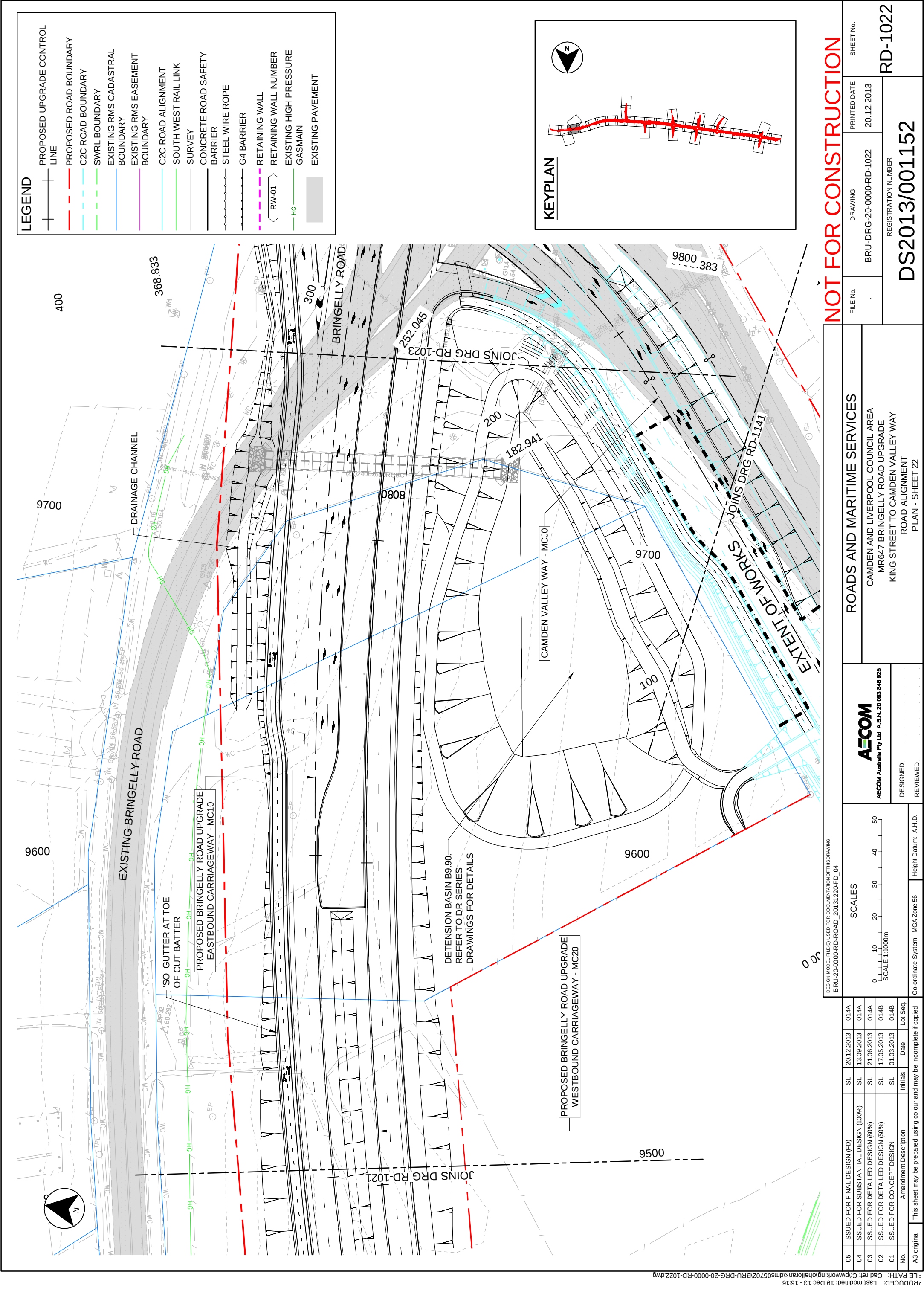


LEGEND	
	PROPOSED UPGRADE CONTROL LINE
	PROPOSED ROAD BOUNDARY
	C2C ROAD BOUNDARY
	SWRL BOUNDARY
	EXISTING RMS CADASTRAL BOUNDARY
	EXISTING RMS EASEMENT BOUNDARY
	C2C ROAD ALIGNMENT
	SOUTH WEST RAIL LINK SURVEY
	CONCRETE ROAD SAFETY BARRIER
	STEEL WIRE ROPE
	G4 BARRIER
	RETAINING WALL
	RETAINING WALL NUMBER
	EXISTING HIGH PRESSURE GASMAIN
	EXISTING PAVEMENT



DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING BRU-20-0000-RD-ROAD_20131220-FD_04									
ROADS AND MARITIME SERVICES		AECOM		ROADS AND MARITIME SERVICES		DRAWING		PRINTED DATE	
CAMDEN AND LIVERPOOL COUNCIL AREA		AECOM Australia Pty Ltd A.B.N. 20 063 846 925		MR647 BRINGELLY ROAD UPGRADE		BRU-DRG-20-0000-RD-1021		20.12.2013	
KING STREET TO CAMDEN VALLEY WAY		DESIGNED		ROAD ALIGNMENT		REGISTRATION NUMBER		RD-1021	
PLAN - SHEET 21		REVIEWED		Height Datum: A.H.D.		FILE No.		SHEET No.	
Co-ordinate System: MGA Zone 56		SCALES		0 10 20 30 40 50		SCALE 1:1000m		DS2013/001152	
A3 original		No.		Amendment Description		Initials		Date	
This sheet may be prepared using colour and may be incomplete if copied		05		ISSUED FOR FINAL DESIGN (FD)		SL		20.12.2013	
		04		ISSUED FOR SUBSTANTIAL DESIGN (100%)		SL		13.09.2013	
		03		ISSUED FOR DETAILED DESIGN (80%)		SL		21.06.2013	
		02		ISSUED FOR DETAILED DESIGN (50%)		SL		17.05.2013	
		01		ISSUED FOR CONCEPT DESIGN		SL		01.03.2013	

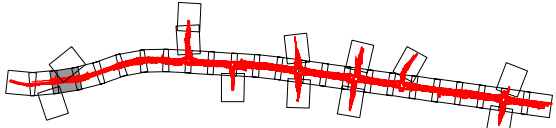
NOT FOR CONSTRUCTION



LEGEND

- PROPOSED UPGRADE CONTROL LINE
- PROPOSED ROAD BOUNDARY
- C2C ROAD BOUNDARY
- SWRL BOUNDARY
- EXISTING RMS CADASTRAL BOUNDARY
- EXISTING RMS EASEMENT BOUNDARY
- C2C ROAD ALIGNMENT
- SOUTH WEST RAIL LINK SURVEY
- CONCRETE ROAD SAFETY BARRIER
- STEEL WIRE ROPE
- G4 BARRIER
- RETAINING WALL
- RETAINING WALL NUMBER
- EXISTING HIGH PRESSURE GASMAIN
- EXISTING PAVEMENT

KEYPLAN



DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING BRU-20-0000-RD-ROAD_20131220-FD_04				ROADS AND MARITIME SERVICES				CAMDEN AND LIVERPOOL COUNCIL AREA MR647 BRINGELLY ROAD UPGRADE KING STREET TO CAMDEN VALLEY WAY ROAD ALIGNMENT PLAN - SHEET 22				FILE No.	DRAWING BRU-DRG-20-0000-RD-1022	PRINTED DATE 20.12.2013	SHEET No. RD-1022
AECOM AECOM Australia Pty Ltd A.B.N. 20 063 846 925				DESIGNED REVIEWED				RD-1022				DS2013/001152			
No.				Amendment Description				Date				Lot Seq.			
05				ISSUED FOR FINAL DESIGN (FD)				20.12.2013				01.4A			
04				ISSUED FOR SUBSTANTIAL DESIGN (100%)				13.09.2013				01.4A			
03				ISSUED FOR DETAILED DESIGN (80%)				21.06.2013				01.4A			
02				ISSUED FOR DETAILED DESIGN (50%)				17.05.2013				01.4B			
01				ISSUED FOR CONCEPT DESIGN				01.03.2013				01.4B			
A3 original				This sheet may be prepared using colour and may be incomplete if copied				Height Datum: A.H.D.				Co-ordinate System: MGA Zone 56			

NOT FOR CONSTRUCTION

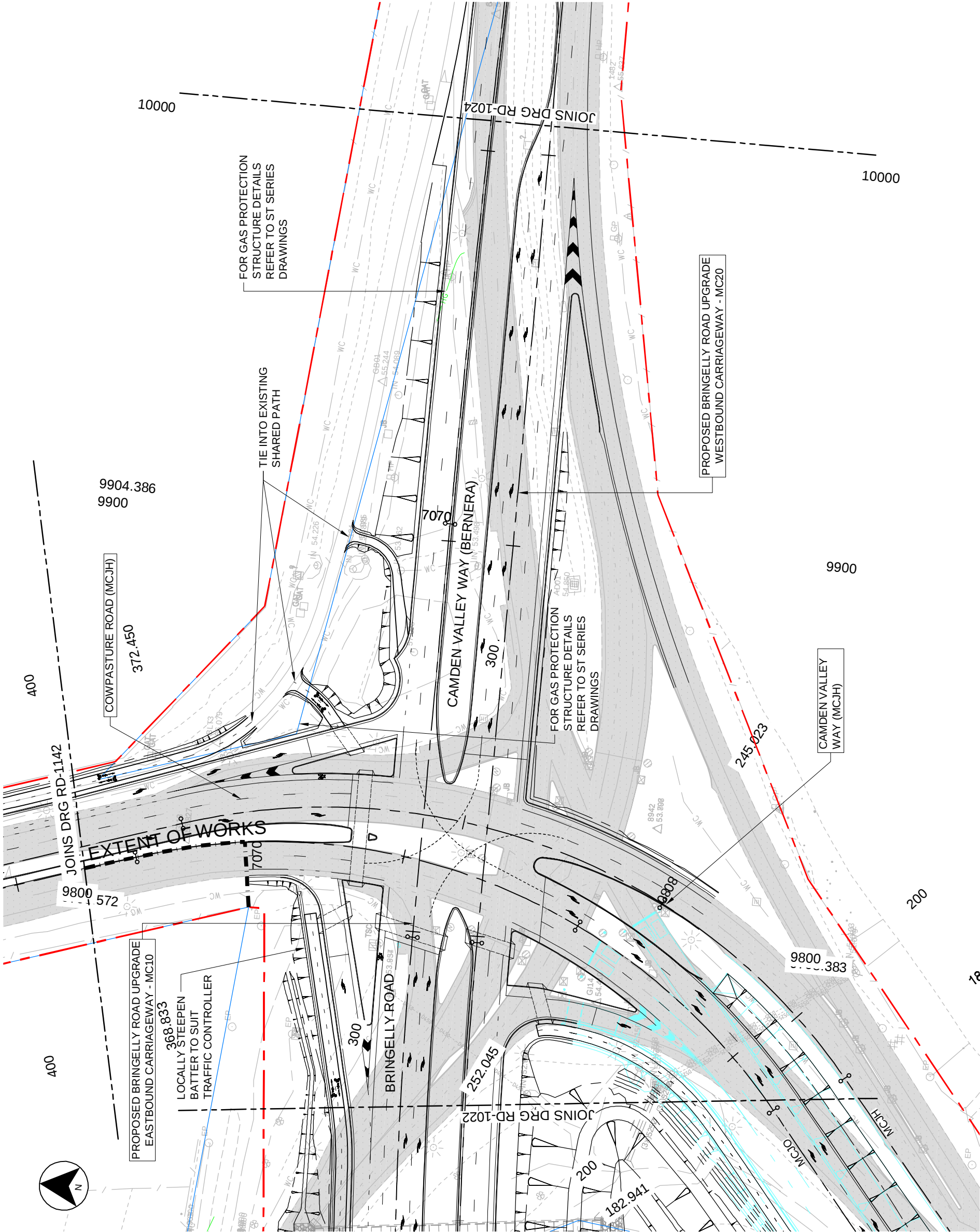
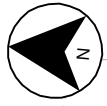
SCALES



Height Datum: A.H.D.

Co-ordinate System: MGA Zone 56

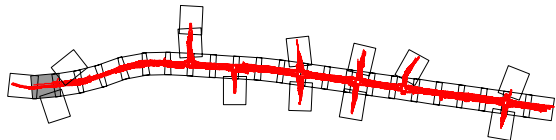
This sheet may be prepared using colour and may be incomplete if copied



LEGEND	
	PROPOSED UPGRADE CONTROL LINE
	PROPOSED ROAD BOUNDARY
	C2C ROAD BOUNDARY
	SWRL BOUNDARY
	EXISTING RMS CADASTRAL BOUNDARY
	EXISTING RMS EASEMENT BOUNDARY
	C2C ROAD ALIGNMENT
	SOUTH WEST RAIL LINK SURVEY
	CONCRETE ROAD SAFETY BARRIER
	STEEL WIRE ROPE
	G4 BARRIER
	RETAINING WALL
	RETAINING WALL NUMBER RW-01
	EXISTING HIGH PRESSURE GASMAIN
	EXISTING PAVEMENT



KEYPLAN



DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING
BRU-20-0000-RD-ROAD_20131220-FD_04

No.	Amendment Description	Initials	Date	Lot Seq.
05	ISSUED FOR FINAL DESIGN (FD)	SL	20.12.2013	01.4A
04	ISSUED FOR SUBSTANTIAL DESIGN (100%)	SL	13.09.2013	01.4A
03	ISSUED FOR DETAILED DESIGN (80%)	SL	21.06.2013	01.4A
02	ISSUED FOR DETAILED DESIGN (50%)	SL	17.05.2013	01.4B
01	ISSUED FOR CONCEPT DESIGN	SL	01.03.2013	01.4B

SCALES	
0 10 20 30 40 50	SCALE 1:1000m

AECOM AECOM Australia Pty Ltd A.B.N. 20 063 846 925	DESIGNED REVIEWED
---	----------------------

ROADS AND MARITIME SERVICES	
CAMDEN AND LIVERPOOL COUNCIL AREA MR647 BRINGELLY ROAD UPGRADE KING STREET TO CAMDEN VALLEY WAY ROAD ALIGNMENT PLAN - SHEET 23	

NOT FOR CONSTRUCTION

FILE No.	DRAWING	PRINTED DATE	SHEET No.
	BRU-DRG-20-0000-RD-1023	20.12.2013	RD-1023
REGISTRATION NUMBER		DS2013/001152	

APPENDIX C

EXTRACTS RELATIVE TO TRAFFIC GENERATION



TRANSPORT AND TRAFFIC PLANNING ASSOCIATES

A division of Monvale Pty Ltd ACN 060 653 125
ABN 44 060 653 125

November 2014 (Issue D)
Ref: 120/2013

BUNNINGS TRAFFIC GENERATION

ROAR Data was engaged to undertake traffic generation surveys at recently constructed large format Bunnings sites in the Sydney Metropolitan Area. These surveys were completed in August 2013 in unusually sunny and warm weather essentially representing an “early spring” seasonal circumstance and the results are appended. ROAR Data has also recently undertaken similar surveys at Parramatta, Wollongong and Rydalmere in NSW as well as Oxenford and North Lakes sites in the Brisbane Metropolitan Area.

Other survey data for existing Bunnings is provided by the results of the RMS Study and a study by the Traffix Group (Mornington and Thomastown in Victoria). These examples provide an escalating scale of floor areas as indicated in the following together with the “peak traffic generation” and “generation rate per 100m²” for each of the locations.

		Thursday		Saturday	
		vtph	vtph/100m ²	vtph	vtph/100m ²
Balgowlah	8,106m ²	237	2.92	444	5.48
Parramatta (RMS)	9,800m ²	247	2.52	514	5.24
Nowra (RMS)	9,948m ²	198	<u>1.99</u>	447	<u>4.49</u>
Wollongong	10,619m ²	260	2.45	550	5.18
Chatswood	11,443m ²	267	2.33	605	5.28
Minchinbury (RMS)	11,915m ²	338	<u>2.84</u>	754	6.33
Mornington (VIC)	13,369m ²	248	1.86	682	5.10
Bankstown (RMS)	*15,853m ²	289	1.82	805	5.08
Thomastown (VIC)	15,851m ²	282	1.78	778	4.91
Rydalmere	16,732m ²	281	1.68	569	<u>3.40</u>
Oxenford (QLD)	16,763m ²	302	1.80	819	4.89
Castle Hill	18,860m ²	314	1.66	900	4.77
North Lakes (QLD)	19,340m ²	180	<u>0.93</u>	482	<u>2.50</u>

☐ Variation to ‘trend’ * RMS incorrectly adopts 14,111m²

Transportation, Traffic and Design Consultants

These results (see attached graph) evidence the very clear characteristic that the traffic generation rate per 100m² reduces as the floor area increases and the 'consistency' of the results, particularly being from a number of sources, gives a high level of confidence to this traffic generation characteristic. The RMS Minchinbury site has been excluded because in 2009 when the surveys were undertaken it overtraded very significantly due to absence of any competition in its catchment. The RMS Bankstown site stated an incorrect floorspace (14,111m²) which has been revised in this document. The recent survey of the North Lakes site reveals that it currently trades very poorly largely due to the difficult accessibility circumstances although this is expected to improve as further development occurs in the catchment.

Bunnings have provided TTPA with 12 month transaction data for 6 existing Bunnings "East Coast" sites extracted to enable an assessment of seasonal influences on trade and hence traffic generation. The results of that assessment are expressed in terms of monthly trading percentile in the following:

	Launceston	Hervey Bay	Sunshine	Mentone	Oakley	Hoxton Park NSW
	Tasmania	Queensland		Victoria		
January	92%	100%	90%	91%	97%	85%
February	72%	80%	85%	82%	87%	83%
March	75%	89%	88%	78%	86%	88%
April	73%	87%	91%	82%	88%	84%
May	65%	89%	84%	78%	82%	85%
June	63%	84%	77%	71%	73%	80%
July	67%	91%	77%	71%	77%	77%
August	72%	93%	84%	78%	83%	85%
September	84%	94%	92%	85%	88%	95%
October	95%	99%	99%	96%	97%	97%
November	90%	92%	95%	95%	96%	94%
December	100%	99%	100%	100%	100%	100%

It is apparent that the colder the climate the later the "spring" trading pick up occurs while in mid Queensland there is very little seasonal variation except for the February wet season.

ARRB has published the results of a study which established "drop in trips" (passing trade) for large format hardware outlet indicating 27% on a weekday afternoon and 28% for Saturday. An extract from this paper is appended.

BUNNINGS PARKING DEMAND

The onsite parking demands were only recorded in the Saturday surveys (ROAR and RMS) as this represents the peak parking demand circumstance. The results of those surveys are as follows:

		Peak Parking	Cars per m ²
Balgowlah	8,106m ²	163 cars	1 space per 50m ²
Parramatta	9,800m ²	196 cars	1 space per 50m ²
Chatswood	11,443m ²	234 cars	1 space per 49m ²
Bankstown	15,853m ²	285 cars	1 space per 55.6m ²
Castle Hill	18,860m ²	397 cars	1 space per 48m ²

It is apparent that the peak parking demand for Bunnings is some 1 space per 50m² and the characteristic that Castle Hill retains a consistent parking demand (but lower traffic generation) reflects the longer stay pattern at the larger floor space Bunnings.

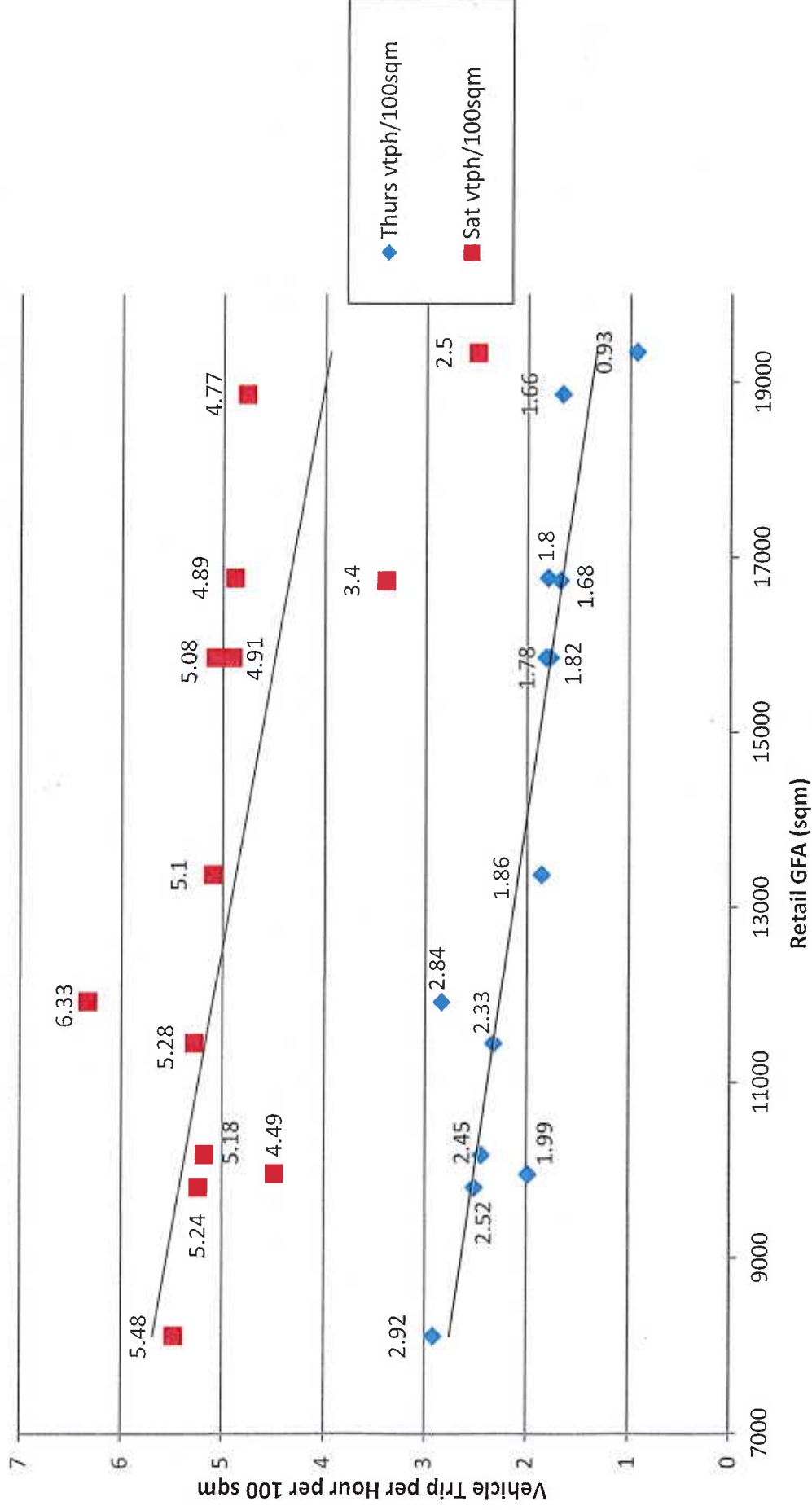
TTM have undertaken comprehensive surveys of the peak parking demands for numerous Bunnings in Queensland and details of the results are appended supporting the peak demands characteristic of 1 space per 50m².

Yours faithfully



Ross Nettle
Director
Transport and Traffic Planning Associates

Thursday & Saturday Peak Periods Traffic Generation Trendlines



ARRB EXTRACT

SUPERMARKET AND HOME IMPROVEMENT RESULTS COMPARED

The lack of data pertaining to the trip type proportion estimates for non-supermarket large-format retail developments has meant that it is common practice to apply supermarket trip type proportions to other forms of large-format retail.

The surveys undertaken at the supermarket and home improvement warehouse reveal similar proportions for primary, pass-by and link diverted trips as can be seen in Figure 10. However, despite this similarity, there is not enough evidence to confidently say that these activities should be treated as one general large-format retail activity.

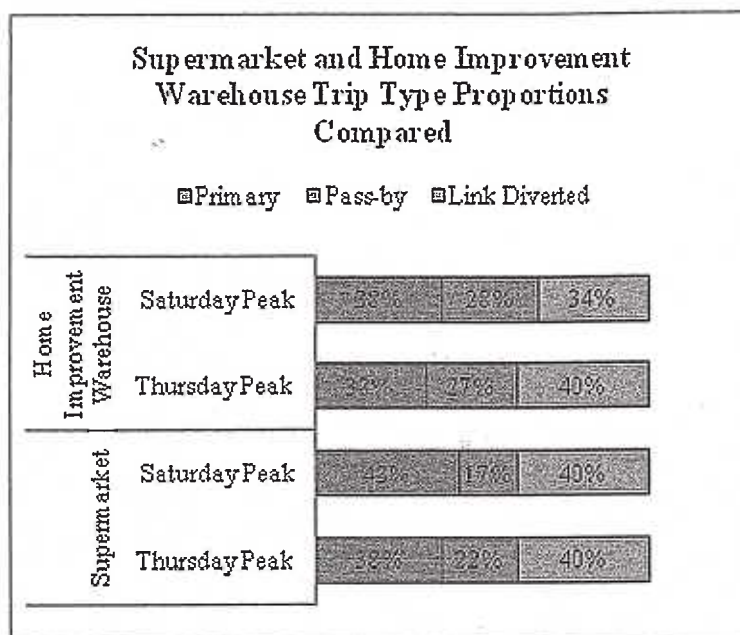


Figure 10: Surveyed trip type proportions for the supermarket and home improvement warehouse compared

CONCLUSIONS AND RECOMMENDATIONS

Given the results of the surveys, it is concluded that a higher proportion of pass-by and link diverted trips are generated by supermarket and home improvement warehouse developments than previously assumed in industry. This means that the effect of the developments surveyed on the surrounding road network is likely to be less than was estimated in the individual traffic impact assessments.

It is also concluded that through the comparison of the measured data to the international trip type proportion data, it is inappropriate to apply the supermarket proportion estimates of ITE (1991, 2008) and TRICS (1995) to a New Zealand based supermarket development. This would likely lead to an overestimate of primary trips.

The recommended trip type proportions for future supermarket developments in urban New Zealand for the Thursday evening and Saturday midday peak hour periods are outlined in Table 8 below.

Table 8: Recommended trip type proportions for supermarket developments

	Primary	Pass-by	Link diverted
Thursday PM Peak	35-45%	20-25%	40%
Saturday Midday Peak	40-50%	10-20%	40%

The recommended trip type proportion estimates to apply to future home improvement warehouse developments are outlined in Table 9 below.

Table 9: Recommended trip type proportions for home improvement warehouse developments

	Primary	Pass-by	Link diverted
Thursday PM Peak	30-35%	25-30%	40%
Saturday Midday Peak	35-40%	25-30%	30-35%

More research needs to be carried out in this area in order to make these estimates with higher confidence.

Despite the similarities in the trip results obtained at the two different developments surveyed here, it is not recommended that supermarket trip type proportions are applied to non-supermarket large-format retail. At this stage, there is not enough data to support this claim.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the significant support of 'Traffic Design Group Ltd' staff which ensured this project was successful. This research was undertaken as part of the first two authors for their BE(Civil) Hons degrees.

REFERENCES

- Consultants, J. (1995), *Trics Research Report 95/2: Pass By and Diverted Traffic – A Resume*, London: *Trip Rate Information Computer System (TRICS)*
- Auckland Council (2011), District plan – Isthmus section, <http://www.aucklandcity.govt.nz/council/documents/district/stindex/ste.asp> (accessed ??)
- Douglass M. and McKenzie D. (2001), *Trips and Parking Related to Land Use*, Vol. 1 Report No. 209, Transfund New Zealand

TTM EXTRACT

5. Car Parking Supply

5.1 Council Parking Supply Requirement

The carparking requirements for the 'Mixed Industry and Business Area North Sector One', as outlined in the Sector Plan no 026-1000 indicates that parking for both a 'hardware shop/centre', and a 'showroom' is 1 space per 30m² gfa (or 3.33 spaces / 100m²). Application of this rate to the proposed development results in a total parking requirement of 647 spaces.

The above parking supply is to include PWD parking, which is required at a minimum rate of 1 PWD space per 50 standard spaces.

5.2 Surveyed Practical Parking Demand

TTM has conducted numerous parking demand surveys at existing Bunnings stores throughout Queensland over the past two years (note that the Rocklea store has been surveyed a number of times). The results indicate that the Saturday demand is significantly higher than the weekday demand.

The Saturday results (summarised in Figure 5.1) indicate that (excluding the Stafford store) the 85th percentile parking demand rate was 1.78 spaces per 100m² gfa (or 1 space per 56.2m² gfa). The Stafford store was excluded as it is not considered representative of a normal Bunnings site in that there is a complete lack of alternative large format hardware stores in the vicinity. This is clearly not the case at the subject site, with other Bunnings stores located at Rothwell (6km), Morayfield (13km), Lawnton (13km); and a Masters to be located within the North Lakes town centre less than 3km away. Application of this rate to the proposed development results in a maximum parking demand of 345 spaces.

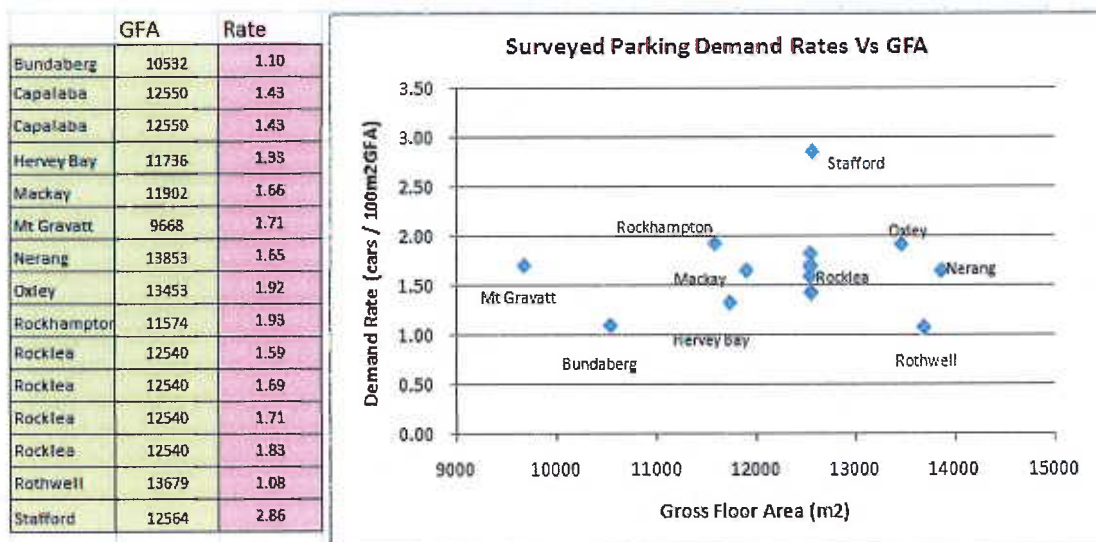


Figure 5.1: Surveyed Parking Demand Rates at Existing Bunnings Stores

RMS EXTRACT





Roads and Traffic Authority

Trip Generation and Parking Generation Surveys

Bulky Goods / Hardware Stores

Analysis Report



Table 2-2 Site Details of the Selected Sites – Hardware/DIY

Site ID	HW1	HW2	HW3	HW4	HW5	HW6	HW7	HW8	HW9
Name	Bunnings	Bunnings	Mitre10	Bunnings	Mitre10	Mitre10	Mitre10	Bunnings	Mitre10
Suburb	North Parramatta	Bankstown Airport	Windsor	Minchinbury	Narellian	Morisset	Picton	South Nowra	Orange
Region	Sydney	Sydney	Sydney	Sydney	Sydney	Northern	Northern	Northern	Southern
Network Peak Hours									
Year of Network Survey	2007	2005	2007	2007	2005	2004	2009	2009	2005
AM Peak - Weekdays	0800-0900	0700-0800	0800-0900	0800-0900	0800-0900	0800-0900	0900-1000	0800-0900	0800-0900
PM Peak - Weekdays	1700-1800	1600-1700	1500-1600	1700-1800	1600-1700	1600-1700	1600-1700	1500-1600	1600-1700
Peak - Weekends	1200-1300	1200-1300	1100-1200	1100-1200	1100-1200	1100-1200	1200-1300	1100-1200	1100-1200
Site Details - Bulky Goods/Hardware									
Area Dimension (m ²)			6,700		3,500		3,600		Unknown
Gross floor area (m ²)	9,800	14,111	1,800	11,915	2,400	2,000	1,600	9,948	1,800
No. of Employee (Total)			42		20		12		23
No. of employee (at one time)			34		15	15	12		8
Year Constructed			1990		1991-1992		Unknown		1980
Accessibility Score	<79	<79	<79	<79	<79	0.5	1	0	2
Opening Hours									
Mon-Fri	0700-2100	0700-2100	0630-1700	0700-2100	0700-1730	0630-1730	0730-1700	0700-2100	0700-1730
Sat	0800-1800	0800-1800	0800-1600	0800-1800	0730-1600	0700-1600	0700-1600	0800-1800	0800-1600
Sun	0800-1800	0800-1800	0900-1500	0800-1800	0900-1600	0700-1600	0900-1400	0800-1800	0900-1600
Parking Spaces									
Customers	263	464	44	397	35	29	75	209	28
Disabled	2	8	0	6	2	1	0	4	2
Staff			0		0	0	0		10
Loading Bay			2		1	0	5		2
Total	265	472	46	403	38	30	80	213	42
Survey Results									
Date of Survey - Weekdays	12/03/09	26/03/09	19/03/09	19/03/09	19/03/09	12/03/09	26/03/09	26/03/09	19/03/09
Weather	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny	(Thurs) Sunny
Date of Survey - Weekend	14/03/09	28/03/09	21/03/09	21/03/09	21/03/09	14/03/09	28/03/09	28/03/09	21/03/09
Weather	(Sat) Sunny	(Sat) Sunny	(Sat) Sunny	(Sat) Sunny	(Sat) Sunny	(Sat) Sunny/ Rain Evening	(Sat) Sunny	(Sat) Sunny	(Sat) Sunny

Table 2-3 Site Details of the Selected Sites – Bulky Goods

Site ID	BGI	BG2	BG3	BG4	BG5	BG6
Name	Freedom/	Harvey Norman	Retravision	Domayne	Bing Lee	Fantastic
Suburb	Balgowlah 2093	Auburn 2144	Springwood 2777	Kotara 2289	Warilla 2528	South Nowra 2541
Region	Sydney	Sydney	Blue Mountain	Newcastle	Southern	Southern
Network Peak Hours	2005	2007	2005	2004	2007	2009
Year of Network Survey Dates						18/3-24/3
AM Peak - Weekdays	0800-0900	0800-0900	0800-0900	0800-0900	0800-0900	0800-0900
PM Peak - Weekdays	1700-1800	1700-1800	1700-1800	1600-1700	1500-1600	1500-1600
Peak - Weekends	1200-1300	1200-1300	1100-1200	1200-1300	1100-1200	1100-1200
Site Details - Bulky Goods/Hardware						
Area Dimension (m ²)	4,300	25,384 (including car park)	1,600	6,029	1,200	1,700
Gross floor area (m ²)	29	220	5	50	20	9
No. of Employee (Total)	10	100	5	78	2008	9
No. of employee (at one time)	Unknown	2001	<79		26	0
Year Constructed	80-139	<79				
Accessibility Score						
Opening Hours						
Mon-Fri	0900-1800	0900-1730	0900-1730	0900-1730	0900-1730	0900-1730
Sat	0900-1700	0900-1730	0900-1600	0900-1700	0900-1700	0900-1700
Sun	1000-1700	0900-1730	1000-1600	1000-1700	1000-1700	1000-1700
Parking Spaces	43	338	13	151	51	30
Customers	0	12	0	2	4	4
Disabled	3	0	0	0	33	9
Staff	4		1	1	4	2
Loading Bay						
Total	50	350	14	154	92	45
Survey Results						
Date of Survey - Weekdays	19/03/09 (Thurs)	12/03/09 (Thurs)	12/03/09 (Thurs)	12/03/09 (Thurs)	19/03/09 (Thurs)	26/03/09 (Thurs)
Weather	Sunny	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny
Date of Survey - Weekend	21/03/09 (Sat)	14/03/09 (Sat)	14/03/09 (Sat)	14/03/09 (Sat)	21/03/09 (Sat)	28/03/09 (Sat)
Weather	Sunny/Shower	Sunny	Sunny	Sunny/Cloudy	Sunny/Cloudy	Sunny

3.3.1 Hardware / DIY

Table 3-1 Traffic Results Summary – Hardware/DIY

	Sydney Metropolitan Area					Non-Metropolitan Area			
Site ID	HW1	HW2	HW3	HW4	HW5	HW6	HW7	HW8	HW9
Gross floor area (m2)	9,800	14,111	1,800	11,915	2,400	2,000	1,600	9,946	1,800
Weekdays									
Person-based Trips									
- Site Peak Hour	484	565	101	688	119	128	97	393	100
Trips/ 100m ² GFA	4.94	4.00	5.61	5.77	4.96	6.40	6.06	3.95	5.56
- Vehicle Network AM Peak	162	92	49	273	65	49	76	127	61
Trips/ 100m ² GFA	1.65	0.65	2.72	2.29	2.71	2.45	4.75	1.28	3.39
- Vehicle Network PM Peak	281	350	88	474	79	93	66	278	64
Trips/ 100m ² GFA	2.87	2.48	4.89	3.98	3.29	4.65	4.13	2.79	3.56
Daily Total Person Trips	4,397	4,639	816	6,346	858	868	667	2,907	703
Trips/ 100m ² GFA	44.87	32.88	45.33	53.26	35.75	43.40	41.69	29.22	39.06
Vehicle-based Trips									
- Site Peak Hour	403	444	84	491	98	112	75	273	83
Trips/ 100m ² GFA	4.11	3.15	4.67	4.12	4.08	5.60	4.69	2.74	4.61
- Network AM Peak	140	84	40	243	51	42	62	108	53
Trips/ 100m ² GFA	1.43	0.60	2.22	2.04	2.13	2.10	3.88	1.09	2.94
- Network PM Peak	225	289	64	338	66	76	50	198	58
Trips/ 100m ² GFA	2.30	2.05	3.56	2.84	2.75	3.80	3.13	1.99	3.22
Daily Total LV Trips	3,441	3,643	514	4,558	605	718	523	2,055	575
Trips/ 100m ² GFA	35.11	25.82	28.56	38.25	25.21	35.90	32.69	20.66	31.94
Daily Total HV Trips	122	139	111	178	51	45	19	69	33
Trips/ 100m ² GFA	1.24	0.99	6.17	1.49	2.13	2.25	1.19	0.69	1.83
Daily Total Vehicle Trips	3,563	3,782	625	4,736	656	763	542	2,124	608
Trips/ 100m ² GFA	36.36	26.80	34.72	39.75	27.33	38.15	33.88	21.35	33.78
% HV	3.4%	3.7%	17.8%	3.8%	7.8%	5.9%	3.5%	3.2%	5.4%
Peak Parking Accumulation	119	155	14	199	25	38	30	104	20
Peak Parking/ 100m ² GFA	1.21	1.10	0.78	1.67	1.04	1.90	1.88	1.05	1.11
Weekend									
Person-based Trips									
- Site Peak Hour	1,000	1,331	123	1,256	205	184	122	739	147
Trips/ 100m ² GFA	10.20	9.43	6.83	10.54	8.54	9.20	7.63	7.43	8.17
- Vehicle Network Peak	925	1,282	108	1,244	192	174	122	709	120
Trips/ 100m ² GFA	9.44	9.09	6.00	10.44	8.00	8.70	7.63	7.13	6.67
Daily Total Person Trips	7,100	8,590	665	8,864	1,238	998	655	4,738	723
Trips/ 100m ² GFA	72.45	60.87	36.94	74.39	51.58	49.90	40.94	47.63	40.17
Vehicle-based Trips									
- Site Peak Hour	656	844	77	754	151	112	78	447	111
Trips/ 100m ² GFA	6.69	5.98	4.28	6.33	6.29	5.60	4.88	4.49	6.17
- Network Peak	593	805	65	754	119	104	78	426	96
Trips/ 100m ² GFA	6.05	5.70	3.61	6.33	4.96	5.20	4.88	4.28	5.33
Daily Total LV Trips	4,780	5,493	396	5,440	882	644	489	2,809	571
Trips/ 100m ² GFA	48.78	38.93	22.00	45.66	36.75	32.20	30.56	28.24	31.72
Daily Total HV Trips	27	115	16	60	3	5	0	15	2
Trips/ 100m ² GFA	0.28	0.81	0.89	0.50	0.13	0.25	0.00	0.15	0.11
Daily Total Vehicle Trips	4,807	5,608	412	5,500	885	649	489	2,824	573
Trips/ 100m ² GFA	49.05	39.74	22.89	46.16	36.88	32.45	30.56	28.39	31.83
% HV	0.6%	2.1%	3.9%	1.1%	0.3%	0.8%	0.0%	0.5%	0.3%
Peak Parking Accumulation	196	318	30	264	36	29	45	152	27
Peak Parking/ 100m ² GFA	2.00	2.59	1.67	2.22	1.50	1.45	2.81	1.53	1.50

Table 3-2 Trips Rate Summary – Hardware/DIY

Trips/ 100m ² GFA	Sydney Metropolitan Area HW1 to HW5			Non-Metropolitan Area HW6 to HW9			All Survey Sites HW1 to HW9			Avg Non-metro / Metro %
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	
Weekdays										
Person-based Trips										
- Site Peak Hour	4.00	5.77	5.06	3.95	6.40	5.49	3.95	6.40	5.25	108.6%
- Vehicle Network AM Peak	0.65	2.72	2.01	1.28	4.75	2.97	0.65	4.75	2.43	147.9%
- Vehicle Network PM Peak	2.48	4.89	3.50	2.79	4.65	3.78	2.48	4.89	3.63	108.0%
Daily Total Person Trips	32.88	53.26	42.42	29.22	43.40	38.34	29.22	53.26	40.61	90.4%
Vehicle-based Trips										
- Site Peak Hour	3.15	4.67	4.03	2.74	5.60	4.41	2.74	5.60	4.20	109.6%
- Network AM Peak	0.60	2.22	1.68	1.09	3.88	2.50	0.60	3.88	2.05	148.7%
- Network PM Peak	2.05	3.56	2.70	1.99	3.80	3.03	1.99	3.80	2.85	112.5%
Daily Total LV Trips	25.21	38.25	30.59	20.66	35.90	30.30	20.66	38.25	30.46	99.0%
Daily Total HV Trips	0.99	6.17	2.40	0.69	2.25	1.49	0.69	6.17	2.00	62.0%
Daily Total Vehicle Trips	26.80	39.75	32.99	21.35	38.15	31.79	21.35	39.75	32.46	96.4%
Peak Parking Accumulation	0.78	1.67	1.16	1.05	1.90	1.48	0.78	1.90	1.30	127.8%
Weekend										
Person-based Trips										
- Site Peak Hour	6.83	10.54	9.11	7.43	9.20	8.11	6.83	10.54	8.66	89.0%
- Vehicle Network Peak	6.00	10.44	8.59	6.67	8.70	7.53	6.00	10.44	8.12	87.6%
Daily Total Person Trips	36.94	74.39	59.25	40.17	49.90	44.66	36.94	74.39	52.76	75.4%
Vehicle-based Trips										
- Site Peak Hour	4.28	6.69	5.91	4.49	6.17	5.28	4.28	6.69	5.63	89.3%
- Vehicle Network Peak	3.61	6.33	5.33	4.28	5.33	4.92	3.61	6.33	5.15	92.3%
Daily Total LV Trips	22.00	48.78	38.42	28.24	32.20	30.68	22.00	48.78	34.98	79.9%
Daily Total HV Trips	0.13	0.89	0.52	0.00	0.25	0.13	0.00	0.89	0.35	24.5%
Daily Total Vehicle Trips	22.89	49.05	38.94	28.39	32.45	30.81	22.89	49.05	35.33	79.1%
Peak Parking Accumulation	1.50	2.59	2.00	1.45	2.81	1.82	1.45	2.81	1.92	91.3%
Weekend/Weekdays %										
Person-based Trips										
- Site Peak Hour	170.7%	213.6%	245.4%	238.6%	187.1%	199.1%	241.9%	213.6%	224.0%	
Daily Total Person Trips	112.4%	139.7%	139.7%	137.5%	115.0%	116.5%	126.4%	139.7%	129.9%	
Vehicle-based Trips										
- Site Peak Hour	136.0%	143.4%	146.9%	163.7%	110.1%	119.8%	155.9%	119.5%	134.2%	
Daily Total LV Trips	87.3%	127.5%	125.6%	136.7%	89.7%	101.3%	106.5%	127.5%	114.8%	
Daily Total HV Trips	12.7%	14.4%	21.7%	0.0%	11.1%	8.6%	0.0%	14.4%	17.4%	
Daily Total Vehicle Trips	85.4%	123.4%	118.0%	133.0%	85.1%	96.9%	107.2%	123.4%	108.8%	
Peak Parking Accumulation	192.9%	155.3%	171.9%	138.7%	148.0%	122.9%	186.4%	148.0%	147.2%	

* LV – Light vehicles, HV – Heavy vehicles

* The units of parking accumulation are Peak parked cars / 100m² GFA.

The bottom section of this table expresses the weekend traffic characteristics as a percentage of the weekday traffic characteristics and the last column expresses the non metropolitan traffic characteristics as a percentage of the metropolitan traffic characteristics.

A review of the data reveals a number of observations

- The surveys were undertaken on a range of GFA from 1,600 to 14,111 square metres.
- The weekday site peak hour trip generation rate varied from 2.74 to 5.6 vehicle trips per 100 sq m GFA with an average of 4.2 trips.
- The weekday daily trip rate varied from 21.35 to 39.75 vehicle trips per 100 sq m GFA with an average of 32.46 trips.
- The non-metropolitan sites generally had higher trip rates than the metropolitan sites.

- The weekday peak parking demand was between 0.78 and 1.9 spaces per 100 sq m GFA. The weekend peak demand is generally higher than the weekday one.
- Higher trips rates were observed in PM network peak than AM network peak. Therefore, such stores would have a higher traffic impact in the PM peak than the AM peak.
- When comparing weekday and weekend data, all the sites are busier at the weekend.

Table 3-3 Trips Rate Summary –Bunnings and Mitre10

Trips/ 100m ² GFA	Bunnings			Mitre10			Avg Mitre10 / Bunnings %
	HW1, HW2, HW4, HW8			HW3, HW5, HW6, HW7, HW9			
	Min	Max	Avg	Min	Max	Avg	
Weekdays							
Person-based Trips							
- Site Peak Hour	3.95	5.77	4.67	4.96	6.40	5.72	122.5%
- Vehicle Network AM Peak	0.65	2.29	1.47	2.45	4.75	3.20	218.2%
- Vehicle Network PM Peak	2.48	3.98	3.03	3.29	4.89	4.10	135.4%
Daily Total Person Trips	29.22	53.26	40.06	35.75	45.33	41.05	102.5%
Vehicle-based Trips							
- Site Peak Hour	2.74	4.12	3.53	4.08	5.60	4.73	133.9%
- Network AM Peak	0.60	2.04	1.29	2.10	3.88	2.65	206.1%
- Network PM Peak	1.99	2.84	2.29	2.75	3.80	3.29	143.5%
Daily Total LV Trips	20.66	38.25	29.96	25.21	35.90	30.86	103.0%
Daily Total HV Trips	0.69	1.49	1.10	1.19	6.17	2.71	245.6%
Daily Total Vehicle Trips	21.35	39.75	31.06	27.33	38.15	33.57	108.1%
Peak Parking Accumulation	1.05	1.67	1.26	0.78	1.90	1.34	106.7%
Weekend							
Person-based Trips							
- Site Peak Hour	7.43	10.54	9.40	6.83	9.20	8.07	85.9%
- Vehicle Network Peak	7.13	10.44	9.02	6.00	8.70	7.40	82.0%
Daily Total Person Trips	47.63	74.39	63.84	36.94	51.58	43.91	68.8%
Vehicle-based Trips							
- Site Peak Hour	4.49	6.69	5.87	4.28	6.29	5.44	92.6%
- Vehicle Network Peak	4.28	6.33	5.59	3.61	5.33	4.80	85.8%
Daily Total LV Trips	28.24	48.78	40.40	22.00	36.75	30.65	75.9%
Daily Total HV Trips	0.15	0.81	0.44	0.00	0.89	0.28	63.0%
Daily Total Vehicle Trips	28.39	49.05	40.84	22.89	36.88	30.92	75.7%
Peak Parking Accumulation	1.53	2.59	2.08	1.45	2.81	1.79	85.7%
Weekend/Weekdays %							
Person-based Trips							
- Site Peak Hour	188.0%	262.4%	297.8%	182.3%	178.0%	180.3%	
Daily Total Person Trips	163.0%	139.7%	159.4%	103.3%	113.8%	107.0%	
Vehicle-based Trips							
- Site Peak Hour	163.7%	162.4%	166.4%	104.8%	112.4%	115.1%	
Daily Total LV Trips	136.7%	127.5%	134.8%	87.3%	102.4%	99.3%	
Daily Total HV Trips	21.7%	54.6%	39.5%	0.0%	14.4%	10.1%	
Daily Total Vehicle Trips	133.0%	123.4%	131.5%	83.7%	96.7%	92.1%	
Peak Parking Accumulation	146.2%	155.3%	165.8%	186.4%	148.0%	133.2%	

* LV – Light vehicles, HV – Heavy vehicles

* The units of parking accumulation are Peak parked cars / 100m² GFA.

The bottom section of this table expresses the weekend traffic characteristics as a percentage of the weekday traffic characteristics and the last column expresses the non metropolitan traffic characteristics as a percentage of the metropolitan traffic characteristics.

In a comparison of the hardware stores, the trips rates during weekdays at Bunnings are similar to those experienced in Mitre10. However, Mitre10 has lower trip rates than Bunnings at the weekends. Observations suggest that Mitre10 has a higher proportion of tradesmen using the store which explains the higher weekday use.

A summary of the daily trips is shown below both for weekdays and weekends.

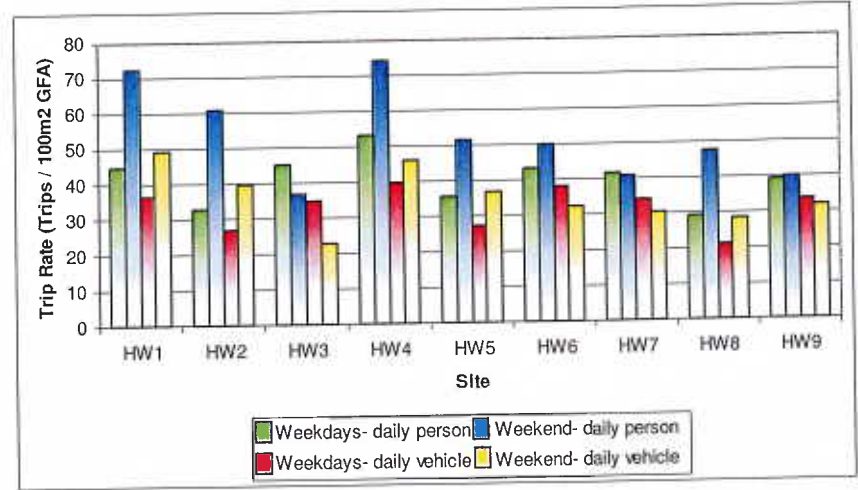


Figure 3-1 Daily Trip Rate – Hardware/DIY - Weekdays and Weekend

The trip rates for Bunnings (HW1, HW2, HW4, and HW8) at weekends are much higher than in weekdays. The Mitre10 (rest of the sites) are relatively consistent over the week.

APPENDIX D

EXTRACTS FROM RMS STUDIES

Bringelly Road Upgrade TA 2016 AM Average Peak Hour Flows (PCUs)

E-3



Bringelly Road Upgrade TA
2016 PM Average Peak Hour Flows (PCUs)



Licensed to AECOM Australia



Bringelly Road Upgrade TA
2026 AM Average Peak Hour Flows (PCUs)



- Centroid Connector
- Local Road
- Collector Road
- Secondary Arterial
- Primary Arterial
- Motoway, other
- Bus Only Lane

Licensed to AECOM Australia

Bringelly Road Upgrade TA 2026 PM Average Peak Hour Flows (PCUs)

E-8

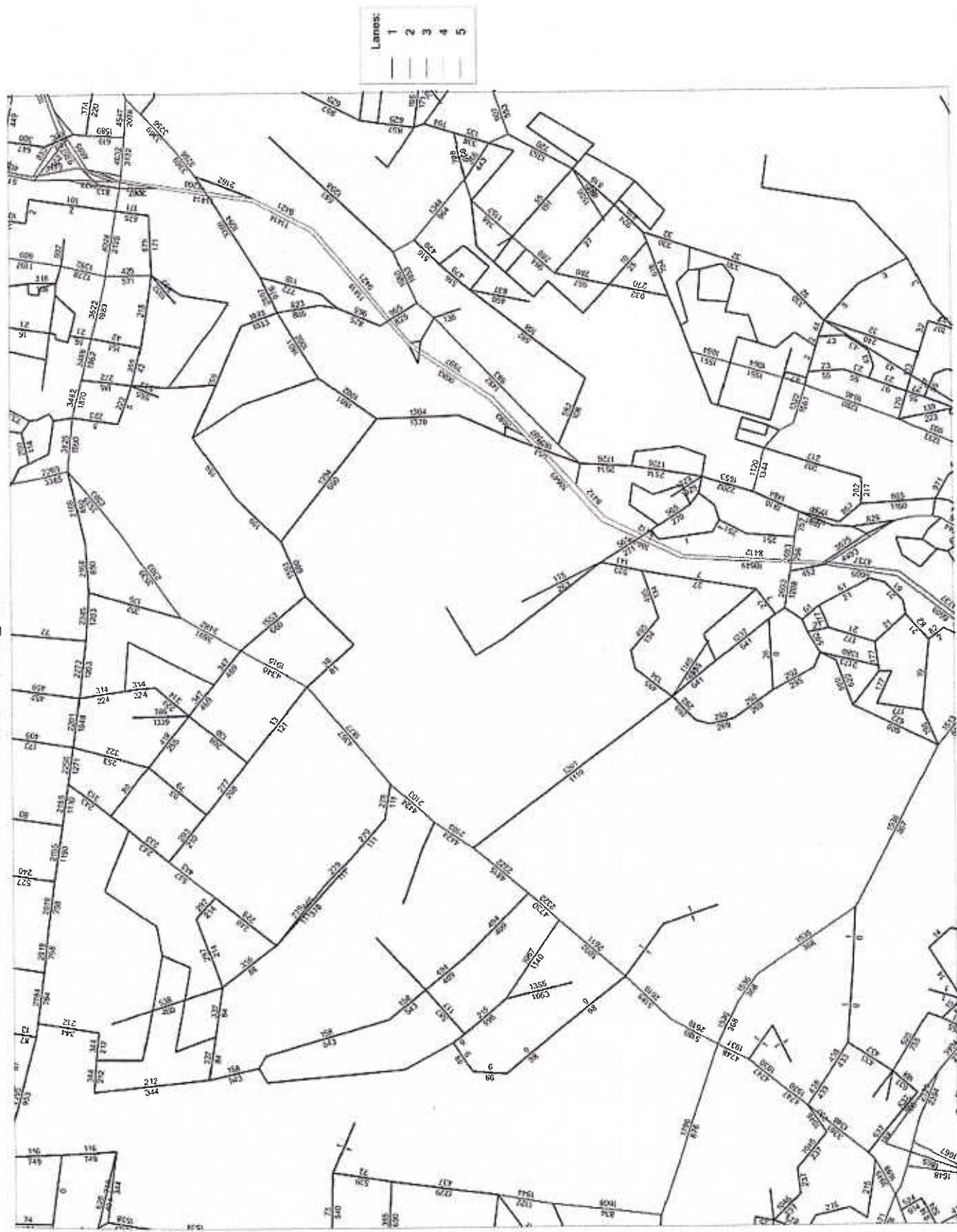


- Centroid Connector
- Local Road
- Collector Road
- Secondary Arterial
- Primary Arterial
- Motorway, other
- Bus Only Lane



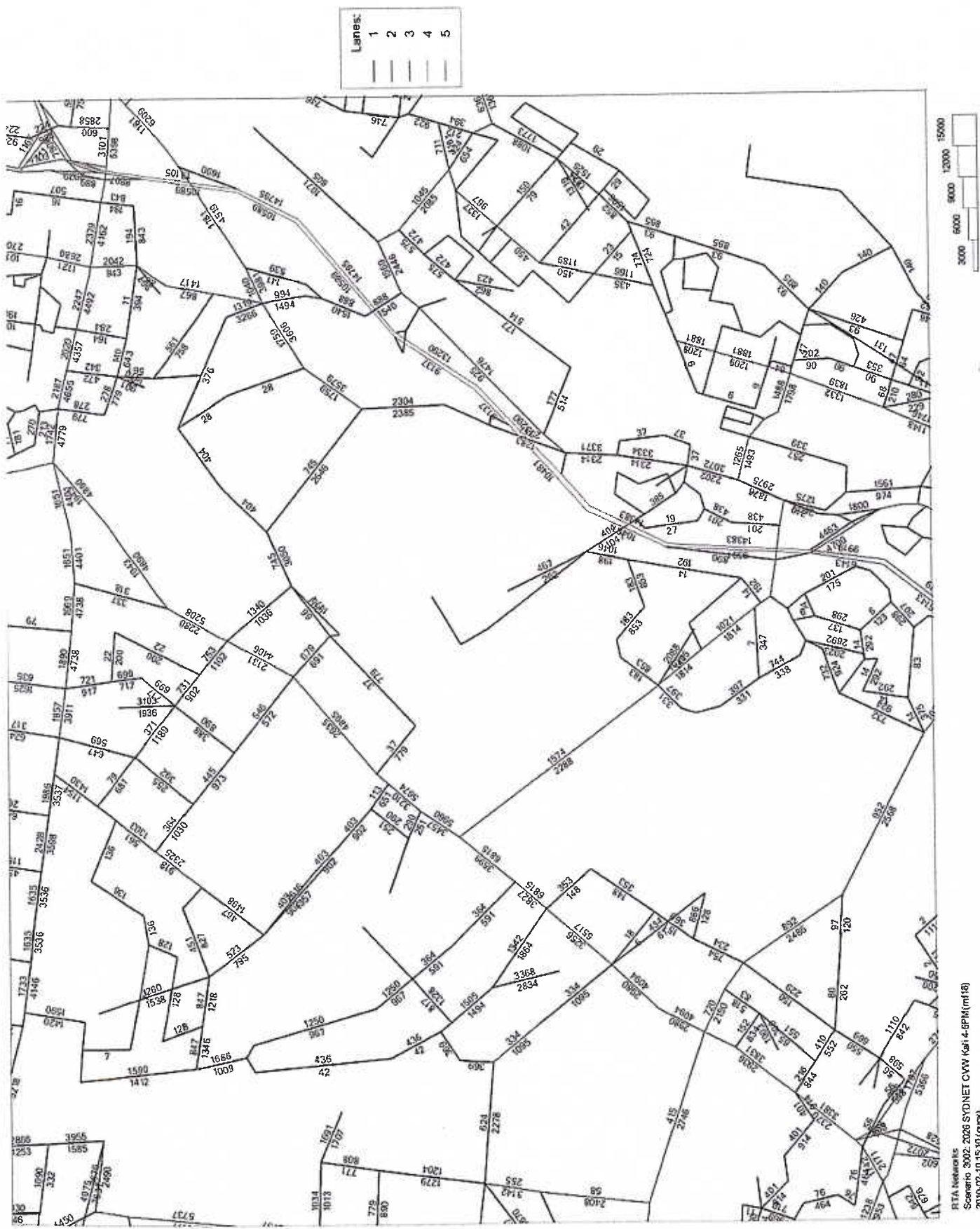
cube

Licensed to AECOM Australia

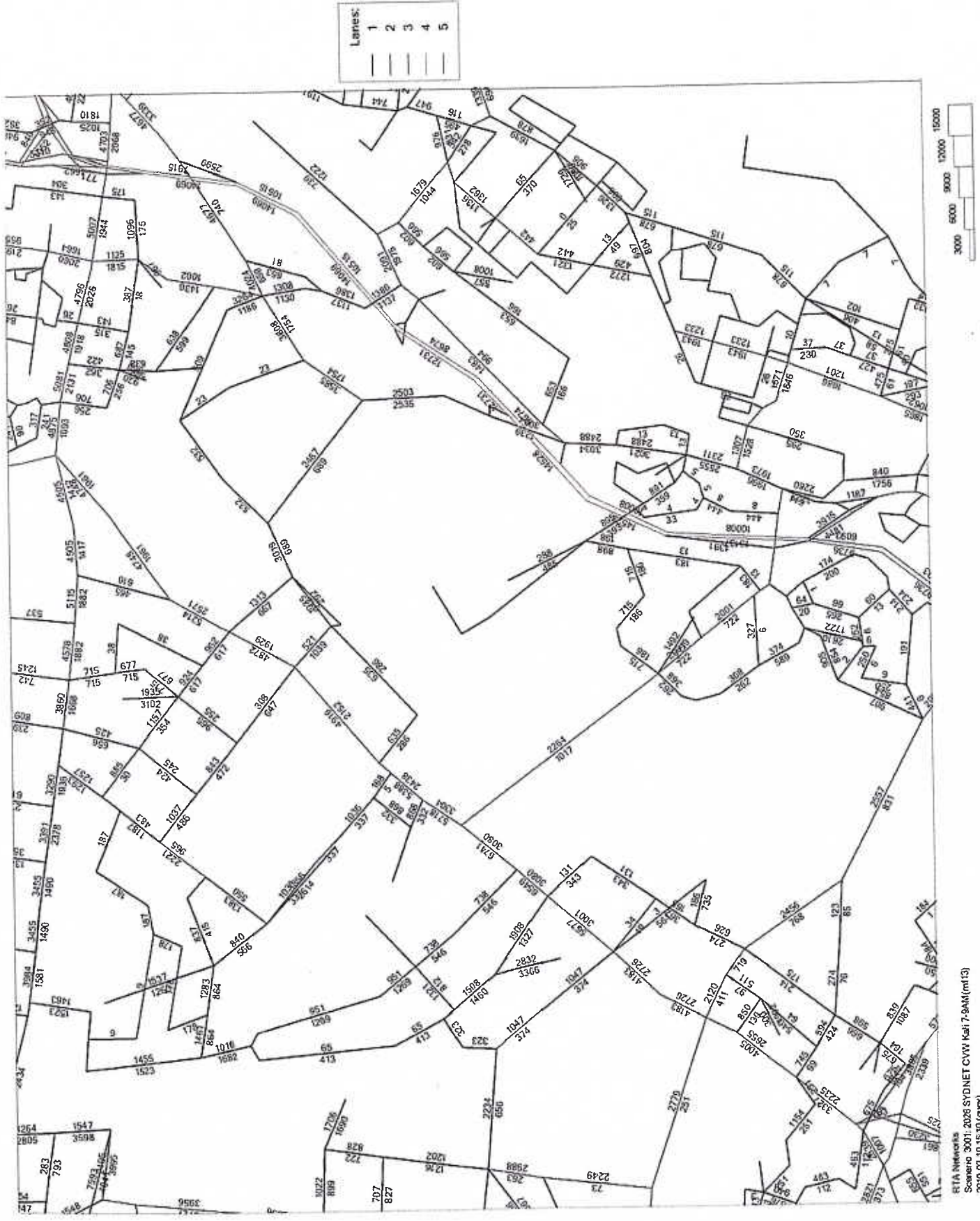


RTA Networks
Scenario: 2102: 2015 SYDNEY ROAD NETWORK (INTDELAY: 7-9AM (mid), C-WAY 3 Lanes
2010-02-18 08:53 (weekday)





RTA Networks
 Scenario 3002, 2035 SYDNET CWW Kati 4-BPM(mf18)
 2010-02-10 15:40 (gscc)



RTA Networks
 Scenario 3001: 2025 SYDNET CWV Kall 7-9AM(mf13)
 2010-02-10 15:10 (gpc)

APPENDIX E

DRAFT WORKPLACE TRAVEL PLAN

BRINGELLY ROAD BUSINESS HUB

**WORKPLACE TRAVEL PLAN
AND
TRANSPORT ACCESS GUIDE**

September 2014

Reference 14103

TRANSPORT AND TRAFFIC PLANNING ASSOCIATES
Transportation, Traffic and Design Consultants
Suite 502, Level 5
282 Victoria Avenue
CHATSWOOD 2067
Telephone (02) 9411 5660
Facsimile (02) 9904 6622
Email: ross@ttpa.com.au

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	WORKPLACE TRAVEL PLAN	2
3.	ACTIVE TRANSPORT	3
3.1	Existing Transport	3
3.2	Proposed Transport.....	4
3.3	Format.....	5
3.4	Objectives	6
4.	MODAL SHIFT	8
4.1	Introduction	8
4.2	Site Specific Measures.....	8
4.3	Wider Transport Measures.....	9
5.	MANAGEMENT OF THE PLAN.....	11
5.1	Monitoring	11
5.2	Monitoring Milestones	12
5.3	Modal Share Targets.....	13
6.	SUMMARY	14
APPENDIX A	BUS AND RAIL SERVICES	
APPENDIX B	TRANSPORT ACCESS GUIDE	

1. INTRODUCTION

The Supplementary Director General's Requirements for the proposed Bringelly Road Business Hub (SSD 6324) require a Draft Workplace Travel Plan (WTP) to be prepared and submitted.

The generic description of a WTP is provided in the following:

- *"A Travel Plan aims to manage transport demand through a series of measures that promote and facilitate more sustainable modes of travel with a view to reducing private motor vehicle use"*
- *The content of a Travel Plan will vary for each development depending on the proposed land use, characteristics of the development and the adjacent transport networks."*

It is proposed to implement a WTP for the development of the site which will promote the use of transport, other than the private car, travel choice to and from the site, which is sustainable and environmentally friendly.

However, the envisaged development because of its nature (large format hardware, bulky goods, automotive and fast food) presents some limitations for achieving a high level of travel by other than private motor vehicle apart from employee travel to/from the BRBH workplace (and ultimately the adjacent, but separately developed tourism, sporting uses). This Workplace Travel Plan (WTP) therefore seeks to build on the circumstances of the site in relation to travel mode of workers.

This WTP will clearly benefit from the future public transport accessibility of the site in relation to bus services and their connection to the Metropolitan transport network.

2. WORKPLACE TRAVEL PLAN

Transport is a necessary part of life which has effects that can be managed. There is a current major focus on improving transport services as well as cycling facilities and provisions for pedestrians in Sydney. As well as delivering better environmental outcomes, providing a range of travel choices with a focus on walking, cycling and public transport will have major public health benefits and will ensure a strong and prosperous city.

The limited parking provision for the hotel and commercial elements and the existing and proposed transport infrastructure forms a major part of the initiatives to encourage reduction of vehicle transport use. However, a Workplace Travel Plan will ensure that the transport infrastructure and services are utilised to the fullest to achieve a sustainable outcome.

A Workplace Travel Plan is a package of measures aimed at promoting and encouraging sustainable travel and reducing reliance on the private car. It will make apparent, encourage and support workers, guests and visitors to travel in a more sustainable way. WTPs can provide both:

- measures which encourage reduced car use
- measures which encourage or support sustainable travel, reduce the need to travel or make travelling more efficient

“Active transport” includes travel by foot, bicycle and other non-motorised vehicles. Use of public transport is also included in the definition as it often involves some walking or cycling to pick-up and from drop-off points.

3. ACTIVE TRANSPORT

3.1 EXISTING TRANSPORT

The development site has access to a range of public transport services as follows:

BUS

RAIL

TAXI

BICYCLE

PEDESTRIANS

3.2 PROPOSED TRANSPORT

The proposed/envisaged future transport services comprise:

BUS

RAIL

TAXI

BICYCLE

PEDESTRIAN

3.3 FORMAT

The WTP will capitalise on the availability of the sustainable transport options described in the foregoing and the site's convenient location close to so many sustainable transport facilities is such that the 'non' car mode share is expected to be relatively high.

The WTP itself will take the form of a package of easy to understand travel information which will be included in the new residents' information pack. The pack will also include a Transport Access Guide (TAG).

A TAG provides customised travel information for people travelling to and from a particular site using sustainable forms of transport – walking, cycling and public transport. It provides a simple quick visual appreciation of the location making it easy to understand the relationship of site to train stations, bus stops, shuttle bus, taxi and walking and cycling routes.

As such TAG's act to encourage the use of non vehicle mode transport and can reduce associated greenhouse gas emissions and traffic congestion while improving health through active transport choices.

TAG's can be in varying forms from a map printed on the back of business cards or envelopes and with compliments slips to more comprehensive information brochures. Best practice suggests that the information should be as concise, simple and site centred as possible and where possible provided on a single side/sheet. If instructions are too complex they are likely to be ignored.

An example of a TAG is provided in Appendix F showing a site centred guide to the available transport options together with links to these facilities both in terms of route and time.

Further graphics design will be undertaken to provide TAG's in various formats appropriate to the range of users within the BRBH.

3.4 OBJECTIVES

The aim of the WTP is to bring about better transport arrangements for the residents, workers, guests and visitors. The key objectives of the WTP are to encourage:

- the use of public transport
- walking
- cycling
- reduced use of private vehicles
- where a private vehicle is to be used, encourage more efficient use. Such smarter travel use can include not travelling by single occupancy cars in peak hours, not using cars for short distance trips when alternative public transport is available etc

The introduction of this WTP will:

- advise the wider travel choices
- help identify transport means which will result in them being healthier, fitter and more productive
- provide equal opportunities by supporting those without access to a car
- aim to reduce congestion and provide easily identifiable transport means, improving relations with neighbours and enabling deliveries and essential journeys to move more freely

It is the objective of this WTP to encourage sustainable transport means which could result in the following benefits:

- higher mode share targets
- greenhouse gas emission reductions and carbon footprint minimisation
- healthy living (those working and visiting the site)
- social equity and reduction in social exclusion
- Improve knowledge and contributes to learning

The WTP will be used both during the marketing of the site and also at the time of handover to tenants who will allocate responsibility to manage the dissemination of information.

DRAFT

4. MODAL SHIFT

4.1 INTRODUCTION

The location of the site, in terms of its future proximity to a wide range of sustainable transport, is a key attribute of the development. The proposed development will capitalise upon and will enhance these links.

The Travel Plan will then put in place measures to further influence the travel patterns of those people working at or visiting the site with a view to encouraging modal shift away from cars. The measures provided in this WTP and their success can inform the travel plans for subsequent developments within the precinct.

4.2 SITE SPECIFIC MEASURES

The proposed development incorporates the following measures to encourage more sustainable travel use.

- Provision of a TAG which would be given to every worker in the development. The TAG is based upon facilities currently available at the site and will need to be updated as infrastructure changes take place.
- Public transport information boards to make workers and visitors more aware of the alternative transport options available. The format of such information boards would be based upon the travel access guide although further investigations into the provision of real time information systems will also be explored.
- Provision of free 'My Zone/Opal quarterly' public transport tickets for the initial tenants so that workers will be encouraged to make public transport their modal choice from the outset.

- Provision of bicycle parking spaces both for visitors and workers
- A half yearly newsletter will also be provided to every tenant for up to two years after occupation bringing the latest news on sustainable travel initiatives in the area.

Every tenant's welcome pack will not only include the Transport Access Guide and tickets which would give detailed information about how to travel to and from the site by means other than the car but also an information sheet explaining how to use the facilities/incentives provided.

It is also important to note that the development layout will provide detailed "way finding" information to assist guests and visitors to be directed to suitable public transport facilities.

The provision of good quality, accurate and useful directional signing to promote walking and cycling is essential and it is proposed that this is provided stating times to destination in minutes taken as well as distances in half kilometres. In addition, the signage will promote links to local services.

These measures would form the framework of the WTP and with this framework in place, the plan is to be managed as described in Section 4.

4.3 WIDER TRANSPORT MEASURES

It is also recognised that changes to infrastructure, policy and services external to the Bringelly area will also have an impact on travel patterns to/from and within the site. These include overarching and wider measures that are being considered and/or implemented by others which will have a positive impact on the mode share, greenhouse gas emissions and social aspects of travel associated with the development.

These include, among others:

- Integrated public transport ticketing
- Extension of the Regional Bicycle Network
- Continued rise in oil prices
- The public's concerns regarding climate change
- Technological innovations
- State Government's involvement in improving regional transport

DRAFT

5. MANAGEMENT OF THE PLAN

It is proposed that the WTP will be subject to ongoing monitoring to ensure that it is achieving the desired benefits or to modify it if required. It is not possible at this stage to state what additional modifications might be made as this will be dependent upon the particular circumstances arising from time to time.

5.1 MONITORING

It will be important to monitor the WTP to ensure that travel mode targets are met and the maximum benefits are being gained.

A WTP Coordinator for the BRBH will be nominated and this person will have responsibility for developing, implementing and monitoring the WTP. The Coordinator will be established when occupation commences.

Travel surveys will be undertaken and the main focus of the surveys will be to establish the travel patterns including the mode share of trips to and from the site. This information will also help inform WTPs for subsequent changes and upgrading.

It will be important to understand people's reasons for travelling the way they do; any barriers to changing their behaviour; and their propensity to change. This will enable the most effective initiatives to be identified, and conversely less effective initiatives can be modified or replaced to ensure the best outcomes are achieved.

It will also be necessary to provide feedback to residents and workers to ensure that they can see the benefits of sustainable transport.

There are several key elements to the development and implementation of a successful WTP. These include:

- **Communications** – Good communications are an essential part of the WTP. It will be necessary to explain the reason for adopting the plan, promote the benefits available and provide information about the alternatives to reliance on private car travel.
- **Commitment** – WTPs involve changing established habits and providing the impetus for people in new developments to choose a travel mode other than private car use. To achieve co-operation it is essential to promote positively the wider objectives and benefits of the Plan. This commitment includes the provision of the necessary resources to implement the Plan, beginning with the introduction of encouragement for changing travel modes upon occupation.
- **Consensus** – It will be necessary to obtain broad support for the introduction of the Plan.

Once the Plan has been adopted it will be essential to maintain interest in the scheme and any new initiative in the Plan will need to be publicised and marketed. Accordingly, it is proposed to produce a half yearly leaflet for residents and workers to inform them of sustainable travel initiatives.

5.2 MONITORING MILESTONES

Monitoring of the plan will be an essential process in establishing the existing travel patterns and publicising the positive outcomes of the plan.

It is therefore proposed that within three months of substantial occupation, a travel survey will be conducted. The results of the travel survey will be achieved and a desirable travel mode outcome is achieved. In this way, the Coordinator will be able to examine the success of the WTP and make appropriate recommendations.

5.3 MODAL SHARE TARGETS

Assessment of the transport circumstances for workers at the site indicate the following desirable Mode Share targets.

Scenario	AM Peak (two hours)	
	Public Transport and other modes of transport	Car Driver
2021	35%	65%
2031	43%	57%

Surveys undertaken each 12 months after occupation will be able to assess whether these targets have been met.

Whilst these targets have been set and though limited parking supply is available and a range of measures have been provided in the travel plan to persuade workers to use sustainable travel, it is not possible to guarantee that these modal split targets will be achieved.

The measures proposed will be taken up by the purchaser as a matter of free choice and this modal choice is beyond the control of the developer. The survey results will however give an indication of the more popular measures which can then be concentrated upon in WTPs.

6. SUMMARY

A WTP will be implemented for the proposed development with the objective of encouraging the use of alternative transport choices and achieving a shift to public transport, cycling and walking by:

- Preparation of a Transport Access Guide in various forms suitable to be given to residents, workers and guests
- Provision of public transport information boards to make occupants more aware of the alternative transport options available to them. The format would be based upon the Transport Access Guide
- Provision of free 'My Zone/Opal quarterly' public transport tickets for the initial occupation so that workers would be encouraged to make public transport their modal choice from the day they take up occupancy
- Provision of bicycle parking spaces both for workers and visitors at the site
- Provision of a half yearly newsletter to workers to promote local travel initiatives

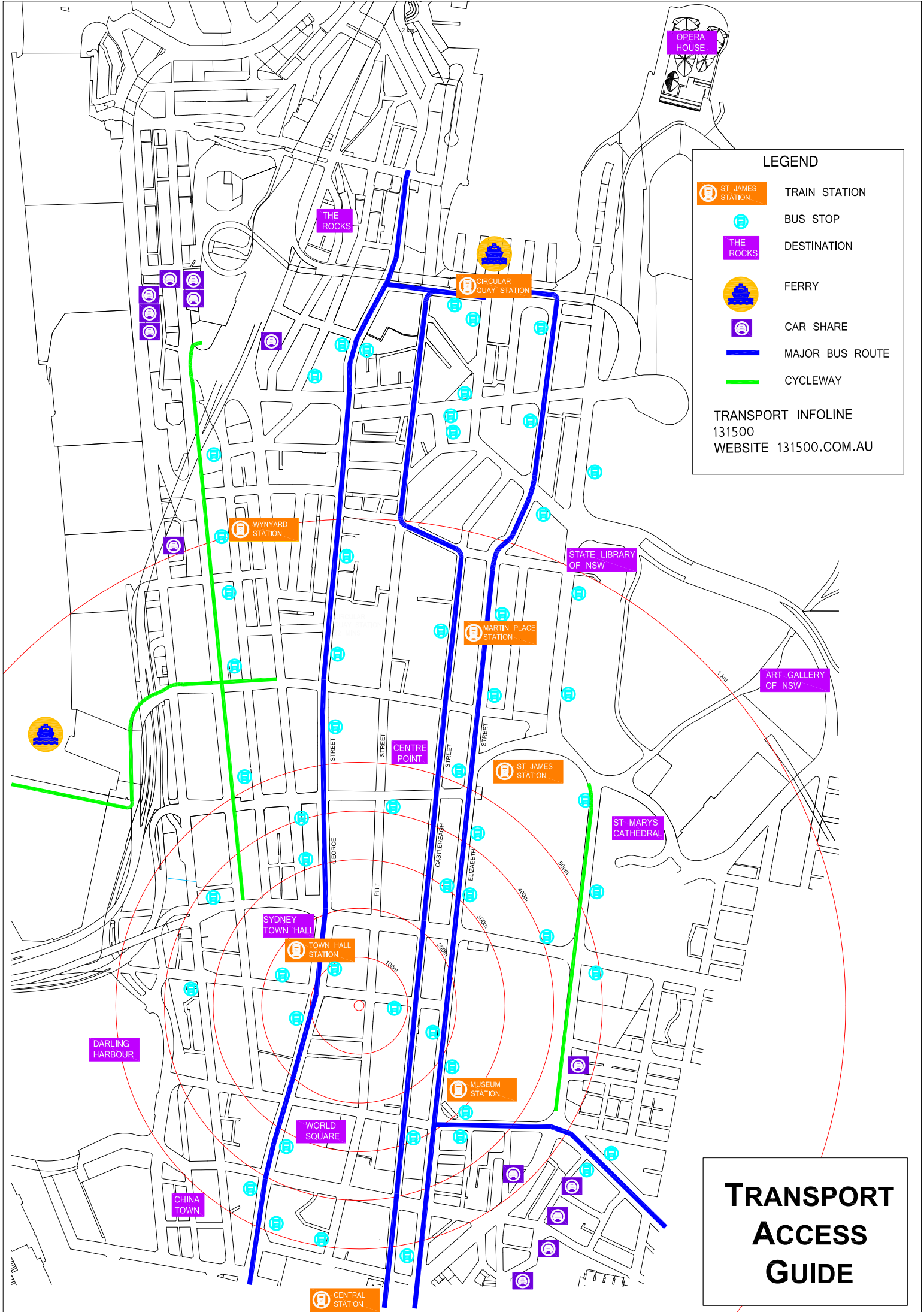
All tenants would be given this travel information and any associated ticketing/membership in the owners pack for new tenants.

It is important that such a plan, and all of the measures incorporated within it, should be available to workers upon moving in to the proposed development. This will allow the plan to influence the worker travel behaviour from the first day of occupation.

A Travel Plan Coordinator will be nominated with responsibility for developing, implementing and monitoring the WTP.

APPENDIX F

EXAMPLE TRANSPORT ACCESS GUIDE



LEGEND

-  ST JAMES STATION
 -  BUS STOP
 -  THE ROCKS
 -  FERRY
 -  CAR SHARE
 -  MAJOR BUS ROUTE
 -  CYCLEWAY
- TRAIN STATION
- BUS STOP
- DESTINATION
- FERRY
- CAR SHARE
- MAJOR BUS ROUTE
- CYCLEWAY

TRANSPORT INFOLINE
131500
WEBSITE 131500.COM.AU

TRANSPORT
ACCESS
GUIDE

APPENDIX G

SIDRA RESULTS

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2A AM Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	1213	2.0	0.384	1.2	LOS A	3.4	24.1	0.09	0.08	57.6
6	R	170	2.0	0.580	82.7	LOS F	6.2	44.5	1.00	0.78	18.3
Approach		1383	2.0	0.580	11.2	LOS A	6.2	44.5	0.20	0.16	45.6
North: WSP ACCESS RD											
7	L	94	2.0	0.385	59.2	LOS E	5.6	40.1	0.86	0.76	23.0
9	R	94	2.0	0.257	76.8	LOS F	3.2	23.1	0.96	0.75	19.3
Approach		188	2.0	0.385	68.0	LOS E	5.6	40.1	0.91	0.76	21.0
West: BRINGELLY RD											
10	L	198	2.0	0.206	9.9	LOS A	2.5	17.9	0.19	0.65	47.4
11	T	1592	2.0	0.591	3.1	LOS A	8.5	60.3	0.16	0.15	54.5
Approach		1790	2.0	0.591	3.8	LOS A	8.5	60.3	0.17	0.21	53.6
All Vehicles		3361	2.0	0.591	10.5	LOS A	8.5	60.3	0.22	0.22	46.2

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
P4	Across E approach	53	67.2	LOS F	0.2	0.2	0.95	0.95
P5	Across N approach	53	10.1	LOS B	0.1	0.1	0.37	0.37
P7	Across W approach	53	67.2	LOS F	0.2	0.2	0.95	0.95
P8	Across W approach	53	64.4	LOS F	0.2	0.2	0.93	0.93
All Pedestrians		265	55.6	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Processed: Sunday, 16 November 2014 1:05:14 PM

SIDRA INTERSECTION 5.1.13.2093

Project: F:\WORK\14\14103 - BRINGELLY ROAD BUSINESS HUB\MODELLING\BRINGELLY BUSINESS HUB

NOV 2014.sip

8000272, TRANSPORT & TRAFFIC PLANNING ASSOCIATES, SINGLE

Copyright © 2000-2011 Akcelik and Associates Pty Ltd

www.sidrasolutions.com

SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2A PM Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	2321	2.0	0.773	2.5	LOS A	15.6	110.8	0.21	0.20	55.1
6	R	304	2.0	0.329	41.4	LOS C	7.4	52.6	0.72	0.77	28.1
Approach		2625	2.0	0.773	7.0	LOS A	15.6	110.8	0.27	0.26	49.6
North: WSP ACCESS RD											
7	L	274	2.0	0.686	28.5	LOS B	10.1	72.1	0.64	0.76	33.9
9	R	363	2.0	0.762	78.4	LOS F	14.4	102.8	1.00	0.86	19.0
Approach		637	2.0	0.762	56.9	LOS E	14.4	102.8	0.85	0.82	23.5
West: BRINGELLY RD											
10	L	288	2.0	0.571	27.4	LOS B	11.2	80.1	0.58	0.75	34.4
11	T	935	2.0	0.675	40.4	LOS C	26.0	185.3	0.83	0.73	27.4
Approach		1223	2.0	0.675	37.3	LOS C	26.0	185.3	0.77	0.74	28.8
All Vehicles		4485	2.0	0.773	22.4	LOS B	26.0	185.3	0.49	0.47	36.6

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	63.5	LOS F	0.2	0.2	0.92	0.92
P4	Across E approach	53	31.4	LOS D	0.1	0.1	0.65	0.65
P5	Across N approach	53	37.5	LOS D	0.2	0.2	0.71	0.71
P7	Across W approach	53	31.4	LOS D	0.1	0.1	0.65	0.65
P8	Across W approach	53	59.0	LOS E	0.2	0.2	0.89	0.89
All Pedestrians		265	44.5	LOS E			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Processed: Sunday, 16 November 2014 1:05:17 PM

SIDRA INTERSECTION 5.1.13.2093

Project: F:\WORK\14\14103 - BRINGELLY ROAD BUSINESS HUB\MODELLING\BRINGELLY BUSINESS HUB

NOV 2014.sip

8000272, TRANSPORT & TRAFFIC PLANNING ASSOCIATES, SINGLE

Copyright © 2000-2011 Akcelik and Associates Pty Ltd

www.sidrasolutions.com

SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2A WEMD
Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	1400	2.0	0.606	11.4	LOS A	19.5	138.5	0.42	0.39	44.3
6	R	386	2.0	0.565	68.3	LOS E	12.9	92.1	0.96	0.82	20.9
Approach		1786	2.0	0.606	23.7	LOS B	19.5	138.5	0.54	0.48	35.6
North: WSP ACCESS RD											
7	L	386	2.0	0.992	42.0	LOS C	16.0	114.2	1.00	0.87	28.1
9	R	445	2.0	0.516	51.1	LOS D	17.9	127.2	0.84	0.82	25.0
Approach		831	2.0	0.992	46.9	LOS D	17.9	127.2	0.91	0.84	26.3
West: BRINGELLY RD											
10	L	445	2.0	0.611	17.4	LOS B	11.2	79.4	0.50	0.74	40.8
11	T	1400	2.0	0.974	75.5	LOS F	62.9	447.8	1.00	1.11	18.9
Approach		1845	2.0	0.974	61.4	LOS E	62.9	447.8	0.88	1.02	21.8
All Vehicles		4462	2.0	0.992	43.6	LOS D	62.9	447.8	0.75	0.77	26.8

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	41.1	LOS E	0.2	0.2	0.74	0.74
P4	Across E approach	53	52.9	LOS E	0.2	0.2	0.84	0.84
P5	Across N approach	53	36.1	LOS D	0.2	0.2	0.69	0.69
P7	Across W approach	53	52.9	LOS E	0.2	0.2	0.84	0.84
P8	Across W approach	53	37.5	LOS D	0.2	0.2	0.71	0.71
All Pedestrians		265	44.1	LOS E			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2B AM Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	1213	2.0	0.263	1.1	LOS A	1.9	13.6	0.07	0.06	57.8
6	R	170	2.0	0.410	76.1	LOS F	5.9	42.1	0.97	0.78	19.5
Approach		1383	2.0	0.410	10.3	LOS A	5.9	42.1	0.18	0.15	46.5
North: WSP ACCESS RD											
7	L	92	2.0	0.352	52.0	LOS D	5.1	36.3	0.81	0.75	24.9
9	R	92	2.0	0.209	73.0	LOS F	3.1	21.9	0.94	0.75	20.0
Approach		184	2.0	0.352	62.5	LOS E	5.1	36.3	0.87	0.75	22.2
West: BRINGELLY RD											
10	L	198	2.0	0.226	10.9	LOS A	3.0	21.6	0.23	0.66	46.4
11	T	1592	2.0	0.426	6.1	LOS A	8.3	58.8	0.24	0.21	50.4
Approach		1790	2.0	0.426	6.6	LOS A	8.3	58.8	0.24	0.26	49.9
All Vehicles		3357	2.0	0.426	11.2	LOS A	8.3	58.8	0.25	0.24	45.4

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
P4	Across E approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P5	Across N approach	53	13.2	LOS B	0.1	0.1	0.42	0.42
P7	Across W approach	53	65.3	LOS F	0.2	0.2	0.93	0.93
P8	Across W approach	53	64.4	LOS F	0.2	0.2	0.93	0.93
All Pedestrians		265	55.5	LOS E			0.83	0.83

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2B PM Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	2321	2.0	0.574	3.0	LOS A	8.0	56.6	0.16	0.14	54.6
6	R	304	2.0	0.329	41.3	LOS C	7.4	52.6	0.72	0.77	28.2
Approach		2625	2.0	0.574	7.5	LOS A	8.0	56.6	0.22	0.22	49.2
North: WSP ACCESS RD											
7	L	274	2.0	0.587	21.5	LOS B	8.3	58.8	0.53	0.73	37.9
9	R	363	2.0	0.561	63.0	LOS E	14.8	105.1	0.92	0.81	22.0
Approach		637	2.0	0.587	45.2	LOS D	14.8	105.1	0.75	0.78	26.9
West: BRINGELLY RD											
10	L	288	2.0	0.571	27.4	LOS B	11.2	80.1	0.58	0.75	34.4
11	T	935	2.0	0.578	49.7	LOS D	18.1	129.1	0.85	0.73	24.5
Approach		1223	2.0	0.578	44.4	LOS D	18.1	129.1	0.79	0.74	26.3
All Vehicles		4485	2.0	0.587	22.9	LOS B	18.1	129.1	0.45	0.44	36.3

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	55.5	LOS E	0.2	0.2	0.86	0.86
P4	Across E approach	53	33.3	LOS D	0.2	0.2	0.67	0.67
P5	Across N approach	53	46.4	LOS E	0.2	0.2	0.79	0.79
P7	Across W approach	53	33.3	LOS D	0.2	0.2	0.67	0.67
P8	Across W approach	53	51.3	LOS E	0.2	0.2	0.83	0.83
All Pedestrians		265	44.0	LOS E			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Processed: Sunday, 16 November 2014 1:05:17 PM

SIDRA INTERSECTION 5.1.13.2093

Project: F:\WORK\14\14103 - BRINGELLY ROAD BUSINESS HUB\MODELLING\BRINGELLY BUSINESS HUB
NOV 2014.sip

8000272, TRANSPORT & TRAFFIC PLANNING ASSOCIATES, SINGLE

Copyright © 2000-2011 Akcelik and Associates Pty Ltd
www.sidrasolutions.com

SIDRA
INTERSECTION

MOVEMENT SUMMARY

Site: WSP ACCESS RD &
BRINGELLY RD 2031 2B WEMD
Slip

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: BRINGELLY RD											
5	T	1400	2.0	0.478	19.2	LOS B	16.0	114.3	0.52	0.46	38.0
6	R	386	2.0	0.586	69.3	LOS E	13.1	93.0	0.97	0.82	20.7
Approach		1786	2.0	0.586	30.0	LOS C	16.0	114.3	0.61	0.54	32.2
North: WSP ACCESS RD											
7	L	386	2.0	0.840	40.0	LOS C	16.0	114.2	0.82	0.87	28.8
9	R	445	2.0	0.415	39.9	LOS C	16.0	114.1	0.73	0.79	28.7
Approach		831	2.0	0.840	40.0	LOS C	16.0	114.2	0.77	0.83	28.7
West: BRINGELLY RD											
10	L	445	2.0	0.602	16.9	LOS B	10.9	77.4	0.49	0.74	41.2
11	T	1400	2.0	0.846	58.0	LOS E	32.7	232.9	0.98	0.92	22.3
Approach		1845	2.0	0.846	48.1	LOS D	32.7	232.9	0.86	0.87	25.1
All Vehicles		4462	2.0	0.846	39.3	LOS C	32.7	232.9	0.75	0.73	28.3

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

Vehicle movement LOS values are based on average delay per movement

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

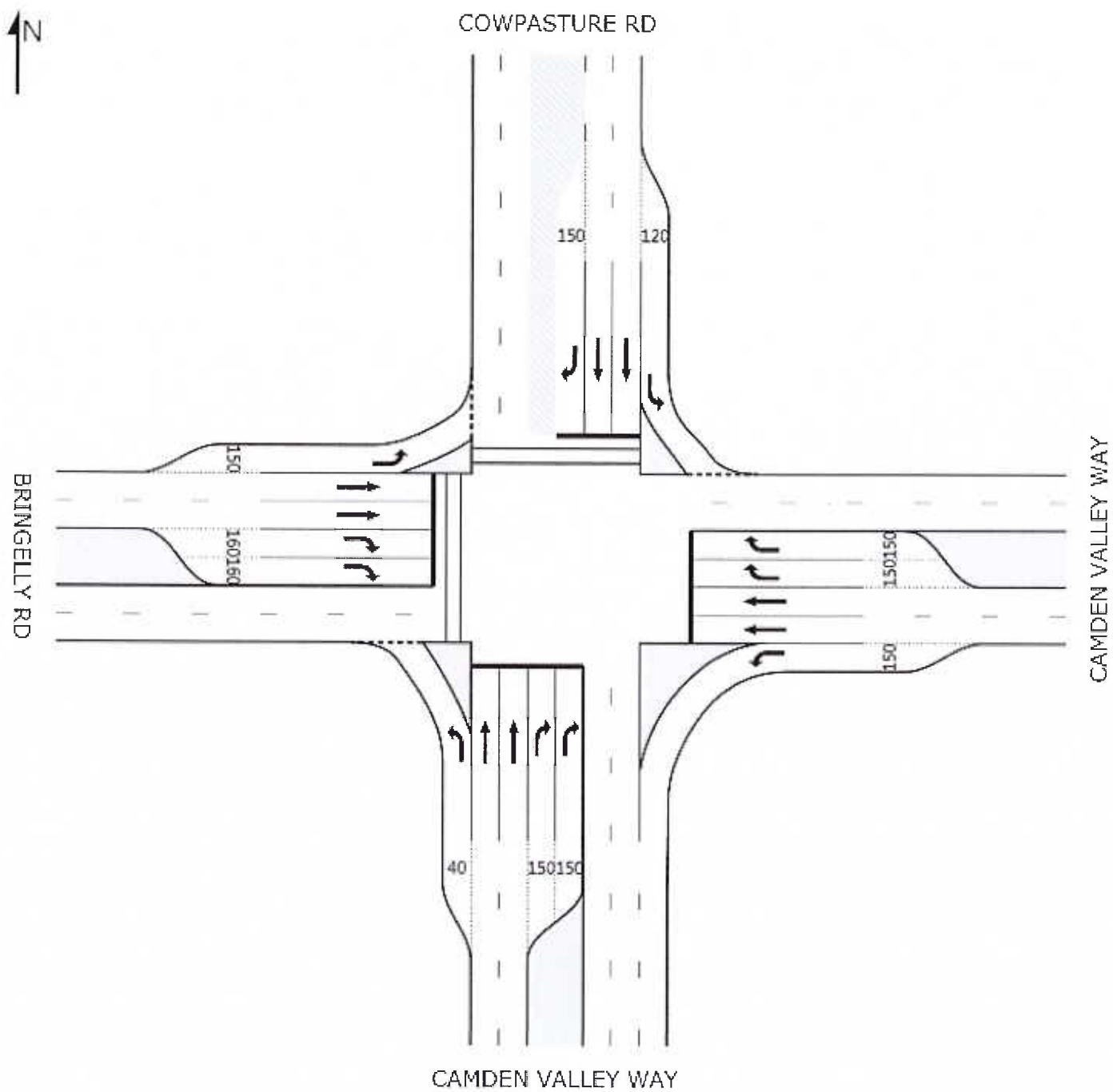
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	33.3	LOS D	0.2	0.2	0.67	0.67
P4	Across E approach	53	56.3	LOS E	0.2	0.2	0.87	0.87
P5	Across N approach	53	45.6	LOS E	0.2	0.2	0.78	0.78
P7	Across W approach	53	56.3	LOS E	0.2	0.2	0.87	0.87
P8	Across W approach	53	30.1	LOS D	0.1	0.1	0.63	0.63
All Pedestrians		265	44.3	LOS E			0.76	0.76

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.



MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY NO DEV AM

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	30	2.0	0.059	9.7	LOS A	0.3	2.4	0.21	0.63	47.5
2	T	1652	2.0	1.355	399.1	LOS F	160.8	1144.8	1.00	2.18	5.0
3	R	674	2.0	1.104	163.5	LOS F	34.4	244.8	1.00	1.29	11.0
Approach		2356	2.0	1.355	326.7	LOS F	160.8	1144.8	0.99	1.90	6.0
East: CAMDEN VALLEY WAY											
4	L	290	2.0	0.158	7.6	X	X	X	X	0.60	49.8
5	T	300	2.0	0.198	31.6	LOS C	7.1	50.4	0.70	0.58	31.0
6	R	254	2.0	0.867	56.5	LOS D	6.4	45.5	1.00	0.90	23.6
Approach		844	2.0	0.867	30.9	LOS C	7.1	50.4	0.55	0.68	32.2
North: COWPASTURE RD											
7	L	399	2.0	0.625	28.7	LOS C	14.5	103.1	0.57	0.76	33.7
8	T	874	2.0	1.143	212.9	LOS F	59.7	425.1	1.00	1.59	8.6
9	R	203	2.0	1.277	344.5	LOS F	34.4	244.8	1.00	1.54	5.8
Approach		1476	2.0	1.277	181.2	LOS F	59.7	425.1	0.88	1.36	10.0
West: BRINGELLY RD											
10	L	463	2.0	0.592	26.5	LOS B	19.3	137.6	0.66	0.79	34.9
11	T	1644	2.0	1.363	405.9	LOS F	159.5	1135.6	1.00	2.30	4.9
12	R	45	2.0	0.307	88.2	LOS F	1.7	12.1	1.00	0.71	17.6
Approach		2152	2.0	1.363	317.7	LOS F	159.5	1135.6	0.93	1.94	6.1
All Vehicles		6828	2.0	1.363	255.8	LOS F	160.8	1144.8	0.89	1.65	7.4

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	44.9	LOS E	0.2	0.2	0.77	0.77
P7	Across W approach	53	61.7	LOS F	0.2	0.2	0.91	0.91
All Pedestrians		106	53.3	LOS E			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY NO DEV PM

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	26	2.0	0.091	22.8	LOS B	0.9	6.1	0.48	0.66	37.1
2	T	554	2.0	0.354	32.6	LOS C	13.8	98.3	0.74	0.64	30.5
3	R	399	2.0	0.605	46.2	LOS D	8.2	58.7	0.97	0.84	26.6
Approach		979	2.0	0.605	37.9	LOS C	13.8	98.3	0.83	0.72	28.9
East: CAMDEN VALLEY WAY											
4	L	906	2.0	0.495	7.7	X	X	X	X	0.60	49.7
5	T	1056	2.0	1.083	166.6	LOS F	65.0	462.8	1.00	1.50	10.6
6	R	428	2.0	1.031	102.7	LOS F	18.6	132.1	1.00	1.10	15.7
Approach		2390	2.0	1.083	94.9	LOS F	65.0	462.8	0.62	1.09	16.5
North: COWPASTURE RD											
7	L	428	2.0	0.397	10.5	LOS A	3.7	26.7	0.15	0.64	46.8
8	T	1418	2.0	1.129	191.7	LOS F	94.8	674.9	1.00	1.59	9.4
9	R	281	2.0	1.097	186.6	LOS F	34.4	244.6	1.00	1.24	9.8
Approach		2127	2.0	1.129	154.5	LOS F	94.8	674.9	0.83	1.36	11.3
West: BRINGELLY RD											
10	L	222	2.0	0.267	12.6	LOS A	4.3	30.7	0.34	0.69	44.7
11	T	585	2.0	1.085	173.8	LOS F	35.5	252.5	1.00	1.40	10.2
12	R	48	2.0	0.328	88.3	LOS F	1.8	13.0	1.00	0.71	17.6
Approach		855	2.0	1.085	127.1	LOS F	35.5	252.5	0.83	1.18	13.2
All Vehicles		6351	2.0	1.129	110.4	LOS F	94.8	674.9	0.75	1.13	14.7

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	67.2	LOS F	0.2	0.2	0.95	0.95
P7	Across W approach	53	45.6	LOS E	0.2	0.2	0.78	0.78
All Pedestrians		106	56.4	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY NO DEV SAT

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	35	2.0	0.124	16.8	LOS B	0.9	6.3	0.39	0.66	41.2
2	T	900	2.0	0.701	46.4	LOS D	28.4	202.2	0.93	0.82	25.4
3	R	520	2.0	0.887	64.6	LOS E	15.8	112.4	1.00	0.98	21.7
Approach		1455	2.0	0.887	52.2	LOS D	28.4	202.2	0.94	0.87	24.1
East: CAMDEN VALLEY WAY											
4	L	52	2.0	0.028	7.6	X	X	X	X	0.60	49.8
5	T	850	2.0	0.690	47.5	LOS D	26.9	191.8	0.94	0.82	25.0
6	R	350	2.0	0.896	60.6	LOS E	9.9	70.8	1.00	0.95	22.6
Approach		1252	2.0	0.896	49.5	LOS D	26.9	191.8	0.91	0.85	24.8
North: COWPASTURE RD											
7	L	350	2.0	0.430	17.2	LOS B	7.4	52.5	0.34	0.69	40.9
8	T	900	2.0	0.923	72.9	LOS F	36.2	258.1	1.00	1.03	19.4
9	R	200	2.0	0.910	91.0	LOS F	16.2	115.7	1.00	0.96	17.2
Approach		1450	2.0	0.923	61.9	LOS E	36.2	258.1	0.84	0.94	21.8
West: BRINGELLY RD											
10	L	300	2.0	0.408	18.1	LOS B	8.8	62.5	0.48	0.73	40.2
11	T	850	2.0	0.920	77.2	LOS F	35.6	253.4	1.00	1.07	18.6
12	R	35	2.0	0.143	81.2	LOS F	1.2	8.9	0.97	0.70	18.7
Approach		1185	2.0	0.920	62.4	LOS E	35.6	253.4	0.87	0.97	21.6
All Vehicles		5342	2.0	0.923	56.5	LOS D	36.2	258.1	0.89	0.91	23.0

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	53.8	LOS E	0.2	0.2	0.85	0.85
P7	Across W approach	53	54.6	LOS E	0.2	0.2	0.85	0.85
All Pedestrians		106	54.2	LOS E			0.85	0.85

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY AM

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	80	2.0	0.167	10.1	LOS A	1.0	7.3	0.23	0.65	47.0
2	T	1653	2.0	1.416	453.7	LOS F	171.0	1217.3	1.00	2.31	4.4
3	R	673	2.0	1.102	162.6	LOS F	34.4	244.8	1.00	1.29	11.1
Approach		2406	2.0	1.416	357.6	LOS F	171.0	1217.3	0.97	1.97	5.5
East: CAMDEN VALLEY WAY											
4	L	290	2.0	0.158	7.6	X	X	X	X	0.60	49.8
5	T	325	2.0	0.211	31.1	LOS C	7.6	54.4	0.69	0.58	31.2
6	R	254	2.0	0.867	56.3	LOS D	6.3	45.0	1.00	0.90	23.6
Approach		869	2.0	0.867	30.7	LOS C	7.6	54.4	0.55	0.68	32.2
North: COWPASTURE RD											
7	L	399	2.0	0.635	29.5	LOS C	14.8	105.6	0.59	0.76	33.3
8	T	903	2.0	1.223	282.8	LOS F	71.5	509.0	1.00	1.79	6.8
9	R	213	2.0	1.245	315.3	LOS F	34.4	244.8	1.00	1.49	6.2
Approach		1515	2.0	1.245	220.7	LOS F	71.5	509.0	0.89	1.48	8.4
West: BRINGELLY RD											
10	L	502	2.0	0.635	25.9	LOS B	20.9	148.8	0.66	0.79	35.2
11	T	1669	2.0	1.355	398.4	LOS F	160.6	1143.5	1.00	2.28	5.0
12	R	95	2.0	0.649	90.8	LOS F	3.7	26.5	1.00	0.78	17.3
Approach		2266	2.0	1.355	302.9	LOS F	160.6	1143.5	0.93	1.89	6.4
All Vehicles		7056	2.0	1.416	270.4	LOS F	171.0	1217.3	0.89	1.68	7.1

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	44.1	LOS E	0.2	0.2	0.77	0.77
P7	Across W approach	53	62.6	LOS F	0.2	0.2	0.91	0.91
All Pedestrians		106	53.3	LOS E			0.84	0.84

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY PM

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	123	2.0	0.420	23.3	LOS B	4.3	30.9	0.51	0.70	36.7
2	T	554	2.0	0.348	31.9	LOS C	13.6	97.2	0.73	0.63	30.8
3	R	399	2.0	0.629	47.3	LOS D	8.4	59.6	0.98	0.85	26.2
Approach		1076	2.0	0.629	36.6	LOS C	13.6	97.2	0.80	0.72	29.5
East: CAMDEN VALLEY WAY											
4	L	906	2.0	0.495	7.7	X	X	X	X	0.60	49.7
5	T	1104	2.0	1.163	232.8	LOS F	80.0	569.8	1.00	1.75	8.0
6	R	428	2.0	1.096	153.3	LOS F	22.2	158.4	1.00	1.20	11.5
Approach		2438	2.0	1.163	135.2	LOS F	80.0	569.8	0.63	1.23	12.7
North: COWPASTURE RD											
7	L	428	2.0	0.406	10.8	LOS A	4.1	29.3	0.16	0.65	46.4
8	T	1502	2.0	1.176	231.0	LOS F	110.5	786.8	1.00	1.72	8.0
9	R	272	2.0	1.113	199.6	LOS F	34.4	244.6	1.00	1.27	9.3
Approach		2202	2.0	1.176	184.4	LOS F	110.5	786.8	0.84	1.46	9.8
West: BRINGELLY RD											
10	L	297	2.0	0.354	12.7	LOS A	6.0	42.8	0.35	0.70	44.6
11	T	635	2.0	1.125	205.3	LOS F	42.0	299.2	1.00	1.51	8.9
12	R	145	2.0	0.848	94.8	LOS F	5.9	41.9	1.00	0.91	16.7
Approach		1077	2.0	1.125	137.3	LOS F	42.0	299.2	0.82	1.20	12.5
All Vehicles		6793	2.0	1.176	135.8	LOS F	110.5	786.8	0.75	1.22	12.6

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	66.3	LOS F	0.2	0.2	0.94	0.94
P7	Across W approach	53	44.9	LOS E	0.2	0.2	0.77	0.77
All Pedestrians		106	55.6	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY SAT

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	185	2.0	0.767	34.4	LOS C	8.3	59.0	0.55	0.79	31.1
2	T	900	2.0	0.762	50.5	LOS D	29.7	211.3	0.97	0.85	24.2
3	R	520	2.0	0.687	46.2	LOS D	12.4	88.4	0.98	0.85	26.6
Approach		1605	2.0	0.767	47.2	LOS D	29.7	211.3	0.92	0.85	25.6
East: CAMDEN VALLEY WAY											
4	L	52	2.0	0.028	7.6	X	X	X	X	0.60	49.8
5	T	925	2.0	0.767	49.9	LOS D	30.5	216.9	0.97	0.86	24.3
6	R	350	2.0	1.024	104.4	LOS F	13.6	97.2	1.00	1.09	15.5
Approach		1327	2.0	1.024	62.6	LOS E	30.5	216.9	0.94	0.91	21.5
North: COWPASTURE RD											
7	L	350	2.0	0.443	18.4	LOS B	8.0	57.1	0.37	0.70	40.0
8	T	900	2.0	1.031	123.7	LOS F	47.2	336.1	1.00	1.29	13.3
9	R	316	2.0	1.036	138.5	LOS F	33.3	237.2	1.00	1.14	12.6
Approach		1566	2.0	1.036	103.1	LOS F	47.2	336.1	0.86	1.13	15.5
West: BRINGELLY RD											
10	L	416	2.0	0.544	18.9	LOS B	13.1	93.3	0.52	0.75	39.6
11	T	925	2.0	1.030	128.8	LOS F	50.1	356.5	1.00	1.34	12.9
12	R	185	2.0	0.947	106.2	LOS F	8.1	57.6	1.00	1.02	15.4
Approach		1526	2.0	1.030	96.1	LOS F	50.1	356.5	0.87	1.14	16.3
All Vehicles		6024	2.0	1.036	77.5	LOS F	50.1	356.5	0.90	1.01	18.9

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	54.6	LOS E	0.2	0.2	0.85	0.85
P7	Across W approach	53	58.1	LOS E	0.2	0.2	0.88	0.88
All Pedestrians		106	56.3	LOS E			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY AM - PROP

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	30	2.0	0.057	9.3	LOS A	0.3	2.2	0.19	0.63	47.8
2	T	1306	2.0	0.808	56.6	LOS E	30.6	217.9	1.00	0.91	22.6
3	R	820	2.0	0.908	57.2	LOS E	24.8	176.3	1.00	0.98	23.5
Approach		2156	2.0	0.908	56.2	LOS D	30.6	217.9	0.99	0.93	23.1
East: CAMDEN VALLEY WAY											
4	L	290	2.0	0.158	7.6	X	X	X	X	0.60	49.8
5	T	300	2.0	0.120	26.7	LOS B	4.3	30.4	0.63	0.51	33.4
6	R	254	2.0	0.867	91.9	LOS F	10.2	72.9	1.00	0.96	17.2
Approach		844	2.0	0.867	39.8	LOS C	10.2	72.9	0.53	0.68	28.5
North: COWPASTURE RD											
7	L	399	2.0	0.573	34.3	LOS C	17.8	126.8	0.69	0.79	31.1
8	T	764	2.0	0.827	70.5	LOS E	18.8	134.1	1.00	0.91	19.8
9	R	313	2.0	0.513	69.8	LOS E	10.2	72.3	0.93	0.80	20.7
Approach		1476	2.0	0.827	60.5	LOS E	18.8	134.1	0.90	0.86	22.2
West: BRINGELLY RD											
10	L	463	2.0	0.589	18.8	LOS B	14.7	104.9	0.53	0.75	39.7
11	T	1644	2.0	0.909	67.2	LOS E	44.2	314.6	1.00	1.03	20.4
12	R	45	2.0	0.138	50.5	LOS D	2.5	17.4	0.78	0.74	25.3
Approach		2152	2.0	0.909	56.4	LOS D	44.2	314.6	0.89	0.96	22.9
All Vehicles		6628	2.0	0.909	55.2	LOS D	44.2	314.6	0.88	0.89	23.4

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	51.3	LOS E	0.2	0.2	0.83	0.83
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		106	60.2	LOS F			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY PM - PROP

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

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	26	2.0	0.084	13.4	LOS A	0.5	3.7	0.32	0.65	44.0
2	T	554	2.0	0.244	32.3	LOS C	8.9	63.4	0.71	0.60	30.7
3	R	399	2.0	0.681	42.3	LOS C	7.8	55.5	0.99	0.82	28.0
Approach		979	2.0	0.681	35.8	LOS C	8.9	63.4	0.82	0.69	29.7
East: CAMDEN VALLEY WAY											
4	L	906	2.0	0.495	7.7	X	X	X	X	0.60	49.7
5	T	1056	2.0	0.490	38.3	LOS C	19.5	138.8	0.82	0.71	28.1
6	R	428	2.0	0.762	76.7	LOS F	15.7	111.8	1.00	0.87	19.5
Approach		2390	2.0	0.762	33.6	LOS C	19.5	138.8	0.54	0.70	30.8
North: COWPASTURE RD											
7	L	428	2.0	0.392	8.9	LOS A	2.1	14.6	0.08	0.63	48.4
8	T	1375	2.0	0.776	50.2	LOS D	29.1	207.2	0.93	0.83	24.3
9	R	324	2.0	0.781	81.8	LOS F	12.0	85.7	1.00	0.86	18.6
Approach		2127	2.0	0.781	46.7	LOS D	29.1	207.2	0.77	0.79	25.7
West: BRINGELLY RD											
10	L	222	2.0	0.268	12.1	LOS A	4.1	29.3	0.32	0.69	45.1
11	T	585	2.0	0.563	60.8	LOS E	13.1	93.4	0.97	0.80	21.7
12	R	48	2.0	0.780	94.3	LOS F	3.9	27.7	1.00	0.85	16.9
Approach		855	2.0	0.780	50.1	LOS D	13.1	93.4	0.80	0.77	24.7
All Vehicles		6351	2.0	0.781	40.5	LOS C	29.1	207.2	0.70	0.74	27.9

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
P7	Across W approach	53	49.6	LOS E	0.2	0.2	0.81	0.81
All Pedestrians		106	59.4	LOS E			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY SAT - PROP

Signals - Fixed Time Cycle Time = 120 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	35	2.0	0.078	10.3	LOS A	0.4	2.9	0.26	0.64	46.9
2	T	900	2.0	0.468	33.9	LOS C	13.8	98.4	0.84	0.72	29.8
3	R	520	2.0	0.741	36.6	LOS C	9.6	68.7	1.00	0.86	30.1
Approach		1455	2.0	0.741	34.3	LOS C	13.8	98.4	0.88	0.77	30.2
East: CAMDEN VALLEY WAY											
4	L	52	2.0	0.028	7.6	X	X	X	X	0.60	49.8
5	T	850	2.0	0.368	27.0	LOS B	11.6	82.2	0.75	0.64	33.1
6	R	350	2.0	0.717	64.5	LOS E	10.3	73.7	1.00	0.86	21.8
Approach		1252	2.0	0.717	36.7	LOS C	11.6	82.2	0.79	0.70	29.2
North: COWPASTURE RD											
7	L	350	2.0	0.388	11.5	LOS A	3.7	26.3	0.22	0.66	45.8
8	T	900	2.0	0.748	49.8	LOS D	16.6	117.9	0.97	0.85	24.4
9	R	200	2.0	0.468	62.9	LOS E	5.5	39.2	0.95	0.78	22.1
Approach		1450	2.0	0.748	42.4	LOS C	16.6	117.9	0.79	0.80	27.1
West: BRINGELLY RD											
10	L	300	2.0	0.354	13.4	LOS A	5.8	41.5	0.42	0.71	44.0
11	T	850	2.0	0.679	47.0	LOS D	15.4	109.8	0.98	0.83	25.1
12	R	35	2.0	0.300	63.3	LOS E	2.0	14.2	0.95	0.75	22.1
Approach		1185	2.0	0.679	39.0	LOS C	15.4	109.8	0.83	0.80	28.1
All Vehicles		5342	2.0	0.748	38.1	LOS C	16.6	117.9	0.82	0.77	28.6

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	55.1	LOS E	0.2	0.2	0.96	0.96
P7	Across W approach	53	53.2	LOS E	0.2	0.2	0.94	0.94
All Pedestrians		106	54.2	LOS E			0.95	0.95

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY PROP+DEV AM

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	80	2.0	0.161	9.8	LOS A	0.9	6.7	0.22	0.65	47.4
2	T	1306	2.0	0.808	56.6	LOS E	30.6	217.9	1.00	0.91	22.6
3	R	820	2.0	0.908	57.2	LOS E	24.8	176.3	1.00	0.98	23.5
Approach		2206	2.0	0.908	55.1	LOS D	30.6	217.9	0.97	0.93	23.4
East: CAMDEN VALLEY WAY											
4	L	290	2.0	0.158	7.6	X	X	X	X	0.60	49.8
5	T	325	2.0	0.130	26.8	LOS B	4.6	33.1	0.63	0.52	33.4
6	R	254	2.0	0.867	91.9	LOS F	10.2	72.9	1.00	0.96	17.2
Approach		869	2.0	0.867	39.4	LOS C	10.2	72.9	0.53	0.67	28.6
North: COWPASTURE RD											
7	L	399	2.0	0.575	35.0	LOS C	18.0	128.4	0.70	0.80	30.8
8	T	764	2.0	0.827	70.5	LOS E	18.8	134.1	1.00	0.91	19.8
9	R	352	2.0	0.577	70.6	LOS F	11.6	82.8	0.94	0.81	20.5
Approach		1515	2.0	0.827	61.2	LOS E	18.8	134.1	0.91	0.86	22.1
West: BRINGELLY RD											
10	L	502	2.0	0.638	19.2	LOS B	16.5	117.5	0.54	0.76	39.4
11	T	1669	2.0	0.922	70.8	LOS F	46.2	329.0	1.00	1.05	19.7
12	R	95	2.0	0.299	53.8	LOS D	5.5	39.3	0.83	0.78	24.4
Approach		2266	2.0	0.922	58.6	LOS E	46.2	329.0	0.89	0.98	22.4
All Vehicles		6856	2.0	0.922	55.6	LOS D	46.2	329.0	0.87	0.90	23.3

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	51.3	LOS E	0.2	0.2	0.83	0.83
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		106	60.2	LOS F			0.89	0.89

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY PROP+DEV PM

Signals - Fixed Time Cycle Time = 140 seconds (User-Given Phase Times)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	123	2.0	0.381	14.9	LOS B	2.8	19.9	0.39	0.68	42.7
2	T	554	2.0	0.269	34.0	LOS C	8.8	63.0	0.75	0.63	29.9
3	R	399	2.0	0.763	44.5	LOS D	8.5	60.4	1.00	0.86	27.2
Approach		1076	2.0	0.763	35.7	LOS C	8.8	63.0	0.80	0.72	29.8
East: CAMDEN VALLEY WAY											
4	L	906	2.0	0.495	7.7	X	X	X	X	0.60	49.7
5	T	1104	2.0	0.686	48.4	LOS D	22.4	159.3	0.95	0.83	24.8
6	R	428	2.0	0.861	53.6	LOS D	11.4	81.0	1.00	0.93	24.5
Approach		2438	2.0	0.861	34.2	LOS C	22.4	159.3	0.61	0.76	30.4
North: COWPASTURE RD											
7	L	428	2.0	0.372	8.8	LOS A	1.9	13.3	0.08	0.63	48.4
8	T	1375	2.0	0.877	59.8	LOS E	31.9	227.1	1.00	0.97	21.9
9	R	399	2.0	1.090	176.5	LOS F	22.7	161.8	1.00	1.26	10.3
Approach		2202	2.0	1.090	71.0	LOS F	31.9	227.1	0.82	0.96	20.0
West: BRINGELLY RD											
10	L	297	2.0	0.340	12.2	LOS A	5.5	39.0	0.35	0.70	45.1
11	T	635	2.0	0.570	55.6	LOS D	13.2	94.1	0.96	0.80	22.9
12	R	145	2.0	0.639	50.2	LOS D	7.5	53.7	1.00	0.80	25.4
Approach		1077	2.0	0.639	42.9	LOS D	13.2	94.1	0.80	0.77	26.9
All Vehicles		6793	2.0	1.090	47.7	LOS D	31.9	227.1	0.74	0.82	25.5

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	64.1	LOS F	0.2	0.2	0.96	0.96
P7	Across W approach	53	51.4	LOS E	0.2	0.2	0.86	0.86
All Pedestrians		106	57.8	LOS E			0.91	0.91

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: COWPASTURE AND
BRINGELLY PROP+DEV SAT

Signals - Fixed Time Cycle Time = 150 seconds (Practical Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: CAMDEN VALLEY WAY											
1	L	185	2.0	0.521	12.0	LOS A	3.5	25.0	0.32	0.68	45.3
2	T	900	2.0	0.584	51.2	LOS D	19.0	135.2	0.93	0.79	24.0
3	R	520	2.0	0.926	69.2	LOS E	16.9	120.3	1.00	1.02	20.9
Approach		1605	2.0	0.926	52.5	LOS D	19.0	135.2	0.88	0.85	24.2
East: CAMDEN VALLEY WAY											
4	L	52	2.0	0.028	7.6	X	X	X	X	0.60	49.8
5	T	925	2.0	0.308	21.6	LOS B	12.6	89.7	0.61	0.53	36.3
6	R	350	2.0	0.956	106.4	LOS F	15.7	111.5	1.00	1.06	15.4
Approach		1327	2.0	0.956	43.4	LOS D	15.7	111.5	0.69	0.67	26.9
North: COWPASTURE RD											
7	L	350	2.0	0.438	10.3	LOS A	3.0	21.7	0.14	0.64	46.9
8	T	900	2.0	0.935	83.3	LOS F	25.0	178.3	1.00	1.04	17.7
9	R	316	2.0	0.925	95.4	LOS F	13.1	93.2	1.00	0.98	16.7
Approach		1566	2.0	0.935	69.5	LOS E	25.0	178.3	0.81	0.94	20.3
West: BRINGELLY RD											
10	L	416	2.0	0.477	15.9	LOS B	11.4	81.3	0.46	0.73	41.9
11	T	925	2.0	0.422	36.4	LOS C	16.4	116.9	0.79	0.68	28.9
12	R	185	2.0	0.957	115.6	LOS F	19.2	136.5	1.00	1.15	14.5
Approach		1526	2.0	0.957	40.4	LOS C	19.2	136.5	0.72	0.75	27.9
All Vehicles		6024	2.0	0.957	51.9	LOS D	25.0	178.3	0.78	0.81	24.3

X: Not applicable for Continuous movement.

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

Vehicle movement LOS values are based on average delay per movement

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

SIDRA Standard Delay Model used.

Movement Performance - Pedestrians								
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P5	Across N approach	53	43.3	LOS E	0.2	0.2	0.76	0.76
P7	Across W approach	53	68.2	LOS F	0.2	0.2	0.95	0.95
All Pedestrians		106	55.7	LOS E			0.86	0.86

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)

Pedestrian movement LOS values are based on average delay per pedestrian movement.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.