PRELIMINARY TRAFFIC ASSESSMENT

RESOURCE RECOVERY FACILITY

MARTIN ROAD, BADGERYS CREEK

PREPARED FOR: KDC PTY LTD

NOVEMBER 2017

REF: 17/163

PRELIMINARY TRAFFIC ASSESSMENT

RESOURCE RECOVERY FACILITY
MARTIN ROAD, BADGERYS CREEK
KDC PTY LTD

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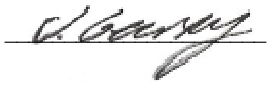
QUALITY ASSURANCE

This document has been prepared, checked and released in accordance with the Quality Control Standards established by Intersect Traffic Pty Ltd.

Issue	Date	Description	By
A	24/11/17	Draft	JG
B		Edit	JG
C		Final Proof	JG
D		Approved	JG

This document has been authorised by



Date: - November 2017

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TABLES

1. INTRODUCTION

Intersect Traffic Pty Ltd has been engaged by KDC Pty Ltd to undertake a preliminary traffic assessment for the development of a resource recovery facility off Martin Road, Badgerys Creek. It is understood KDC are looking at several sites on Martins Road for this facility and it was noted on inspection that Australian Native Landscapes (ANL) already operates a similar facility in the area and the Martins Road is adjacent to the Badgerys Creek Waste Disposal and Recycling Centre.

This preliminary traffic assessment is required to inform the feasibility stage of the development and guide the project team in matters pertaining to the traffic impact and access issues associated with the development.

Specifically the report looks to establish;

- What road upgrades would be required to facilitate the facility;
- What are the current capacity thresholds for the local and state road network; and
- What Traffic Impacts may need to be further investigated prior to lodgement of a development application.

This assessment has been undertaken with reference to the *RTA's Guide to Traffic Generating Developments (2002),* Austroads *Guide to Road Design – Part 4A Unsignalised and signalised intersections (2010)*, latest Australian Standards *AS2890.1 & 2 – Parking Facilities – Part 1 – Off street car parking and Part 2 – Commercial vehicle facilities* and Liverpool City Council requirements.

2. DEVELOPMENT PROPOSAL

2.1 Site Location

Martin Road is a no through road that runs for 2 kms generally north south from Elizabeth Drive at Badgerys Creek approximately 7 km west of the M7 Westlink Expressway. The Badgerys Creek Waste Disposal and Recycling Centre is located approximately 800 metres north of the Elizabeth Drive / Martin Road intersection. ***Figure 1*** below shows an aerial view of the Elizabeth Drive / Martin Road intersection while ***Photographs 1*** also shows this intersection.

The surrounding area is mainly rural and Martin Road and Elizabeth Drive have both been constructed as rural standard roads with sealed shoulders and table drains / grass verges. Martin Road however does provide access to a number of light industrial land uses such as resource recovery facilities with a large facility run by ANL being located at the end of Martin Road. Photograph 2 below shows the current land uses within the vicinity of Martin Road.

Figure 1 – Elizabeth Drive / Martin Road intersection

Photograph 1 – Elizabeth Drive / Martin Road intersection from Elizabeth Drive.

Photograph 2 – Land Use – Martin Road.

2.2 Development Proposal

The proposed development concept involves the following;

- Waste Management Facility / resource Recovery Facility with a capacity to cater for 500,000 tonnes per annum of waste and also potentially provide for 100,000 tonnes of waste on the site at any time.

No development concept plans were available at the time of composing this report.

2.3 Existing Road Network

2.3.1 Elizabeth Drive

Elizabeth Drive under a functional road hierarchy is a local collector road that connects the Cecil Park, Kemps Creek, Badgerys Creek and Luddenham areas to the arterial and sub-arterial road networks at the M7 Westlink and The Northern Road respectively. It collects traffic from the local access roads in the area and distributes it to the sub-arterial and arterial road networks at each end. As such it would be under the care and control of Liverpool City Council and a 60 km/h speed zone exists through the area. At the time of inspection it was found to be in good conditions as evidenced in ***Photograph 3*** below. Elizabeth Drive was found to provide a single lane of travel for each direction.

Photograph 3 – Elizabeth Drive near Martin Road

2.3.2 Martin Road

Martin Road in the vicinity of the site is a sealed rural local road (no through road) providing a single travel lane in each direction with sealed shoulders and longitudinal table drains along both sides of the road. The carriageway width was found to be approximately 10 metres wide with only minimal 1 metre unsealed shoulders. A 50 km/hr speed zoning would apply to the road. The road would also be under the care and control of Liverpool City Council and at the time of inspection was found to be in fair to good condition as evidenced in ***Photograph 4*** below.

Photograph 4 – Martin Road near Elizabeth Drive.

2.4 Traffic Generation

Traffic generation data for this assessment report has been determined from the operational details provided by KDC Pty Ltd and assumptions made in relation to operating hours of the facility and truck sizes. The key data used for the traffic generation calculations are;

- Waste delivery is 500,000 tonnes per annum;
- Waste removal based on 100,000 tonnes of storage on site i.e. 400,000 tonnes per annum.
- Each vehicle load (delivery and removal) represents an inbound and outbound trip that will occur in the same hour.
- Operating Hours 10 hours per day – weekdays and 5 hours on Saturdays.
- Facility is open 50 weeks of the year (Closed Christmas, New Year & Easter)
- Waste delivery provided in a number of different sized trucks with an average haulage load of 20 tonnes.
- Waste removal undertaken using semi-trailers and B-Doubles with an average haulage load of 24 tonnes operated by contractors.
- Staff numbers assumed to be 15 staff including drivers.

Therefore the traffic generation calculations are;

1. Waste delivery – 500000 tonnes per annum / 50 weeks per annum / 65 hours per week / 20 tonnes per vehicle x 2 trips per vehicle = approximately 16 vehicle trips per hour.
2. Waste removal – 400,000 tonnes per annum / 50 weeks per annum / 65 hours per week / 24 tonnes per vehicle x 2 trips per vehicle = approximately 10 vehicle trips per hour.
3. Staff trips – Peak Hour considered to be arrival at work (AM) all inbound trips – 15 vtph and departure from work (PM) all outbound trips – 15 vtph.

Therefore Peak Hour and daily Trips can be calculated as follows;

Weekday Daily Vehicle Trips = 16 x 10 + 10 x 10 + 15 x 2 = 290 say **300 vtpd** with visitors.

AM Peak hour = 13 inbound trips + 13 outbound trips + 15 inbound = 41 vtph (28 inbound and 13 outbound).

PM Peak hour = 13 inbound trips + 13 outbound trips + 15 outbound trips = 41 vtph (13 inbound and 28 outbound).

2.5 Trip Distribution

In distributing the traffic from the development the following assumptions are made. The major origin/destination will be to the east towards the M7 Westlink. Therefore at Elizabeth Drive a 70 % east 30% west trip distribution for origins and destinations is assumed. Noting the inbound and outbound movements in the AM and PM peak are as discussed in Section 2.4 the following trip distribution results.

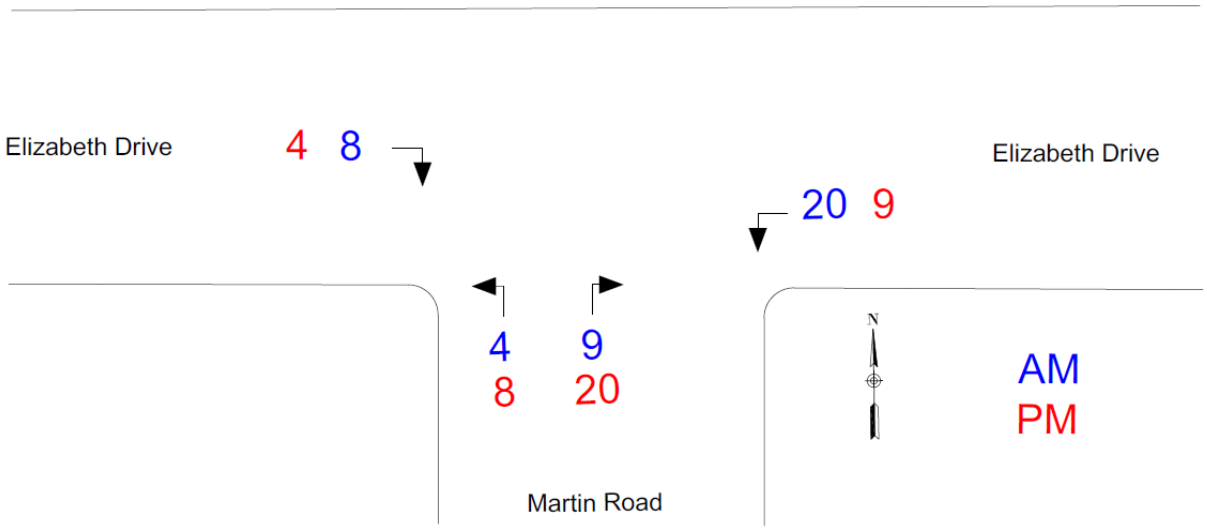


Figure 2 – Development Traffic Trip Distribution

2.6 Traffic Impacts and Considerations

2.6.1 Road Network Capacity

Table 4.4 of the RMS publication "*RTA's Guide to Traffic Generating Developments"* provides some guidance on likely levels of service being experienced on two lane two way urban roads though the capacity of urban roads is generally determined by intersection capacity. This table is reproduced below.

Table 4.4
Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Source:- RTA's Guide to Traffic Generating Developments 2002

In determining the capacity of Martin Road and Elizabeth Drive from this table the following has been considered;

- Both are two way two lane urban roads i.e. one lane per direction;
- A LoS C is considered the acceptable level of service for these roads given their function within a functional road hierarchy.

On this basis the likely mid-block two-way road capacity for both roads is 1,800 vtph (i.e. 2 x 900 vtph) noting a LoS C exists until the LoS D threshold is reached therefore the LoS D threshold is the lane capacity for a LoS C.

Road Data on behalf of Intersect Traffic undertook traffic counts at the Elizabeth Drive / Martin Road intersection and the Elizabeth Drive / Mamre Road roundabout on Wednesday 1st November 2017 (see ***Attachment A***) and determined the following peak hour volumes on the road network;

- Martin Road – 45 vtph in the AM peak hour and 64 vtph in the PM peak;
- Elizabeth Drive – 1,299 vtph in the AM peak and 1,333 vtph in the PM peak.

The additional traffic from the proposed development would increase these traffic volumes (see ***Figure 2***) as follows;

- Martin Road – 41 vtph in both the AM and PM peak hours;
- Elizabeth Drive – 29 vtph in both the AM peak and PM peak hours.

Adopting a background traffic growth of 2 % per annum on the road network and adding the development traffic would result in future 2027 traffic volumes of;

- Martin Road – 95 vtph in the AM peak hour and 118 vtph in the PM peak;
- Elizabeth Drive – 1,590 vtph in the AM peak and 1,630 vtph in the PM peak.

Therefore as these values are below the mid-block two-way road capacity for the road network of 1,800 vtph it is reasonable to conclude that the existing road network has sufficient two-way mid-block capacity to cater for the proposed development.

2.6.2 Intersection Capacity

To determine the impact of the development on intersection capacity both the Elizabeth Drive / Martin Road give way controlled T-intersection and the Elizabeth Drive / Mamre Road roundabout have been modelled for the AM and PM peak traffic periods using the Sidra Intersection modelling program. This software package predicts likely delays, queue lengths and thus levels of service that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below:

Table 4.2
Level of service criteria for intersections

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

Source: - RTA's Guide to Traffic Generating Developments (2002).

Assumptions made in this modelling are:

- The intersection layout will remain as per current conditions.
- Traffic volumes used in the modelling are as collected by Roar Data on Wednesday 1st November 2017.
- Traffic generated by the development is distributed as per ***Figure 2.***
- Future 2027 traffic growth predicted using a 2.0 % per annum background traffic growth rate.

The results of the modelling are summarised in ***Tables 1 & 2*** below for 'all vehicles' and in the case of the priority controlled Elizabeth Drive / Martin Road intersection the worst movement based on LoS (i.e. average delay). The Sidra Movement Summary Tables are provided in ***Attachment B.***

Table 1 – Elizabeth Drive / Martin Road intersection - Sidra Modelling Results Summary

Model	Deg. Satn (v/c)	Average Delay (s)	Worst Level of Service	95 % back of queue length (cars)
2017 AM + development	0.42	1.9	F	1.4
2017 PM + development	1.156	24.4	F	18.1
2027 AM + development	1.025	10	F	6.8
2027 PM + development	3.197	211.2	F	82.1
2027AM + dev roundabout	0.456	3.9	A	3.9
2027PM + dev + roundabout	0.614	4.5	A	6.3

Table 2 – Elizabeth Drive / Mamre Road roundabout - Sidra Modelling Results Summary

Model	Deg. Satn (v/c)	Average Delay (s)	Worst Level of Service	95 % back of queue length (cars)
2017 AM + development	0.626	7.9	A	5.6
2017 PM + development	0.687	8.1	A	6.0
2027 AM + development	0.817	11.7	B	12.1
2027 PM + development	0.874	11	B	12.7

This modelling shows that currently the Elizabeth Drive / Martin Road give way controlled intersection operates with lengthy delays for vehicles turning out of Martin Road during peak periods. While currently the delays and queue lengths are still satisfactory and would not generally require upgrading of the intersection with a further ten years background traffic growth the delays and queue lengths would reach unacceptable levels and the accident risk at the intersection will increase significantly. Therefore with only background traffic growth it is likely this intersection would need to be upgraded to signal or roundabout control. Therefore the intersection is currently operating at or above capacity.

Whilst this development would accelerate the decrease in intersection performance overall its impact is minimal as traffic generated from the site is not considered major. However based on this modelling Council is likely to require upgrading of the intersection prior to further development along Martin Road. It is noted modelling of the intersection as a single lane roundabout indicated satisfactory performance through to and past 2027.

It is my opinion, that as the intersection will fail with background traffic growth it would be unreasonable and unfair for the Council to expect the development fully fund this work. The work would benefit all traffic users on the road network therefore the development should only be expected to pay a fair and reasonable contribution to the upgrade. As development traffic represents only about 1.5 % of existing traffic the fair and reasonable contribution should only be 1.5 % of the road work cost. As I could not find any reference to this intersection in the current Liverpool City Council S94 Developer Contributions Plan such a contribution would need to be via a Voluntary Planning Agreement.

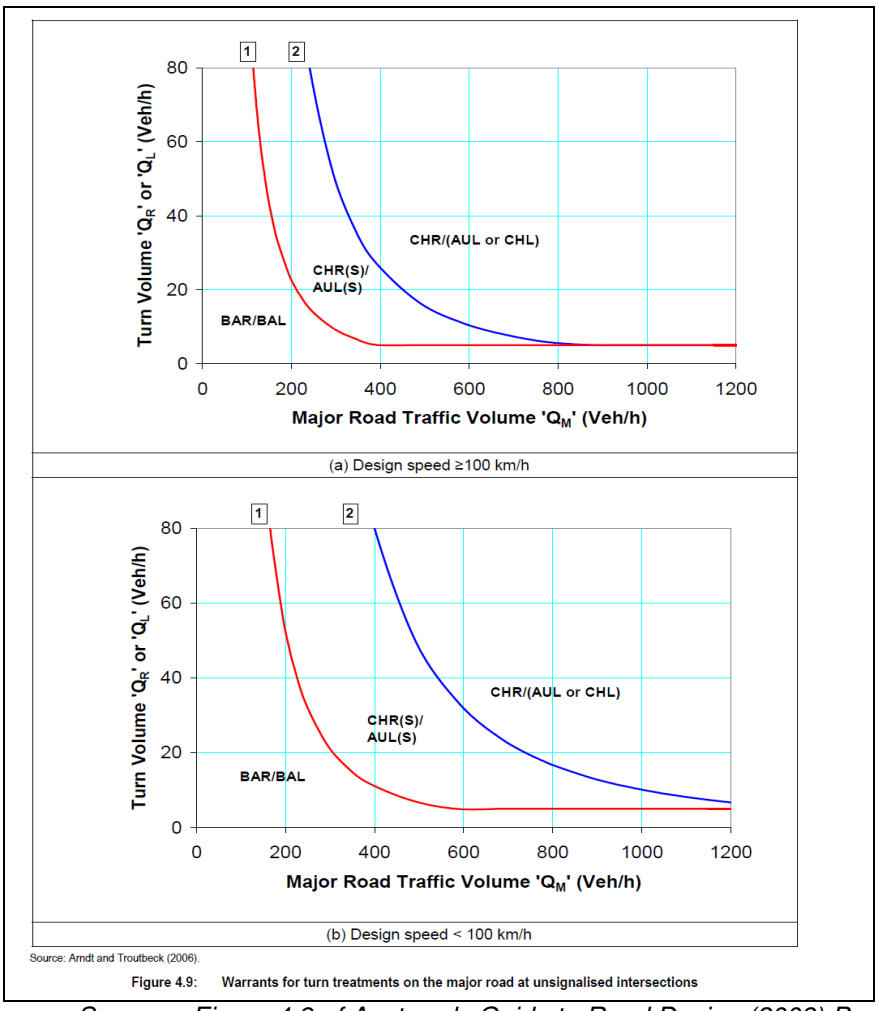
The Elizabeth Drive / Mamre Road intersection continued to operate satisfactorily post development through to and beyond 2027.

2.6.3 Site Access / Road Upgrading

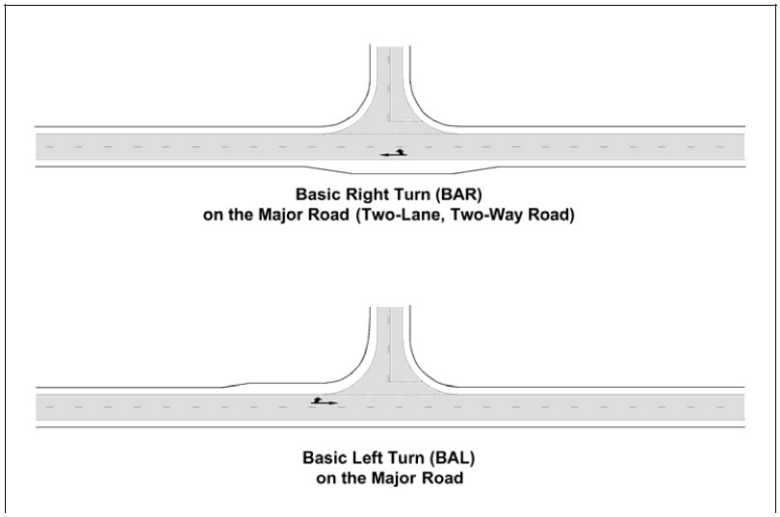
Post development the site access will probably service in excess of < 25 car spaces. Under Table 3.1 of Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* a car park with between 0 to 25 car parking spaces accessed via a local road providing long term employee parking (Class 1) is required to have a Category 1 access facility. A Category 1 access facility is combined entry / exit access 3 m to 5.5 metres wide. However for the type of vehicle using the site the access width will be determined by the swept path analysis for entry and exit to and from the site by B-Double vehicles. It is noted from the RMS restricted vehicle access maps that Martin Road is already approved for 25/B26 metre B-Double heavy vehicles therefore it would appear unreasonable for Council to require any upgrading of Martin Road.

Warrants for turning lanes at rural intersections are contained within Figure 4.9 of Austroads *Guide to Road Design (2010) Part 4A – Signalised and Unsignalised intersections* which is reproduced below. For the site access using diagram (b) above for speeds < 100 km/h and with a major road total flow of approximately 45 vtph as well as a right turn or left turn with a maximum volume of in the order of 20 vtph identifies that a BAR / BAL intersection is considered satisfactory for the site access i.e. no dedicated right or left turn deceleration / storage lanes are required at the access (see figure below).

Sight Distance at the access cannot be assessed at this stage and further review is required at DA stage.



Source :- Figure 4.9 of Austroads Guide to Road Design (2009) Part 4A



Source :- Austroads Guide to Road Design (2009) Part 4A

2.6.4 On-site parking and driveway

Not applicable for this stage of the assessment process though it is likely the on-site parking requirements will be 1 space per employee plus a couple of visitor car spaces.

2.6.5 Alternate Transport Modes

Not required at this stage of the development planning though it was noted that it appears a public transport service runs along Elizabeth Drive with bus stops at the Martin Road intersection. To be investigated further at DA stage should the proposal proceed to that stage.

3. CONCLUSIONS

This preliminary traffic assessment for a proposed Resource Recovery Facility in Martin Road, Badgerys Creek has concluded;

- The proposed development is likely to generate in the order of an additional 41 vtph during the AM and PM peak hour traffic periods.
- There is sufficient two-way mid-block capacity within the local road network to cater for the additional traffic generated by this development.
- SIDRA modelling has shown that the Elizabeth Drive / Martin Road give way controlled T-intersection operates at or above capacity during the current AM and PM peak periods. Whilst this development would accelerate the decrease in intersection performance overall its impact is minimal as traffic generated from the site is not considered major. However based on this modelling Council is likely to require upgrading of the intersection prior to further development along Martin Road.
- SIDRA modelling indicates that conversion of the existing Elizabeth Drive / Martin Road give way controlled T-intersection to a roundabout would result in satisfactory intersection performance through to and beyond 2027 post development.
- As the Elizabeth Drive / Martin Road intersection is currently operating at or above capacity and intersection performance will deteriorate quickly with just background traffic growth it would be unreasonable for Liverpool Council to require the upgrading of the Elizabeth Drive / Martin Road intersection be fully funded by the subject development.
- A fair and reasonable contribution to the Elizabeth Drive / Martin Road intersection is considered to be 1.5 % of the cost as the development traffic only represents 1.5 % of all traffic through the intersection.
- As the Elizabeth Drive / Martin Road intersection upgrade does not appear to be contained within Liverpool Council's current S94 Developer Contributions Plan contribution could only be by way of a Voluntary planning Agreement.
- SIDRA modelling of the existing Elizabeth Drive / Mamre Road showed this intersection continues to operate satisfactorily post development through to and beyond 2027.
- The site access width will be determined by the swept path analysis for entry and exit to and from the site by B-Double vehicles. This would need to be reviewed at DA stage.
- It is noted from the RMS restricted vehicle access maps that Martin Road is already approved for 25/B26 metre B-Double heavy vehicles therefore it would appear unreasonable for Council to require any upgrading of Martin Road.
- A turn lane warrant assessment has determined that any site access could be constructed as a basic right turn and basic left turn (BAR / BAL) access and no dedicated right or left turn deceleration lanes are required on Martin Road.
- Site access sight distance, on-site car parking and alternative transport modes have not been considered in this assessment and will need to be further assessed at DA lodgement stage.
- Overall it is concluded that subject to the Elizabeth Drive / Martin Road intersection being upgraded to a roundabout or traffic signals or a financial plan being in place to ensure upgrading within 10 years the local road network has sufficient spare capacity to cater for the development and Liverpool City Council could support the development.

JR Garry BE (Civil), Masters of Traffic
Director
Intersect Traffic Pty Ltd

ATTACHMENT A
TRAFFIC COUNT DATA

R.O.A.R. DATA

Reliable, Original & Authentic Results

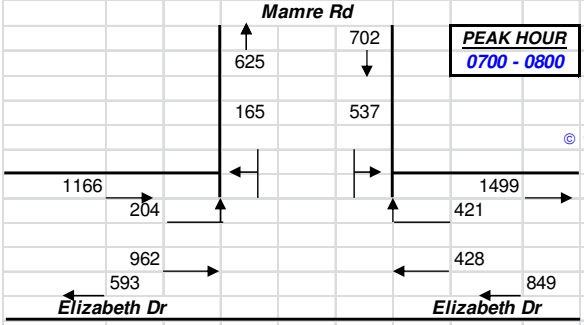
Ph.88196847, Mob.0418-239019

Client	: InTersect Traffic
Job No/Name	: 6617 BADGERYS CREEK Elizabeth Dr
Day/Date	: Wednesday 1st November 2017

All Vehicles

	WEST *Elizabeth*		NORTH *Mamre Rd*		EAST *Elizabeth*		
Time Per	L	T	R	L	T	R	TOTAL
0700 - 0715	45	232	44	94	138	111	**664**
0715 - 0730	52	243	41	150	98	95	**679**
0730 - 0745	59	212	45	146	77	96	**635**
0745 - 0800	48	275	35	147	115	119	**739**
0800 - 0815	71	203	32	107	89	96	**598**
0815 - 0830	59	194	39	77	112	95	**576**
0830 - 0845	43	167	48	84	123	86	**551**
0845 - 0900	41	158	59	88	124	77	**547**
Period End	**418**	**1684**	**343**	**893**	**876**	**775**	**4989**

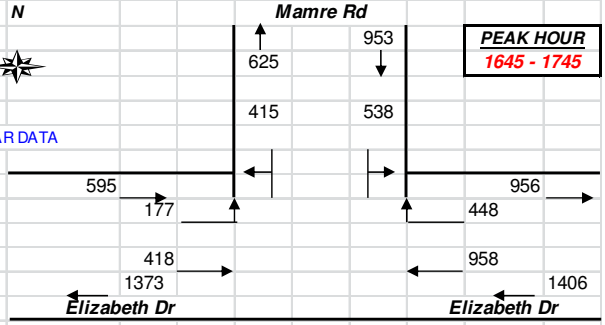
	WEST *Elizabeth*		NORTH *Mamre Rd*		EAST *Elizabeth*		
Peak Per	L	T	R	L	T	R	TOTAL
0700 - 0800	204	962	165	537	428	421	**2717**
0715 - 0815	230	933	153	550	379	406	**2651**
0730 - 0830	237	884	151	477	393	406	**2548**
0745 - 0845	221	839	154	415	439	396	**2464**
0800 - 0900	214	722	178	356	448	354	**2272**
PEAK HR	**204**	**962**	**165**	**537**	**428**	**421**	**2717**



All Vehicles

	WEST *Elizabeth*		NORTH *Mamre Rd*		EAST *Elizabeth*		
Time Per	L	T	R	L	T	R	TOTAL
1600 - 1615	53	113	85	86	275	111	**723**
1615 - 1630	41	108	104	122	239	118	**732**
1630 - 1645	39	104	86	89	238	122	**678**
1645 - 1700	29	122	120	133	266	98	**768**
1700 - 1715	52	104	86	127	257	117	**743**
1715 - 1730	55	110	117	154	217	109	**762**
1730 - 1745	41	82	92	124	218	124	**681**
1745 - 1800	45	88	113	107	203	153	**709**
Period End	**355**	**831**	**803**	**942**	**1913**	**952**	**5796**

	WEST *Elizabeth*		NORTH *Mamre Rd*		EAST *Elizabeth*		
Peak Per	L	T	R	L	T	R	TOTAL
1600 - 1700	162	447	395	430	1018	449	**2901**
1615 - 1715	161	438	396	471	1000	455	**2921**
1630 - 1730	175	440	409	503	978	446	**2951**
1645 - 1745	177	418	415	538	958	448	**2954**
1700 - 1800	193	384	408	512	895	503	**2895**
PEAK HOUR	**177**	**418**	**415**	**538**	**958**	**448**	**2954**



Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Job No/Name : 6617 BADGERYS CREEK Elizabeth Dr

Day/Date : Wednesday 1st November 2017

TOTAL VOLUMES FOR COUNT

PM

R.O.A.R. DATA

Reliable, Original & Authentic Results

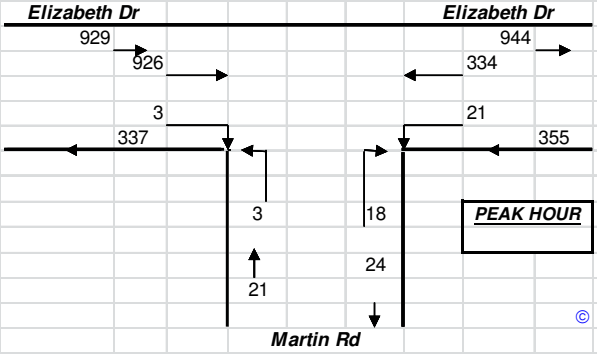
Ph.88196847, Mob.0418-239019

Client	: InTersect Traffic
Job No/Name	: 6617 BADGERYS CREEK Elizabeth Dr
Day/Date	: Wednesday 1st November 2017

All Vehicles

	WEST		SOUTH		EAST		
	Elizabeth		*Martin Rd*		*Elizabeth*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
0700 - 0715	205	0	1	4	4	83	**297**
0715 - 0730	236	1	0	3	5	67	**312**
0730 - 0745	253	0	0	2	7	102	**364**
0745 - 0800	232	2	2	9	5	82	**332**
0800 - 0815	204	1	3	7	0	97	**312**
0815 - 0830	169	3	3	5	3	90	**273**
0830 - 0845	155	1	2	2	3	89	**252**
0845 - 0900	148	1	3	6	1	120	**279**
Period End	**1602**	**9**	**14**	**38**	**28**	**730**	**2421**

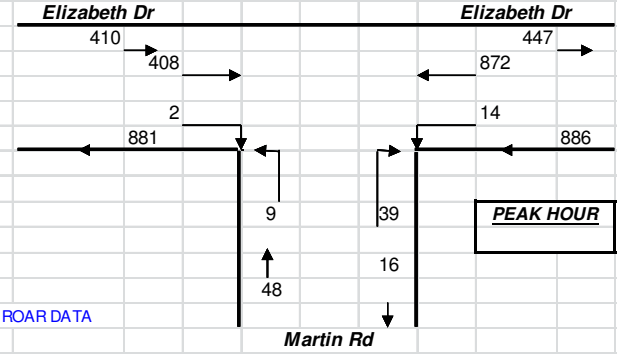
	WEST		SOUTH		EAST		
	Elizabeth		*Martin Rd*		*Elizabeth*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
0700 - 0800	926	3	3	18	21	334	**1305**
0715 - 0815	925	4	5	21	17	348	**1320**
0730 - 0830	858	6	8	23	15	371	**1281**
0745 - 0845	760	7	10	23	11	358	**1169**
0800 - 0900	676	6	11	20	7	396	**1116**
PEAK HR	**926**	**3**	**3**	**18**	**21**	**334**	**1305**



All Vehicles

	WEST		SOUTH		EAST		
	Elizabeth		*Martin Rd*		*Elizabeth*		
Time Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
1600 - 1615	92	3	1	4	7	178	**285**
1615 - 1630	91	1	2	4	2	201	**301**
1630 - 1645	93	1	2	6	4	214	**320**
1645 - 1700	118	0	0	7	3	204	**332**
1700 - 1715	101	1	6	21	6	231	**366**
1715 - 1730	96	0	1	5	1	223	**326**
1730 - 1745	85	2	0	6	0	174	**267**
1745 - 1800	99	3	3	1	1	169	**276**
Period End	**775**	**11**	**15**	**54**	**24**	**1594**	**2473**

	WEST		SOUTH		EAST		
	Elizabeth		*Martin Rd*		*Elizabeth*		
Peak Per	**T**	**R**	**L**	**R**	**L**	**T**	**TOTAL**
1600 - 1700	394	5	5	21	16	797	**1238**
1615 - 1715	403	3	10	38	15	850	**1319**
1630 - 1730	408	2	9	39	14	872	**1344**
1645 - 1745	400	3	7	39	10	832	**1291**
1700 - 1800	381	6	10	33	8	797	**1235**
PEAK HR	**408**	**2**	**9**	**39**	**14**	**872**	**1344**



Reliable, Original & Authentic Results

Ph.88196847, Mob.0418-239019

Job No/Name	: 6617 BADGERYS CREEK Elizabeth Dr
Day/Date	: Wednesday 1st November 2017

AM

TOTAL VOLUMES FOR COUNT

PM

ATTACHMENT B
SIDRA MOVEMENT SUMMARY TABLE

MOVEMENT SUMMARY

Site: 101 [2017 AM + development]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	7	15.0	0.420	20.9	LOS B	1.4	10.7	0.92	1.01	28.9
3	R2	27	15.0	0.420	74.3	LOS F	1.4	10.7	0.92	1.01	28.8
Approach		34	15.0	0.420	63.3	LOS E	1.4	10.7	0.92	1.01	28.8
East: Elizabeth Drive											
4	L2	41	10.0	0.024	5.7	LOS A	0.0	0.0	0.00	0.57	53.2
5	T1	334	10.0	0.182	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		375	10.0	0.182	0.6	NA	0.0	0.0	0.00	0.06	59.1
West: Elizabeth Road											
11	T1	926	10.0	0.377	0.0	LOS A	0.0	0.0	0.00	0.00	59.9
12	R2	11	10.0	0.012	7.5	LOS A	0.0	0.3	0.44	0.61	51.6
Approach		937	10.0	0.377	0.1	NA	0.0	0.3	0.01	0.01	59.8
All Vehicles		1346	10.1	0.420	1.9	NA	1.4	10.7	0.03	0.05	58.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2017 PM + development]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	17	15.0	1.156	400.1	LOS F	18.1	143.1	1.00	2.40	7.1
3	R2	59	15.0	1.156	452.5	LOS F	18.1	143.1	1.00	2.40	7.1
Approach		76	15.0	1.156	440.8	LOS F	18.1	143.1	1.00	2.40	7.1
East: Elizabeth Drive											
4	L2	23	10.0	0.013	5.7	LOS A	0.0	0.0	0.00	0.57	53.2
5	T1	872	10.0	0.476	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		895	10.0	0.476	0.2	NA	0.0	0.0	0.00	0.01	59.7
West: Elizabeth Road											
11	T1	408	10.0	0.166	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	6	10.0	0.017	14.3	LOS A	0.1	0.4	0.74	0.85	47.1
Approach		414	10.0	0.166	0.2	NA	0.1	0.4	0.01	0.01	59.7
All Vehicles		1385	10.3	1.156	24.4	NA	18.1	143.1	0.06	0.14	42.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2027 AM + development]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Giveway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	8	15.0	1.025	311.8	LOS F	6.8	53.8	1.00	1.57	7.8
3	R2	31	15.0	1.025	425.0	LOS F	6.8	53.8	1.00	1.57	7.8
Approach		39	15.0	1.025	401.8	LOS F	6.8	53.8	1.00	1.57	7.8
East: Elizabeth Drive											
4	L2	45	10.0	0.026	5.7	LOS A	0.0	0.0	0.00	0.57	53.2
5	T1	401	10.0	0.219	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		446	10.0	0.219	0.6	NA	0.0	0.0	0.00	0.06	59.2
West: Elizabeth Road											
11	T1	1111	10.0	0.453	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
12	R2	12	10.0	0.015	8.0	LOS A	0.1	0.4	0.48	0.64	51.2
Approach		1123	10.0	0.453	0.1	NA	0.1	0.4	0.01	0.01	59.8
All Vehicles		1608	10.1	1.025	10.0	NA	6.8	53.8	0.03	0.06	51.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2027 PM + development]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	19	15.0	3.197	4022.8	LOS F	82.1	648.4	1.00	3.49	0.9
3	R2	67	15.0	3.197	4067.0	LOS F	82.1	648.4	1.00	3.49	0.9
Approach		86	15.0	3.197	4057.2	LOS F	82.1	648.4	1.00	3.49	0.9
East: Elizabeth Drive											
4	L2	26	10.0	0.015	5.7	LOS A	0.0	0.0	0.00	0.57	53.2
5	T1	1046	10.0	0.571	0.1	LOS A	0.0	0.0	0.00	0.00	59.8
Approach		1072	10.0	0.571	0.3	NA	0.0	0.0	0.00	0.01	59.6
West: Elizabeth Road											
11	T1	490	10.0	0.200	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
12	R2	6	10.0	0.026	20.1	LOS B	0.1	0.6	0.84	0.93	43.7
Approach		496	10.0	0.200	0.3	NA	0.1	0.6	0.01	0.01	59.7
All Vehicles		1654	10.3	3.197	211.2	NA	82.1	648.4	0.06	0.19	13.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [2027 AM + development - Conversion]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	8	15.0	0.046	5.9	LOS A	0.2	1.7	0.50	0.65	51.3
3	R2	31	15.0	0.046	11.7	LOS A	0.2	1.7	0.50	0.65	52.9
Approach		39	15.0	0.046	10.5	LOS A	0.2	1.7	0.50	0.65	52.5
East: Elizabeth Drive											
4	L2	45	10.0	0.044	3.7	LOS A	0.2	1.5	0.08	0.41	56.0
5	T1	401	10.0	0.245	3.6	LOS A	1.4	10.6	0.08	0.34	57.9
Approach		446	10.0	0.245	3.6	LOS A	1.4	10.6	0.08	0.34	57.7
West: Elizabeth Road											
11	T1	1111	10.0	0.456	3.8	LOS A	3.9	29.3	0.19	0.34	57.3
12	R2	12	10.0	0.010	9.5	LOS A	0.0	0.4	0.14	0.59	53.5
Approach		1123	10.0	0.456	3.8	LOS A	3.9	29.3	0.19	0.34	57.3
All Vehicles		1608	10.1	0.456	3.9	LOS A	3.9	29.3	0.16	0.35	57.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [2027 PM + development - Conversion]

Elizabeth Drive / Martin Road, Badgerys Creek
Give Way T
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Martin Road											
1	L2	19	15.0	0.188	14.9	LOS B	1.1	8.8	0.84	0.91	45.8
3	R2	67	15.0	0.188	20.7	LOS B	1.1	8.8	0.84	0.91	47.1
Approach		86	15.0	0.188	19.4	LOS B	1.1	8.8	0.84	0.91	46.8
East: Elizabeth Drive											
4	L2	26	10.0	0.025	3.7	LOS A	0.1	0.9	0.06	0.42	56.1
5	T1	1046	10.0	0.614	3.6	LOS A	6.3	48.0	0.09	0.33	57.9
Approach		1072	10.0	0.614	3.6	LOS A	6.3	48.0	0.09	0.33	57.8
West: Elizabeth Road											
11	T1	490	10.0	0.214	3.9	LOS A	1.5	11.3	0.25	0.36	56.9
12	R2	6	10.0	0.005	9.6	LOS A	0.0	0.2	0.24	0.56	53.1
Approach		496	10.0	0.214	3.9	LOS A	1.5	11.3	0.25	0.36	56.9
All Vehicles		1654	10.3	0.614	4.5	LOS A	6.3	48.0	0.18	0.37	56.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2017AM + dev]

Elizabeth Drive / Mamre Road
Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Elizabeth Drive											
5	T1	448	10.0	0.350	4.6	LOS A	2.0	15.4	0.38	0.44	55.6
6	R2	421	10.0	0.359	9.8	LOS A	2.1	15.7	0.40	0.65	52.0
Approach		869	10.0	0.359	7.1	LOS A	2.1	15.7	0.39	0.54	53.7
North: Mamre Road											
7	L2	537	10.0	0.537	7.1	LOS A	3.9	29.3	0.81	0.90	52.8
9	R2	165	10.0	0.096	11.3	LOS A	0.5	3.8	0.67	0.80	51.2
Approach		702	10.0	0.537	8.1	LOS A	3.9	29.3	0.77	0.87	52.4
West: Elizabeth Drive											
10	L2	204	10.0	0.626	8.3	LOS A	5.6	42.6	0.75	0.82	51.9
11	T1	971	10.0	0.626	8.4	LOS A	5.6	42.6	0.75	0.83	53.6
Approach		1175	10.0	0.626	8.4	LOS A	5.6	42.6	0.75	0.83	53.3
All Vehicles		2746	10.0	0.626	7.9	LOS A	5.6	42.6	0.64	0.75	53.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2017PM + dev]

Elizabeth Drive / Mamre Road
Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Elizabeth Drive											
5	T1	967	10.0	0.687	7.5	LOS A	6.0	45.6	0.72	0.81	53.3
6	R2	448	10.0	0.687	13.2	LOS A	5.9	44.9	0.74	0.91	51.3
Approach		1415	10.0	0.687	9.3	LOS A	6.0	45.6	0.73	0.84	52.7
North: Mamre Road											
7	L2	538	10.0	0.413	5.2	LOS A	2.4	18.6	0.57	0.61	53.7
9	R2	415	10.0	0.178	10.3	LOS A	0.9	6.7	0.49	0.71	51.8
Approach		953	10.0	0.413	7.4	LOS A	2.4	18.6	0.53	0.65	52.8
West: Elizabeth Drive											
10	L2	177	10.0	0.353	6.4	LOS A	2.2	16.7	0.65	0.68	52.8
11	T1	438	10.0	0.353	6.4	LOS A	2.2	16.7	0.66	0.65	54.2
Approach		615	10.0	0.353	6.4	LOS A	2.2	16.7	0.66	0.66	53.8
All Vehicles		2983	10.0	0.687	8.1	LOS A	6.0	45.6	0.65	0.74	53.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2027AM + dev]

Elizabeth Drive / Mamre Road
Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Elizabeth Drive											
5	T1	534	10.0	0.430	4.8	LOS A	2.7	20.8	0.46	0.46	55.2
6	R2	505	10.0	0.445	10.1	LOS A	2.8	21.5	0.48	0.67	51.7
Approach		1039	10.0	0.445	7.4	LOS A	2.8	21.5	0.47	0.57	53.4
North: Mamre Road											
7	L2	644	10.0	0.786	12.1	LOS A	8.1	61.4	0.98	1.16	49.6
9	R2	198	10.0	0.143	12.2	LOS A	0.8	6.4	0.78	0.87	50.9
Approach		842	10.0	0.786	12.1	LOS A	8.1	61.4	0.94	1.09	49.9
West: Elizabeth Drive											
10	L2	245	10.0	0.817	14.3	LOS A	12.1	91.6	0.96	1.15	48.0
11	T1	1163	10.0	0.817	14.7	LOS B	12.1	91.6	0.96	1.17	49.2
Approach		1408	10.0	0.817	14.6	LOS B	12.1	91.6	0.96	1.16	49.0
All Vehicles		3289	10.0	0.817	11.7	LOS A	12.1	91.6	0.80	0.96	50.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [2027PM + dev]

Elizabeth Drive / Mamre Road
Roundabout
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Elizabeth Drive											
5	T1	1159	10.0	0.874	12.5	LOS A	12.7	96.6	0.93	1.17	50.4
6	R2	538	10.0	0.874	18.8	LOS B	12.4	94.0	0.94	1.23	47.8
Approach		1697	10.0	0.874	14.5	LOS B	12.7	96.6	0.94	1.19	49.5
North: Mamre Road											
7	L2	646	10.0	0.526	5.8	LOS A	3.7	28.3	0.68	0.71	53.3
9	R2	498	10.0	0.228	10.6	LOS A	1.2	9.2	0.56	0.75	51.6
Approach		1144	10.0	0.526	7.9	LOS A	3.7	28.3	0.63	0.72	52.5
West: Elizabeth Drive											
10	L2	212	10.0	0.480	7.7	LOS A	3.7	27.8	0.80	0.82	52.0
11	T1	522	10.0	0.480	7.9	LOS A	3.7	27.8	0.80	0.82	53.5
Approach		734	10.0	0.480	7.8	LOS A	3.7	27.8	0.80	0.82	53.1
All Vehicles		3575	10.0	0.874	11.0	LOS A	12.7	96.6	0.81	0.97	51.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.