



**TRAFFIC AND PARKING IMPACT ASSESSMENT OF
SHOPPING CENTRE DEVELOPMENT
AT 1 MACQUARIEDALE ROAD, APPIN**



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Transport Planning, Traffic Impact Assessments, Road Safety Audits, Expert Witness

Development Type: Shopping Centre Development

Site Address: 1 Macquariedale Road, Appin

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1 INTRODUCTION

McLaren Traffic Engineering (MTE) was commissioned by *Apex Intelligent Design* to provide a Traffic and Parking Impact Assessment of the Shopping Centre Development at 1 Macquariedale Road, Appin.

1.1 Description and Scale of Development

The proposed redevelopment (as depicted in **Annexure A**) is to include the following;

- Total Leasable Area of 4,141m² including:
 - Convenience Store 204m² GLFA;
 - Carwash 115m² GLFA
 - Fruit Market 159m² GLFA;
 - Retail & Food 1,096m² GLFA;
 - Supermarket 1,527m² GLFA;
 - Semi Major Shop 1,040m² GLFA.
- Two-level basement carpark providing 162 car parking spaces;
- Proposed vehicular access to the car park is provided via a new two-way driveway from the public access road off Macquariedale Road.

1.2 State Environmental Planning Policy (Infrastructure) 2007

The proposed development is of relevant size and capacity under Clause 104 of the SEPP (Infrastructure) 2007 to be referred to the Roads and Maritime Services (RMS) as it has a floor area in excess of 4000m². It is expected that Wollondilly Sire Council will consult the RMS as part of the Development Application process.

1.3 Site Description

The subject site is currently land zoned “B2 – Local Centre” under the Wollondilly Shire Council LEP 2011, with frontages to Macquariedale Road to the south, Elizabeth Close to the west and an access road to the east.

The site is generally surrounded by low to medium density residential dwellings with retail businesses to the east, Appin Public School located to the north.

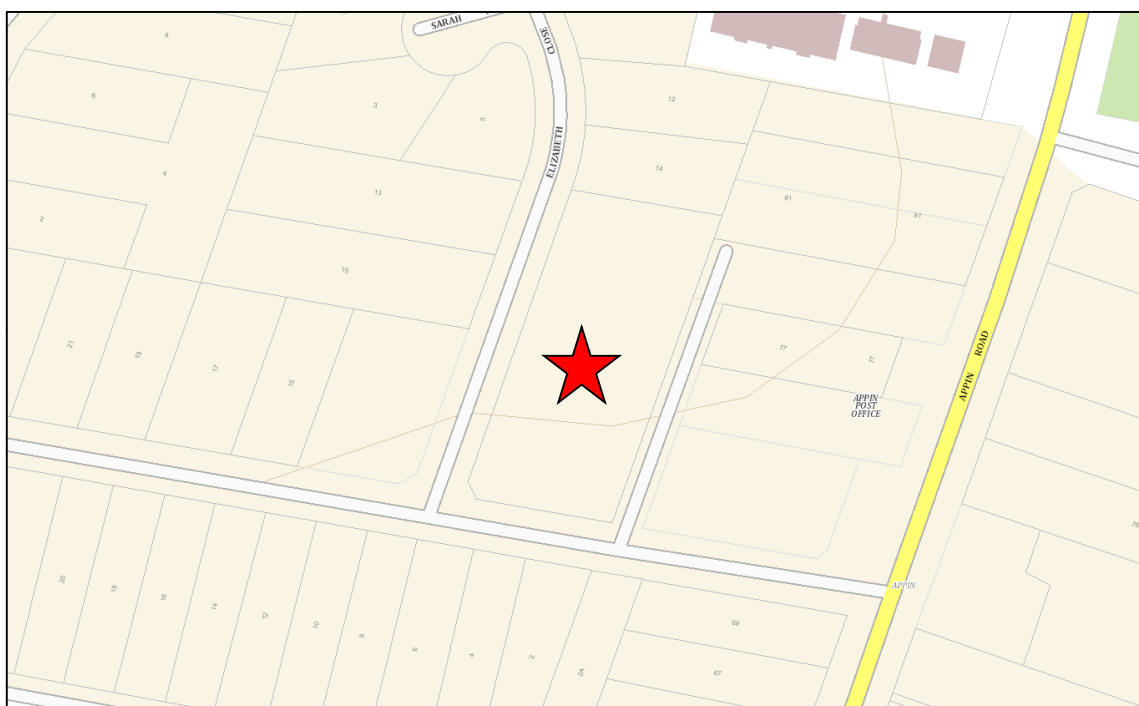
1.4 Site Context

The site location is shown on aerial imagery and a map in **Figure 1 & Figure 2** respectively.



★ Site Location

FIGURE 1: SITE CONTEXT – AERIAL PHOTO



★ Site Location

FIGURE 2: SITE CONTEXT – STREET MAP

2 EXISTING TRAFFIC AND PARKING CONDITIONS

2.1 *Road Hierarchy*

Appin Road has the following characteristics within close proximity to the site:

- Classified STATE road (No. 177);
- Approximately 12m in width facilitating one traffic flow lane in each direction;
- 50km/h speed limit marked on road, with a 40km/hr school zone speed limit which runs approximately 400m north from the intersection of Macquariedale Road;
- No kerbside parking permitted along both sides of the street

Macquariedale Road has the following characteristics within close proximity to the site:

- Unclassified LOCAL road;
- Approximately 9m in width facilitating one traffic flow lane in both directions and kerbside parking on both sides of the road;
- 50km/h speed limit marked on road, with 40km/hr school zone speed limit on frontage of site
- Generally unrestricted kerbside parking permitted along both sides of the street with “No Stopping” zones on either side of the road close to Appin Road.

Elizabeth Close has the following characteristics within close proximity to the site:

- Unclassified LOCAL road;
- Approximately 8m in width facilitating one traffic flow lane in both directions and kerbside parking along both sides of the road;
- No posted speed limit, 50km/hour applies
- Unrestricted kerbside parking along both sides of the road.

Access Lane has the following characteristics within close proximity to the site:

- Unclassified Access Lane;
- Approximately 8m in width facilitating one traffic flow lane in each direction and kerbside parking on both sides of the road;
- No posted speed limit, 50km/hour applies
- Unrestricted kerbside parking on both sides of the road.

2.2 *Existing Traffic Management*

- Give way intersection of Elizabeth Close / Macquariedale Road;
- Give way intersection of Macquariedale Road / Appin Road;

2.3 Existing Traffic and Parking Environment

Traffic counts were completed at the intersections of Appin Road / Macquariedale Road, and Macquariedale Road / Access Lane on Thursday the 31st of August 2017, between 4:00 – 7:00pm representing a typical weekday and Saturday the 2nd of September 2017, between 10:00am – 2:00pm representing a typical weekend. The results of these surveys are presented in **Annexure B** for reference.

2.3.1 Intersection Performances

Existing intersection performances have been assessed using SIDRA INTERSECTION 7.0. The analysis is summarised in **Table 1** below, with detailed SIDRA outputs reproduced in **Annexure C** for reference.

TABLE 1: EXISTING INTERSECTION PERFORMANCES
(SIDRA INTERSECTION 7.0)

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Appin Road / Macquariedale Road	PM (Thursday)	0.24	1.2 (Worst: 9.2)	N/A (Worst A)	Give Way	RT from Macquariedale Road
	Midday (Saturday)	0.26	1.6 (Worst: 9.7)	N/A (Worst A)		RT from Macquariedale Road
Macquariedale Road / Laneway	PM (Thursday)	0.03	1.4 (Worst: 5.7)	N/A (Worst A)	Give Way	RT from Laneway
	Midday (Saturday)	0.03	0.4 (Worst: 5.7)	N/A (Worst A)		LT from Laneway

NOTES:

- (1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
- (2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
- (3) Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.
- (4) 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.

As shown above, the surrounding intersections worst turning movements are operating satisfactorily at Level of Service (LoS) “A” during the afternoon and weekend peak periods. This represents minimal delays and additional spare capacity.

2.3.2 Parking Surveys

Parking surveys were undertaken on Thursday the 31st of August 2017, between 4:00 – 7:00pm and Saturday the 2nd of September 2017, between 10:00am – 2:00pm within 200m of the site.

The results of these parking surveys are presented in **Annexure B** for reference. The existing parking supply is summarised in **Table 2** below.

TABLE 2: EXISTING ON-STREET PARKING SUPPLY & SPARE CAPACITY

Survey Day	Total Capacity	4-7PM Spare Capacity	Midday Spare Capacity
Thursday	131	116 (88.5%)	-
Saturday	131	-	114 (87.0%)

As shown above, there is an abundance of parking within the local streets during both the weekday peak period where a minimum of 116 car spaces are available between 4:00-7:00pm and the weekend peak period where a minimum of 114 car spaces are available between 10:00am – 2:00pm.

2.4 Public Transport

The subject site has access to existing bus routes 887 provided by Busabout which runs through Appin Road and Priam Street, with the nearest bus stops located within 150m walking distance from the site. The bus route provide access between Wollongong and Campbelltown.

Figure 3 below shows the location of the site relative to the surrounding public transport.

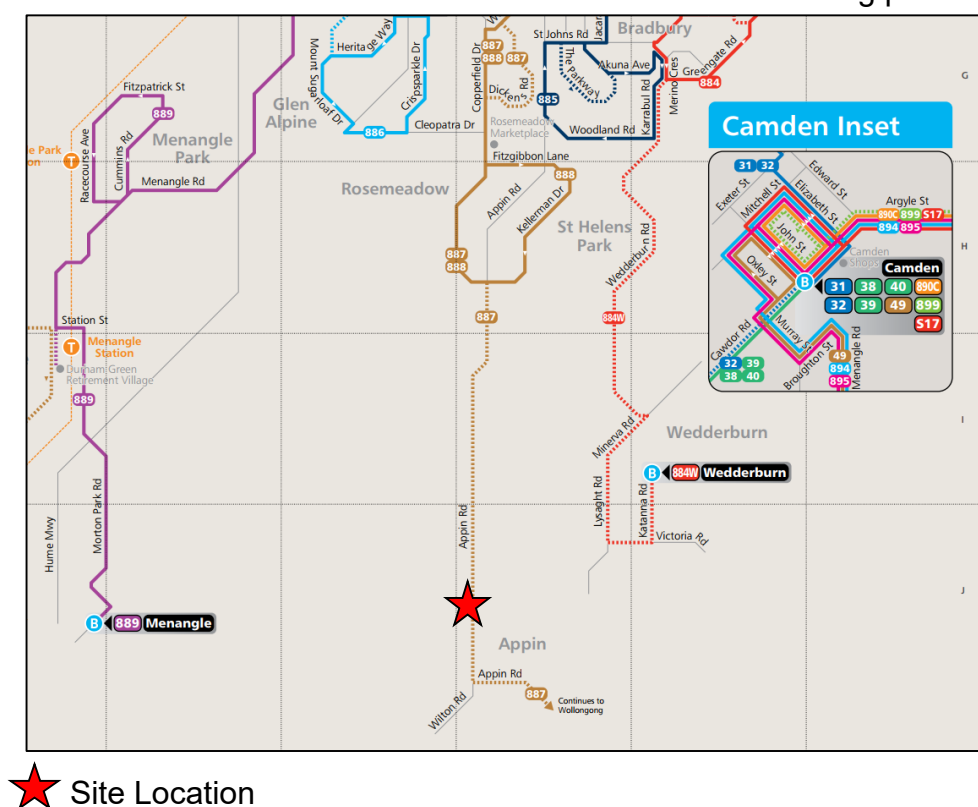


FIGURE 3: PUBLIC TRANSPORT

2.5 Future Road and Infrastructure Upgrades

From Wollondilly Council's Development Application tracker and website, it appears that there is no future planned road or public transport changes that will affect traffic conditions within the immediate vicinity of the subject site.

3 PARKING ASSESSMENT

The proposed development has been assessed in regards to parking supply and demand within the subsections below. It is the reasonable conclusion of the development within a “Village Centre” location to provide sufficient parking to meet demand generated on the site, without unduly encouraging high levels of private vehicle trips.

3.1 Council DCP Parking Requirement

Reference is made to *Wollondilly Development Control Plan Volume 5 – Commercial and Community Uses* which outlines the following car parking rates applicable for the shopping centre and the proposed tenancy uses:

Shopping Centres

GFA ≤ 10,000 – 6.1 spaces per 100m² GLFA

10,000 < GFA ≤ 20,000 – 5.6 spaces per 100m² GLFA

20,000 < GFA ≤ 30,000 – 4.3 spaces per 100m² GLFA

GFA > 30,000 – 4.1 spaces per 100m² of GLFA

Food and Drink Premises.

The greatest of: 12 spaces per 100 m² of GFA;

or 1 space per 5 seats (internal and external);

or 1 space per 2 seats (internal);

and Where a drive through is proposed queuing area for 12 cars

Office and Business Premises

2.5 car parking space per 100m² of GFA.

Retail Premises

2.5 car parking space per 100m² of GFA.

Based upon the above rates, the car parking requirement based upon Wollondilly Council's DCP requirement is summarised in **Table 3** below:

TABLE 3: DCP PARKING REQUIREMENTS

Land Use	Scale	DCP Parking Rate	Parking Quantum
Shopping Centre	1,686m ²	6.1 spaces / 100m ²	102.8 spaces
Food and Drink Premises	384m ²	12 spaces / 100m ²	46 spaces
Office and Business Premises	115m ²	2.5 spaces / 100m ²	2.9 spaces
Retail Premises	1,956m ²	2.5 spaces / 100m ²	48.9 spaces
Total	4,141m²	-	200.6 (201) Spaces

As shown above, Council requires a total of **201** car parking spaces. The development proposes **162** spaces representing a numerical shortfall of **39** spaces from Council's DCP. Council's DCP parking requirement is based off a parking requirement for individual developments and as such does not take into account the reduced parking demand from the use of shared trips to the site and nearby developments. Therefore, the RMS parking rates for shopping centres has been adopted to assess the parking rate of the site as specified in **Section 3.2** below.

3.2 RMS Parking Demand Estimate

Reference is made to the RMS's "Guide to Traffic Generating Developments" Part 5.7.1 *Shopping Centres* which estimates the following parking demand for shopping centres:

$$\text{Peak Parking} = 24A(S) + 40 A(F) + 42 A(SM) + 45 A(SS) + 9 A(OM)$$

Demand (per 1,000m²) where:

A(S): Slow trade GLFA

A(F): Faster Trade GLFA,

A(SM): Supermarket GLFA,

A(SS): Speciality Shops and Secondary retail GLFA,

A(OM): Offices, medical GLFA.

The proposed shopping centre has the following scale as outlined in **Section 1.1** and reproduced below for ease of assessment:

- Convenience Store A(SS): 204m²;
- Carwash A(OM): 115m²
- Fruit Market A(SM): 159m²;
- Retail & Food (SS): 1,096m²;
- Supermarket A(SM): 1,527m².
- Semi Major Shop 24A(S): 1,040m²

The RMS parking requirements are summarised in **Table 4** below.

TABLE 4: RMS PERCENTILE PARKING REQUIREMENTS

Land Use	Scale	DCP Parking Rate	Parking Quantum
Convenience Store	204m ²	45 spaces / 1000m ²	9.2 spaces
Carwash	115m ²	9 spaces / 1000m ²	1.1 spaces
Fruit Market	159m ²	42 spaces / 1000m ²	6.7 spaces
Retail & Food	1,096m ²	45 spaces / 1000m ²	49.3 spaces
Supermarket	1,527m ²	42 spaces / 1000m ²	64.1 spaces
Semi Major Shop	1,040m ²	24 spaces / 1000m ²	25 spaces
Total	4,141m²	-	155.4 (156) Spaces

Based upon above, the RMS requires a parking demand of **156** parking spaces. The proposed development supplies **162** parking spaces, a surplus of six (6) car parking spaces above the RMS estimate for retail parking demand and is supported.

3.3 Bicycle & Motorcycle Parking Requirements

3.3.1 Bicycle Parking Requirements

Wollondilly Council provides the following recommendations in terms of the provision of bicycle parking for any retail development over 500m² GFA as summarised in **Table 5** below.

TABLE 5: COUNCIL'S DCP BICYCLE PARKING REQUIREMENT

Land Use	Rate	Retail Floor Area	Bicycle Spaces
Retail Development > 500m ² GFA	1 space / 100m ² GFA	4,140 m ²	41.4 (41)

A total of **41** secure bicycle rack spaces should be provided. The proposed plan shows a total of **44** bicycle spaces throughout Basement Level 1 and the Ground Floor. This gives a numeric surplus of three (**3**) bicycle space from Councils DCP.

3.3.2 Motorcycle Parking Requirements

Wollondilly Council does not provide a motorcycle parking rate for shopping centres and as such does not require this facility. The development proposes three (3) motorcycle parking spaces within the basement car park which should be looked at favourably for the parking rates of the site.

3.4 Servicing & Loading

Council's DCP requires service and delivery vehicles to have a separate access for developments with a GFA greater than 500m² and has been provided.

The proposed loading and servicing facilities of the supermarket and speciality shops is proposed with access from the laneway separate from the public car park. The largest vehicle that can access the loading dock is an 8.8m length Medium Rigid Vehicle which can enter and leave the site in a forward direction.

The delivery route for up to an 8.8m length Medium Rigid Vehicle to the site shall come by turning right from Appin Road into Macquariedale Road, right into the access lane and left into the loading dock area. Deliveries leaving the site shall turn right onto Macquariedale Road from the access lane, right onto Kerr Street, right onto Rixon Road and a right/ left turn onto Appin Road. Swept path tests have been undertaken for this route and are reproduced in **Annexure D** for reference. It should be noted that deliveries shall only be conducted during normal business hours to maintain residential amenity in the area.

Waste collection will be undertaken within the proposed loading dock, which is of sufficient dimensions to accommodate forwards entry and exit of all typical waste collection vehicles by a private waste contractor.

The operation of deliveries and waste collection for the shopping centre development can be managed under a Plan of Management and can be detailed as part of the consent conditions if required by Council.

3.5 Disabled Parking

Council's DCP does not designate a disabled parking rate for shopping centres and as such the Building Code of Australia (BCA) rates have been adopted. According to the BCA, the proposed shopping centre is a Class 6 building and as such requires that the site provides *"1 space for every 50 carparking spaces or part thereof."* Therefore, the site requires 3.24 rounded up to four (4) disabled car parking spaces. The site provides five (5) disabled car parking spaces exceeding the BCA disabled parking requirement.

3.6 Car Park Design & Compliance

The car parking layout has been assessed against the relevant clauses of AS2890.1, AS2890.6 and AS2890.2:2002 and found to be compliant. The design achieves:

- Car parking spaces with a minimum of 2.7m in width and 5.4m in length;
- Disabled spaces of minimum 2.4m x 5.4m and adjacent shared zones;
- Minimum 6.2m parking aisle widths;
- Provision of on-site loading / delivery area for a Medium Rigid Vehicle;
- Minimum headroom of 2.2m provided above all paths throughout basement car park with minimum 2.5m headroom above disabled parking spaces.
- Separated entry and exit driveway with 4m and 3m width between kerbs respectively.
- Complaint pedestrians sight triangles with no obstruction greater than 600mm in height;

A number of swept path tests have been undertaken and are reproduced in **Annexure D** with the recommended internal circulation provide in the following sub-section.

It should be noted that while we have assessed the plans to be compliant with the relevant standards, it is usual that a design certification is conditioned at the Construction Certificate Stage due to possible changes during or after the Development Application stage.

3.6.1 Recommended Internal Traffic Circulation and Parking Allocation

To optimise the shopping centre internal car park circulation efficiency and queuing it is recommended that the parking spaces located near the entrance/exit driveway and at the bottom of the ramp be allocated as staff spaces to prevent the queuing of cars onto the public road and along ramp. Alternatively, the spaces at the bottom of the ramp can be monitored to determine if these spaces have any impact upon the internal circulation efficiency and queuing. This will determine if these space are required to be low turnover space (staff spaces only). It is also recommended that the carpark have the circulation and traffic flow as shown in red in **Figure 4** and **Figure 5** below. It is suggested that these recommendations be adopted to improve traffic flow throughout the basement levels.

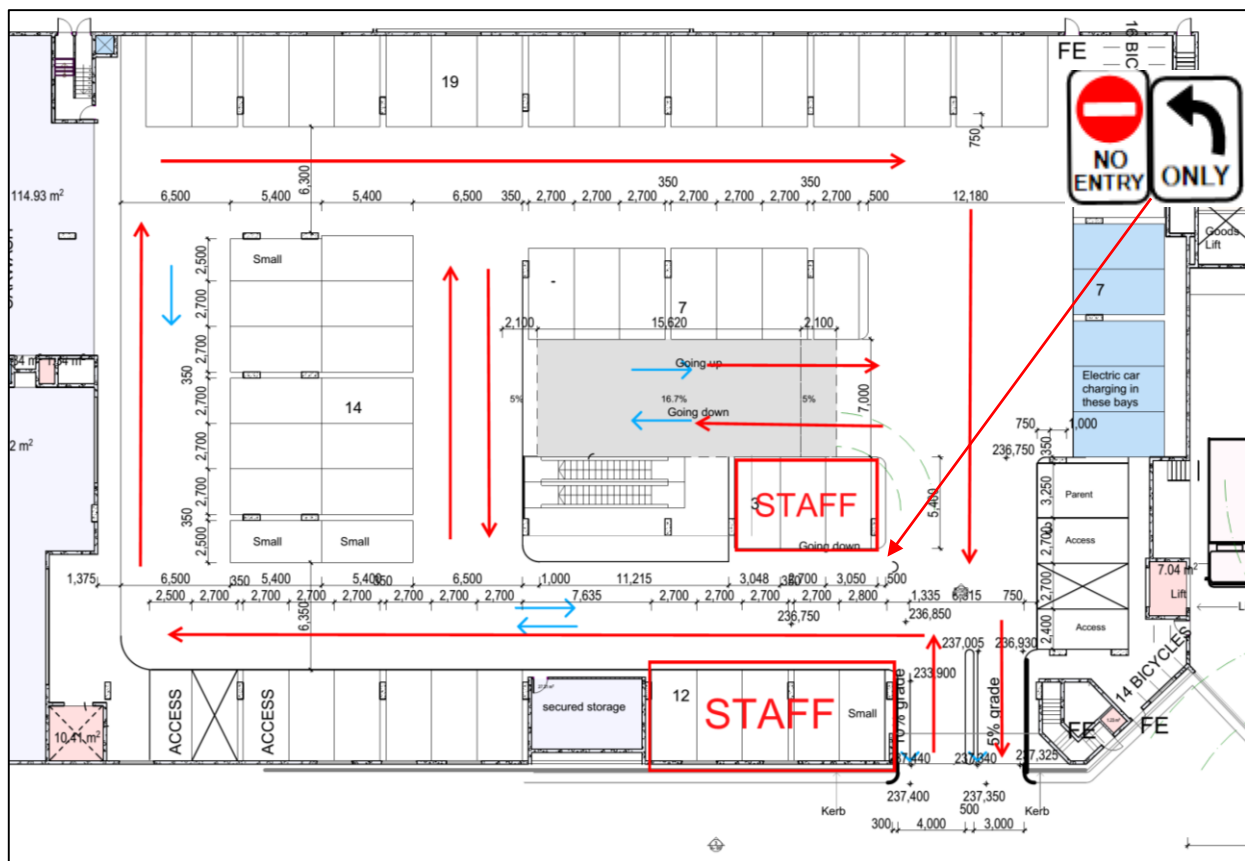


FIGURE 4: BASEMENT LEVEL 1 CIRCULATION

Shopping Centre Development
1 Macquariedale Road, Appin
17481.01FA - 19th December 2017

4 TRAFFIC ASSESSMENT

4.1 *Traffic Generation*

4.1.1 Retail Centre

The RMS provides estimated traffic generation levels for shopping centres based on traffic surveys of metropolitan sites in the RMS “*Guide to Traffic Generating Developments*”, assuming a high proportion of private vehicle trips. The applicable traffic generation rates are detailed below:

Thursday:

$V(P) = 20 A(S) + 51 A(F) + 155 A(SM) + 46 A(SS) + 22 A(OM)$ (vehicle trips per 1000m²).

Saturday:

$PVT = 38 A(S) + 13 A(F) + 147 A(SM) + 107 A(SS)$ (vehicle trips per 1000m²). where:

$A(S)$: Slow Trade GLFA

$A(F)$: Faster Trade GLFA

$A(SM)$: Supermarket GLFA

$A(SS)$: Speciality shops, secondary retail GLFA

$A(OM)$: Office, medical GLFA

Applying these site-specific traffic generation rates to the subject site, results in the estimated traffic generation as summarised in **Table 7** below.

TABLE 6: ESTIMATED FUTURE RETAIL TRAFFIC GENERATION

Land Use	Day	Scale	Rate	Trips
Supermarket	Thursday	1,686m ²	155 trips / 1000m ²	261
Semi Major Shop		1,040m ²	20 trips / 1000m ²	21
Speciality Shops		1,300m ²	46 trips / 1000m ²	60
Car Wash		115m ²	22 trips / 1000m ²	3
Thursday Total	-	4,141m²	-	345 (173 in, 172 out)
Supermarket	Saturday	1,686m ²	147 trips / 1000m ²	248
Semi Major Shop		1,040m ²	38 trips / 1000m ²	40
Speciality Shops		1,300m ²	107 trips / 1000m ²	139
Car Wash ⁽²⁾		115m ²	22 trips / 1000m ²	3
Saturday Total	-	4,141m²	-	430 (215 in, 215 out)

Notes:

(1) Thursday traffic generation has been adopted for the Saturday Car Wash traffic generation.

As shown above the proposed development is expected to generate a 345 (173 in, 172 out) vehicles trips during the PM Thursday peak hour period and 430 (215 in, 215 out) vehicle trips during the weekend peak hour period.

4.2 Trip Assignment

Given the surrounding road network and available routes to / from the site the traffic generated from the subject site has been assigned as depicted in **Figure 6** below.

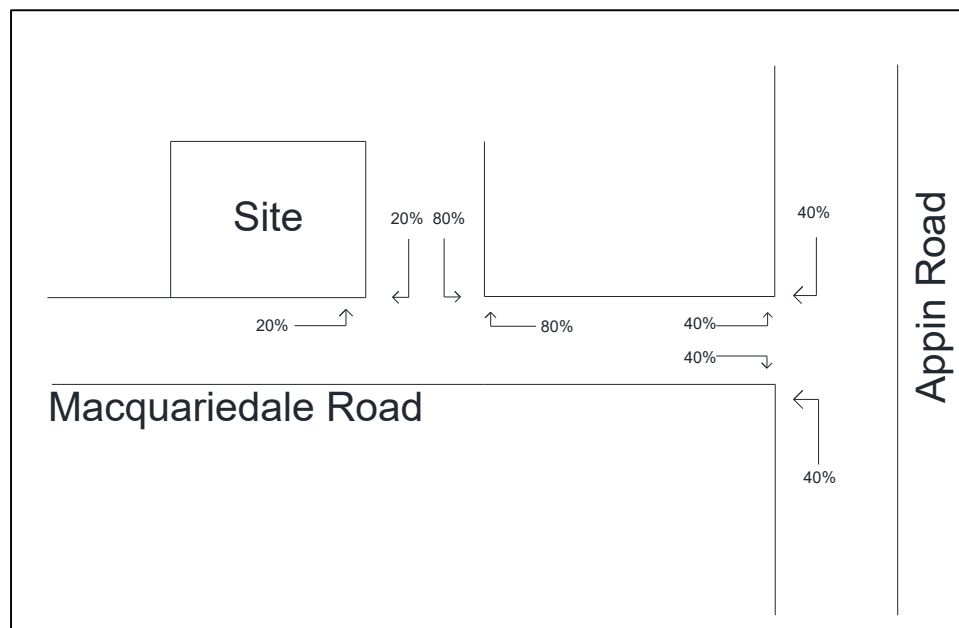


FIGURE 6: TRAFFIC ASSIGNMENT

4.3 Traffic Impact

The traffic generation of the site as estimated in **Section 4.1** has been distributed through the traffic network based upon the traffic assignment provided in **Section 4.2**. The intersections have been modelled under the future traffic case in SIDRA INTERSECTION 7.0. The purpose of this assessment is to compare the existing intersection operations to the future scenario under the increased traffic load. The results of this assessment are shown in **Table 8** below, with detailed SIDRA results reproduced in **Annexure C**.

**TABLE 7: INTERSECTION PERFORMANCES - FUTURE
SIDRA INTERSECTION 7.0**

Intersection	Peak Hour	Degree of Saturation ⁽¹⁾	Average Delay ⁽²⁾ (sec/veh)	Level of Service ⁽³⁾⁽⁴⁾	Control Type	Worst Movement
EXISTING PERFORMANCE						
Appin Road / Macquariedale Road	Thursday	0.24	1.2 (Worst: 9.2)	N/A (Worst A)	Give Way	RT from Macquariedale Road
	Saturday	0.26	1.6 (Worst: 9.7)	N/A (Worst A)		RT from Macquariedale Road
Macquariedale Road / Laneway	Thursday	0.03	1.4 (Worst: 5.7)	N/A (Worst A)	Give Way	RT from Laneway
	Saturday	0.03	0.6 (Worst: 5.7)	N/A (Worst A)		RT from Laneway
FUTURE PERFORMANCE (post development)						
Appin Road / Macquariedale Road	Thursday	0.30	3.2 (Worst: 11.0)	N/A (Worst A)	Give Way	RT from Macquariedale Road
	Saturday	0.34	4.0 (Worst: 12.8)	N/A (Worst A)		RT from Macquariedale Road
Macquariedale Road / Laneway	Thursday	0.13	4.8 (Worst: 6.4)	N/A (Worst A)	Give Way	RT from Laneway
	Saturday	0.16	4.9 (Worst: 6.7)	N/A (Worst A)		RT from Laneway

NOTES:

- (1) Degree of Saturation is the ratio of demand to capacity for the most disadvantaged movement.
- (2) Average delay is the delay experienced on average by all vehicles. The value in brackets represents the delay to the most disadvantaged movement.
- (3) Level of Service is a qualitative measure of performance describing operational conditions. There are six levels of service, designated from A to F, with A representing the best operational condition and level of service F the worst. The LoS of the intersection is shown in bold, and the LoS of the most disadvantaged movement is shown in brackets.
- (4) 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.

As shown above, the traffic generated by the development will have no noticeable effect on the road network in terms traffic flow and road safety considerations. The existing LoS has been maintained, with minor increases to the average delays and capacity maintained.

4.4 Access Lane

Reference is made to the RMS *Guide To Traffic Generating Developments 2002*, which outlines the following with respect to the daily traffic generation:

$$DVT = 314 A(S) + 528 A(F) + 1475 A(SM) + 555 A(SS) + 51 A(OM)$$

Based upon the above, the highest daily vehicle trips generated from the proposed development is 3,250 vehicle trips, which will typically occur on Thursday. Considering this and the design of the access lane, it is recommended that both sides of the road be provided with “*No Parking*” signage, to improve the circulation along this road due to the increase in two-way traffic flow.

The road reserve within the access lane currently measures at 9m in width, with an existing carriageway width of 6.85m. No provision of pedestrian facilities under the existing conditions have been provided within the laneway. Due to the proposed developing being a shopping centre it is envisaged that pedestrian paths would be required to ensure safe pedestrian access around the site and within the surrounding locality of the site. It is recommended to provide the following within the access lane:

- 1.2m footpath along the east side of the road;
- A carriageway width of 7m in width;
- A 1.5m footpath along the western side of the carriageway.

The proposed design provides a varying footpath width of 1.2m to 1.7m on the eastern side of the road, with the provision of a 1.7m wide footpath provided at the main access to the shopping centre.

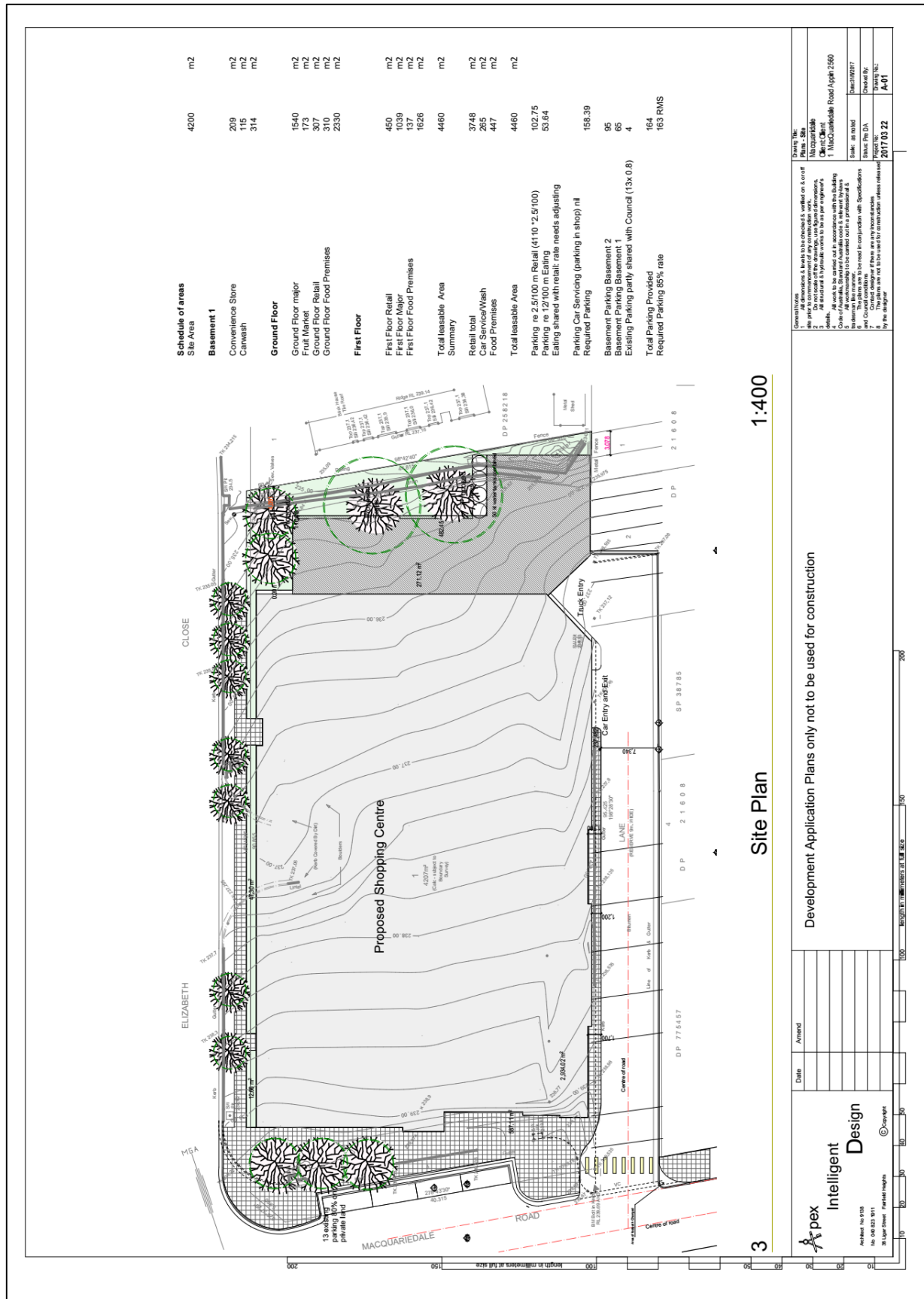
The above would require a total road reserve of 9.7m, an additional 0.7m above the current road reserve. As such it is recommend that 0.7m be provided from the proposed development to ensure the safe operation of the access lane.

5 **CONCLUSION**

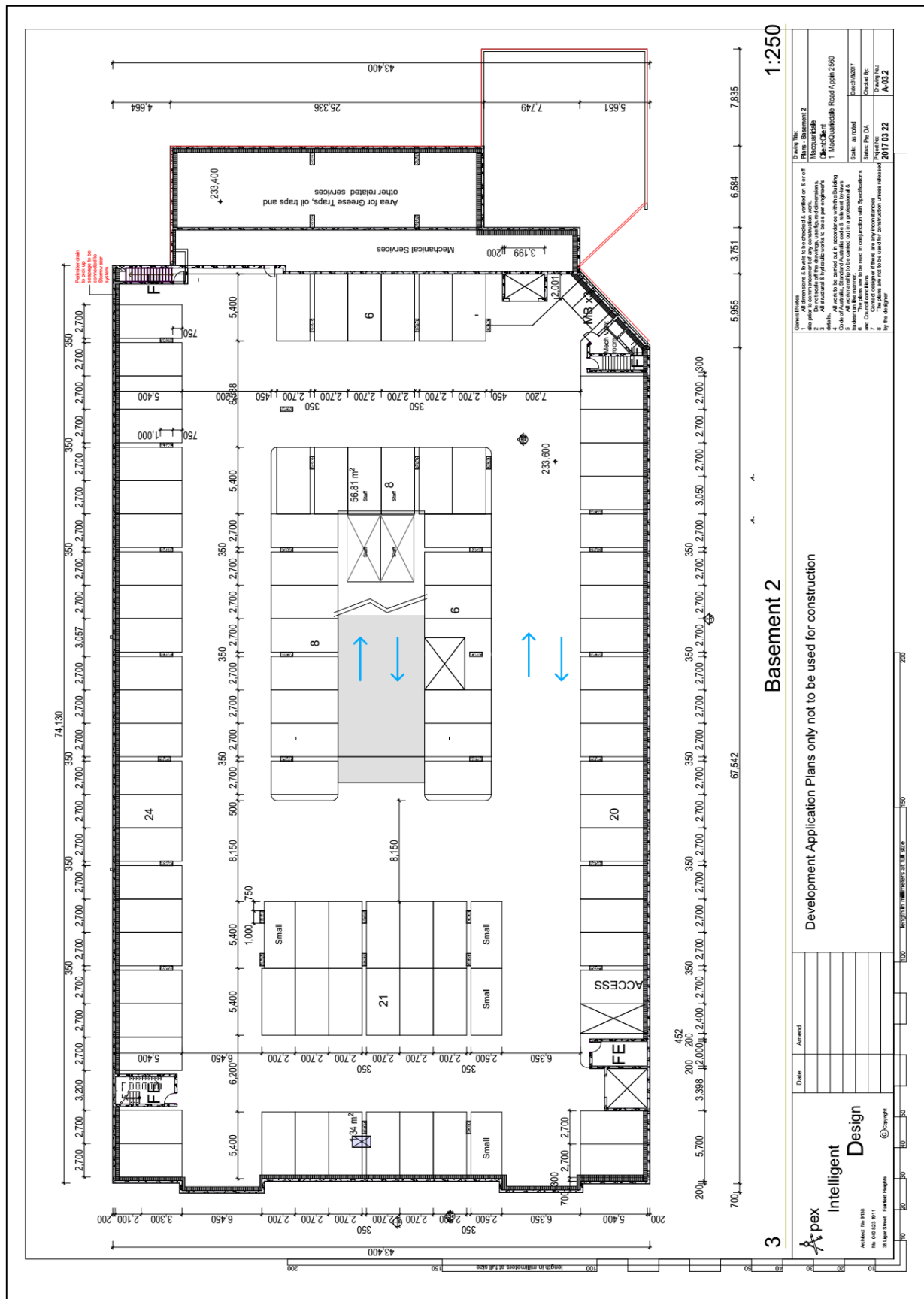
The traffic and parking impacts the proposed Shopping Centre development at 1 Macquariedale Road, Appin, as depicted in **Annexure A** have been assessed and are fully supported in terms of traffic and parking impacts. The following are relevant to note:

- Council DCP requires the provision of 201 parking spaces and the RMS requires the provision of 156 car parking spaces. The site provides 162 parking spaces a shortfall of 39 car parking spaces from Council's DCP and a surplus of 6 car parking spaces from the RMS parking requirement. The RMS parking requirement is deemed acceptable given that Council's car parking requirements assess the development as separate land uses and does not consider the reduced parking demand from the use of shared vehicle trips to the site and nearby developments.
- The car parking layout has been assessed against the relevant Australian Standards, namely AS2890.2:2002, AS2890.6:2009 and AS2890.1:2004 and deemed to comply. Swept path testing has been undertaken for critical areas and is reproduced in **Annexure D** for reference.
- The traffic generation of the site has been estimated at some 345 and 452 trips in the Weekday PM (173 in, 172 out) and Weekend Midday (215 in, 215 out) road network peak hours respectively. The traffic generation has been assessed using SIDRA Intersection 7.0 to have no noticeable impact on the surrounding road network, with only minor increases in average delays and queue lengths expected.
- The highest daily traffic generation is expected to be 3,250 vehicle trips, with this typically occurring on Thursday. Considering this and the design of the access lane, it is recommended that both side of the road be provided with "*No Parking*" signage, to improve the circulation along this road due to the increase in two-way traffic flow.
- The largest vehicle for the purposes of deliveries will be an 8.8m length Medium Rigid Vehicle, which can access and exit the loading dock in a forward direction. It is expected that the loading dock will also be used for waste collection for the entire development and can be provided under a Management Plan as part of a consent condition if required by Council.

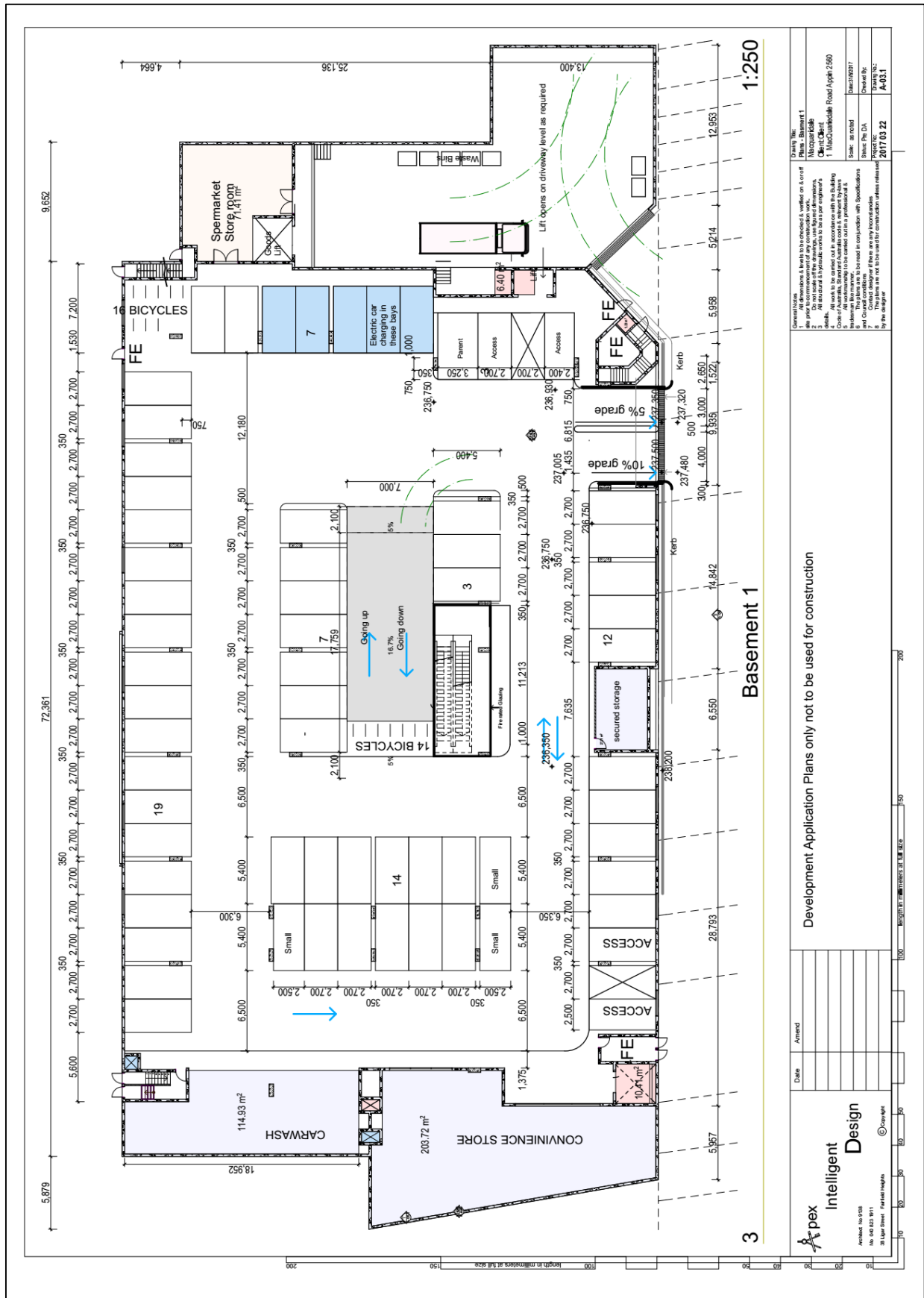
ANNEXURE A: PROPOSED PLANS (SHEET 1 OF 3)



ANNEXURE A: PROPOSED PLANS
(SHEET 2 OF 3)



ANNEXURE A: PROPOSED PLANS
(SHEET 3 OF 3)



ANNEXURE B: SURVEY RESULTS

(SHEET 1 OF 6)

Curtis Traffic Surveys			Turning movement count				Appin Rd		N ↑
Job:			170809mcl (17 481)				56	385	
Day, date			31/08/17				21		
Location:			Appin Rd & Macquariedale Rd				11	45	
Weather:			Fine					277	
Client:			McLaren Traffic Engineering						
			From Appin Rd north		From Macquariedale Rd		From Appin Rd south		
			through	right	left	right	left	through	
Time Period								Total vehicles	Peak
16:00 to 16:15			88	12	3	2	7	55	167
16:15 to 16:30			92	15	5	1	6	52	171
16:30 to 16:45			95	13	4	2	8	50	172
16:45 to 17:00			87	19	3	4	7	69	189
17:00 to 17:15			95	16	5	3	10	71	200
17:15 to 17:30			120	11	7	5	12	67	222 peak
17:30 to 17:45			78	17	5	1	13	64	178
17:45 to 18:00			92	12	4	2	10	75	195
18:00 to 18:15			84	17	6	2	8	62	179
18:15 to 18:30			67	11	14	1	9	63	165
18:30 to 18:45			68	15	5	0	1	48	137
18:45 to 19:00			71	11	8	3	2	51	146
Total									
Hourly summary									
16:00 to 17:00			362	59	15	9	28	226	699
16:15 to 17:15			369	63	17	10	31	242	732
16:30 to 17:30			397	59	19	14	37	257	783
16:45 to 17:45			380	63	20	13	42	271	789
17:00 to 18:00			385	56	21	11	45	277	795 peak hour
17:15 to 18:15			374	57	22	10	43	268	774
17:30 to 18:30			321	57	29	6	40	264	717
17:45 to 18:45			311	55	29	5	28	248	676
18:00 to 19:00			290	54	33	6	20	224	627

ANNEXURE B: SURVEY RESULTS

(SHEET 2 OF 6)

Curtis Traffic Surveys			Turning movement count						lane			
Job:			170809mcl (17 481)								14	
Day, date			31/08/17						Peak Hour Volumes		7	
Location:			lane & Macquariedale Rd						27		48	
Weather:			Fine									
Client:			McLaren Traffic Engineering						Macquariedale Rd			

ANNEXURE B: SURVEY RESULTS

(SHEET 3 OF 6)

Curtis Traffic Surveys			Turning movement count				Appin Rd		<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></d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ANNEXURE B: SURVEY RESULTS
(SHEET 5 OF 6)

[illegible]

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 1 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Appin Road / Macquariedale Road Thu ex pm]**

Appin Road / Macquariedale Road
Thursday PM Peak Hour
Existing Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Appin Road											
1	L2	45	0.0	0.166	5.6	LOS A	0.0	0.0	0.00	0.08	57.6
2	T1	277	0.0	0.166	0.0	LOS A	0.0	0.0	0.00	0.08	59.2
Approach		322	0.0	0.166	0.8	NA	0.0	0.0	0.00	0.08	59.0
North: Appin Road											
8	T1	385	0.0	0.241	0.3	LOS A	0.5	3.7	0.14	0.08	58.7
9	R2	56	0.0	0.241	6.9	LOS A	0.5	3.7	0.14	0.08	56.6
Approach		441	0.0	0.241	1.1	NA	0.5	3.7	0.14	0.08	58.4
West: Macquariedale Road											
10	L2	21	0.0	0.035	6.4	LOS A	0.1	0.8	0.38	0.63	52.2
12	R2	11	0.0	0.035	9.2	LOS A	0.1	0.8	0.38	0.63	51.7
Approach		32	0.0	0.035	7.4	LOS A	0.1	0.8	0.38	0.63	52.0
All Vehicles		795	0.0	0.241	1.2	NA	0.5	3.7	0.09	0.10	58.4

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 2 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Appin Road / Macquariedale Road Sat ex am]**

Appin Road / Macquariedale Road
Saturday AM Peak Hour
Existing Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Appin Road											
1	L2	27	0.0	0.169	5.6	LOS A	0.0	0.0	0.00	0.05	57.9
2	T1	302	0.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.05	59.5
Approach		329	0.0	0.169	0.5	NA	0.0	0.0	0.00	0.05	59.4
North: Appin Road											
8	T1	381	0.0	0.259	0.4	LOS A	0.8	5.3	0.20	0.11	58.2
9	R2	82	0.0	0.259	6.9	LOS A	0.8	5.3	0.20	0.11	56.1
Approach		463	0.0	0.259	1.6	NA	0.8	5.3	0.20	0.11	57.9
West: Macquariedale Road											
10	L2	50	0.0	0.075	6.6	LOS A	0.3	1.9	0.40	0.65	52.1
12	R2	20	0.0	0.075	9.7	LOS A	0.3	1.9	0.40	0.65	51.6
Approach		70	0.0	0.075	7.5	LOS A	0.3	1.9	0.40	0.65	52.0
All Vehicles		862	0.0	0.259	1.6	NA	0.8	5.3	0.14	0.13	57.9

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 3 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Macquariedale Road / Laneway Thu ex pm]**

Macquariedale Road / Laneway
Thursday PM Peak Hour
Existing Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Macquariedale Road											
5	T1	48	0.0	0.029	0.0	LOS A	0.0	0.3	0.03	0.08	59.2
6	R2	7	0.0	0.029	5.5	LOS A	0.0	0.3	0.03	0.08	57.0
Approach		55	0.0	0.029	0.7	NA	0.0	0.3	0.03	0.08	58.9
North: Laneway											
7	L2	14	0.0	0.010	5.6	LOS A	0.0	0.3	0.08	0.55	53.4
9	R2	1	0.0	0.010	5.7	LOS A	0.0	0.3	0.08	0.55	52.8
Approach		15	0.0	0.010	5.6	LOS A	0.0	0.3	0.08	0.55	53.3
West: Macquariedale Road											
10	L2	2	0.0	0.015	5.5	LOS A	0.0	0.0	0.00	0.04	58.0
11	T1	27	0.0	0.015	0.0	LOS A	0.0	0.0	0.00	0.04	59.6
Approach		29	0.0	0.015	0.4	NA	0.0	0.0	0.00	0.04	59.5
All Vehicles		99	0.0	0.029	1.4	NA	0.0	0.3	0.03	0.14	58.2

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 4 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Macquariedale Road / Laneway Sat ex am]**

Macquariedale Road / Laneway
Saturday AM Peak Hour
Existing Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Macquariedale Road											
5	T1	36	0.0	0.020	0.0	LOS A	0.0	0.1	0.02	0.05	59.5
6	R2	3	0.0	0.020	5.6	LOS A	0.0	0.1	0.02	0.05	57.3
Approach		39	0.0	0.020	0.4	NA	0.0	0.1	0.02	0.05	59.3
North: Laneway											
7	L2	4	0.0	0.003	5.7	LOS A	0.0	0.1	0.12	0.54	53.3
9	R2	1	0.0	0.003	5.7	LOS A	0.0	0.1	0.12	0.54	52.7
Approach		5	0.0	0.003	5.7	LOS A	0.0	0.1	0.12	0.54	53.2
West: Macquariedale Road											
10	L2	1	0.0	0.025	5.5	LOS A	0.0	0.0	0.00	0.01	58.3
11	T1	48	0.0	0.025	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
Approach		49	0.0	0.025	0.1	NA	0.0	0.0	0.00	0.01	59.8
All Vehicles		93	0.0	0.025	0.6	NA	0.0	0.1	0.02	0.06	59.2

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 5 OF 8)

MOVEMENT SUMMARY



Site: 101 [Appin Road / Macquariedale Road Thu fut pm]

Appin Road / Macquariedale Road
Thursday PM Peak Hour
Future Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Appin Road											
1	L2	116	0.0	0.205	5.6	LOS A	0.0	0.0	0.00	0.18	56.8
2	T1	277	0.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.18	58.4
Approach		393	0.0	0.205	1.7	NA	0.0	0.0	0.00	0.18	57.9
North: Appin Road											
8	T1	385	0.0	0.303	0.8	LOS A	1.2	8.7	0.31	0.17	57.5
9	R2	127	0.0	0.303	7.4	LOS A	1.2	8.7	0.31	0.17	55.4
Approach		512	0.0	0.303	2.4	NA	1.2	8.7	0.31	0.17	56.9
West: Macquariedale Road											
10	L2	92	0.0	0.228	6.6	LOS A	0.8	5.8	0.46	0.71	51.3
12	R2	82	0.0	0.228	11.0	LOS A	0.8	5.8	0.46	0.71	50.8
Approach		174	0.0	0.228	8.7	LOS A	0.8	5.8	0.46	0.71	51.0
All Vehicles		1079	0.0	0.303	3.2	NA	1.2	8.7	0.22	0.26	56.2

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 6 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Appin Road / Macquariedale Road Sat fut am]**

Appin Road / Macquariedale Road
Saturday AM Peak Hour
Future Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Appin Road											
1	L2	116	0.0	0.217	5.6	LOS A	0.0	0.0	0.00	0.17	56.9
2	T1	302	0.0	0.217	0.0	LOS A	0.0	0.0	0.00	0.17	58.5
Approach		418	0.0	0.217	1.6	NA	0.0	0.0	0.00	0.17	58.0
North: Appin Road											
8	T1	381	0.0	0.342	1.2	LOS A	1.8	12.9	0.39	0.22	56.8
9	R2	171	0.0	0.342	7.7	LOS A	1.8	12.9	0.39	0.22	54.8
Approach		552	0.0	0.342	3.3	NA	1.8	12.9	0.39	0.22	56.2
West: Macquariedale Road											
10	L2	139	0.0	0.338	7.2	LOS A	1.5	10.6	0.50	0.76	50.5
12	R2	109	0.0	0.338	12.8	LOS A	1.5	10.6	0.50	0.76	50.1
Approach		248	0.0	0.338	9.7	LOS A	1.5	10.6	0.50	0.76	50.3
All Vehicles		1218	0.0	0.342	4.0	NA	1.8	12.9	0.28	0.31	55.5

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 7 OF 8)

MOVEMENT SUMMARY

 **Site: 101 [Macquariedale Road / Laneway Thu fut pm]**

Macquariedale Road / Laneway
Thursday PM Peak Hour
Future Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Macquariedale Road											
5	T1	48	0.0	0.113	0.2	LOS A	0.6	3.9	0.16	0.43	55.7
6	R2	149	0.0	0.113	5.6	LOS A	0.6	3.9	0.16	0.43	53.7
Approach		197	0.0	0.113	4.3	NA	0.6	3.9	0.16	0.43	54.2
North: Laneway											
7	L2	156	0.0	0.133	5.6	LOS A	0.6	3.9	0.08	0.56	53.4
9	R2	37	0.0	0.133	6.4	LOS A	0.6	3.9	0.08	0.56	52.9
Approach		193	0.0	0.133	5.8	LOS A	0.6	3.9	0.08	0.56	53.3
West: Macquariedale Road											
10	L2	37	0.0	0.034	5.5	LOS A	0.0	0.0	0.00	0.34	55.5
11	T1	27	0.0	0.034	0.0	LOS A	0.0	0.0	0.00	0.34	57.0
Approach		64	0.0	0.034	3.2	NA	0.0	0.0	0.00	0.34	56.1
All Vehicles		454	0.0	0.133	4.8	NA	0.6	3.9	0.10	0.47	54.1

ANNEXURE C: SIDRA ANALYSIS RESULTS

(SHEET 8 OF 8)

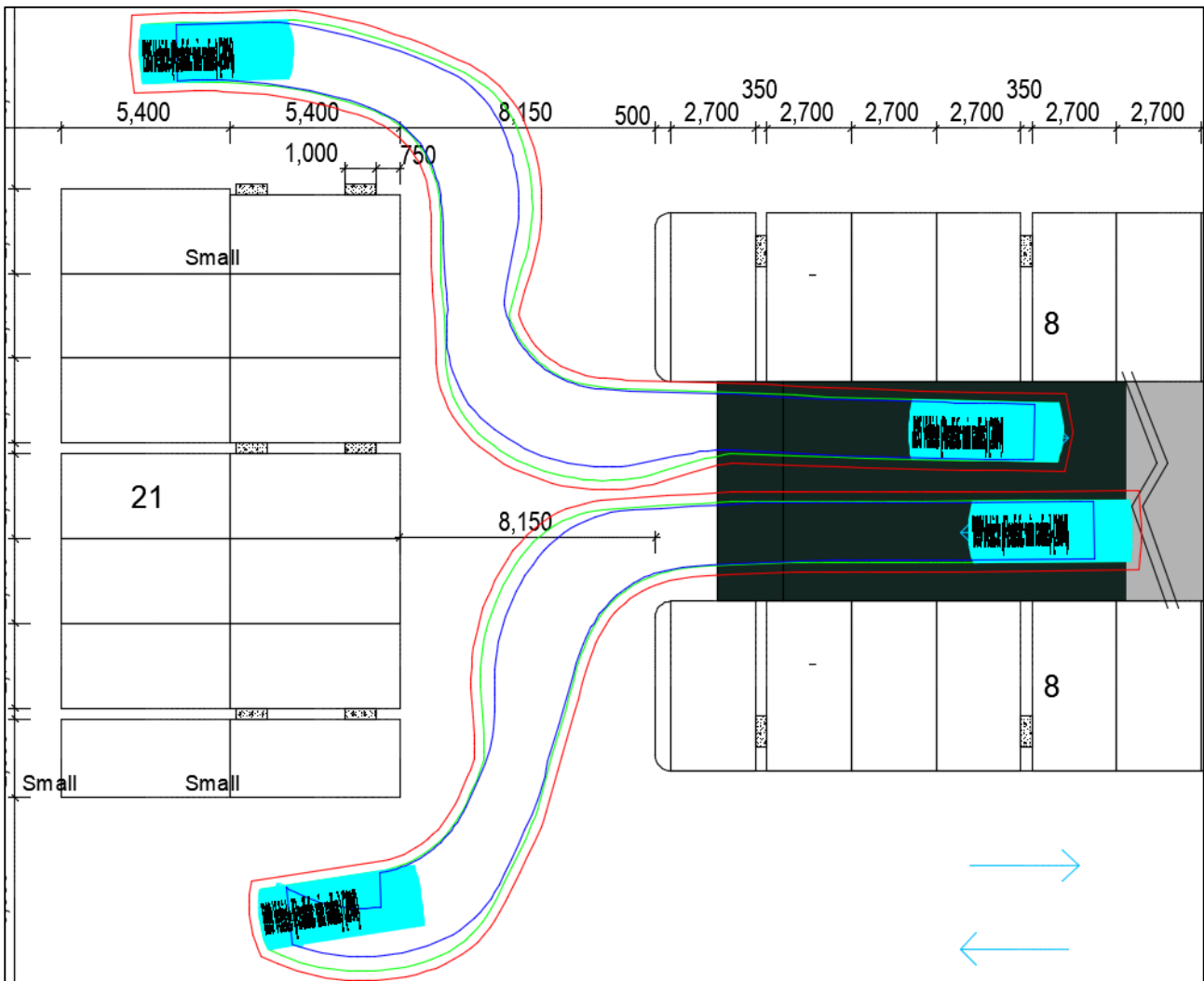
MOVEMENT SUMMARY

 **Site: 101 [Macquariedale Road / Laneway Sat fut am]**

Macquariedale Road / Laneway
Saturday AM Peak Hour
Existing Conditions
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Total veh/h	Flows 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: Macquariedale Road											
5	T1	36	0.0	0.128	0.3	LOS A	0.6	4.5	0.21	0.47	55.2
6	R2	181	0.0	0.128	5.7	LOS A	0.6	4.5	0.21	0.47	53.2
Approach		217	0.0	0.128	4.8	NA	0.6	4.5	0.21	0.47	53.6
North: Laneway											
7	L2	182	0.0	0.160	5.7	LOS A	0.7	4.7	0.12	0.56	53.3
9	R2	44	0.0	0.160	6.7	LOS A	0.7	4.7	0.12	0.56	52.7
Approach		226	0.0	0.160	5.9	LOS A	0.7	4.7	0.12	0.56	53.2
West: Macquariedale Road											
10	L2	44	0.0	0.048	5.5	LOS A	0.0	0.0	0.00	0.28	56.0
11	T1	48	0.0	0.048	0.0	LOS A	0.0	0.0	0.00	0.28	57.5
Approach		92	0.0	0.048	2.7	NA	0.0	0.0	0.00	0.28	56.8
All Vehicles		535	0.0	0.160	4.9	NA	0.7	4.7	0.14	0.48	53.9

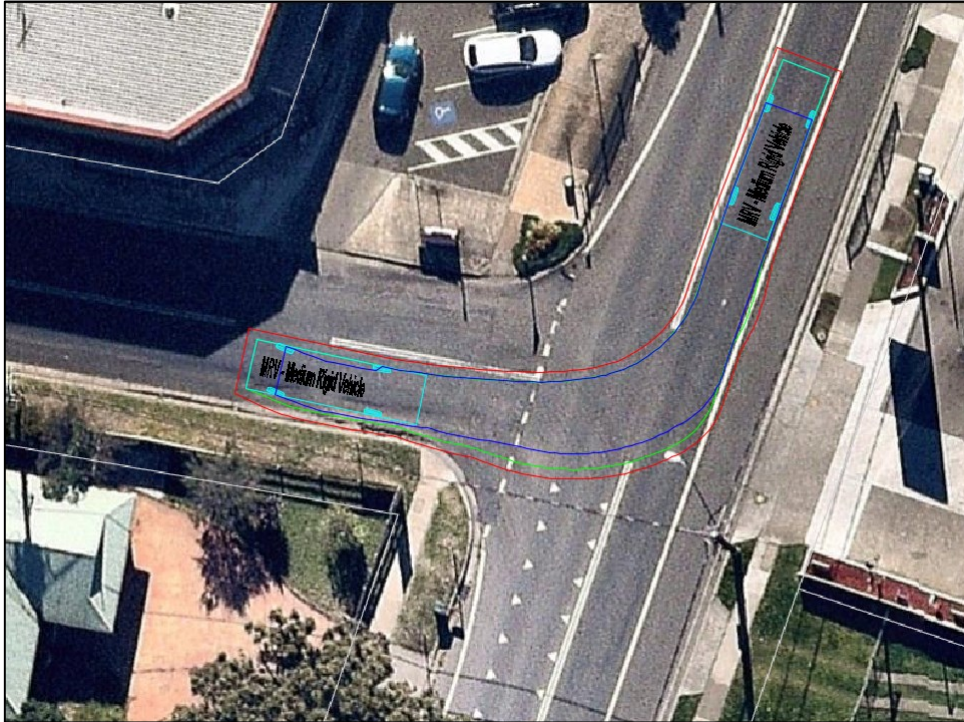
ANNEXURE D: SWEEP PATH TESTS
(SHEET 3 of 10)



B85 passing B99 at basement level 2 ramp Entry/Exit
Tested @ 5 km/hr
Successful

Blue = Tyre Paths
Green = Vehicle body
Red = 300mm clearance

ANNEXURE D: SWEEP PATH TESTS
(SHEET 4 of 10)

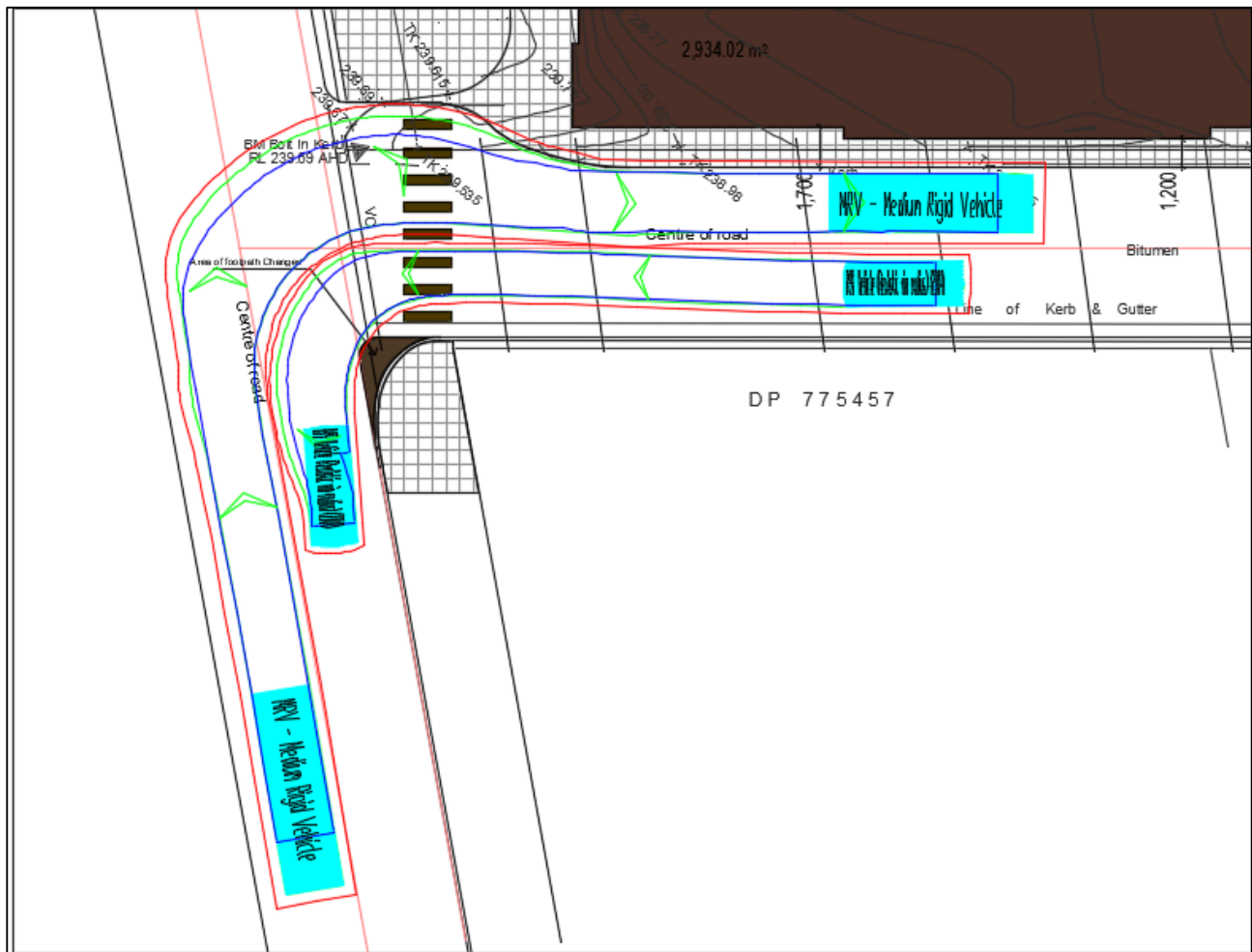


8.8m Medium Rigid Vehicle into Macquariedale Road
Tested @ 5km/h
Successful

Blue – Vehicle tyres
Green – Vehicle Body
Red – 500mm clearance

ANNEXURE D: SWEEP PATH TESTS

(SHEET 5 of 10)



8.8m Medium Rigid Vehicle into Access Road passing a B85

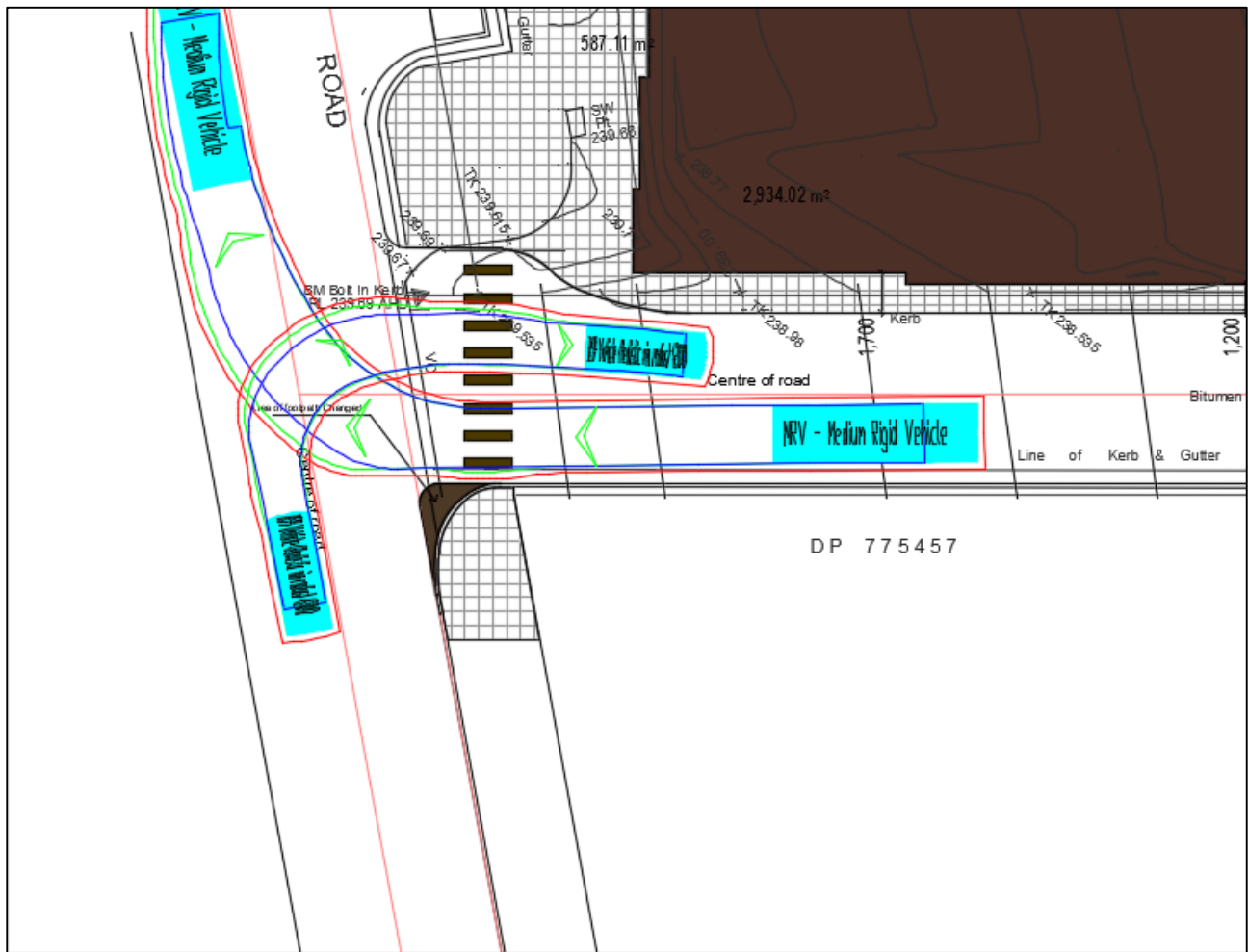
Tested @ 5km/h

Successful

Blue – Vehicle tyres
Green – Vehicle Body
Red – 500mm clearance

ANNEXURE D: SWEEP PATH TESTS

(SHEET 6 of 10)



8.8m Medium Rigid Vehicle right into Macquariedale Road

Tested @ 5km/h

Successful

Blue – Vehicle tyres

Green – Vehicle Body

Red – 300mm clearance

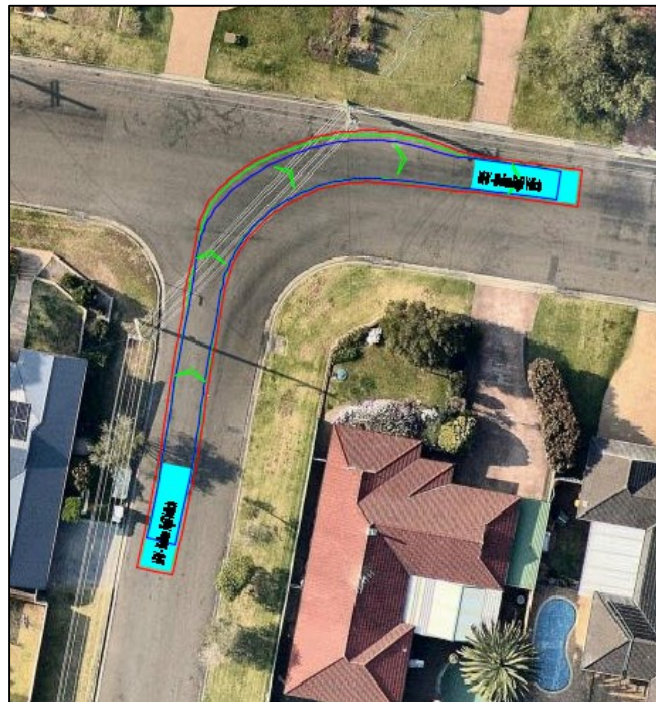
ANNEXURE D: SWEEP PATH TESTS
(SHEET 7 of 10)



8.8m Medium Rigid Vehicle right turn from Macquariedale Road to Kerr Street
Tested @ 10km/h
Successful

Blue – Vehicle tyres
Green – Vehicle Body
Red – 500mm clearance

ANNEXURE D: SWEEP PATH TESTS
(SHEET 8 of 10)



8.8m Medium Rigid Vehicle right turn from Kerr Street to Rixon Road
Tested @ 10km/h
Successful

Blue – Vehicle tyres
Green – Vehicle Body
Red – 500mm clearance

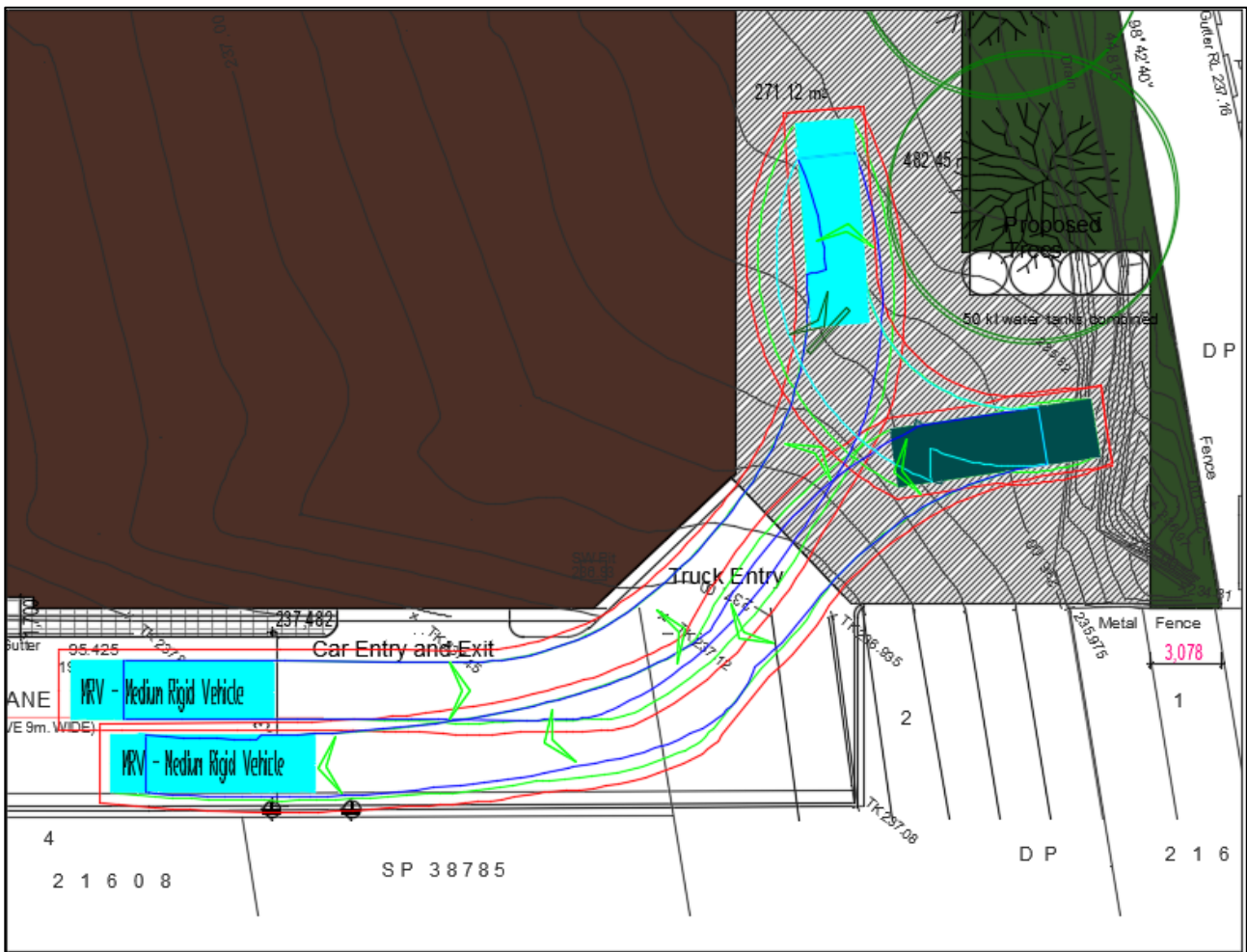
ANNEXURE D: SWEEP PATH TESTS
(SHEET 9 of 10)



8.8m Medium Rigid Vehicle left / right turn from Rixon Road to Appin Road
Tested @ 10km/h
Successful

Blue – Vehicle tyres
Green – Vehicle Body
Red – 500mm clearance

ANNEXURE D: SWEEP PATH TESTS
(SHEET 10 of 10)



8.8m length Medium Rigid Vehicle entry and egress from loading area
Tested @ 5km/h
Successful

Blue - Vehicle Tyres
Green - Vehicle Body
Red - 300mm clearance