

M^CLAREN TRAFFIC ENGINEERING

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

8th March 2018

Reference: 17481.02FA

Apex Intelligent Design
38 Ligar Street, Fairfield Heights
Attention: John Kechagias

RESPONSE TO COUNCIL OF SHOPPING CENTRE AT MACQUARIEDALE ROAD, APPIN

Dear John,

Reference is made to your request to provide supplementary traffic advice in response to the comments from the Wollondilly Shire Council in their letter dated 8 February 2018 in regard to the proposed shopping centre at Macquariedale Road, Appin as depicted on plans reproduced in **Annexure A**. Each of the relevant comments is reproduced below in *italics* and responded to thereafter.

- 1. The traffic survey was carried out outside the school zone time i.e. 8-9.30am & 2.30 – 4pm, which usually attracts heavy traffic at the area. There is always a shortage in parking in the existing Appin shops parking area at this period. As the analysis of the LOS is based on the survey result, it warrants additional traffic survey at this period to ensure consistency of the analysis.*

MTE Response: The peak time of the shopping centres occurs between 4:30 -5:30pm on a Thursday and Friday as per the RMS "Guide to Traffic Generating Developments". The network peak typically occurs between 4:00pm to 6:00pm. It envisaged from personal experience and traffic engineering principles that traffic surveys between 2:30pm to 4:00pm would provide lower traffic volumes even with the school located to the north of the site. Further, as the peak traffic generation of shopping centres does not coincide with the school peak, the worst traffic flow volumes would correspond to times between 4:00pm to 6:00pm (network peak) when assessed in conjunction with the shopping centre.

Counts have been conducted during this time with the network peak shown to be between 5-6pm during the week as shown in **Annexure B**. If the worst-case scenario (4-6pm) performs satisfactorily, the traffic network outside of this time would also perform sufficiently. Hence, there is no need to get additional traffic surveys during the school peak periods.

It is relevant to note that the proposed traffic volumes as shown in the survey results in **Annexure B** were undertaken during the closure of Wilton Road (Broughton pass Bridge). There was a storm event on the 5th of June 2016 which caused the retaining wall on the Broughton Pass bridge to

collapsed resulting in the closure of Wilton Road. The two-way traffic flow volumes along Appin Road may therefore be insufficient to assess the proposed development. Although it is considered that the turning movements associated with the intersection of Macquariedale Road / Appin Road would be relatively the same. If not worse for right turn movements into Macquariedale Road as a result of displaced vehicle trips. Any additional traffic surveys during the closure of Broughton Pass may still indicate low traffic flow volumes.

There exists a traffic volume counter provided by the RMS within Appin Road to the south of the intersection of King Street / Appin Road. A summary of the average northbound and southbound traffic flows within the PM peak weekday period and weekend are shown in **Table 1** and Table 2 below

It should be noted the average daily flows between 2:30-4pm are less than the peak traffic flows during the 4-6pm peak hour period.

TABLE 1: WEEKDAY TRAFFIC VOLUME VIEWER ALONG APPIN ROAD

Year	Travel Direction	Average Vehicle Trips				
		2:00pm	3:00pm	4:00pm	5:00pm	6:00pm
2013	Northbound	-	-	-	-	-
	Southbound	319	480	538	531	340
2014	Northbound	-	-	-	-	-
	Southbound	302	434	503	511	322
2015	Northbound	274	339	353	337	233
	Southbound	300	426	466	419	256
2016	Northbound	253	314	329	327	235
	Southbound	288	339	413	421	256
2017	Northbound	257	305	337	337	221
	Southbound	328	446	520	504	298

TABLE 2: WEEKEND TRAFFIC VOLUME VIEWER ALONG APPIN ROAD

Year	Travel Direction	Average Vehicle Trips				
		10:00am	11:00am	12:00pm	1:00pm	2:00pm
2013	Northbound	-	-	-	-	-
	Southbound	434	482	443	396	371
2014	Northbound	-	-	-	-	-
	Southbound	381	419	378	349	331
2015	Northbound	323	386	347	339	345
	Southbound	343	383	372	338	337
2016	Northbound	323	292	306	337	338
	Southbound	330	370	371	346	333
2017	Northbound	316	322	311	339	346
	Southbound	374	389	384	352	319

As shown above, there does not seem to be any constant growth rate in relation to the number of vehicle trips travelling southbound from 2013 to 2017. Further, as a result of the bridge collapse in 2016 there are reduced vehicle trips heading northbound in comparison to the average 2015 northbound vehicle trips. As a conservative assessment the largest average traffic flow values will be used for the southbound and northbound movements as shown in **Table 1** and **Table 2** above during the weekday and weekend assessment, plus the turning movements observed from the traffic surveys shown in **Annexure B** at the intersection of *Macquariedale Road / Appin Road*.

2. *There is an appreciable traffic impact at this period at intersection of Macquariedale Rd and Appin Rd as well as the exit from Appin shops car park onto Appin Rd especially the RT manoeuvre."*

MTE Response: As shown in response 1, peak traffic generation occurs between 4-5pm. Traffic surveys were undertaken on the 8th of February 2016 for the Appin Shops car park entrance and are shown in **Annexure B** for reference. The use of these turning movements is acceptable given the proposed traffic generation from the shops would not have changed over the years. These turning movements plus the two-way traffic flows above and turning movements (left and right turn) from the intersection of Macquariedale Road have been assessed in SIDRA for the existing conditions and the future assessment provided thereafter based upon the traffic generation of the proposed shopping centre. Detailed SIDRA results are also shown in **Annexure C** for reference.

**TABLE 3: 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 / Appin Shops	Thursday	0.295	0.6 (Worst: 12)	N/A (Worst A)	Give Way	RT from Appin Shops
FUTURE PERFORMANCE (post development)						
Appin Road / Macquariedale Road	Thursday	0.33	0.6 (Worst: 14.0)	N/A (Worst A)	Give Way	RT from Appin Shops

As shown above the intersection of Appin Road / Appin Shops is operating with worst turning movements of LoS A. Additional spare capacity has been maintained with minor increases to average delay.

Notwithstanding the above it is relevant to note that the proposed shopping centre would result in a degree of passing trade. That is vehicles travelling to the shopping centre will consist of existing vehicles within the road network, such that there will be less vehicle trips on the main road than what the proposed traffic generation indicates.

- The proposed development utilises a smaller 8.8m trucks for deliveries but how could this be enforced? The applicant must provide for semi-trailers which will require larger turning circles and affect the truck manoeuvre into the loading dock. This will also then provide for a garbage truck.*

MTE Response: As part of the Council Development Consent Conditions, the proposed development will enforce an 8.8m length vehicle limit for all deliveries. No vehicle larger than this will be permitted to access the site and cannot be supported due to the road geometry restrictions of the site.

- Separation of customers vehicles and trucks is paramount*

MTE Response: Separation of visitors and service vehicles have been provided. Each are assessed through a separate entry and egress driveway.

- Impact of vehicles to/from the development vs the traffic into Appin shops car park must be assessed as part of the TM.*

MTE Response: The proposed development will increase traffic along Macquariedale Road travelling eastbound and as a result it would make it difficult for vehicles to turn into the existing driveway of Appin Shops. Queues may which back up onto Appin Road, which is further not supported.

In view of the above, the only solution to ensuring no vehicle queues back onto Appin Road as a result of vehicles attempting to turn right into Appin Shops would be to provide a median within Macquariedale Road, physically restricting right turns into the site driveway. To ensure the safe entry

into Appin Shops car park as a result of the proposed median, a roundabout can be proposed as part of the development at the intersection of Macquariedale Road / Elizabeth Close to allow vehicles to undertake a safe U-turn manoeuvre.

Further detailed concept designs and civil works would have to be undertaken for the roundabout which can be provided if the median and roundabout concept is endorsed.

7. *Impact of vehicles doing RT from Appin Rd. to Macquariedale Rd. are not included in the assessment.*

MTE Response: The SIDRA provided within the traffic report have been amended based upon the traffic flows provided in Response 1. The SIDRA results below supersede the SIDRA assessment within the traffic report. The results of the existing and future SIDRA analysis because of the proposed development are reproduced below with detailed SIDRA outputs provided in **Annexure C** for reference.

**TABLE 4: 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	0.314	1.1 (Worst: 11.4)	N/A (Worst A)	Give Way	RT from Macquariedale Road
	Saturday	0.32	1.6 (Worst: 11.8)	N/A (Worst A)	Give Way	RT from Macquariedale Road
FUTURE PERFORMANCE (post development)						
Appin Road / Macquariedale Road	Thursday	0.38	3.2 (Worst: 14.5)	N/A (Worst A)	Give Way	RT from Macquariedale Road
Appin Road / Macquariedale Road	Saturday	0.41	4.2 (Worst: 16.5)	N/A (Worst B)	Give Way	RT from Macquariedale Road

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 under the future scenario the proposed intersection of Appin Road / Macquariedale Road operates with worst turning movements of LoS "B" during all time periods except on weekends. This indicates minor delays and additional spare capacity is maintained.

The detailed results of the right turn movement from Appin Road into Macquariedale Road, increases from an average delay of 7.6 seconds to 8.8 seconds (as observed on Saturday being the worst) with an overall queue length of 17.8m (from 6.5m) in the future scenario. This is equivalent to 3 vehicles waiting within Appin Road.

The SIDRA model has been assessed as a single lane travelling southbound, such that vehicles cannot pass a vehicle waiting to turn right into Macquariedale Road with a result of LoS "A". The road width on the southbound lane of Appin Road measures at approximately 6.2m in width measured from the centreline. This is sufficient width for an urban BAR treatment based upon AUSTRROADS *Guide to Road Design Part 4A*. This allows sufficient road width to allow a car to wait to turn right and vehicles to pass. This will therefore result in no delays or queues along the southbound travel lane of Appin Road.



FIGURE 1: INTERSECTION OF MACQUARIEDALE ROAD / APPIN ROAD WIDTH

8. *“Impact of vehicle waiting for RT into existing car park on Appin Rd. & effect on the intersection is not included.*

MTE Response: Refer to Response 6.

9. *Include an assessment of the existing lane users.*

MTE Response: The existing road users within the lane would be staff and visitors travelling to the Appin Shop car parking areas.

“Consider moving the entry/exit to the car park to the top end of the lane to provide max separation in the lane between cars & trucks, would need to consider any queuing in the lane.

MTE Response: Moving the lane to the top end of the lane is not recommended as a result of queuing impacts upon Macquariedale Road. The driveway location has been relocated to be in the middle of the laneway. Providing greater separation of the visitor and service vehicle driveways.

13. *The access to the shops off the lane should be removed due to the narrow proposed footpath. Customers will walk from the shops onto the lane & into traffic.*

MTE Response: The amended plans indicate that the access.

14. *It is proposed that trucks will leave the site via Kerr St. to Appin Road this is not accepted.*

The proposed haulage route for up to a 8.8m length Medium Rigid Vehicle will exit the site via a left turn from the laneway and continue to the Macquariedale Road/ Appin Road intersection. Laneway upgrades have been proposed which will require widening/ splaying the laneway entrance. Swept Path Testing has been undertaken and provided in **Annexure D**.

15. *It is proposed to widen the lane to a 7.0m carriageway, this should be wider.*

MTE Response: The proposed laneway width has been modified to provide an 8m wide carriageway, with additional splay at the connection to Macquariedale Road to facilitate an 8.8m length Medium Rigid Vehicle passing a B99 design vehicle.

16. *Vehicle RT to Appin Rd. from Mac. Rd. would be difficult at peak times, but shown as LOS A?*

MTE Response: SIDRA results for this movement are shown in **Annexure C** based upon the conservative approach as provided within Response 1 and 7. The results of the SIDRA with the weekend being the worst-case maximum indicates an average delay of 16.5 seconds corresponding to LoS "B". Further the 98th percentile queue on the west approach (Macquariedale Road) is 13.3m (3 vehicles). As shown, the traffic generated by the development is not expected to have a detrimental impact upon the surrounding road network.

The provision of a median to restrict right turns into the existing Appin Shops development, proposed roundabout at the intersection of Macquariedale Road / Elizabeth Close and proposed BAR treatment for right turns into Macquariedale Road from Appin Road are sufficient for the proposed development.

17. *The intersection of Appin Rd. & Macquariedale Rd. requires a complete assessment to consider all vehicle movements & impacts which includes all trucks to & from the site. Potential truck movement numbers are to be included. It is expected some improvements will be required to this intersection to provide for the additional traffic.*

Delivery movements are considered to be minor. One additional heavy vehicle trip will not hinder traffic flows in the area which are also expected to occur outside of peak operating hours.

18. *A Traffic Safety Audit is required once an acceptable proposal has been submitted.*

A Traffic Safety Audit can be completed as part of Council Consent Conditions prior to Construction Certificate.

Please contact Mr Matthew M^cCarthy or the undersigned should you require further information or assistance.

Yours faithfully
M^cLaren Traffic Engineering



Craig M^cLaren

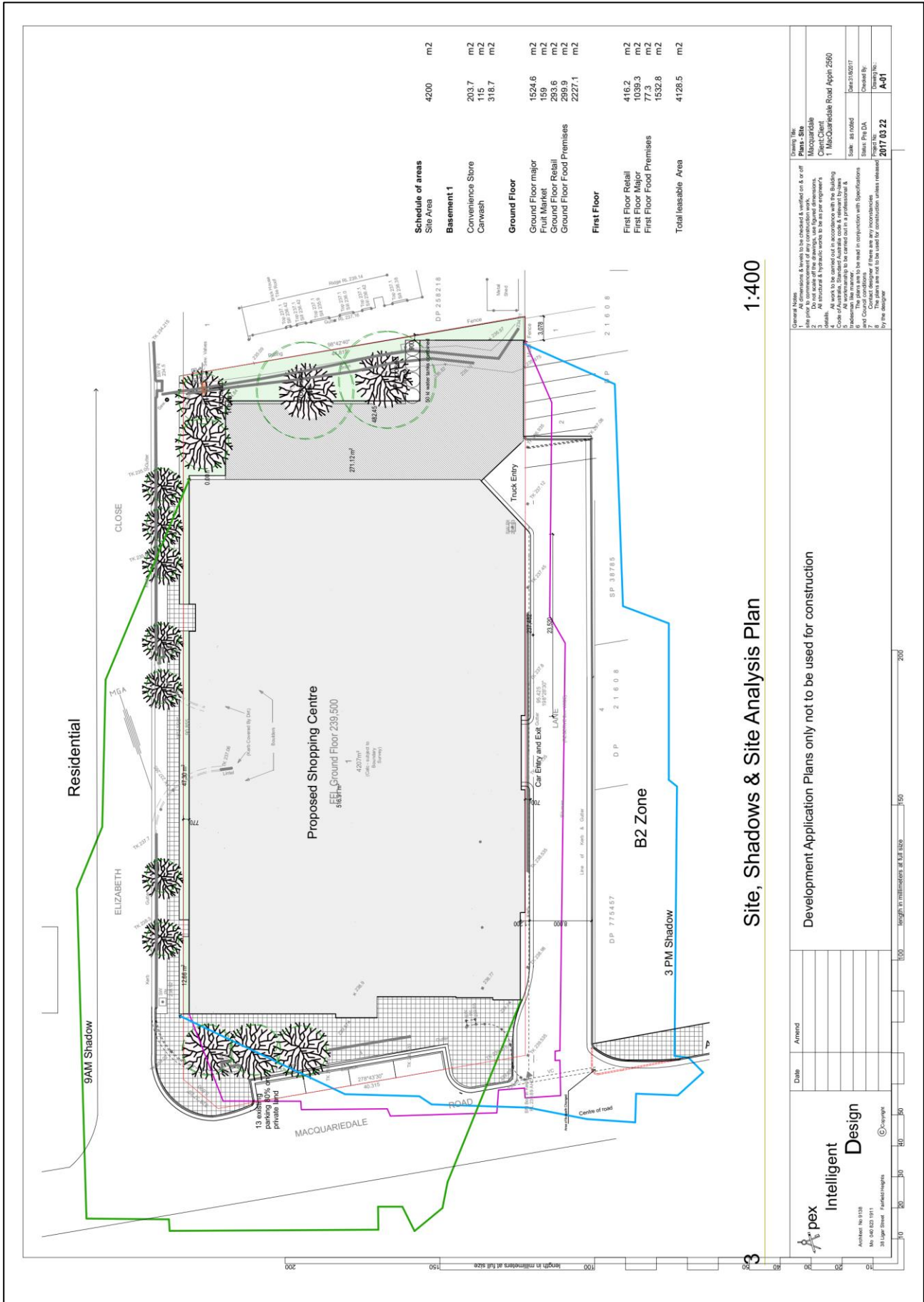
Director

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RMS Accredited Traffic Control Planner, Auditor & Certifier (Orange Card)

ANNEXURE A: CONCEPT SITE PLAN



ANNEXURE B: SURVEY RESULTS (SHEET 1 OF 5)

Curtis Traffic Surveys		Turning movement count						Appin Rd	
Job:	170809mcl (17 481)						← 56	↓ 385	N ↑
Day, date	31/08/17						← 21	↓ 11	
Location:	Appin Rd & Macquariedale Rd						← 45	↓ 277	
Weather:	Fine								
Client:	McLaren Traffic Engineering								
		From Appin Rd north		From Macquariedale Rd		From Appin Rd south			
Time Period	through	right	left	right	left	through	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 5)

Curtis Traffic Surveys		Turning movement count							lane	
Job:	170809mcl (17_481)							1	14	
Day, date	31/08/17							2		7
Location:	lane & Macquariedale Rd							27		48
Weather:	Fine									
Client:	McLaren Traffic Engineering							Macquariedale Rd		
	From Macquariedale Rd east			From lane		From Macquariedale Rd west				
Time Period	through	right	left	right	left	through	Total vehicles	Peak		
16:00 to 16:15	6	0	0	0	0	0	6	12		
16:15 to 16:30	8	0	1	1	1	0	8	18		
16:30 to 16:45	7	1	0	1	0	0	8	17		
16:45 to 17:00	16	2	1	0	0	0	8	27	peak	
17:00 to 17:15	13	2	4	1	1	1	5	26		
17:15 to 17:30	7	3	6	0	0	0	9	25		
17:30 to 17:45	12	0	3	0	1	1	5	21		
17:45 to 18:00	15	1	3	1	0	0	4	24		
18:00 to 18:15	14	2	2	0	1	1	6	25		
18:15 to 18:30	10	0	2	0	0	0	10	22		
18:30 to 18:45	11	1	0	0	0	0	6	18		
18:45 to 19:00	9	0	0	0	0	0	9	18		
Total										
Hourly summary										
16:00 to 17:00	37	3	2	2	0	0	30	74		
16:15 to 17:15	44	5	6	3	1	1	29	88		
16:30 to 17:30	43	8	11	2	1	1	30	95		
16:45 to 17:45	48	7	14	1	2	2	27	99	peak hour	
17:00 to 18:00	47	6	16	2	2	2	23	96		
17:15 to 18:15	48	6	14	1	2	2	24	95		
17:30 to 18:30	51	3	10	1	2	2	25	92		
17:45 to 18:45	50	4	7	1	1	1	26	89		
18:00 to 19:00	44	3	4	0	1	1	31	83		

ANNEXURE B: SURVEY RESULTS (SHEET 3 OF 5)

Curtis Traffic Surveys		Turning movement count					Appin Rd		
Job:	170809mcl (17_481)						82	381	N ↑
Day, date	02/09/17					Peak Hour Volumes	50		
Location:	Appin Rd & Macquariedale Rd					Macquaried	20		
Weather:	Fine						27	302	
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	
10:00 to 10:15		84	12	5	3	8	61	173	
10:15 to 10:30		71	17	6	4	10	53	161	
10:30 to 10:45		95	13	6	10	18	68	210	
10:45 to 11:00		87	20	9	3	11	59	189	
11:00 to 11:15		95	14	10	4	6	62	191	
11:15 to 11:30		91	16	12	5	5	71	200	
11:30 to 11:45		95	17	16	8	4	81	221	peak
11:45 to 12:00		90	22	9	4	8	82	215	
12:00 to 12:15		92	25	13	3	8	74	215	
12:15 to 12:30		104	18	12	5	7	65	211	
12:30 to 12:45		94	23	10	4	9	73	213	
12:45 to 13:00		63	17	5	3	10	50	148	
13:00 to 13:15		96	19	4	2	6	71	198	
13:15 to 13:30		107	14	7	2	8	70	208	
13:30 to 13:45		71	10	8	2	9	89	189	
13:45 to 14:00		85	9	6	3	5	72	180	
Total									
Hourly summary									
10:00 to 11:00		337	62	26	20	47	241	733	
10:15 to 11:15		348	64	31	21	45	242	751	
10:30 to 11:30		368	63	37	22	40	260	790	
10:45 to 11:45		368	67	47	20	26	273	801	
11:00 to 12:00		371	69	47	21	23	296	827	
11:15 to 12:15		368	80	50	20	25	308	851	
11:30 to 12:30		381	82	50	20	27	302	862	peak hour
11:45 to 12:45		380	88	44	16	32	294	854	
12:00 to 13:00		353	83	40	15	34	262	787	
12:15 to 13:15		357	77	31	14	32	259	770	
12:30 to 13:30		360	73	26	11	33	264	767	
12:45 to 13:45		337	60	24	9	33	280	743	
13:00 to 14:00		359	52	25	9	28	302	775	

ANNEXURE B: SURVEY RESULTS (SHEET 4 OF 4)

Curtis Traffic Surveys		Turning movement count					lane			
Job:	170809mcl (17 481)					Peak Hour Volumes		0	4	
Day, date	02/09/17							0		3
Location:	lane & Macquariedale Rd					N ↑		48		36
Weather:	Fine							Macquariedale Rd		
Client:	McLaren Traffic Engineering									
	From Macquariedale Rd east		From lane		From Macquariedale Rd west					
Time Period	through	right	left	right	left	through	Total vehicles	Peak		
16:00 to 16:15	15	0	1	0	0	7	23			
16:15 to 16:30	12	0	0	0	0	9	21			
16:30 to 16:45	10	1	1	0	0	15	27	peak		
16:45 to 17:00	8	1	0	0	0	7	16			
17:00 to 17:15	12	0	1	0	0	12	25			
17:15 to 17:30	6	1	2	0	0	14	23			
17:30 to 17:45	4	0	0	0	0	14	18			
17:45 to 18:00	7	0	2	0	0	9	18			
18:00 to 18:15	8	1	2	0	0	9	20			
18:15 to 18:30	6	0	0	1	0	15	22			
18:30 to 18:45	3	0	2	0	0	9	14			
18:45 to 19:00	7	0	1	0	0	5	13			
19:00 to 19:15	4	0	0	0	0	6	10			
19:15 to 19:30	8	0	0	0	0	9	17			
19:30 to 19:45	7	2	1	0	0	7	17			
19:45 to 20:00	7	0	0	0	0	9	16			
Total										
Hourly summary										
16:00 to 17:00	45	2	2	0	0	38	87			
16:15 to 17:15	42	2	2	0	0	43	89			
16:30 to 17:30	36	3	4	0	0	48	91	peak hour		
16:45 to 17:45	30	2	3	0	0	47	82			
17:00 to 18:00	29	1	5	0	0	49	84			
17:15 to 18:15	25	2	6	0	0	46	79			
17:30 to 18:30	25	1	4	1	0	47	78			
17:45 to 18:45	24	1	6	1	0	42	74			
18:00 to 19:00	24	1	5	1	0	38	69			
18:15 to 19:15	20	0	3	1	0	35	59			
18:30 to 19:30	22	0	3	0	0	29	54			
18:45 to 19:45	26	2	2	0	0	27	57			
19:00 to 20:00	26	2	1	0	0	31	60			

**ANNEXURE B: SURVEY RESULTS
(SHEET 5 OF 5)**

Curtis Traffic Surveys			Turning movement count			Peak Hour Volumes
Job:			160204mcl(16_039)			
Day, date			08/02/16			46
Location:			Appin Rd & 78 & 79			No 79 0
Weather:			Fine			25
Client:			McLaren Traffic Engineering			
			From No 79			
			left	through	right	
Time Period						
16:00 to 16:15			14		7	
16:15 to 16:30			11		6	
16:30 to 16:45			7		2	
16:45 to 17:00			14		10	
17:00 to 17:15			6		8	
17:15 to 17:30			6		7	
17:30 to 17:45			10		8	
17:45 to 18:00			7		8	
Total			75	0	56	
Hourly summary						
16:00 to 17:00			46	0	25	
16:15 to 17:15			38	0	26	
16:30 to 17:30			33	0	27	
16:45 to 17:45			36	0	33	
17:00 to 18:00			29	0	31	

ANNEXURE C: SIDRA ANALYSIS RESULTS (SHEET 1 OF 5)

MOVEMENT SUMMARY

▽ Site: 101 [Appin Road/ Shop Thu EX pm]

Appin Road/ Appin Shops - Thurs
Existing
PM Peak Period
Giveaway / Yield (Two-Way)

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows 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 S												
2	T1	374	0.0	0.192	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		374	0.0	0.192	0.0	NA	0.0	0.0	0.00	0.00	60.0	
North: Appin Road N												
8	T1	576	0.0	0.295	0.0	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		576	0.0	0.295	0.0	NA	0.0	0.0	0.00	0.00	59.9	
West: Shop DW												
10	L2	46	0.0	0.095	6.9	LOS A	0.3	2.3	0.48	0.71	51.3	
12	R2	25	0.0	0.095	12.0	LOS A	0.3	2.3	0.48	0.71	50.6	
Approach		71	0.0	0.095	8.7	LOS A	0.3	2.3	0.48	0.71	51.0	
All Vehicles		1021	0.0	0.295	0.6	NA	0.3	2.3	0.03	0.05	59.2	

MOVEMENT SUMMARY

▽ Site: 101 [Appin Road/ Shop Thu fut pm]

Appin Road/ Appin Shops - Thurs
Future
PM Peak Period
Giveaway / Yield (Two-Way)

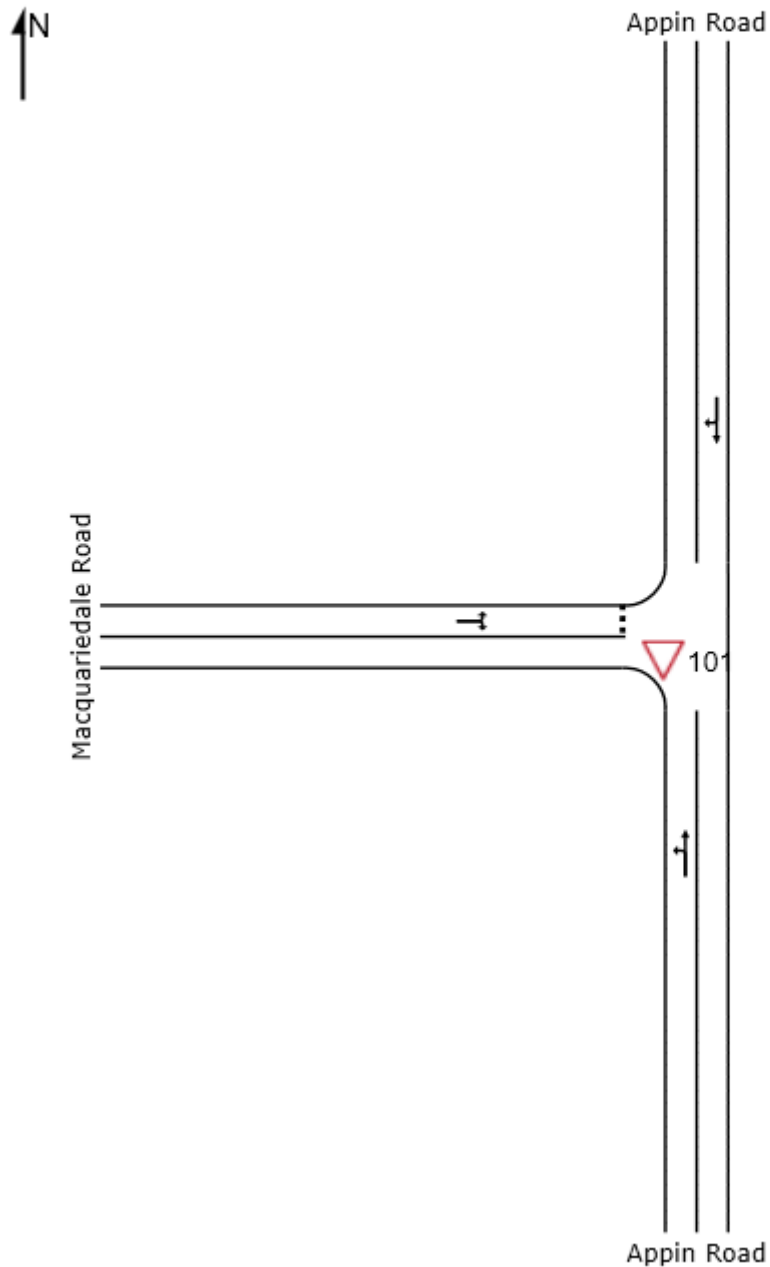
Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h	
South: Appin Road S												
2	T1	444	0.0	0.228	0.0	LOS A	0.0	0.0	0.00	0.00	60.0	
Approach		444	0.0	0.228	0.0	NA	0.0	0.0	0.00	0.00	60.0	
North: Appin Road N												
8	T1	646	0.0	0.331	0.0	LOS A	0.0	0.0	0.00	0.00	59.9	
Approach		646	0.0	0.331	0.0	NA	0.0	0.0	0.00	0.00	59.9	
West: Shop DW												
10	L2	46	0.0	0.111	7.2	LOS A	0.4	2.6	0.53	0.74	50.6	
12	R2	25	0.0	0.111	14.0	LOS A	0.4	2.6	0.53	0.74	50.0	
Approach		71	0.0	0.111	9.6	LOS A	0.4	2.6	0.53	0.74	50.4	
All Vehicles		1161	0.0	0.331	0.6	NA	0.4	2.6	0.03	0.05	59.2	

**ANNEXURE C: SIDRA ANALYSIS RESULTS
(SHEET 2 OF 5)**

SITE LAYOUT

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

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



ANNEXURE C: SIDRA ANALYSIS RESULTS (SHEET 3 OF 5)

MOVEMENT SUMMARY

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

Appin Road / Macquariedale Road
Thursday PM Peak Hour
Existing Conditions
Giveway / 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	0.205	5.6	LOS A	0.0	0.0	0.00	0.07	57.7
2	T1	353	0.0	0.205	0.0	LOS A	0.0	0.0	0.00	0.07	59.3
Approach		398	0.0	0.205	0.6	NA	0.0	0.0	0.00	0.07	59.2
North: Appin Road											
8	T1	520	0.0	0.314	0.3	LOS A	0.6	4.4	0.14	0.06	58.9
9	R2	56	0.0	0.314	7.5	LOS A	0.6	4.4	0.14	0.06	56.7
Approach		576	0.0	0.314	1.0	NA	0.6	4.4	0.14	0.06	58.7
West: Macquariedale Road											
10	L2	21	0.0	0.042	6.7	LOS A	0.1	1.0	0.45	0.67	51.5
12	R2	11	0.0	0.042	11.4	LOS A	0.1	1.0	0.45	0.67	51.0
Approach		32	0.0	0.042	8.3	LOS A	0.1	1.0	0.45	0.67	51.3
All Vehicles		1006	0.0	0.314	1.1	NA	0.6	4.4	0.09	0.08	58.6

MOVEMENT SUMMARY

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

Appin Road / Macquariedale Road
Thursday PM Peak Hour
Future Conditions
Giveway / 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	115	0.0	0.243	5.6	LOS A	0.0	0.0	0.00	0.15	57.1
2	T1	353	0.0	0.243	0.0	LOS A	0.0	0.0	0.00	0.15	58.6
Approach		468	0.0	0.243	1.4	NA	0.0	0.0	0.00	0.15	58.2
North: Appin Road											
8	T1	520	0.0	0.381	1.1	LOS A	1.8	12.8	0.30	0.14	57.6
9	R2	126	0.0	0.381	8.4	LOS A	1.8	12.8	0.30	0.14	55.5
Approach		646	0.0	0.381	2.5	NA	1.8	12.8	0.30	0.14	57.2
West: Macquariedale Road											
10	L2	90	0.0	0.283	7.3	LOS A	1.1	7.7	0.54	0.78	49.8
12	R2	80	0.0	0.283	14.5	LOS A	1.1	7.7	0.54	0.78	49.4
Approach		170	0.0	0.283	10.7	LOS A	1.1	7.7	0.54	0.78	49.6
All Vehicles		1284	0.0	0.381	3.2	NA	1.8	12.8	0.22	0.23	56.4

ANNEXURE C: SIDRA ANALYSIS RESULTS (SHEET 3 OF 3)

MOVEMENT SUMMARY

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

Appin Road / Macquariedale Road
Saturday AM Peak Hour
Existing Conditions
Giveway / 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	0.212	5.6	LOS A	0.0	0.0	0.00	0.04	58.0	
2	T1	386	0.0	0.212	0.0	LOS A	0.0	0.0	0.00	0.04	59.6	
Approach		413	0.0	0.212	0.4	NA	0.0	0.0	0.00	0.04	59.5	
North: Appin Road												
8	T1	482	0.0	0.317	0.5	LOS A	0.9	6.5	0.20	0.10	58.4	
9	R2	82	0.0	0.317	7.6	LOS A	0.9	6.5	0.20	0.10	56.2	
Approach		564	0.0	0.317	1.6	NA	0.9	6.5	0.20	0.10	58.0	
West: Macquariedale Road												
10	L2	50	0.0	0.088	6.9	LOS A	0.3	2.2	0.47	0.69	51.5	
12	R2	20	0.0	0.088	11.8	LOS A	0.3	2.2	0.47	0.69	51.0	
Approach		70	0.0	0.088	8.3	LOS A	0.3	2.2	0.47	0.69	51.4	
All Vehicles		1047	0.0	0.317	1.6	NA	0.9	6.5	0.14	0.11	58.1	

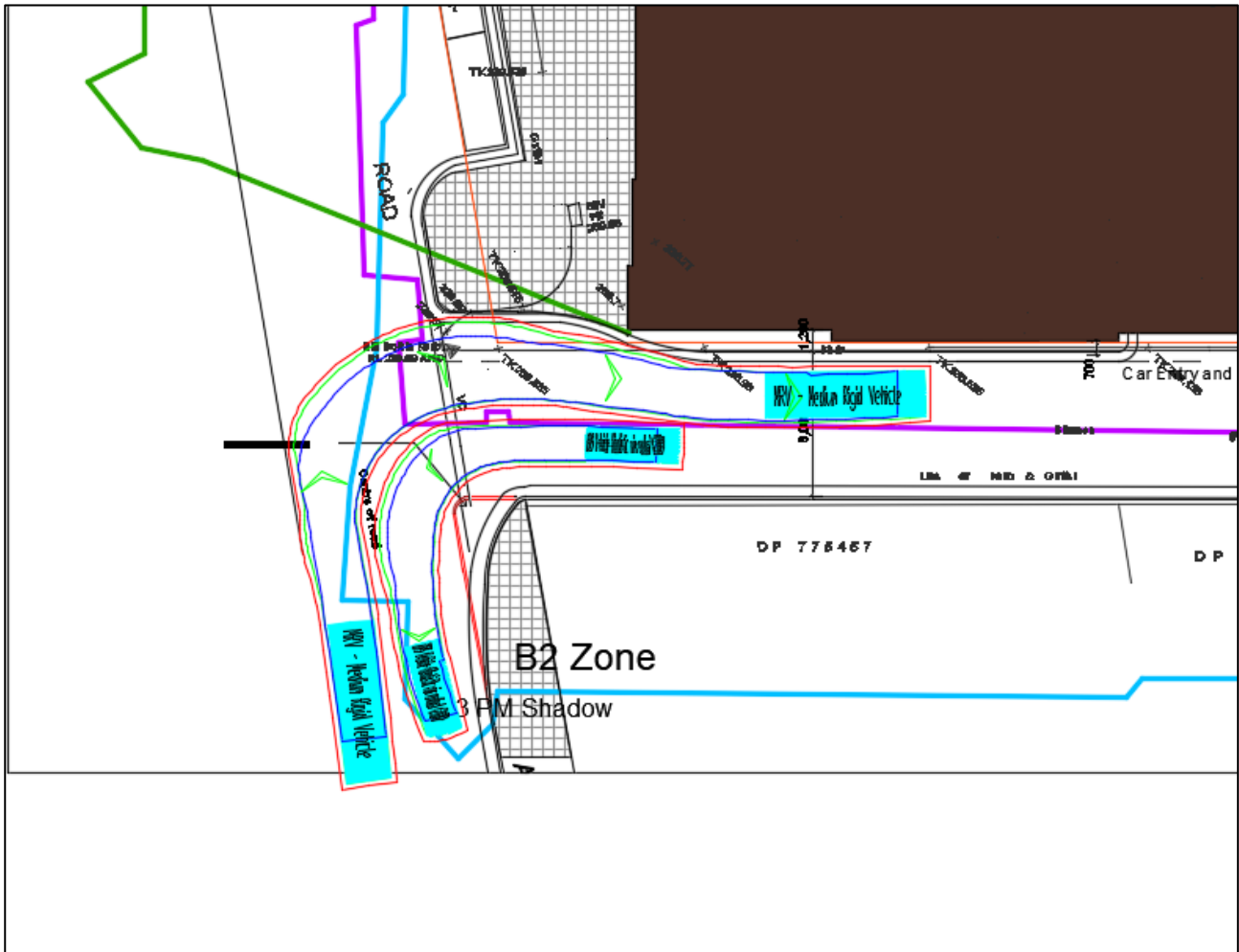
MOVEMENT SUMMARY

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

Appin Road / Macquariedale Road
Saturday AM Peak Hour
Future Conditions
Giveway / 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	113	0.0	0.259	5.6	LOS A	0.0	0.0	0.00	0.13	57.2	
2	T1	386	0.0	0.259	0.0	LOS A	0.0	0.0	0.00	0.13	58.7	
Approach		499	0.0	0.259	1.3	NA	0.0	0.0	0.00	0.13	58.4	
North: Appin Road												
8	T1	482	0.0	0.406	1.7	LOS A	2.5	17.8	0.40	0.20	56.7	
9	R2	168	0.0	0.406	8.8	LOS A	2.5	17.8	0.40	0.20	54.7	
Approach		650	0.0	0.406	3.5	NA	2.5	17.8	0.40	0.20	56.2	
West: Macquariedale Road												
10	L2	136	0.0	0.407	8.4	LOS A	1.9	13.3	0.59	0.86	49.0	
12	R2	106	0.0	0.407	16.5	LOS B	1.9	13.3	0.59	0.86	48.6	
Approach		242	0.0	0.407	11.9	LOS A	1.9	13.3	0.59	0.86	48.8	
All Vehicles		1391	0.0	0.407	4.2	NA	2.5	17.8	0.29	0.29	55.5	

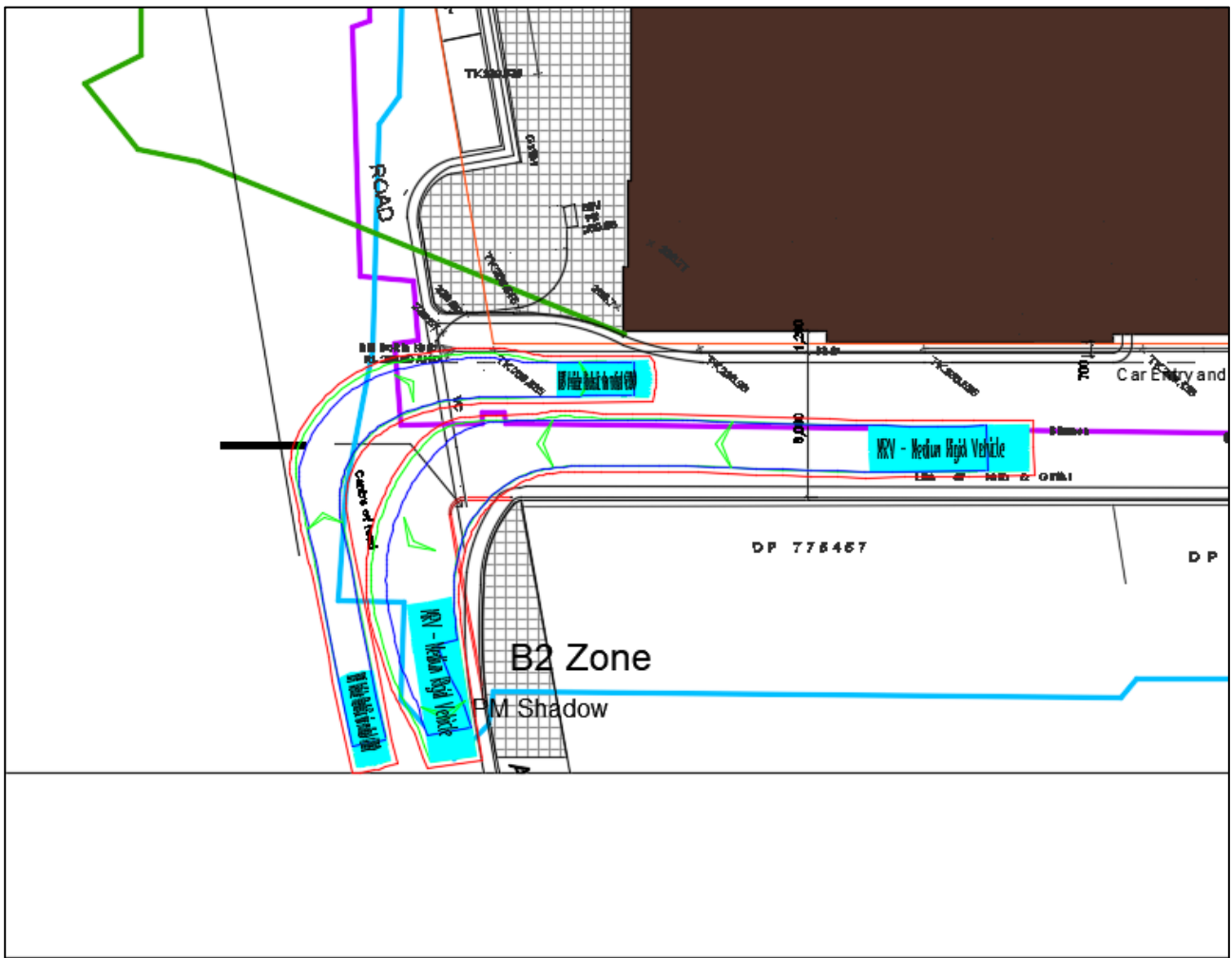
ANNEXURE D: SWEEP PATH TESTING
(Sheet 1 of 2)



MRV passing B99 upon entry into Access Lane
Tested @ 5km/h
Successful

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

ANNEXURE D: SWEEP PATH TESTING
(Sheet 2 of 2)



MRV passing B99 upon egress from Access Lane
Tested @ 5km/h
Successful

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