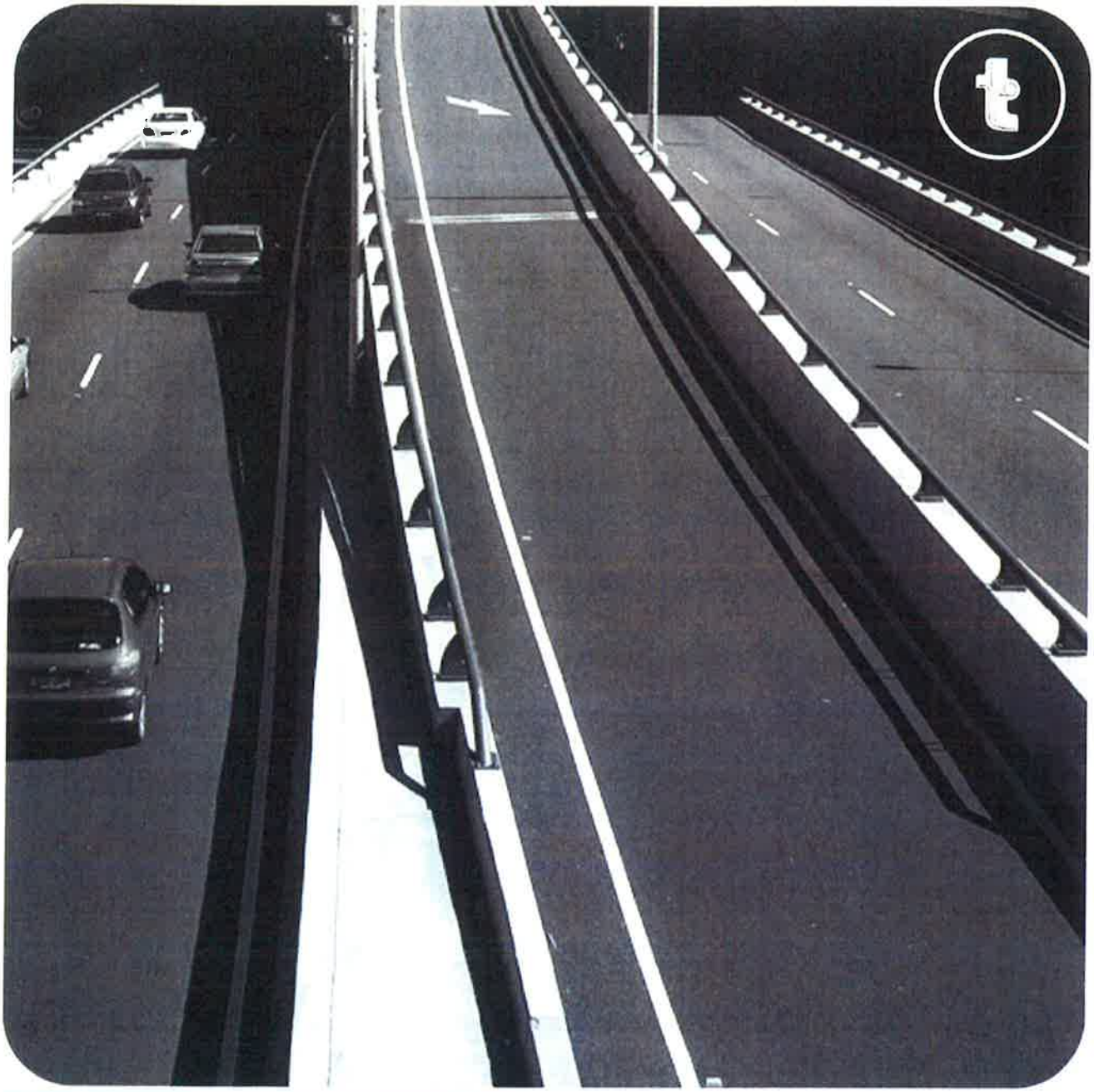

Traffic Impact Assessment

Proposed Hotel Development
2-8 Twin Creeks Drive, Luddenham

Reference: 16.103r01v05
Date: July 2017

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Contents

Appendix A: Photographic Record

Appendix B: Reduced Plans

Appendix C: Parking Analysis

Appendix D: SIDRA Modelling Results

Appendix E: Swept Path Analysis

1. Introduction

TRAFFIX has been commissioned by Tony Owen Partners to undertake a traffic impact assessment in support of a Development Application (DA) relating to construct a hotel and associated function room development, with an expansion of the existing Golf Club building located at 2-8 Twin Creeks Drive, Luddenham. The development is located within the Penrith Council LGA and has been assessed under that council's controls.

This report documents the findings of our investigations and should be read in the context of the Statement of Environmental Effects (SEE) prepared separately. The development is a major development and requires referral to the RTA under the provisions of SEPP (Infrastructure) 2007.

The report is structured as follows:

- Section 2: Describes the site and its location
- Section 3: Documents existing traffic conditions
- Section 4: Describes the proposed development
- Section 5: Assesses the parking requirements
- Section 6: Assesses traffic impacts
- Section 7: Discusses access and internal design aspects
- Section 8: Presents the overall study conclusions.

2. Location and Site

The site is situated on the western side of Twin Creeks Drive and lies within the sector bounded by the Cosgroves Creek to the north and west and Twin Creek Drive to the south and east. It is located 8.3 kilometres due south of St. Marys Railway Station, approximately 4 kilometres northeast of the proposed Western Sydney Airport and 41 kilometres west of the Sydney CBD.

The site has an irregular configuration and currently accommodates a recreational facility (Twin Creeks Golf and Country Club) with a combined site area of approximately 2.1 hectares. The subject site has an eastern frontage of approximately 209 metres to Twin Creeks Drive, a northern and western site boundary of approximately 110 and 180 metres to Cosgrove Creek Reserve, respectively. An irregular southern boundaries of approximately 300 metres to neighbouring residential properties and a public playground development. The site is legally described as Lot 221 of plan DP270417 and is zoned as E4 - Environmental Living in the Penrith LEP (2010).

Current access is provided by a 10-metre wide driveway at the northern end of the site frontage to Twin Creeks Drive, permitting the full range of movements. In addition, a secondary access, comprising a 7-metre wide driveway, is provided at the southern most pont of the Twin Creeks Drive frontage, providing left in / left out site access.

The existing site comprises a golf and country club including a club house comprising a club bar and resteraut over an existing GFA of 1,646 m^2.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2**. Reference should also be made to the Photographic Record presented in **Appendix A**, which provides an appreciation of the general character of roads and other key attributes in proximity to the site.

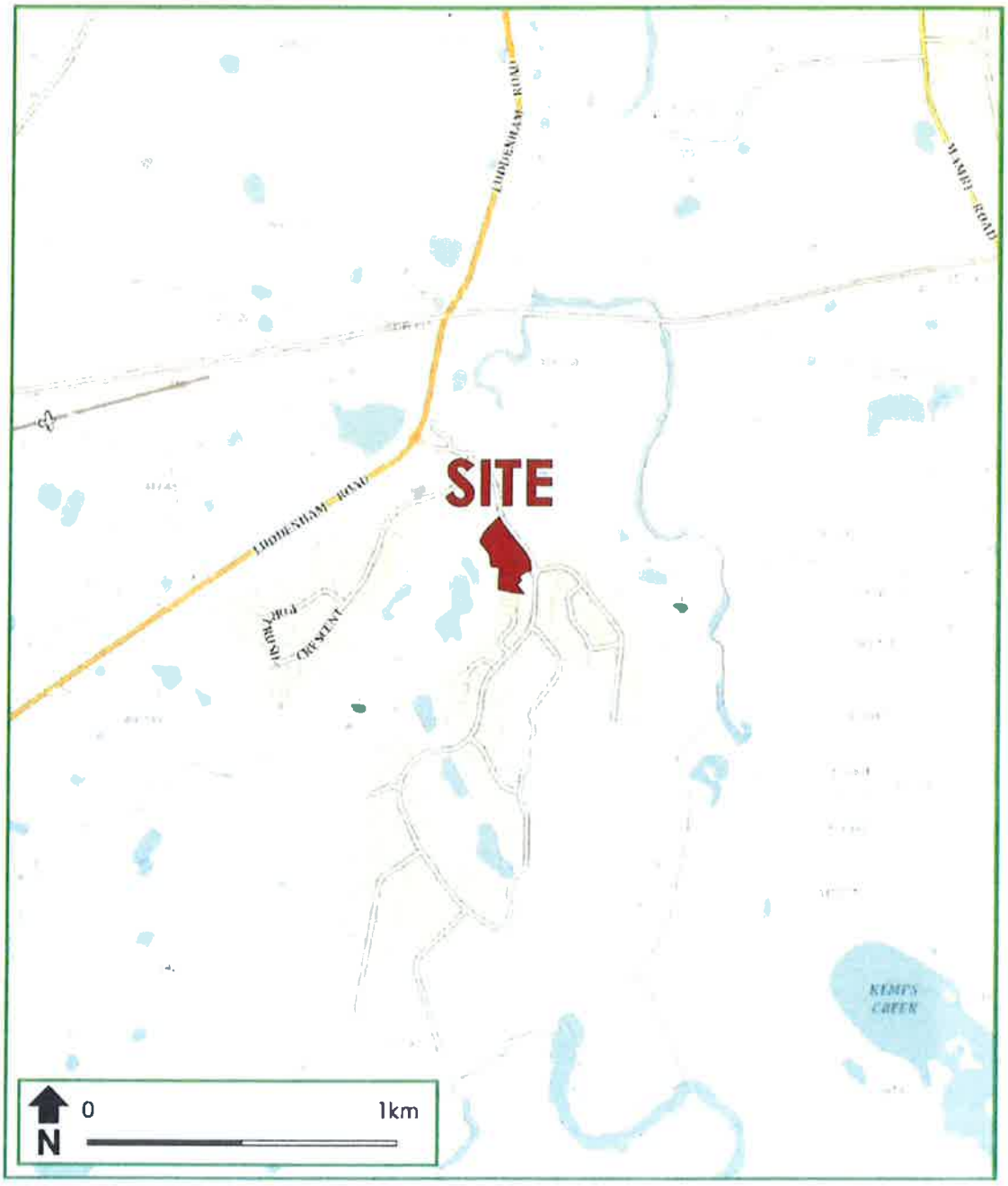


Figure 1: Location Plan

Figure 2: Site Plan

3. Existing Traffic Conditions

3.1 Road Network

The road hierarchy in the vicinity of the site is shown in **Figure 3** with the following roads of particular interest:

- Luddenham Road: A local road that generally runs in a north-south direction in the vicinity of the site and connects Elizabeth Drive in the south to Mamre Road in the north. Luddenham Road is subject to a 60km/h speed zoning in the vicinity of the site and carries one lane of traffic in either direction within a combined carriageway of width 7.0 metres.
- Twin Creeks Drive: A no through road that runs in a north-south direction from Luddenham Road. It carries one 6-metre traffic lane for each direction with separated carriageway and a 2-metre median on the middle. Accesses to the proposed development are proposed via Twin Creeks Drive.
- Portrush Crescent: A local road that runs in an east-west direction and derives from Twins Creeks Drive, terminating in a cul-de-sac. Portrush Crescent provides access for a limited group of residential dwellings adjacent to the golf course. It carries one traffic lane for each direction over a carriageway of 6.5m.

It can be seen from **Figure 3** that the site is conveniently located with respect to the collector road system serving the region. It is therefore able to effectively distribute traffic onto the wider road network, minimising traffic impacts.

Figure 3: Road Hierarchy

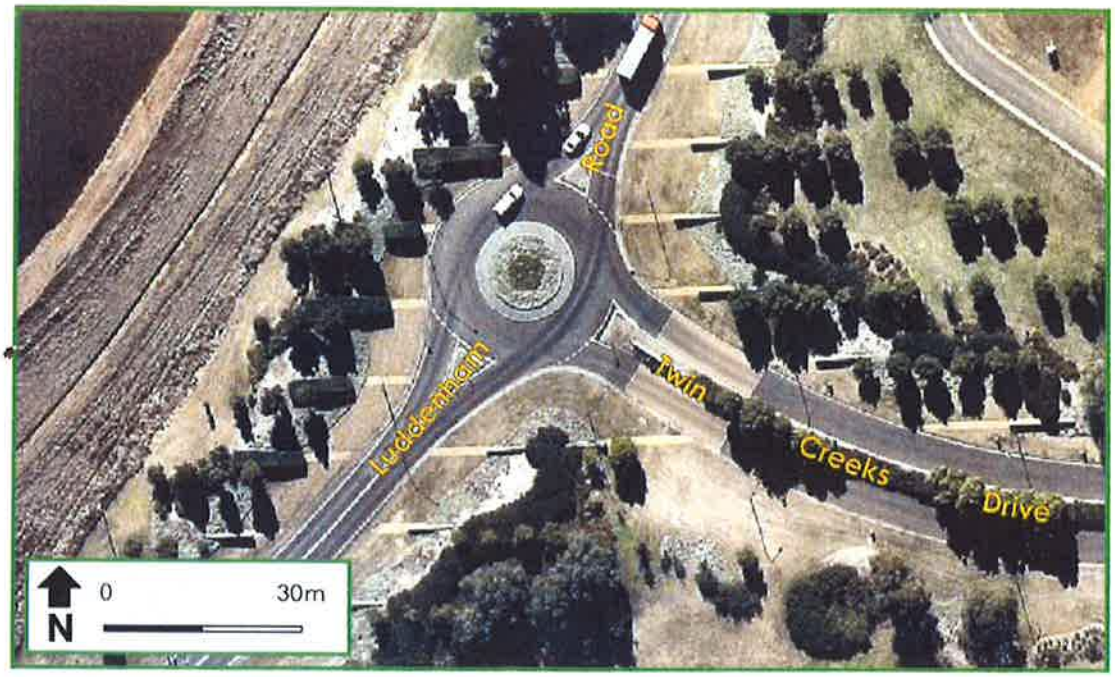
3.2 Key Intersection

The key intersections in the vicinity of the site are shown below and provide an understanding of the existing road geometry and alignment:

Source: Near Map

Figure 4: intersection of Twin Creeks Drive and Portrush Crescent

It can be seen from **Figure 4** that the Twin Creeks Drive generally carries one lane of traffic in either direction in the vicinity of the site. Footpaths are provided along the southern side of the kerb adjacent to the subject site.



Source: Near Map

Figure 5: intersection of Twin Creeks Drive and Luddenham Road

It can be seen from **Figure 5** that the Twin Creeks Drive forms a roundabout intersection with Luddenham Road. Ludenham Road currently carries one lane of traffic in each direction in the vicinity of site. There are currently limited pedestrian facilities provided at Luddenham Road.

3.3 Public Transport

There are no public bus or train services currently operating within the area and visitors are required to arrive by private vehicle, coach or taxi hire.

Notwithstanding the above, additional commercial development will increase the potential 'catchment' for public transport services which could be regarded to improve the feasibility of transport routes to the region which has benefits for the improvement of public transport services in the area more generally, particularly in light of the assessment undertaken as part of the Western Sydney Infrastructure Plan.

3.4 Existing Site Generation

In order to assess the peak traffic generation of the existing development, a traffic survey was undertaken of the development accesses during the peak demand period, considered to be a Saturday midday for a Golf Club. This survey recorded the peak hour for the site as occurring from 11:30 AM - 12:30 PM on Saturday, 30th July 2016 with the following generation features recorded:

- North access 22 veh/hr (2 In and 20 Out);
- South access 9 veh/hr (2 In and 7 Out).

It can be concluded that the peak hour trip generation rate for the existing golf club is as follow:

- 31 veh/hr (4 In and 27 Out).

3.5 Seasonal Variation

In addition to the above surveyed assessment, an increase of 10% has been applied to allow for seasonal variation throughout the year. Having regard for the above the following final trip rates were able to be derived for the existing facilities:

- 35 veh/hr (5 In and 30 Out) - Saturday midday peak

4. Description of Proposed Development

A detailed description of the proposed development is provided in the Statement of Environmental Effects prepared, separately. In summary, the development for which approval is now sought comprises the following components to be constructed over three stages:

- **Stage 1**:
  - Retaining existing golf club and assocaited at grade carpark
  - Construction of a hotel with 196 rooms;
  - Public facilities associated with the future hotel comprising Gym (195m^2), Spa (182.2m^2), Retail units (204m^2);
  - Construction of a new function centre with 897.6m^2 GFA for the hotel
  - Construction of two levels of basement carparking with 107 car park spaces (for a total of 211)
  - Construction of three loading bays within the basement
  - A temproary overspill carpark for 91 vehicles
- **Stage 2**:
  - Construction of an additional level to the existing Golf Club House including a lounge / bar (387.4 m^2 GFA), karaoke room (53.3m^2) and adminstration office (218.9m^2);
  - Expansion of the basement carpak and reduction in at grade parking to provide a total of 333 spaces (34 ground level and 299 basement);
- **Possible Future Stage 3 (Subject to a Separate Development Application)**:
  - Possible expansion of the hotel for up to 266 rooms (an increase of 70)
  - Increase in parking provision to 385 spaces to accomdate expansion;

The traffic and parking impacts arising from the development are discussed in **Sections 5** and **6**. In order to allow for the possibility of the potential future expansion detailed above the traffic and parking impacts in **Sections 5** and **6** have been assessed against the future expansion development yield, ensuring a level of comfort for the Stage 1 and Stage 2 DA proposal. Reference should be made to the plans submitted separately to Council which are presented at reduced scale in **Appendix B.**

5. Parking Requirements

5.1 Parking Assessment

The Penrith Council DCP (2014) – **Section C10.2** sets out the parking requirement for proposed land use categories. When assessing the requirements of the subject development a 'pro-rata' assessment, i.e. tallying up each land use proposed to derive a total number of spaces, is considered inappropriate for the following reasons:

- The mixed-use nature of the facility leads to the likelihood that people associated with one use on the site (e.g. guests at the hotel) will use other facilities on the site (e.g. attend a function), effecting a reduction in the overall parking demand;
- Efficiencies are gained as a result of differing peak parking demand periods (for example, the restaurant/bar peak parking demand is expected to occur in the evening, and is therefore unlikely to coincide with the golf club peak parking demand period which would occur before midday);
- There is expected to be high demand for both pick up / drop off relating to coach or taxi services, particularly in relation to future demand created by the proximity to the proposed Western Sydney Airport and carpooling/coach travel relating to guests attending wedding/family functions when not wishing to drive.
- In addition, the parking demand and parking requirement for the existing Golf Club is to be factored into the overall calculation for the site;

Furthermore, a case study of a similar development, known as 'Fairmont Resort' located in Leura was undertaken by TRAFFIX with the following findings notable:

- Fairmont Resort provides for a golf course, a hotel with 212 rooms (50 employees) a function rooms for 315 seats and auxiliary hotel facilities (bar, restaurant etc).
- The development includes parking for 348 spaces.
- In correspondence between representatives of Fairmont Resort and Blue Mountains Council reviewed by TRAFFIX it was established that the site typically only uses an estimated 100-120 vehicle spaces during day to day operations, peaking at 250-300 spaces when large functions are held;

- Due to this reduced parking demand over the expected DA requirement, approximately 70 parking spaces (consisting of the whole lower parking bay and a portion of the third parking tier) are never used and have since been turned over for storage;

In response to the above, a parking assessment has been undertaken to achieve a practical parking provision for this specific development based on the peak parking demand expected.

5.2 Existing Club Parking

In order to determine the peak parking requirements of the existing facilities a peak parking demand survey has been undertaken of the existing Golf and Country Club. The parking survey identified that the peak parking demand for the club occurred on a Saturday between 11.30 AM and 12.30 PM when 87 vehicles were present on site.

In order to account for potential seasonal variation an increase to this peak demand of 10% has been applied giving an expected peak parking demand of 96 spaces. It is expected that peak demand for golf players to be on midday weekend with a small number of players expected to stay on into the evening.

Table 1: Existing Parking Demand

Type	Council DCP Rate	Assessed Rate	Adjusted Rate	Adjusted Parking Requirements
Existing Club	N/A	87	110%	96

The expected seasonal variation adjustment rate is presented in **Table 1** and applied in the final parking requirement **Table 4**.

5.3 Council Controls

In order to derive a basis for the parking assessment the parking rates found in Section C10.2 of Council's DCP have been applied for each land use type.

The parking requirement for the full DA proposal, as assessed against a 'pro-rata' assessment, has been displayed in **Table 2.**

Table 2: Council DCP Requirement

Type	Number/GFA	Council DCP	Council DCP Raw Requirement
Existing Golf Club			
Existing Golf Club (including current bar / bistro)	N/A	Surveyed Assessment	87
Hotel			
Hotel Rooms	196 rooms / 45 staff	1 per room plus 1 per 6 employees	193
Gym	195.2 m2	7 spaces per 100m2	14
Spa	188.2 m2	7 spaces per 100m2	13
Retail	204.2 m2	1 space per 30 m2	7
Karaoke	53.3 m2	1 space per 4 m2	13
Admin	218.9 m2	1 space per 6 m2 plus 1 per employee	5
Lounge / New Club Room	387.4 m2	1 space per 6 m2 plus 1 per employee	65
Functions			
Hotel and Golf Club Overall Function Areas	897.6 m2 (425 guests 43 staff)	1 space per 6 m2 plus 1 per employee	193
		Total	**590**

It can be seen from **Table 2** that the proposed development under the full 'Stage 2' proposal is required to provide 590 spaces using a pro-rata assessment of the DCP. Due to the nature of the development as discussed in **Section 5.1,** it is considered this provision would represent a gross over provision of parking.

Hence a parking assessment has been undertaken to establish the peak parking demand expected. It is noteworthy to reiterate that all assessment is based on the "worst case" scenario whereby stages one and two of the development **and** a potential future development stage will occur.

5.4 Peak Parking Demand

The rates identified in **Table 2** have been factored to account for the expected overlap between the different land uses and travel modes expected for the site. Furthermore a factor has been applied for the following three demand periods assessed to find the overall peak demand requirement for the site:

- Weekday Evening (Friday Night)
- Weekend Midday
- Weekend Evening (Saturday night);

The full parking analysis can be viewed in **Appendix C**, including notes on the assumptions made when factoring the DCP base rates. A summary of the peak parking demand expected can be viewed in **Table 3**:

Table 4: Peak Parking Demand - Full Development

Type	Number/GFA	Council DCP Raw Requirement	Peak Demand Period		
			Weekday Evening	Weekend Midday	Weekend Evening
Existing Golf Club					
Existing Golf Club (including current bar / bistro)	N/A	87	14	96	19
Hotel					
Hotel Rooms	196 rooms / 45 staff	193	148	113	148
Gym	195.2 m2	14	0	0	0
Spa	188.2 m2	13	1	2	0
Retail	204.2 m2	7	0	1	0
Karaoke	53.3 m2	13	4	3	5
Admin	218.9 m2	5	1	5	0
Lounge / New Club Room	387.4 m2	65	13	0	26
Functions					
Hotel and Golf Club Overall Function Areas	897.6 m2 (425 guests 43 staff)	193	108	68	135
	Totals	**828**	**289**	**288**	**333**

It can be seen from **Table 4** that the peak parking demand for the site under the full 'Stage 2' proposal is expected to be in the order of 333 car spaces, with the analysis identifying this demand is expected to occur on a Saturday evening, coinciding with large functions at the site.

In response, the development application provides a total of 333 parking spaces on site, including at grade parking and two basement levels. In this regard, the proposed parking provision of 333 spaces is considered appropriate to cover the peak parking demands of the proposed development.

Interim 'Stage 1'

It is noted that the site is to be developed in two stages with an interim Stage 1 proposed for the hotel and function centre. A parking assessment of the Stage 1 yield has been undertaken with the results displayed in **Table 5**.

Table 5: Peak Parking Demand - Full Development

Type	Number/GFA	Council DCP Raw Requirement	Peak Demand Period		
			Weekday Evening	Weekend Midday	Weekend Evening
Existing Golf Club					
Existing Golf Club (including current bar / bistro)	N/A	87	14	96	19
Hotel					
Hotel Rooms	196 rooms / 45 staff	193	148	113	148
Gym	195.2 m2	14	0	0	0
Spa	188.2 m2	13	1	2	0
Retail	204.2 m2	7	0	1	0
Functions					
Hotel and Golf Club Overall Function Areas	897.6 m2 (425 guests 43 staff)	193	108	68	135
Totals		**828**	**271**	**280**	**302**

It is noted that during this interim stage there will be an expected parking demand of up to 302 spaces. In order to cater for this demand the development shall provide 211 permanent spaces with overspill parking for a further 91 vehicles on land owned by the development adjacent to the golf course in the location marked in **Figure 6**.

Figure 6: Temporary Overspill Parking

Possible Future 'Stage 3'

A possible future expansion of the hotel accommodation has been considered. This stage 3 proposal relates to an addition of 70 hotel rooms and would be subject to a separate development application. Nevertheless, an assessment of the peak parking demand has been undertaken with this assessment demonstrating an additional 47 spaces should be provided to accommodate this demand.

5.5 Accessible Parking

The DCP stipulates that accessible parking should be provided in accordance with the Building Code of Australia.

Hotel developments (a 'Class 3' use), requires the percentage of accessible parking equal to the percentage of accessible rooms (4%) Whilst the golf club and function rooms (a 'Class 6' use) require 2% of spaces to be accessible.

In response, the proposed development provides 14 accessible parking spaces in Stage 1 and 11 in Stage 2, representing over 3% of the total, meeting the Building Code of Australia requirements for both usage classes.

5.6 Bicycle Facilities

The DCP stipulates that bicycle parking should be provided in accordance with the suggested rates in the document 'Planning Guidelines for Walking and Cycling' (NSW Government 2004). In turn, the guideline recommends that the number of bicycle spaces provided each for staff and visitors be equal to 3-5% of the total number of rooms for a hotel and 3-5% of the total number of seats plus staff for a function centre or a club.

In the case of the proposed development, this equates to between 13 and 22 bicycle spaces provided for hotel staff and guests and between 14 and 24 bicycle spaces. Therefore, a total of 24 to 46 bicycle spaces are required.

In response, the development proposal provides a total of 48 bicycle space within the first and second basement level and satisfy the DCP and Planning Guidelines for Walking and Cycling requirements.

5.7 Servicing

The DCP does not stipulate specific requirements relating to the provision of service vehicles, however states that the RMS Guide to Traffic Generating Developments should be referred to in any absence.

The RMS Guide to Traffic Generating Developments recommends as following:

- 4 plus 1 per 100 bedrooms over 200 rooms for large hotels and 1 per 1,000m^2 for bar/restaurant areas.
- 50% of these loading spaces are supposed to accommodate trucks.

In addition, the guide recommends that 50% of the required service vehicle spaces be design adequate for trucks. It can be seen that a total of 6 loading bays are required for the proposed development and half of these spaces should be designed for truck access.

In response, three loading bays are proposed for a design vehicle up to and including HRV truck within the first basement for garbage removal and service deliveries. In addition, three coach bays capable of holding a 12.5 HRV have been provided at grade for coach pick up and drop off.

Furthermore, three pick-up and drop-off areas located on the at grade forecourt permit pick up/drop off for vehicles up to a B99 design vehicle.

It is considered that this provision would result in an appropriate provision of onsite service and loading.

6. Traffic Impacts

6.1 Trip Generation

The peak traffic generation of the subject development is expected to occur on a weekend when the golf club use departing after the Saturday morning peak overlaps with a wedding function arriving on Saturday afternoon. The hotel traffic generation is expected to remain largely steady throughout. In addition, a lesser peak period for the subject site is expected to occur on a Thursday or Friday evening, with patrons attracted to the restaurant and bar facilities on offer during the evening.

This compares with the peak generation for the surrounding road network, expected to occur during the typical AM and PM weekday commuter peak period.

As such, two traffic generation scenarios have been considered, the Saturday peak generation for the site and the weekday PM peak period for the surrounding network. The generation for each component during these scenarios has been assessed below. It should be noted that traffic generation assessment is implemented based on the worst possible scenario with the maximum traffic generation assumed for the proposed stages under this DA added to the current network peak in each scenario.

6.1.1 Golf Club

The existing golf club is to operate as existing following completion of the development, as such the traffic from this component is already accounted for on the network.

6.1.2 Function Centre

Neither the RMS Guide to Traffic Generating Developments (2002) nor the supplementary Technical Direction - TDT 2013/04a provide a trip generation rate for function centre developments.

It is acknowledged that it is very difficult to derive a generation rate for a function centre from a survey of other centres as conditions between centres, and the facilities each centre offers, differ greatly. Hence in order to derive an appropriate traffic generation rate a 'first principles' approach has been taken. In this regard, the trips related to the proposed development have been formulated on the basis of the maximum capacity of the development, estimated travel modes and estimated average vehicle occupancies.

TRAFFIX have been informed by the client that the proposed function centre will have a maximum capacity of up to 425 patrons. Staff at the site are expected to arrive outside of the peak arrival / departure times of patrons and hence, this assessment relates to patron trips only. Furthermore, a

typical wedding function at the centre where the capacity is reached would occur in the afternoon and stretch in to the evening. Hence to assess the impact on the network the arrivals to the centre is considered the critical period. Private vehicle arrivals are recorded as one trip whilst taxi / minibus / coach arrivals account for the vehicle dropping patrons and departing site again in the peak hour.

Having regard for the above and points listed under Section 5.1, the traffic generation of the development under a 425 patron event scenario would be as per **Table 5** below.

Table 5: 'First Principles' Trip Generation

Travel Modes	Percentage	No. of Patrons	Average Vehicle Occupancy	No. of Vehicles	Trips (in/out)
Walk from Hotel	30%	127	n/a	0	0
Private Coaches	15%	64	32	2	4
Private Car (Park On-Site)	40%	170	2.5	68	68
Drop-Off (Taxi, Maxi, Hire Car, Limousine)	15%	64	3	21	42
Total	***100%***	***425***			***114***

It can be seen from **Table 5** that the proposed development is estimated to generate a total of 114 vehicle trips at the commencement of a full capacity event. It is important to note that this is a worst case whereby 425 patrons are in attendance, which would typically only occur on occasions such as a large wedding. As such, the generation of the development would typically be considerably less.

The above also does not take into consideration the potential for staggered arrivals. Hence, adoption of the above generation will provide a conservative estimate of the traffic impacts of the development.

This assessment is based on the assumption that all patrons will arrive at the development during the network peak period, the PM peak on a weekday and the midday peak on the weekend. It also assumes that all trips will occur over a one hour period. Vehicle trips for vehicles dropping off patrons have been doubled to account for the in / out movement associated with a bus or taxi.

Accordingly, a conservative assumption for the peak hour trip generation for the development is expected to be as follows:

- 114 trips/hr (91 in, 23 out), during the network peak period;

By way of a comparison, the function centre, assessed as a restaurant (a similar use to a wedding venue) would record a peak generation of 5 veh/h per 100m^2 according to the RMS Guide. Giving a

generation rate of 45 vehicles per hour. As such the assessment above can be considered to be conservative.

6.1.3 Hotel

Neither the RMS Guide to Traffic Generating Developments nor the supplementary Technical Direction - TDT 2013/04a provide a trip generation rate for hotel developments. In this regard, in order to assess the traffic generating potential of the hotel component, trip rate assumptions for a motel have been used.

It is considered the assessment of a motel will produce a conservative rate when comparted with a tourist hotel where a larger proportion of guests are expected to arrive by taxi. Nevertheless, the RMS guide suggests a rate of 0.4 trips per room with an assumption of 85% occupancy to determine the peak hour generation.

Application of the above trip rate to the subject development indicates that the proposed hotel of 196 rooms would generate a maximum of 67 trips per hour during the PM peak hours. During the Saturday midday peak a trip generation of 75% of the evening peak has been assumed. On this basis, the following presents the trip generation forecasts for the proposed hotel component:

- 67 veh/hr during the PM peak - 33 inbound (50%) 34 outbound (50%);
- 50 veh/hr during the Saturday midday peak - 25 inbound (50%) 25 outbound (50%);

Ancillary Hotel Facilities

The ancillary facilities located within the hotel, such as the gym, spa and retail units are expected to service guests already accounted for in the hotel with negligible additional trips expected. As such no additional traffic generation has been assumed for these uses in the peak period assessment.

6.1.4 Bar / Restaurant

The RMS Guide to Traffic Generating Developments provides a trip generation rate of 5 vehicles per 100 GFA per hour in the evening peak period for bars and restaurants, with 50% assumed for the Saturday lunchtime peak. The application of this rate to the additional 284.5m^2 (bar and restaurant combined) will result to the following:

- 14 vehicle trips in the evening peak 7 inbound (50%) 7 outbound (50%)
- 7 vehicle trips in the Saturday midday peak 5 inbound (70%) 2 outbound (30%)

6.1.5 Combined Trip Generation

The combined trip generation rates and net increase arising from the proposed development is therefore represented in **Table 5** for the weekday PM and Table 6 for the Saturday midday peak periods.

Table 5: Weekday PM Peak (Friday)

Type	Number/GLFA	Generation Rate	In	Out	Total
Hotel	428 rooms	0.4 trips per room (85% Occupied)	33	34	67
Restaurant / Bars	284 m2	5 vehicles 100m^2 GFA per hour	7	7	14
Function Areas	425 guests	'First Principles'	91	23	114
		Totals	**131**	**64**	**195**

Table 6: Saturday Midday Peak

Type	Number/GLFA	Generation Rate	In	Out	Total
Hotel	428 rooms	0.3 trips per (85% Occupied)	25	25	50
Restaurant / Bars	284 m2	2.5 vehicles 100m^2 GFA per hour	5	2	7
Function Areas	425 guests	'First Principles'	91	23	114
		Totals	**121**	**50**	**171**

It can be seen above that the peak generation for the expansion of the site is approximately 195 vehicles per hour in the weekday scenario and 171 for the weekend peek for the proposed development.

It is noteworthy that the addition of the existing golf club generation identified in **Section 3.5** gives a total expected peak hour generation of 206 vehicles per hour for the site, occurring during the Saturday midday peak period.

6.2 Traffic distribution

The additional volume of traffic generated by the proposed development displayed in **Tables 5 & 6** has been applied to the local road network. The directional split of this traffic throughout the network has been assumed to be in line with the existing Golf Club based on the traffic count surveys undertaken.

The expected distributions for arrivals / departures through the network are thus illustrated in **Figure 6**.

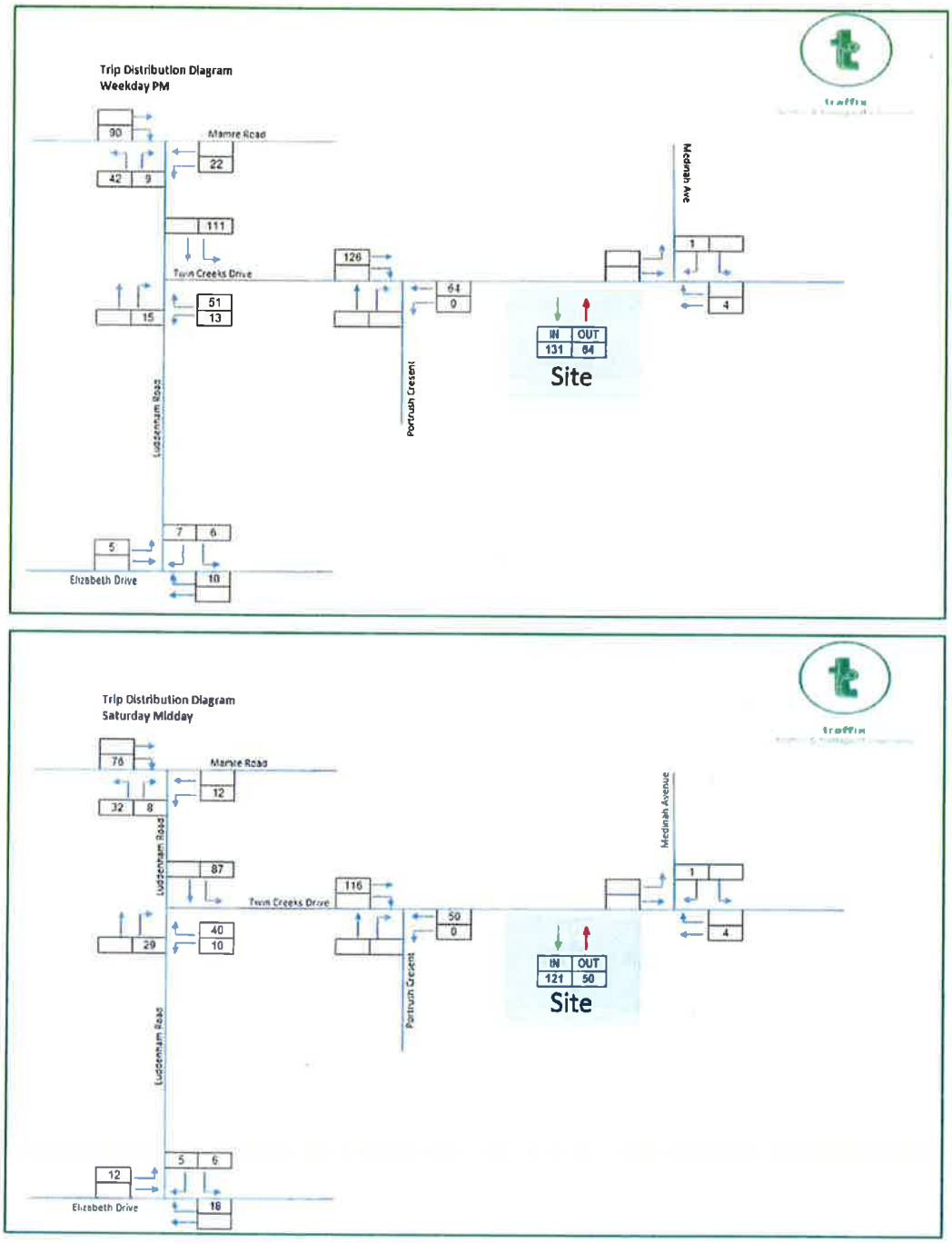


Figure 6: Net Traffic Distribution (by percentage of site generation)

6.3 Peak Period Intersection Performances

For the purposes of the assessment of traffic impacts of this development, surveys were undertaken of the most critical intersections immediate adjacent to the site, being the intersections of Twin Creeks Drive with Luddenham Road and Twin Creeks Drive with Portrush Crescent. Traffic surveys were undertaken on Tuesday, 23rd August from 16:00 to 19:00 and Saturday, 13th of August from 12:00 to 15:00 to record the peak periods at these intersections. In addition, following a request for further information from the RMS an assessment of the intersections of Luddenham Road / Mamre Road and Luddenham Road / Elizabeth Drive way undertaken with surveys recorded on Wednesday 29th of March and Saturday the 1st of April.

The results of these surveys were analysed using the SIDRA computer program to determine their performance characteristics under existing traffic conditions. The SIDRA model produces a range of outputs, the most useful of which are the Degree of Saturation (DOS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LOS) criteria. These performance measures can be interpreted using the following explanations:

DOS - the DOS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DOS approaches 1, it is usual to attempt to keep DOS to less than 0.9. When DOS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DOS of 0.8 or less.

AVD - the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).

LOS - this is a comparative measure which provides an indication of the operating performance of an intersection as shown below:

Table 8: Intersection Performance Indicators

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

A summary of the modelled results are provided below. Reference should also be made to the SIDRA outputs provided in **Appendix D** which provide detailed results for individual lanes and approaches.

Table 9: Intersection Performance Existing and Proposed

Intersection Description	Control Type	Different Scenarios	Model	Degree of Saturation	Intersection Delay	Level of Service
Twin Creeks Drive / Portrush Crescent	Roundabout*	Saturday Midday	Without Development	0.009	8.5	A
			With Development	0.010	8.8	A
		Weekday Evening	Without Development	0.013	8.5	A
			With Development	0.014	8.8	A
Twin Creeks Drive / Luddenham Road	Roundabout*	Saturday Midday	Without Development	0.064	8.9	A
			With Development	0.147	9.0	A
		Weekday Evening	Without Development	0.073	10.1	A
			With Development	0.140	10.3	A
Luddenham Road / Mamre Road	Give Way* (Seagull)	Saturday Midday	Without Development	0.164	9.6	A
			With Development	0.194	9.7	A
		Weekday Evening	Without Development	0.438	18.3	B
			With Development	0.514	19.6	B
Luddenham Road / Elizabeth Drive	Give Way* (Seagull)	Saturday Midday	Without Development	0.065	8.0	A
			With Development	0.07	8.0	A
		Weekday Evening	Without Development	0.115	8.1	A
			With Development	0.119	8.1	A

*Traffic movement with largest delay presented

It can be seen from **Table 9** that the intersection operates satisfactorily under the existing and future scenarios, with a level of service A or B during both peak periods and with moderate delays under all scenarios. Hence the proposed development will have manageable impacts on key intersections analysed above which will continue to operate as presently occurs and with similar delays and queues.

7. Access & Internal Design Aspects

7.1 Access

It can be seen from reduced plans shown in **Appendix B** that the construction process is divided into two (2) proposed stages and one possible future stage. The access arrangements for each stage are discussed separately below:

7.1.1 Stage 1

Stage 1 of the development requires a Category 3 Driveway under AS 2890.1 (2004) to service the parking arrangements, being a separated entry-exit driveway each with a width of 6.0 metres. In response, the development proposes to maintain the existing driveway accesses to Twin Creeks Drive, being a 10 metre driveway and a second 7 metre driveway thereby satisfying the minimum requirements of AS 2890.1 (2004).

For Servicing this stage proposes the full use of the basement loading dock, ensuring all servicing requirements are contained on site. .

7.1.2 Stage 2 and Possible Future Stage

With the full parking provision developed, Stage 2 and the possible future stage require a Category 4 driveway, being a separated driveway of width 6 to 8 metres. In response, the development proposes three separated driveways accessing Twin Creeks Drive, two of 7.5 metres in width and one of 4.5 metres. The northern two accesses provide egress for visitors and guests from either the basement or at grade parking whilst the southern driveway allows all entry movements from site. These arrangements satisfy the minimum requirements of AS 2890.1 (2004).

For truck servicing such as garbage collection or food / beverage deliveries it is proposed service vehicles make use of the southern access for both entry and egress to reach the loading dock. It is proposed this servicing arrangement shall be managed with deliveries to be scheduled to occur outside of the peak periods of arrivals / departures for visitors and guests and as such will operate satisfactorily.

In addition, swept path analysis for the key access manoeuvres has been undertaken of the site accesses, as is permissible under AS 2890. The assessment demonstrates satisfactory operation and can be viewed in **Appendix E.**

7.2 Internal Design

The internal basement car park generally complies with the requirements of AS 2890.1 (2004) and the following characteristics are noteworthy:

7.2.1 Parking Modules

- All parking spaces have been designed in accordance with a Class 2 user (hotels / entertainment centre) and are provided with a minimum space length of 5.4m a minimum width of 2.5m and a minimum aisle width of 5.8m.
- All spaces located adjacent to obstructions of greater than 150mm in height are provided with an additional width of 300mm.
- Dead-end aisles are provided with the required 1.0m aisle extension in accordance with Figure 2.3 of AS2890.1.
- All disabled parking spaces are designed in accordance with AS2890.6. Spaces are provided with a clear width of 2.4m and located adjacent to a minimum shared area of 2.4m.

7.2.2 Ramps

- All ramps accessing basement car park by a B99 design vehicle have a maximum gradient of 20% (1 in 5) with transitions of 12.5% (1 in 8).
- Ramps associated with the service vehicle loading dock have a maximum gradient of 15.4% (1 in 6.5) with transitions of 6.25% (1 in 16) for 7 metres. These provisions satisfy the requirements of AS 2890.2 (2002) for a HRV design vehicle;

7.2.3 Clear Head heights

- A minimum clear head height of 2.2m is to be provided for all areas within the basement car park as required by AS2890.1. A clear head height of 2.5m is to be provided above all disabled spaces as required by AS2890.6.

7.2.4 Other Considerations

- All columns are required to be located outside of the parking space design envelope shown in Figure 5.2 of AS 2890.1 (2004).
- Appropriate visual splays are to be provided in accordance with the requirements of Figure 3.3 of AS2890.1 at all accesses.

- Pedestrian priority walkways have been provided throughout the carpark to guide pedestrians to the lifts and entry.

- A swept path analysis of all critical movements has been undertaken to confirm geometry and compliance with the relevant standards. The swept path assessment is included in **Appendix E**.

7.2.5 Service Area Design

- The internal design of the service area has been undertaken in accordance with the requirements of AS28090.2 for the maximum length vehicle permissible on-site being a 12.5m HRV

- A minimum clear head height of 4.5m is to be provided within the service area

- A minimum bay width of 3.5m is provided for all service bays.

- A swept path analysis has been undertaken as permissible under AS2890.2 and confirms the internal design. The swept path assessment is included in **Appendix E**.

In summary the internal configuration of the basement car park and loading areas have been designed in accordance with the both AS2890.1 and AS2890.2. It is however envisaged that a condition of consent would be imposed requiring compliance with these standards and as such any minor amendments considered necessary (if any) can be dealt with prior to the release of a Construction Certificate.

8. Conclusions

In summary:

- The proposed development involves the expansion of the existing Twin Creeks Golf and Country Club to provide a hotel accommodating 196 rooms with associated bar, restaurant and function rooms.

- The traffic generation arising from the proposed expansion development has been assessed as a net increase over and above existing traffic conditions for the full Stage 2 proposal. The increase under this scenario is 195 veh/hr for a weekday evening peak period and 171 veh/h for the Saturday peak. These trips have shown to be readily able to be accommodated, with minimal impacts on the surrounding road system;

- With 333 off-street parking spaces, the centre will contain the assessed peak parking demand within the site. Provision of these vehicle spaces in a combination of at grade and within the basement levels will ensure that visitors have convenient and safe access.

- The proposed car park complies with the requirements of both AS 2890.1 (2004), AS2890.2 (2002) and AS2890.6 (2009). The car park has also been assessed using the computer program Auto Track, as permitted by AS 2890.1 (2004) and operates safely and efficiently.

It is therefore concluded that the proposed development is supportable on traffic planning grounds and will operate satisfactorily.

Appendix A

Photographic Record

View looking towards south at the subject site's southern driveway access on Twin Creeks Drive.

View looking north on Twin Creeks Drive from south of the subject site.

View looking south on Twin Creeks Drive from the subject site.

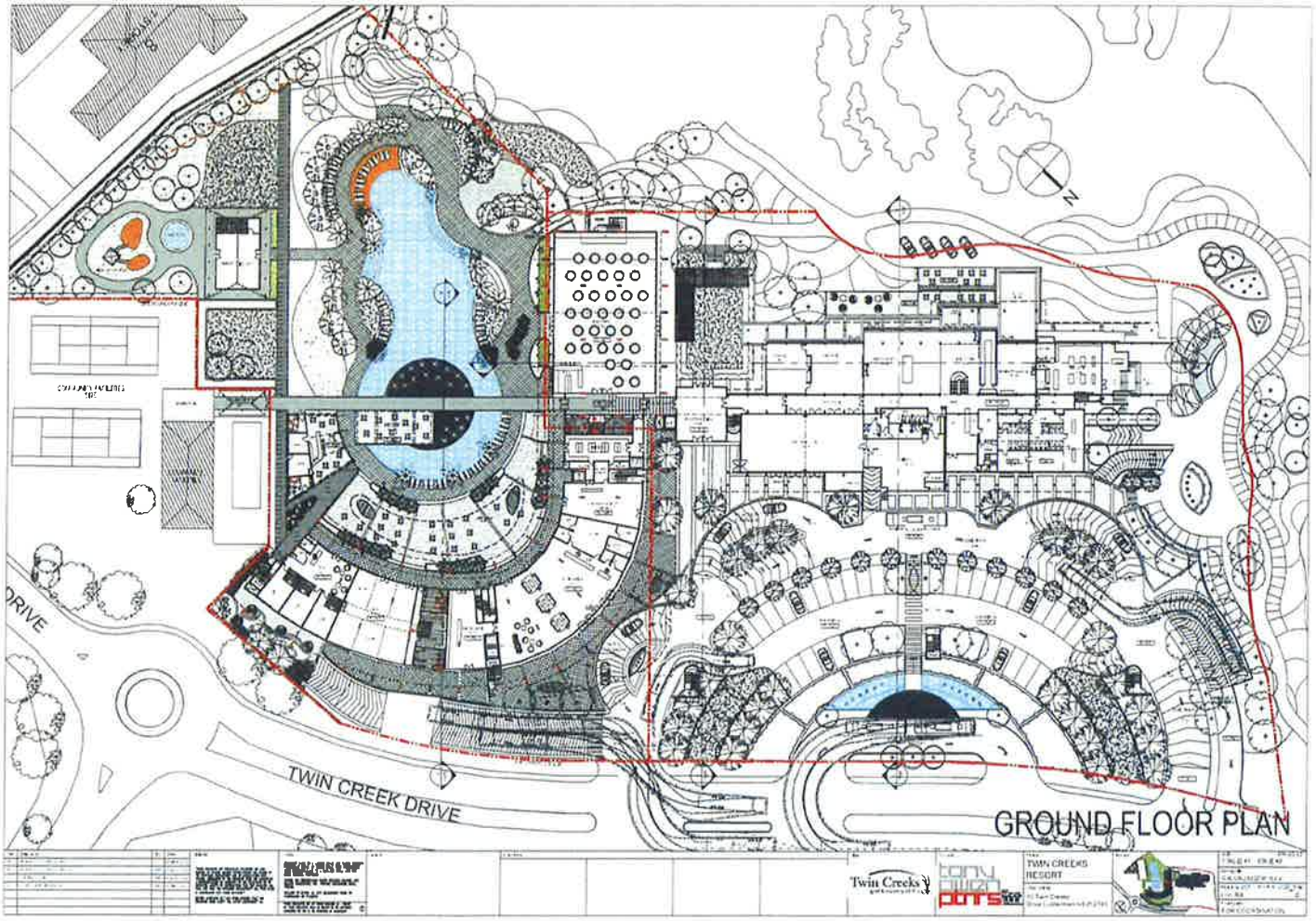
View looking towards north at the subject site's northern driveway access on Twin Creeks Drive.

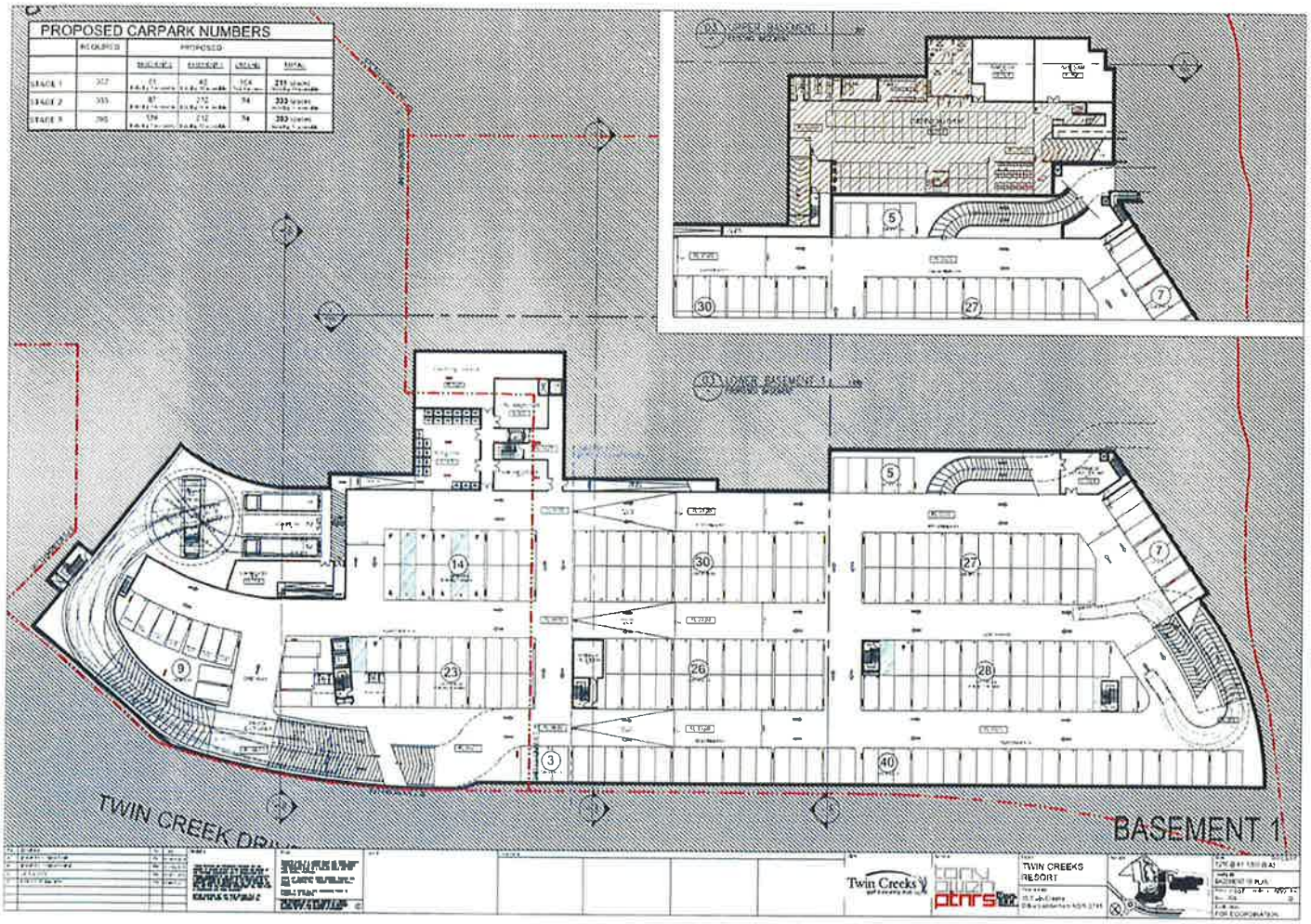
View looking towards west at the subject site's northern access on Twin Creeks Drive.

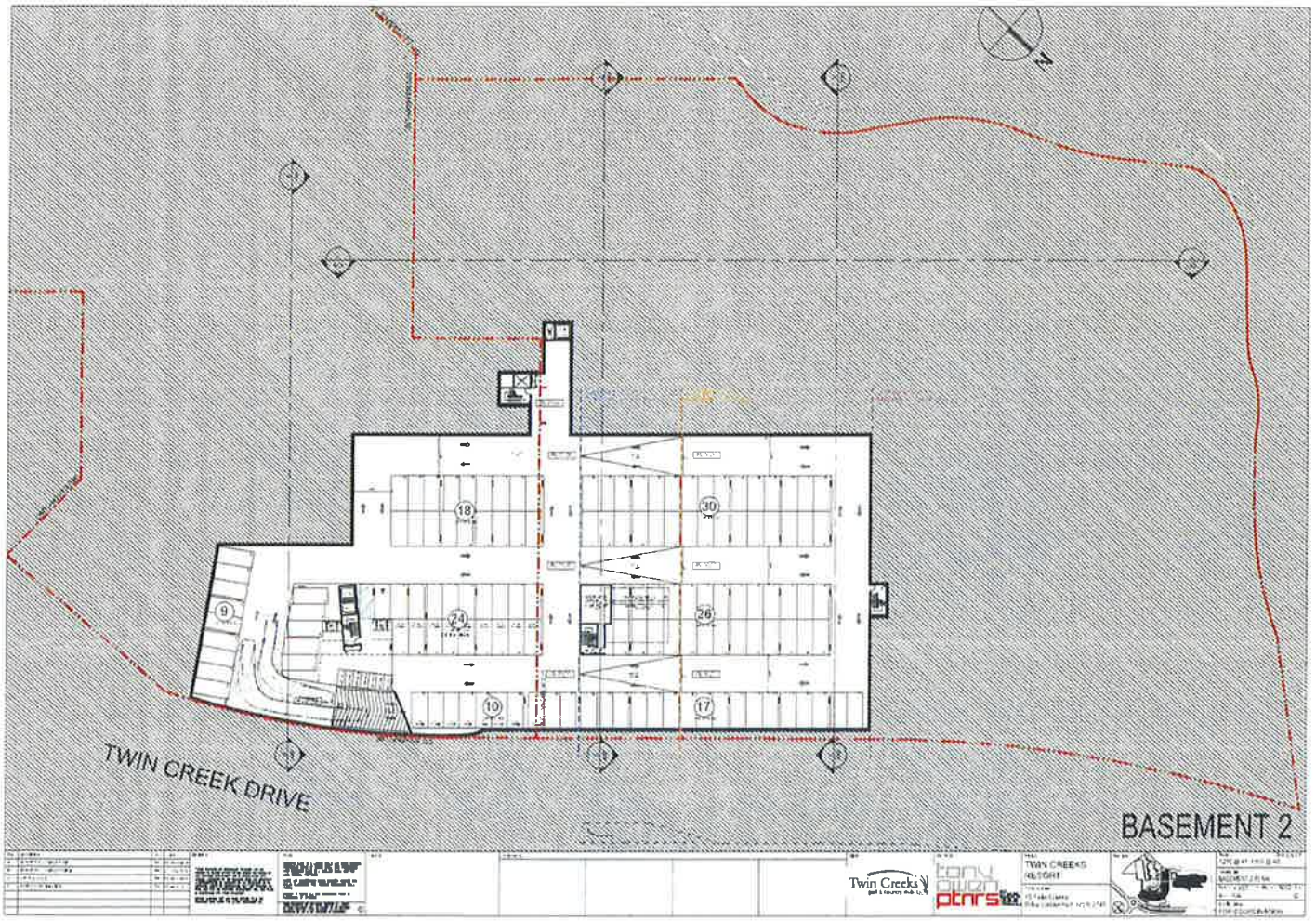
Intersection of Portrush Crescent and Twin Creeks Drive

Appendix B

Reduced Plans


TWIN CREEK DRIVE
GROUND FLOOR PLAN
Twin Creeks
TWIN CREEKS
RESORT


PROPOSED CARPARK NUMBERS
REQUIRED
PROPOSED
TOTAL
TWIN CREEK DRIVE
BASEMENT 1
TWIN CREEKS RESORT


TWIN CREEK DRIVE
BASEMENT 2

Appendix C

Parking Analysis

S1 Option 1

Use		No./ Area	Council Rate	Council DCP Raw Requirement	Variation from Raw DCP Requirement (see notes)	NOTES	Adjusted Base Requirement	Rounded (to nearest) Base Requirement	Demand - % of Peak Demand			Demand - Spaces		
									Weekday Evening	Weekend Midday	Weekend Evening	Weekday Evening	Weekend Midday	Weekend Evening
Golfers														
Existing Golf Club (including current bar/bistro/proshop)		N/A	Survey Assessment	87	110%	Parking rate based on existing club peak demand survey, increased to account for potential seasonal variation. Peak demand for golf on weekend midday - some players expected to stay into the evening	96	96	15%	100%	20%	14.4	96	19
Functions														
Function Centres (Hotel and Golf Club total)		697 6m2 (425 guests 43 staff)	1 space per 6m2 plus 1 per employee	153	70%	Assumed that 30% of guests will stay at the hotel and will be already accounted for there. Peak demand during the evening	135	135	90%	50%	100%	109	68	135
Hotel														
Hotel Rooms		150 rooms 34 staff	1 space per room plus 1 per 6 employees	156	85%	Expected a proportion of guests are to arrive to hotel via taxi/coach/rideshare rather than 1 car per room (15%). Peak parking demand expected to occur overnight	133	133	85%	65%	85%	114	87	114
Gym		0	7 spaces per 100m2	0	0%	Small gym associated with hotel guests already accounted for elsewhere on site	0	0	10%	50%	10%	0	0	0
Spa		0	7 spaces per 100m2	0	15%	Largely populated by hotel guests. Peak demand occurs in morning outside these peak assessment periods	0	0	50%	100%	0%	0	0	0
Retail		204.2	1 spaces per 30m2	7	10%	Small retail units expected to cater to existing visitors/guests rather than drawing additional customers to site	1	1	0%	100%	0%	0	1	0
Bar / Karaoke		0	1 space / 4 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	75%	50%	100%	0	0	0
Admin		0	1 space / 6 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	75%	50%	100%	0	0	0
Lounge / new club room		0	1 space / 6 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	50%	0%	100%	0	0	0
				442				365				336.4	252	268

Peak Parking demand	268
Occurring on	Weekend Evening

S1 Option 2

Use		No./ Area	Council Rate	Council DCP Raw Requirement	Variation from Raw DCP Requirement (see notes)	NOTES	Adjusted Base Requirement	Rounded (to nearest) Base Requirement	Demand - % of Peak Demand			Demand - Spaces		
									Weekday Evening	Weekend Midday	Weekend Evening	Weekday Evening	Weekend Midday	Weekend Evening
Golfers														
Existing Golf Club (including current bar/bistro)		N/A	Survey Assessment	87	110%	Parking rate based on existing club peak demand survey, increased to account for potential seasonal variation. Peak demand for golf on weekend midday - some players expected to stay into the evening	96	96	15%	100%	20%	14.4	96	19
Functions														
Function Centres (Hotel and Golf Club total)		897.6m2 (426 guests 43 staff)	1 space per 5m2 plus 1 per employee	193	70%	Assumed that 30% of guests will stay at the hotel and will be already accounted for there. Peak demand during the evening	135	135	80%	50%	100%	108	68	135
Hotel														
Hotel Rooms		196 rooms 45 staff	1 space per room plus 1 per 6 employees	204	85%	Expected a proportion of guests are to arrive to hotel via taxi/coach/rideshare rather than 1 car per room (15%). Peak parking demand expected to occur overnight	173	173	85%	65%	85%	148	113	148
Gym		195.2	7 spaces per 100m2	14	0%	Small gym associated with hotel guests already accounted for elsewhere on site	0	0	10%	50%	10%	0	0	0
Spa		188.2	7 spaces per 100m2	13	15%	Largely populated by hotel guests. Peak demand occurs in morning outside these peak assessment periods	2	2	50%	100%	0%	1	2	0
Retail		204.2	1 spaces per 30m2	7	10%	Small retail units expected to cater to existing visitors/guests rather than drawing additional customers to site	1	1	0%	100%	0%	0	1	0
Bar / Karaoke		0	1 space / 4 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	75%	50%	100%	0	0	0
Admin		0	1 space / 6 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	75%	50%	100%	0	0	0
Lounge / new club room		0	1 space / 6 sqm	0	40%	Predominantly customers drawn from the associated hotel and golf club	0	0	50%	0%	100%	0	0	0
				517				407				271.4	280	302

Peak Parking demand	302
Occurring on	Weekend Evening

S2

Use	No./ Area	Council Rate	Council DCP Raw Requirement	Variation from Raw DCP Requirement (see notes)	NOTES	Adjusted Base Requirement	Rounded (to nearest) Base Requirement	Demand - % of Peak Demand			Demand - Spaces		
								Weekday Evening	Weekend Midday	Weekend Evening	Weekday Evening	Weekend Midday	Weekend Evening
Golfers													
Existing Golf Club (including current bar/bistro)	N/A	Survey Assessment	87	110%	Parking rate based on existing club peak demand survey, increased to account for potential seasonal variation. Peak demand for golf on weekend midday - some players expected to stay into the evening	96	96	15%	100%	20%	14.4	96	19
Functions													
Function Centres (Hotel and Golf Club total)	897.6m2 (425 guests 43 staff)	1 space per 4m2 plus 1 per employee	193	70%	Assumed that 30% of guests will stay at the hotel and will be already accounted for there. Peak demand during the evening	135	135	80%	50%	100%	108	68	135
Hotel													
Hotel Rooms	196 rooms 45 staff	1 space per room plus 1 per 6 employees	204	85%	Expected a proportion of guests are to arrive to hotel via taxi/coach/rideshare rather than 1 car per room (15%). Peak parking demand expected to occur overnight	173	173	85%	65%	85%	148	113	148
Gym	195.2	7 spaces per 100m2	14	0%	Small gym associated with hotel guests already accounted for elsewhere on site	0	0	10%	50%	10%	0	0	0
Spa	169.2	7 spaces per 100m2	13	15%	Largely populated by hotel guests. Peak demand occurs in morning outside these peak assessment periods	2	2	50%	100%	0%	1	2	0
Retail	204.2	1 spaces per 30m2	7	10%	Small retail units expected to cater to existing visitors/guests rather than drawing additional customers to site	1	1	0%	100%	0%	0	1	0
Bar / Karaoke	53.3	1 space / 4 sqm	13	40%	Predominantly customers drawn from the associated hotel and golf club	5	5	75%	50%	100%	4	3	5
Admin	218.9	1 space / 40 sqm	5	100%	Typically weekday 9-5 staff	5	5	15%	100%	0%	1	5	0
Lounge / new club room	387.4	1 space / 6 sqm	65	40%	Predominantly customers drawn from the associated hotel and golf club	26	26	50%	0%	100%	13	0	26
			601				443				289.4	288	333

Peak Parking demand	333
Occurring on	Weekend Evening

S3

Use	No / Area	Council Rate	Council DCP Raw Requirement	Variation from Raw DCP Requirement (see notes)	NOTES	Adjusted Base Requirement	Rounded (to nearest) Base Requirement	Demand - % of Peak Demand			Demand - Spaces		
								Weekday Evening	Weekend Midday	Weekend Evening	Weekday Evening	Weekend Midday	Weekend Evening
Golfers													
Existing Golf Club (including current bar/bistro)	N/A	Survey Assessment	87	110%	Parking rate based on existing club peak demand survey, increased to account for potential seasonal variation. Peak demand for golf on weekend midday - some players expected to stay into the evening	96	96	15%	100%	20%	14.4	96	19
Functions													
Function Centres (Hotel and Golf Club total)	897.6m2 (425 guests 43 staff)	1 space per 5m2 plus 1 per employee	193	70%	Assumed that 30% of guests will stay at the hotel and will be already accounted for there. Peak demand during the evening	135	135	80%	50%	100%	108	68	135
Hotel													
Hotel Rooms	266 rooms 60 staff	1 space per room plus 1 per 6 employees	276	85%	Expected a proportion of guests are to arrive to hotel via taxi/coach/rideshare rather than 1 car per room (15%). Peak parking demand expected to occur overnight	235	235	85%	85%	85%	200	163	200
Gym	195.2	7 spaces per 100m2	14	0%	Small gym associated with hotel guests already accounted for elsewhere on site	0	0	10%	50%	10%	0	0	0
Spa	188.2	7 spaces per 100m2	13	15%	Largely populated by hotel guests. Peak demand occurs in morning outside these peak assessment periods	2	2	50%	100%	0%	1	2	0
Retail	204.2	1 spaces per 30m2	7	10%	Small retail units expected to cater to existing visitors/guests rather than drawing additional customers to site	1	1	0%	100%	0%	0	1	0
Bar / Karaoke	53.3	1 space / 4 sqm	13	40%	Predominantly customers drawn from the associated hotel and golf club	5	5	75%	60%	100%	4	3	5
Admin	218.9	1 space / 40 sqm	5	100%	Typically weekday 9-5 staff	5	5	15%	100%	0%	1	5	0
Lounge / new club room	387.4	1 space / 6 sqm	65	40%	Predominantly customers drawn from the associated hotel and golf club	26	26	50%	0%	100%	13	0	26
			573				505				341.4	328	385

Peak Parking demand	385
Occurring on	Weekend Evening

Appendix D - 1

SIDRA Results (Existing)

MOVEMENT SUMMARY

Site: 2 [EX Twin Creeks Drive and Portrush Crescent - Import]

Network: N101 [Network SAT EX]

Twin Creeks Drive and Portrush Crescent
Existing Peak Saturday Midday

Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival 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: Portrush Crescent													
1	L2	11	0.0	11	0.0	0.009	4.6	LOS A	0.0	0.3	0.18	0.51	51.1
3	R2	1	0.0	1	0.0	0.009	8.5	LOS A	0.0	0.3	0.18	0.51	54.7
Approach		12	0.0	12	0.0	0.009	5.0	LOS A	0.0	0.3	0.18	0.51	51.6
East: Twin Creeks Drive													
4	L2	1	0.0	1	0.0	0.045	4.4	LOS A	0.2	1.4	0.06	0.45	54.3
5	T1	63	0.0	63	0.0	0.045	4.7	LOS A	0.2	1.4	0.06	0.45	51.9
Approach		64	0.0	64	0.0	0.045	4.7	LOS A	0.2	1.4	0.06	0.45	52.0
West: Twin Creeks Drive													
11	T1	69	0.0	69	0.0	0.048	4.6	LOS A	0.2	1.6	0.02	0.49	53.3
12	R2	9	0.0	9	0.0	0.048	8.2	LOS A	0.2	1.6	0.02	0.49	52.8
Approach		79	0.0	79	0.0	0.048	5.1	LOS A	0.2	1.6	0.02	0.49	53.2
All Vehicles		**155**	**0.0**	**155**	**0.0**	**0.048**	**4.9**	**LOS A**	**0.2**	**1.6**	**0.05**	**0.47**	**52.7**

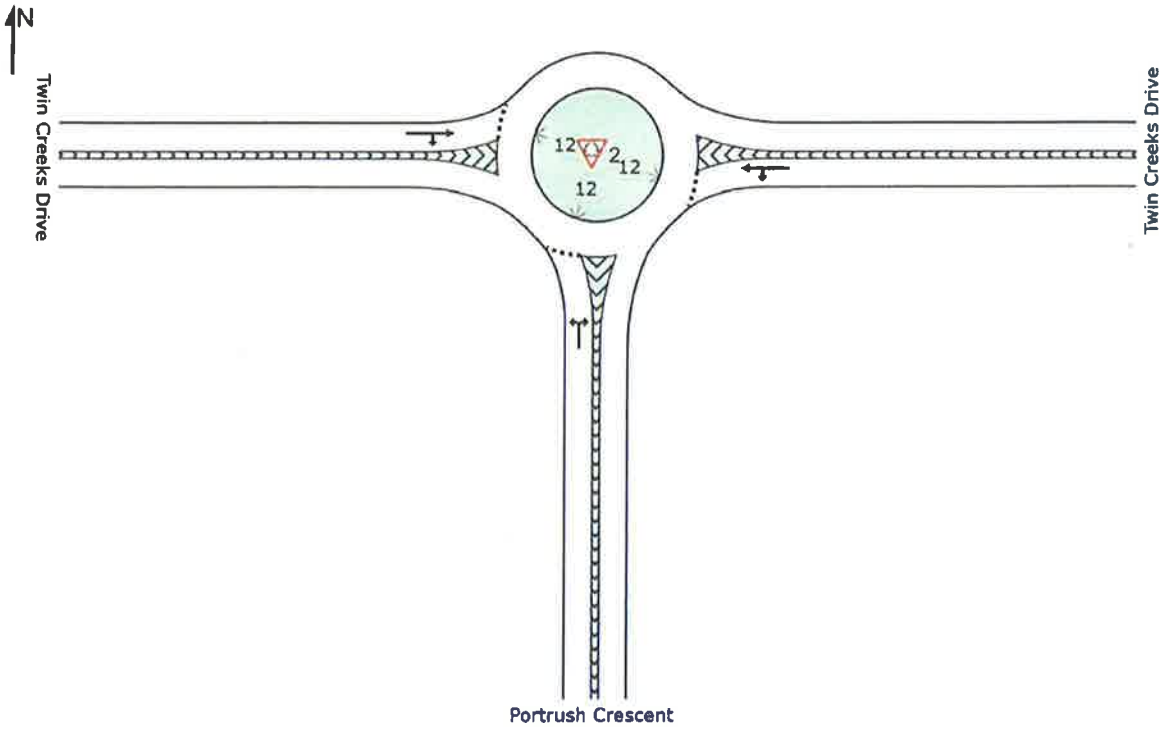
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 2 [EX Twin Creeks Drive and Portrush Crescent - Import]

Twin Creeks Drive and Portrush Crescent
Existing Peak Saturday Midday

Roundabout



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MOVEMENT SUMMARY

Site: 2 [EX Twin Creeks Drive and Portrush Crescent - Import (3)]

Network: N101 [Network PM EX]

Twin Creeks Drive and Portrush Crescent
Exiting PM Peak
Roundabout

Movement Performance - Vehicles

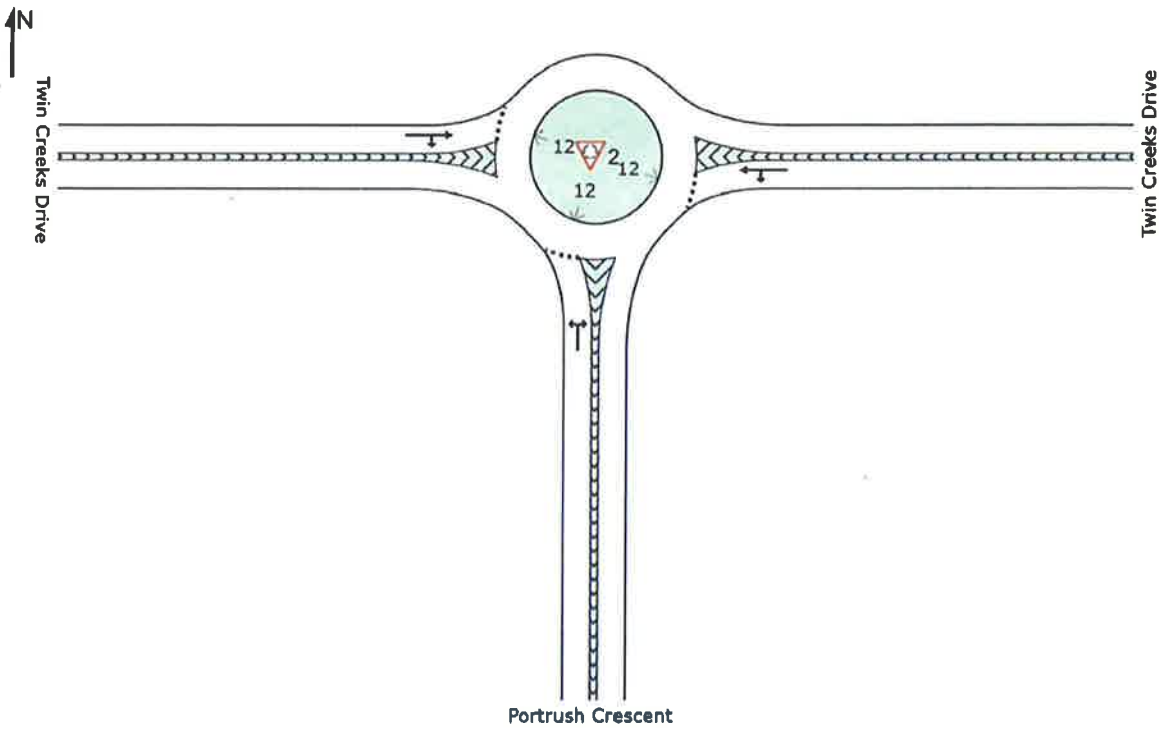
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portrush Crescent													
1	L2	15	0.0	15	0.0	0.013	4.6	LOS A	0.1	0.4	0.18	0.50	51.2
3	R2	1	0.0	1	0.0	0.013	8.5	LOS A	0.1	0.4	0.18	0.50	54.7
Approach		16	0.0	16	0.0	0.013	4.9	LOS A	0.1	0.4	0.18	0.50	51.6
East: Twin Creeks Drive													
4	L2	1	0.0	1	0.0	0.046	4.4	LOS A	0.2	1.5	0.08	0.44	54.2
5	T1	62	0.0	62	0.0	0.046	4.7	LOS A	0.2	1.5	0.08	0.44	51.8
Approach		63	0.0	63	0.0	0.046	4.7	LOS A	0.2	1.5	0.08	0.44	51.8
West: Twin Creeks Drive													
11	T1	106	0.0	106	0.0	0.073	4.6	LOS A	0.4	2.6	0.02	0.49	53.3
12	R2	15	0.0	15	0.0	0.073	8.2	LOS A	0.4	2.6	0.02	0.49	52.8
Approach		121	0.0	121	0.0	0.073	5.1	LOS A	0.4	2.6	0.02	0.49	53.2
All Vehicles		200	0.0	200	0.0	0.073	4.9	LOS A	0.4	2.6	0.05	0.48	52.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 2 [EX Twin Creeks Drive and Portrush Crescent - Import (3)]

Twin Creeks Drive and Portrush Crescent
Exiting PM Peak
Roundabout



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MOVEMENT SUMMARY

Site: 1 [EX Twin Creeks Drive and Luddenham Road - Import]

Network: N101 [Network SAT EX]

Twin Creeks Drive and Luddenham Road
Existing Peak Saturday Midday

Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
2	T1	132	0.0	132	0.0	0.116	4.7	LOS A	0.6	4.2	0.20	0.47	51.4
3	R2	21	0.0	21	0.0	0.116	8.7	LOS A	0.6	4.2	0.20	0.47	51.4
Approach		153	0.0	153	0.0	0.116	5.3	LOS A	0.6	4.2	0.20	0.47	51.4
East: Twin Creeks Drive													
4	L2	16	0.0	16	0.0	0.064	4.6	LOS A	0.3	2.1	0.25	0.60	35.5
6	R2	62	0.0	62	0.0	0.064	8.9	LOS A	0.3	2.1	0.25	0.60	35.5
Approach		78	0.0	78	0.0	0.064	8.0	LOS A	0.3	2.1	0.25	0.60	35.5
North: Luddenham Road													
7	L2	64	0.0	64	0.0	0.112	4.2	LOS A	0.6	4.1	0.10	0.45	54.1
8	T1	100	0.0	100	0.0	0.112	4.5	LOS A	0.6	4.1	0.10	0.45	54.1
Approach		164	0.0	164	0.0	0.112	4.4	LOS A	0.6	4.1	0.10	0.45	54.1
All Vehicles		395	0.0	395	0.0	0.116	5.5	LOS A	0.6	4.2	0.17	0.48	51.2

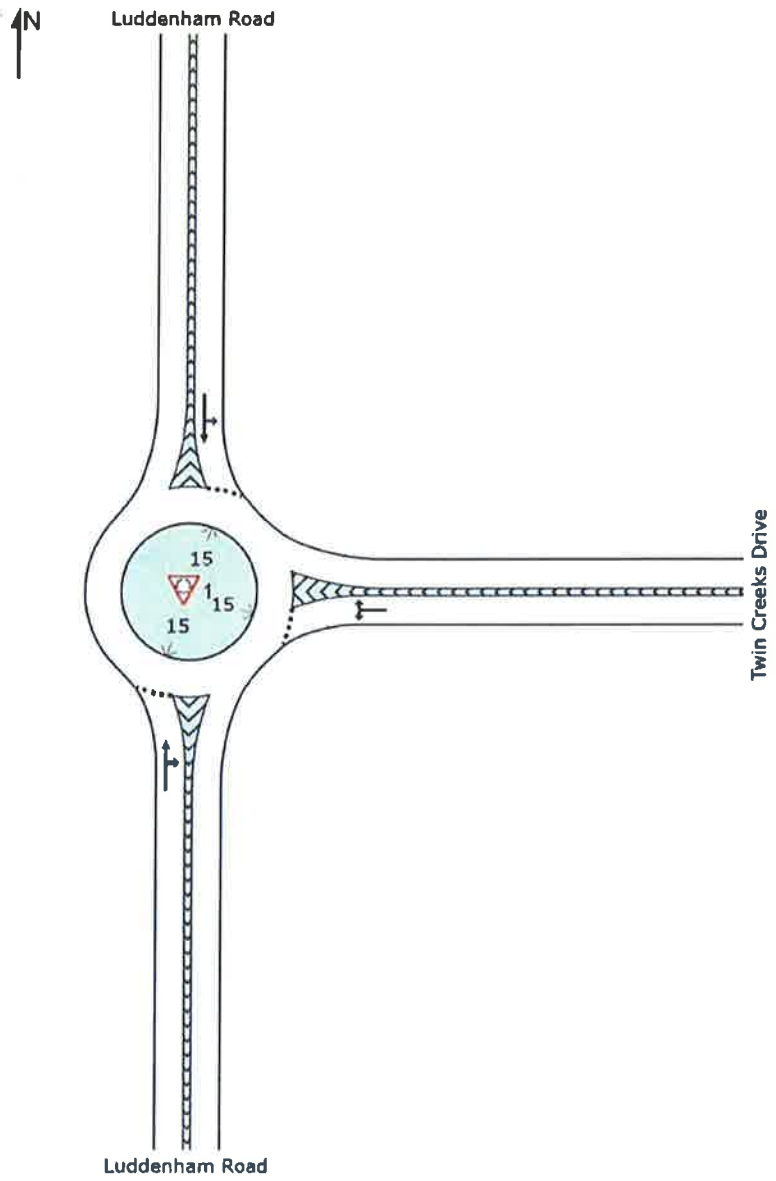
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 1 [EX Twin Creeks Drive and Luddenham Road - Import]

Twin Creeks Drive and Luddenham Road
Existing Peak Saturday Midday

Roundabout



MOVEMENT SUMMARY

Site: 1 [EX Twin Creeks Drive and Luddenham Road - Import (3)]

Network: N101 [Network PM EX]

Twin Creeks Drive and Luddenham Road
Existing PM Peak
Roundabout

Movement Performance - Vehicles

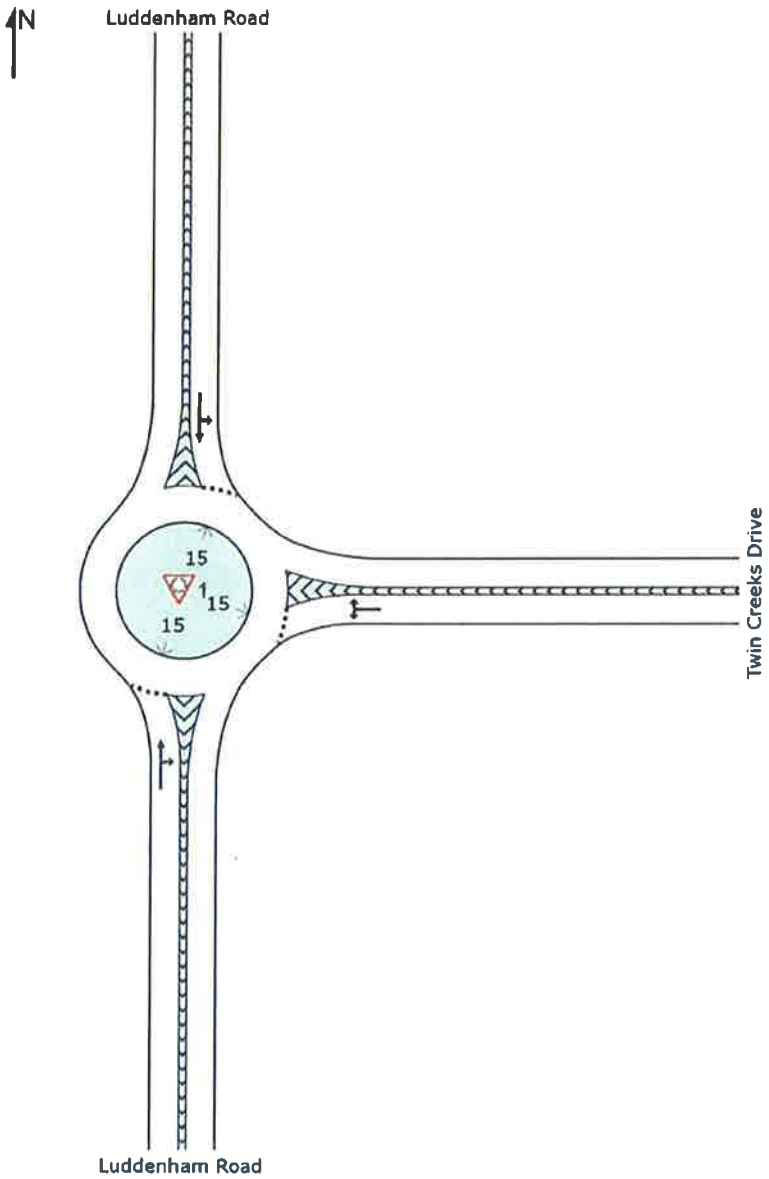
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
2	T1	182	2.9	182	2.9	0.149	4.7	LOS A	0.9	6.1	0.21	0.45	51.6
3	R2	15	0.0	15	0.0	0.149	8.7	LOS A	0.9	6.1	0.21	0.45	51.6
Approach		197	2.7	197	2.7	0.149	5.0	LOS A	0.9	6.1	0.21	0.45	51.6
East: Twin Creeks Drive													
4	L2	15	0.0	15	0.0	0.073	5.9	LOS A	0.4	2.5	0.46	0.66	34.1
6	R2	59	0.0	59	0.0	0.073	10.1	LOS A	0.4	2.5	0.46	0.66	34.1
Approach		74	0.0	74	0.0	0.073	9.3	LOS A	0.4	2.5	0.46	0.66	34.1
North: Luddenham Road													
7	L2	106	0.0	106	0.0	0.280	4.2	LOS A	1.8	12.4	0.10	0.44	54.1
8	T1	336	1.6	336	1.6	0.280	4.5	LOS A	1.8	12.4	0.10	0.44	54.1
Approach		442	1.2	442	1.2	0.280	4.4	LOS A	1.8	12.4	0.10	0.44	54.1
All Vehicles		713	1.5	713	1.5	0.280	5.1	LOS A	1.8	12.4	0.17	0.46	52.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 1 [EX Twin Creeks Drive and Luddenham Road - Import (3)]

Twin Creeks Drive and Luddenham Road
Existing PM Peak
Roundabout



MOVEMENT SUMMARY

▽ Site: 106a [EX PM Weekday Luddenham Road and Mamre Road Merge from Right]

Network: N101 [Network PM EX]

Luddenham Road and Mamre Road Merge from Right Merge From Exisitng Site
Weekday PM Peak Period
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

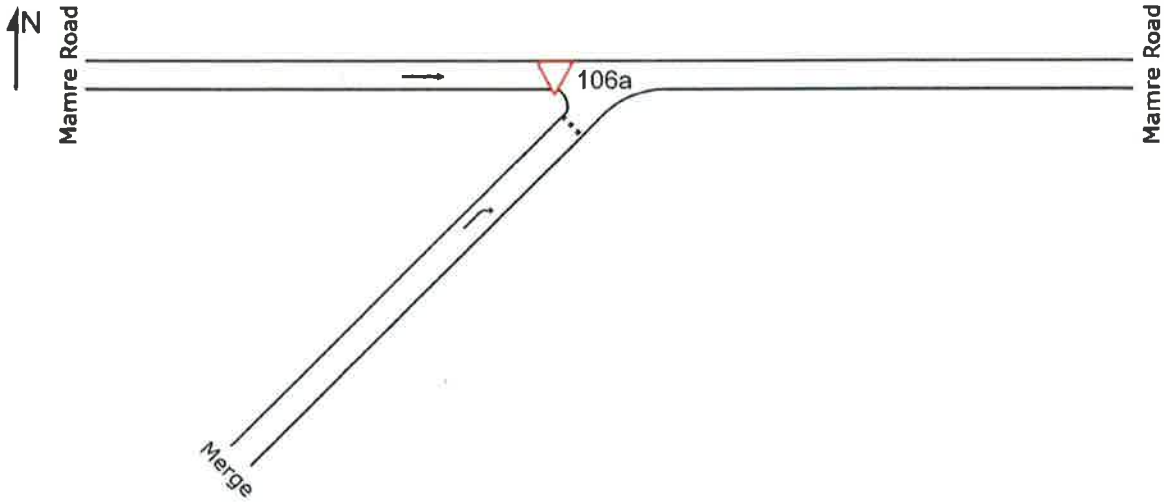
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
West: Mamre Road													
1	T1	375	2.0	375	2.0	0.195	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		375	2.0	375	2.0	0.195	0.0	NA	0.0	0.0	0.00	0.00	79.9
SouthWest: Merge													
2	R1	56	3.8	56	3.8	0.040	1.6	LOS A	0.1	0.9	0.31	0.47	65.5
Approach		56	3.8	56	3.8	0.040	1.6	LOS A	0.1	0.9	0.31	0.47	65.5
All Vehicles		431	2.2	431	2.2	0.195	0.2	NA	0.1	0.9	0.04	0.06	79.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106a [EX PM Weekday Luddenham Road and Mamre Road Merge from Right]

Luddenham Road and Mamre Road Merge from Right Merge From Exisitng Site
Weekday PM Peak Period
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:19:24 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 107a [EX PM Weekday Luddenham Road and Elizabeth Drive with Storage]

Network: N101 [Network PM EX]

Luddenham Road and Elizabeth Drive with Storage
Exisitng Site
PM Wednesday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

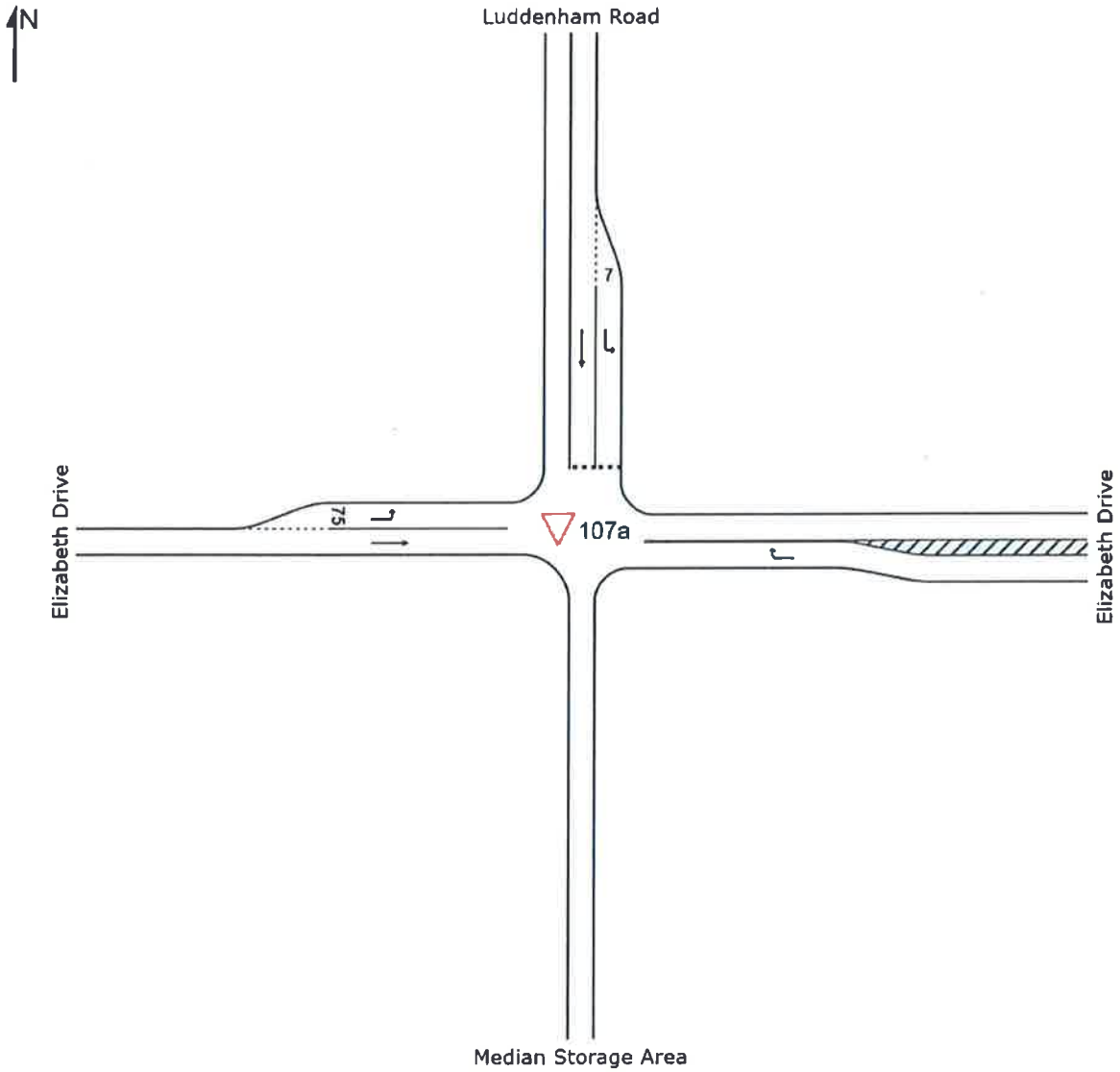
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
12	R2	122	3.4	122	3.4	0.086	5.4	LOS A	0.4	2.8	0.38	0.61	33.8
Approach		122	3.4	122	3.4	0.086	5.4	NA	0.4	2.8	0.38	0.61	33.8
North: Luddenham Road													
1	L2	163	1.3	163	1.3	0.115	8.1	LOS A	0.7	4.9	0.43	0.61	56.6
2	T1	220	3.8	220	3.8	0.166	7.1	LOS A	0.8	5.7	0.45	0.66	62.4
Approach		383	2.7	383	2.7	0.166	7.5	LOS A	0.8	5.7	0.44	0.64	59.6
West: Elizabeth Drive													
4	L2	72	2.9	72	2.9	0.039	7.0	LOS A	0.0	0.0	0.00	0.63	73.7
5	T1	207	10.7	207	10.7	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		279	8.7	279	8.7	0.114	1.8	NA	0.0	0.0	0.00	0.16	78.3
All Vehicles		784	5.0	784	5.0	0.166	5.2	NA	0.8	5.7	0.27	0.46	70.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107a [EX PM Weekday Luddenham Road and Elizabeth Drive with Storage]

Luddenham Road and Elizabeth Drive with Storage
Exisitng Site
PM Wednesday
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:19:31 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 106b [EX PM Weekday Luddenham Rd and Mamre Rd with Median Storage]

Network: N101 [Network PM EX]

Luddenham Road and Mamre Road with Storage
Exisitng Site
PM Peak Period
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

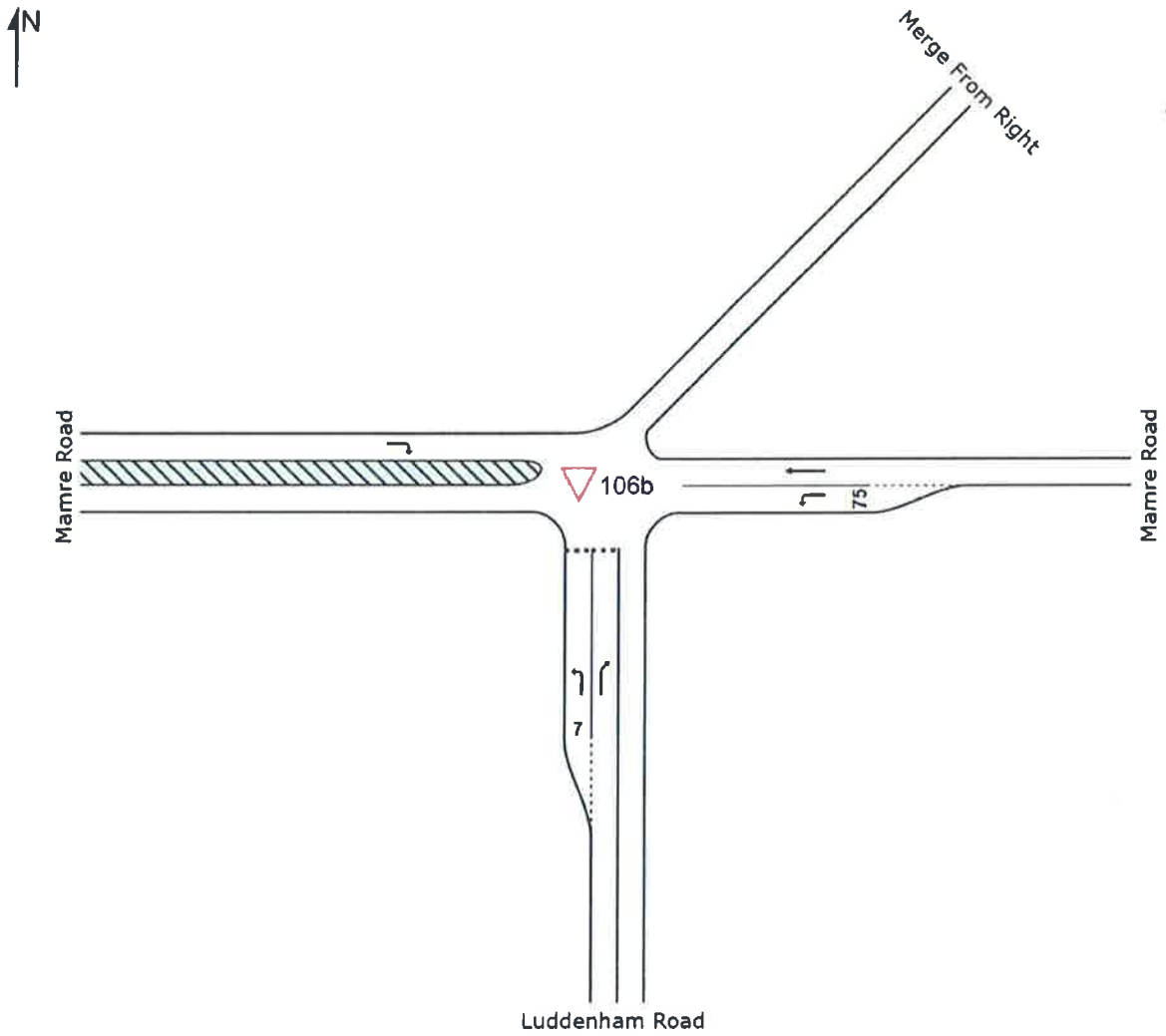
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
1	L2	231	3.0	231	3.0	0.438	18.3	LOS B	2.6	19.0	0.83	1.02	50.6
32a	R1	56	3.8	56	3.8	0.098	10.0	LOS A	0.2	1.5	0.64	0.85	61.5
Approach		287	3.2	287	3.2	0.438	16.7	LOS B	2.6	19.0	0.79	0.99	52.2
East: Mamre Road													
4	L2	150	2.0	150	2.0	0.082	7.0	LOS A	0.0	0.0	0.00	0.63	48.3
5	T1	859	5.5	859	5.5	0.456	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		1009	5.0	1009	5.0	0.456	1.1	NA	0.0	0.0	0.00	0.09	74.8
West: Mamre Road													
12	R2	662	4.7	662	4.7	0.685	11.4	LOS A	4.2	30.3	0.77	1.09	28.9
Approach		662	4.7	662	4.7	0.685	11.4	NA	4.2	30.3	0.77	1.09	28.9
All Vehicles		1958	4.6	1958	4.6	0.685	6.9	NA	4.2	30.3	0.38	0.56	54.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106b [EX PM Weekday Luddenham Rd and Mamre Rd with Median Storage]

Luddenham Road and Mamre Road with Storage
Exisitng Site
PM Peak Period
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 107b [EX PM Weekday Elizabeth Drive and Storage Lane]

Network: N101 [Network PM EX]

Elizabeth Drive and Storage Lane
Existing Situation
PM Weekday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

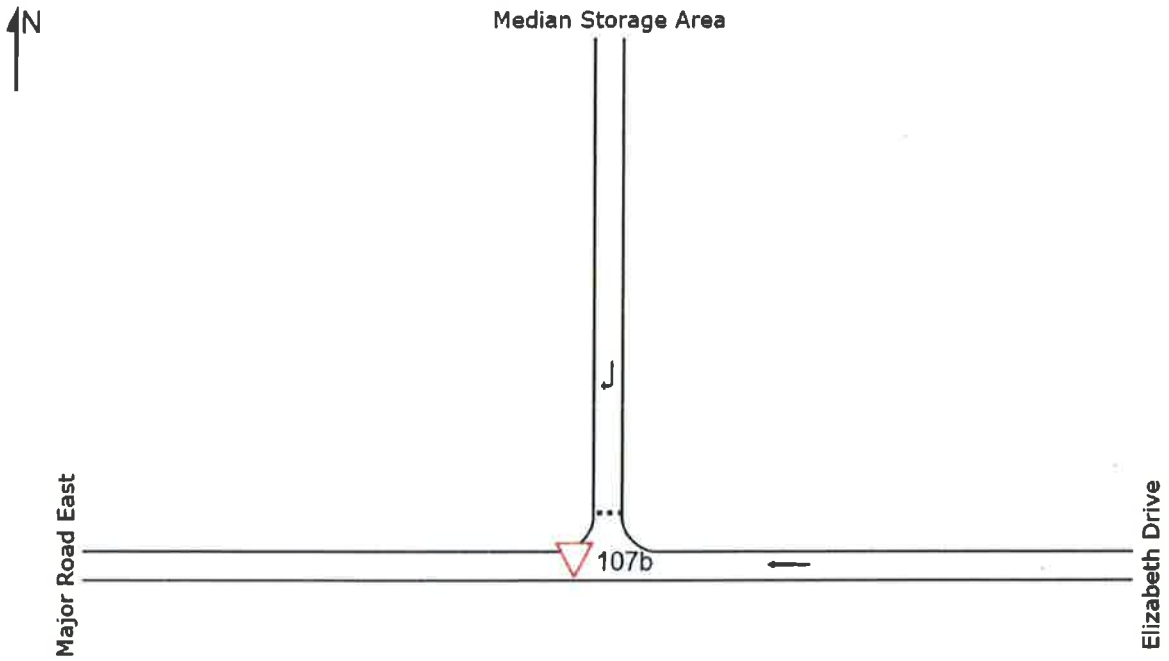
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
11	T1	483	8.5	483	8.5	0.261	0.1	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		483	8.5	483	8.5	0.261	0.1	NA	0.0	0.0	0.00	0.00	79.9
North: Median Storage Area													
3	R2	220	3.8	220	3.8	0.223	3.4	LOS A	0.8	4.3	0.45	0.67	73.3
Approach		220	3.8	220	3.8	0.223	3.4	LOS A	0.8	4.3	0.45	0.67	73.3
All Vehicles		703	7.0	703	7.0	0.261	1.1	NA	0.8	4.3	0.14	0.21	78.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107b [EX PM Weekday Elizabeth Drive and Storage Lane]

Elizabeth Drive and Storage Lane
Existing Situation
PM Weekday
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:19:40 PM
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MOVEMENT SUMMARY

▽ Site: 106a [EX Midday Saturday Luddenham Road and Mamre Road Merge from Right]

Network: N101 [Network SAT EX]

Luddenham Road and Mamre Road Merge from Right
Exisitng Site
Midday Saturday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

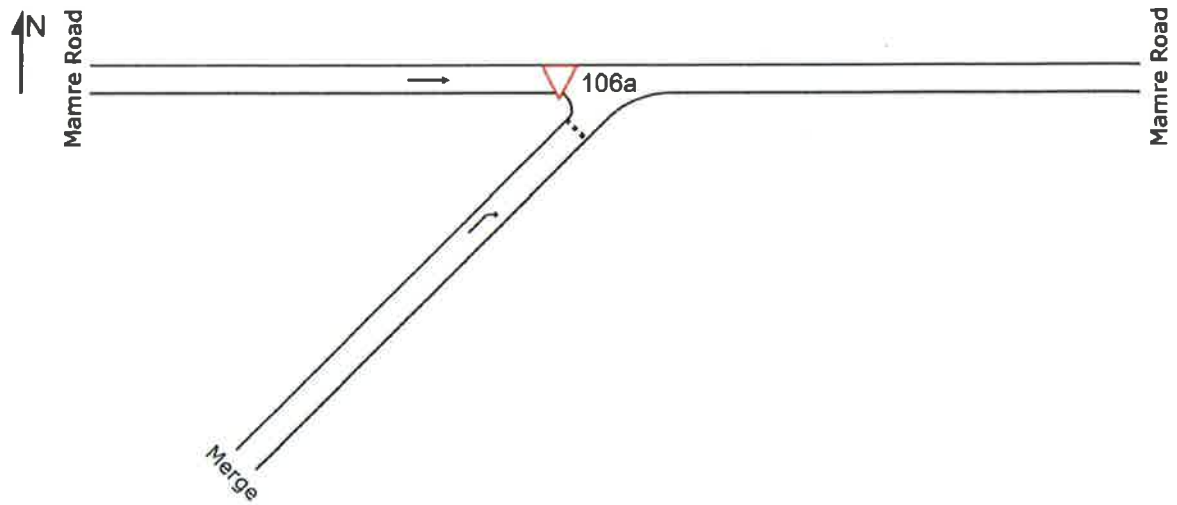
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
West: Mamre Road													
1	T1	176	1.2	176	1.2	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		176	1.2	176	1.2	0.091	0.0	NA	0.0	0.0	0.00	0.00	80.0
SouthWest: Merge													
2	R1	48	0.0	48	0.0	0.029	1.1	LOS A	0.1	0.6	0.19	0.40	69.0
Approach		48	0.0	48	0.0	0.029	1.1	LOS A	0.1	0.6	0.19	0.40	69.0
All Vehicles		**224**	**0.9**	**224**	**0.9**	**0.091**	**0.3**	**NA**	**0.1**	**0.6**	**0.04**	**0.09**	**79.0**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106a [EX Midday Saturday Luddenham Road and Mamre Road Merge from Right]

Luddenham Road and Mamre Road Merge from Right
Exisitng Site
Midday Saturday
Giveway / Yield (Two-Way)



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Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 107a [EX Midday Saturday Luddenham Road and Elizabeth Drive with Storage]

Network: N101 [Network SAT EX]

Luddenham Road and Elizabeth Drive with Storage
Exisitng Site
PM Wednesday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

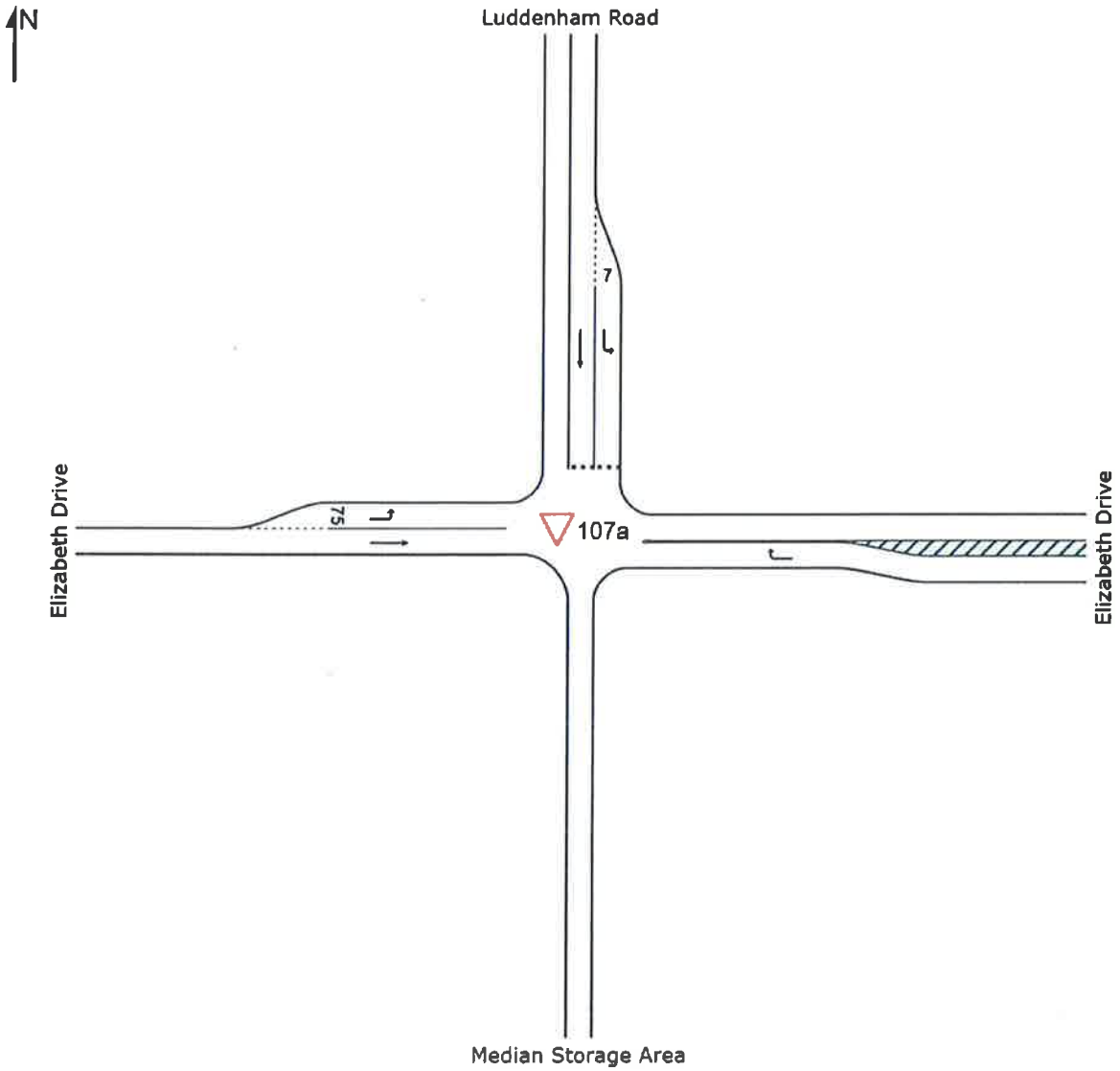
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
12	R2	94	1.1	94	1.1	0.064	5.2	LOS A	0.3	2.0	0.35	0.59	34.0
Approach		94	1.1	94	1.1	0.064	5.2	NA	0.3	2.0	0.35	0.59	34.0
North: Luddenham Road													
1	L2	94	2.2	94	2.2	0.065	8.0	LOS A	0.4	2.7	0.40	0.59	56.7
2	T1	79	6.7	79	6.7	0.058	6.9	LOS A	0.3	1.9	0.39	0.61	62.8
Approach		173	4.3	173	4.3	0.065	7.5	LOS A	0.4	2.7	0.39	0.60	59.2
West: Elizabeth Drive													
4	L2	62	0.0	62	0.0	0.033	7.0	LOS A	0.0	0.0	0.00	0.63	73.7
5	T1	193	8.2	193	8.2	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		255	6.2	255	6.2	0.104	1.7	NA	0.0	0.0	0.00	0.15	78.4
All Vehicles		**521**	**4.6**	**521**	**4.6**	**0.104**	**4.3**	**NA**	**0.4**	**2.7**	**0.19**	**0.38**	**72.7**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107a [EX Midday Saturday Luddenham Road and Elizabeth Drive with Storage]

Luddenham Road and Elizabeth Drive with Storage
Exisitng Site
PM Wednesday
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 106b [EX Midday Saturday Luddenham Rd and Mamre Rd with Median Storage]

Network: N101 [Network SAT EX]

Luddenham Road and Mamre Road with Storage
Exisitng Site
Midday Saturday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

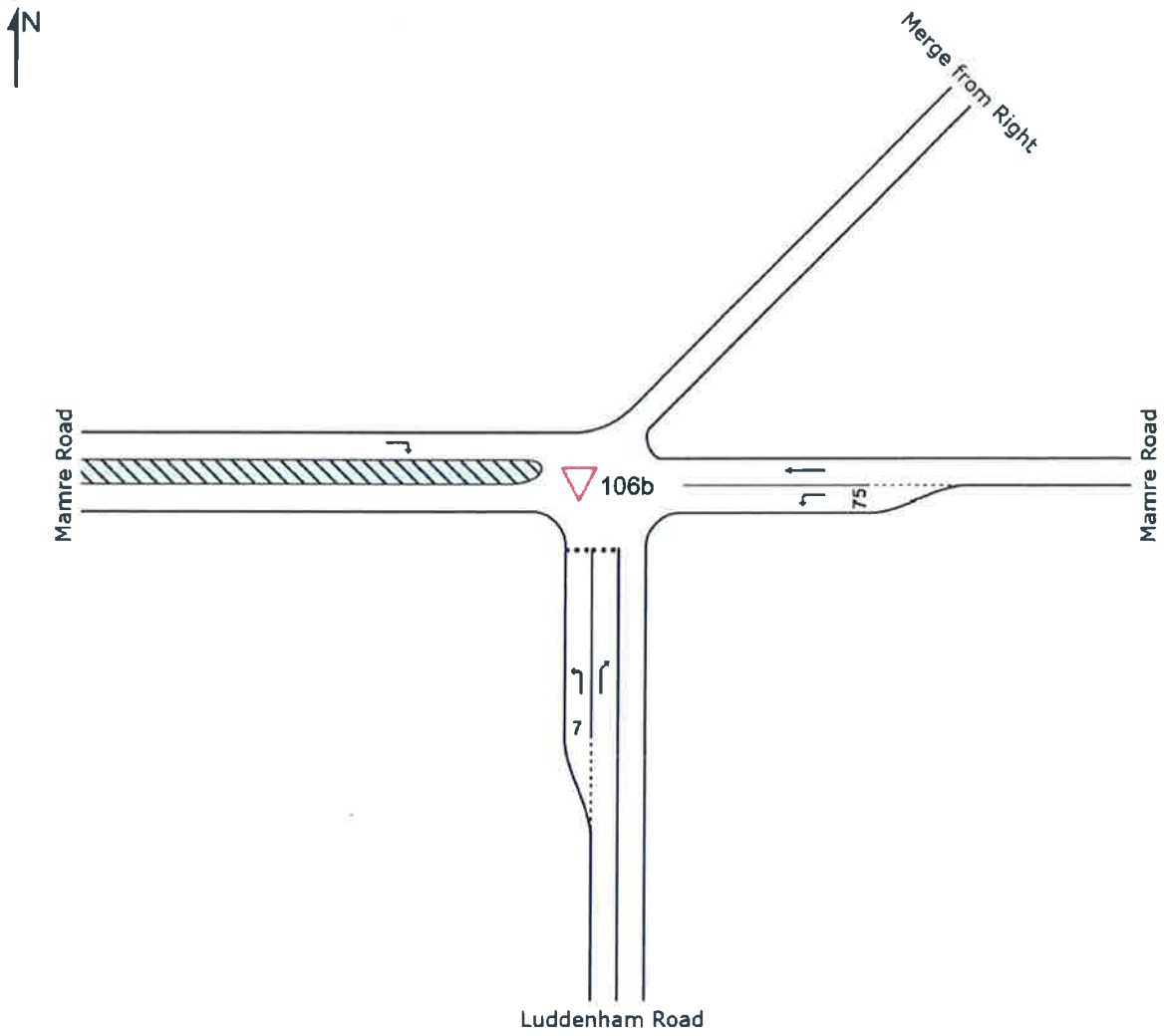
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
1	L2	177	2.4	177	2.4	0.164	9.6	LOS A	0.9	6.5	0.60	0.72	58.7
32a	R1	48	0.0	48	0.0	0.052	9.0	LOS A	0.2	1.5	0.59	0.75	62.9
Approach		225	1.9	225	1.9	0.164	9.5	LOS A	0.9	6.5	0.60	0.73	59.5
East: Mamre Road													
4	L2	54	2.0	54	2.0	0.029	7.0	LOS A	0.0	0.0	0.00	0.63	48.3
5	T1	425	4.5	425	4.5	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		479	4.2	479	4.2	0.224	0.8	NA	0.0	0.0	0.00	0.07	75.8
West: Mamre Road													
12	R2	373	6.2	373	6.2	0.320	7.5	LOS A	1.7	12.5	0.56	0.77	32.4
Approach		373	6.2	373	6.2	0.320	7.5	NA	1.7	12.5	0.56	0.77	32.4
All Vehicles		1077	4.4	1077	4.4	0.320	4.9	NA	1.7	12.5	0.32	0.45	59.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106b [EX Midday Saturday Luddenham Rd and Mamre Rd with Median Storage]

Luddenham Road and Mamre Road with Storage
Exisitng Site
Midday Saturday
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:16:25 PM
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MOVEMENT SUMMARY

▽ Site: 107b [EX Midday Saturday Elizabeth Drive and Storage Lane]

Network: N101 [Network SAT EX]

Elizabeth Drive and Storage Lane
Existing Situation
PM Weekday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

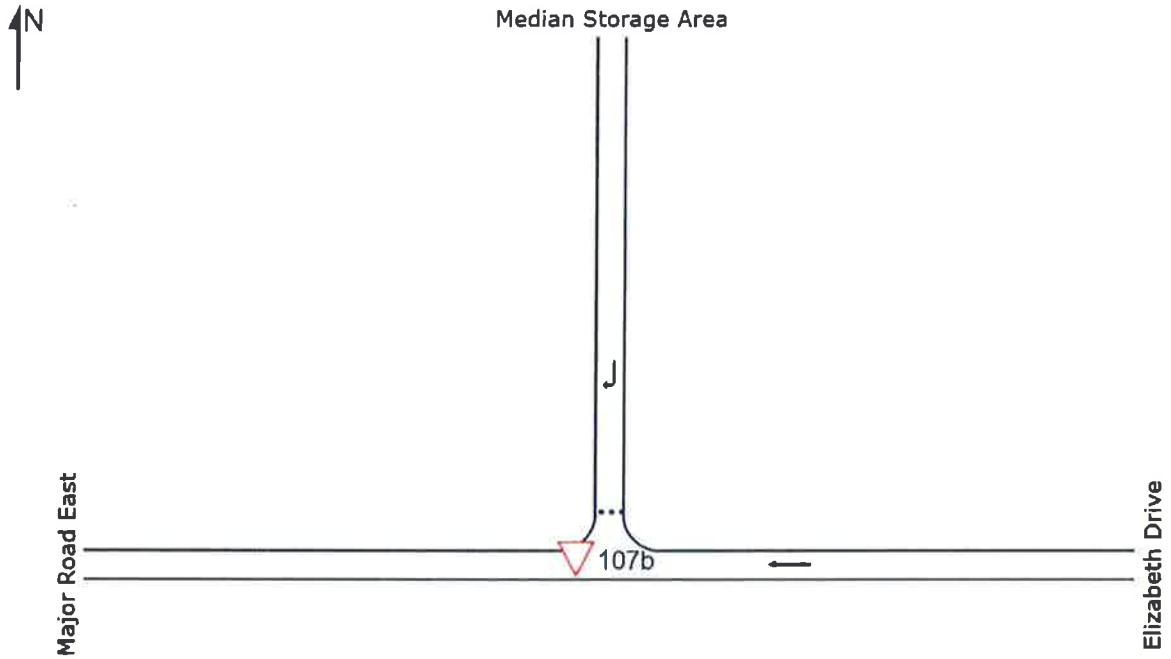
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
11	T1	185	6.3	185	6.3	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		185	6.3	185	6.3	0.099	0.0	NA	0.0	0.0	0.00	0.00	80.0
North: Median Storage Area													
3	R2	79	6.7	79	6.7	0.064	2.1	LOS A	0.2	1.2	0.24	0.49	74.0
Approach		79	6.7	79	6.7	0.064	2.1	LOS A	0.2	1.2	0.24	0.49	74.0
All Vehicles		264	6.4	264	6.4	0.099	0.6	NA	0.2	1.2	0.07	0.15	78.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107b [EX Midday Saturday Elizabeth Drive and Storage Lane]

Elizabeth Drive and Storage Lane
Existing Situation
PM Weekday
Giveway / Yield (Two-Way)



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Appendix D - 2

SIDRA Results (Future)

MOVEMENT SUMMARY

Site: 2 [EX + DEV Twin Creeks Drive and Portrush Crescent - Import]

Network: N102 [Network SAT EX + DEV]

Twin Creeks Drive and Portrush Crescent
Future Peak - Saturday Midday
Roundabout

Movement Performance - Vehicles

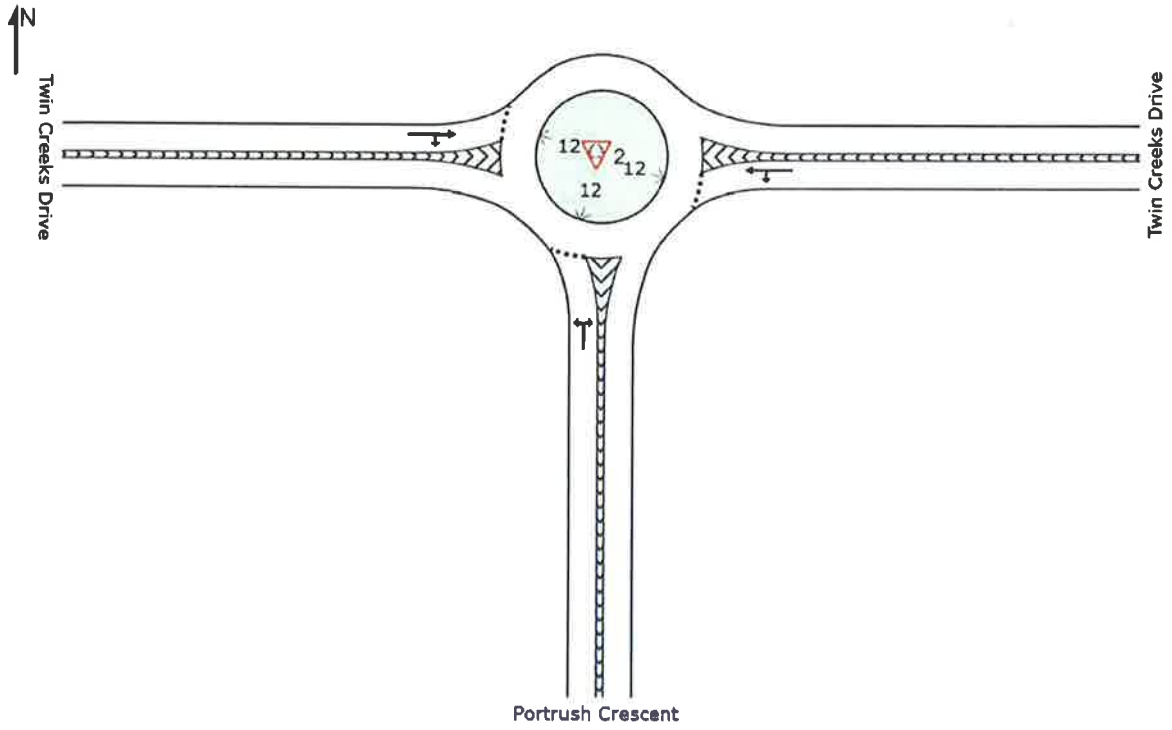
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portrush Crescent													
1	L2	11	0.0	11	0.0	0.010	4.9	LOS A	0.0	0.3	0.26	0.51	50.7
3	R2	1	0.0	1	0.0	0.010	8.8	LOS A	0.0	0.3	0.26	0.51	54.4
Approach		12	0.0	12	0.0	0.010	5.2	LOS A	0.0	0.3	0.26	0.51	51.3
East: Twin Creeks Drive													
4	L2	1	0.0	1	0.0	0.079	4.4	LOS A	0.4	2.6	0.06	0.45	54.3
5	T1	116	0.0	116	0.0	0.079	4.7	LOS A	0.4	2.6	0.06	0.45	51.9
Approach		117	0.0	117	0.0	0.079	4.7	LOS A	0.4	2.6	0.06	0.45	51.9
West: Twin Creeks Drive													
11	T1	192	0.0	192	0.0	0.120	4.6	LOS A	0.6	4.5	0.02	0.47	53.5
12	R2	9	0.0	9	0.0	0.120	8.2	LOS A	0.6	4.5	0.02	0.47	53.1
Approach		201	0.0	201	0.0	0.120	4.8	LOS A	0.6	4.5	0.02	0.47	53.5
All Vehicles		**329**	**0.0**	**329**	**0.0**	**0.120**	**4.8**	**LOS A**	**0.6**	**4.5**	**0.04**	**0.46**	**53.0**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 2 [EX + DEV Twin Creeks Drive and Portrush Crescent - Import]

Twin Creeks Drive and Portrush Crescent
Future Peak - Saturday Midday
Roundabout



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MOVEMENT SUMMARY

Site: 2 [EX + DEV Twin Creeks Drive and Portrush Crescent - Import]

Network: N102 [Network PM EX + DEV]

Twin Creeks Drive and Portrush Crescent
Future PM Peak
Roundabout

Movement Performance - Vehicles

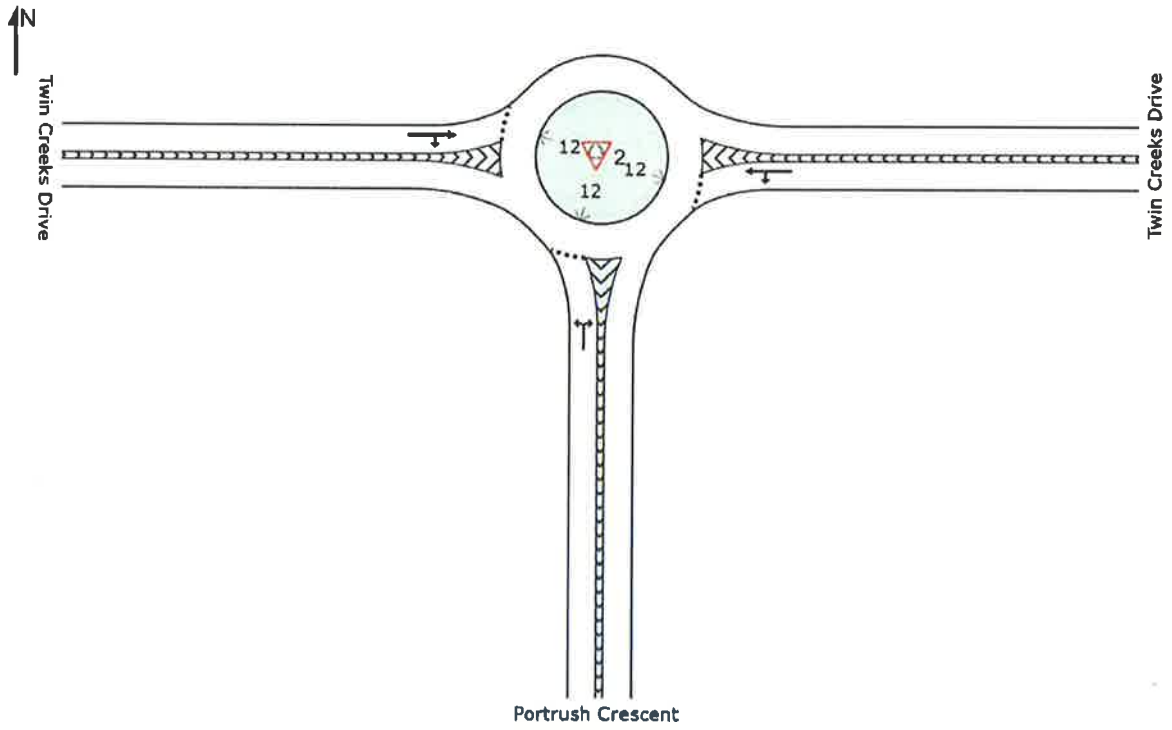
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Portrush Crescent													
1	L2	15	0.0	15	0.0	0.014	5.0	LOS A	0.1	0.4	0.27	0.51	50.7
3	R2	1	0.0	1	0.0	0.014	8.8	LOS A	0.1	0.4	0.27	0.51	54.5
Approach		16	0.0	16	0.0	0.014	5.2	LOS A	0.1	0.4	0.27	0.51	51.1
East: Twin Creeks Drive													
4	L2	1	0.0	1	0.0	0.090	4.4	LOS A	0.4	3.0	0.08	0.44	54.2
5	T1	129	0.0	129	0.0	0.090	4.7	LOS A	0.4	3.0	0.08	0.44	51.7
Approach		131	0.0	131	0.0	0.090	4.7	LOS A	0.4	3.0	0.08	0.44	51.8
West: Twin Creeks Drive													
11	T1	239	0.0	239	0.0	0.151	4.6	LOS A	0.8	5.9	0.02	0.47	53.5
12	R2	15	0.0	15	0.0	0.151	8.2	LOS A	0.8	5.9	0.02	0.47	53.1
Approach		254	0.0	254	0.0	0.151	4.8	LOS A	0.8	5.9	0.02	0.47	53.5
All Vehicles		**400**	**0.0**	**400**	**0.0**	**0.151**	**4.8**	**LOS A**	**0.8**	**5.9**	**0.05**	**0.47**	**52.9**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 2 [EX + DEV Twin Creeks Drive and Portrush Crescent - Import]

Twin Creeks Drive and Portrush Crescent
Future PM Peak
Roundabout



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MOVEMENT SUMMARY

Site: 1 [EX + DEV Twin Creeks Drive and Luddenham Road - Import]

Network: N102 [Network SAT EX + DEV]

Twin Creeks Drive and Luddenham Road
Future Peak - Saturday Midday
Roundabout

Movement Performance - Vehicles

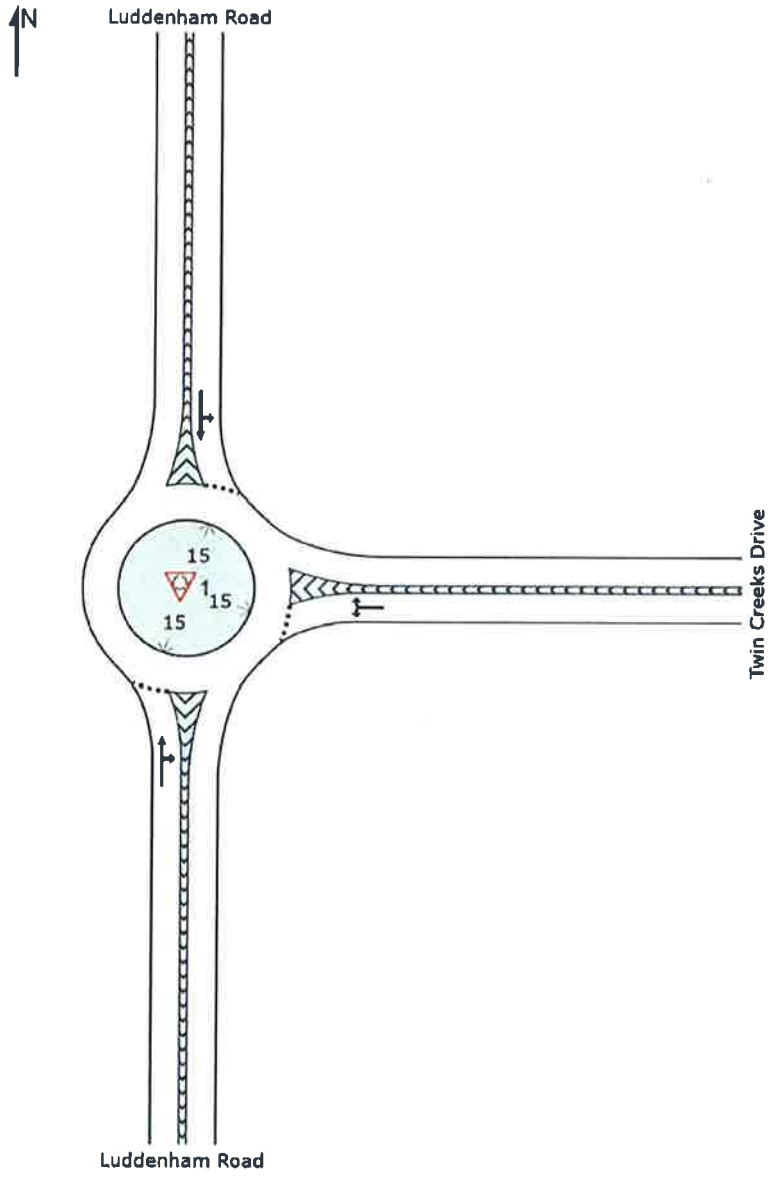
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
2	T1	132	0.0	132	0.0	0.147	5.0	LOS A	0.8	5.5	0.28	0.52	50.4
3	R2	52	0.0	52	0.0	0.147	9.0	LOS A	0.8	5.5	0.28	0.52	50.4
Approach		183	0.0	183	0.0	0.147	6.1	LOS A	0.8	5.5	0.28	0.52	50.4
East: Twin Creeks Drive													
4	L2	26	0.0	26	0.0	0.106	4.7	LOS A	0.5	3.8	0.26	0.60	35.4
6	R2	104	0.0	104	0.0	0.106	8.9	LOS A	0.5	3.8	0.26	0.60	35.4
Approach		131	0.0	131	0.0	0.106	8.1	LOS A	0.5	3.8	0.26	0.60	35.4
North: Luddenham Road													
7	L2	156	0.0	156	0.0	0.185	4.4	LOS A	1.0	7.3	0.19	0.46	53.8
8	T1	100	0.0	100	0.0	0.185	4.7	LOS A	1.0	7.3	0.19	0.46	53.8
Approach		256	0.0	256	0.0	0.185	4.5	LOS A	1.0	7.3	0.19	0.46	53.8
All Vehicles		**569**	**0.0**	**569**	**0.0**	**0.185**	**5.8**	**LOS A**	**1.0**	**7.3**	**0.24**	**0.51**	**50.5**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 1 [EX + DEV Twin Creeks Drive and Luddenham Road - Import]

Twin Creeks Drive and Luddenham Road
Future Peak - Saturday Midday
Roundabout



MOVEMENT SUMMARY

Site: 1 [EX + DEV Twin Creeks Drive and Luddenham Road - Import]

Network: N102 [Network PM EX + DEV]

Twin Creeks Drive and Luddenham Road
Future PM Peak
Roundabout

Movement Performance - Vehicles

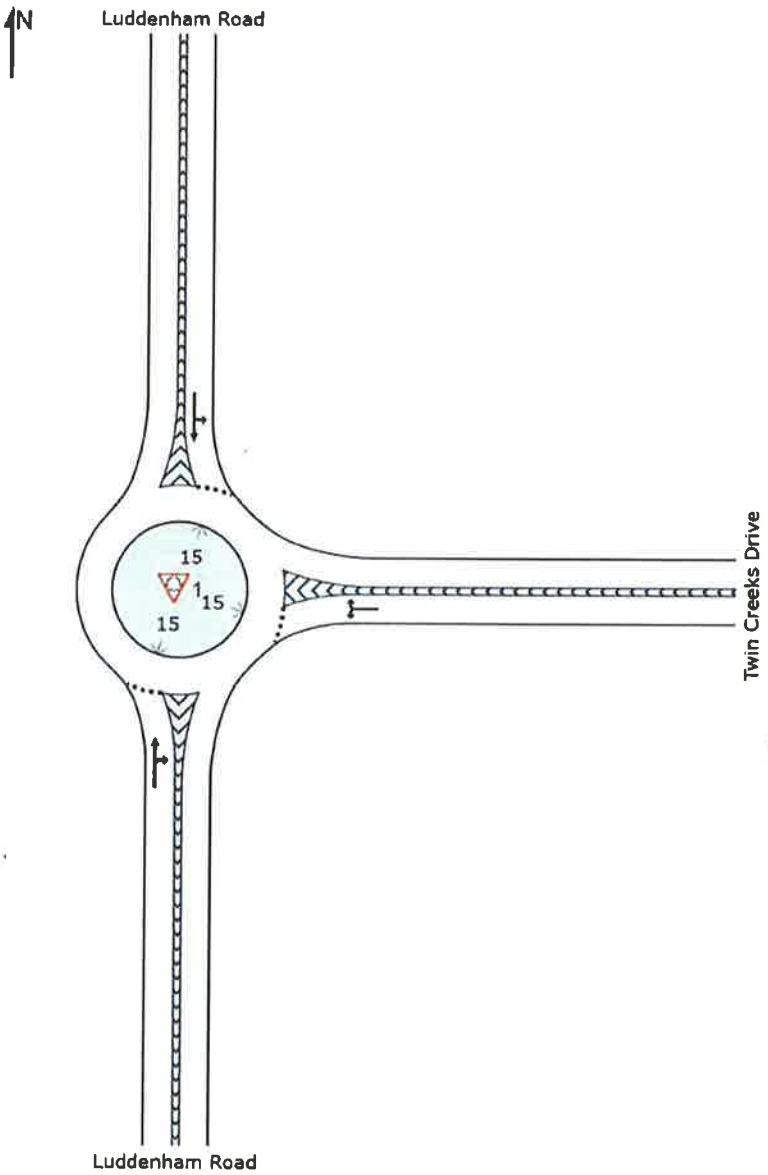
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
2	T1	182	2.9	182	2.9	0.175	5.1	LOS A	1.0	7.3	0.31	0.49	50.7
3	R2	31	0.0	31	0.0	0.175	9.0	LOS A	1.0	7.3	0.31	0.49	50.7
Approach		213	2.5	213	2.5	0.175	5.6	LOS A	1.0	7.3	0.31	0.49	50.7
East: Twin Creeks Drive													
4	L2	28	0.0	28	0.0	0.140	6.0	LOS A	0.7	5.2	0.49	0.68	34.0
6	R2	113	0.0	113	0.0	0.140	10.3	LOS A	0.7	5.2	0.49	0.68	34.0
Approach		141	0.0	141	0.0	0.140	9.4	LOS A	0.7	5.2	0.49	0.68	34.0
North: Luddenham Road													
7	L2	223	0.0	223	0.0	0.368	4.3	LOS A	2.6	18.6	0.17	0.44	53.8
8	T1	336	1.6	336	1.6	0.368	4.6	LOS A	2.6	18.6	0.17	0.44	53.8
Approach		559	0.9	559	0.9	0.368	4.5	LOS A	2.6	18.6	0.17	0.44	53.8
All Vehicles		**913**	**1.2**	**913**	**1.2**	**0.368**	**5.5**	**LOS A**	**2.6**	**18.6**	**0.25**	**0.49**	**51.5**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 1 [EX + DEV Twin Creeks Drive and Luddenham Road - Import]

Twin Creeks Drive and Luddenham Road
Future PM Peak
Roundabout



MOVEMENT SUMMARY

▽ Site: 106a [FU PM Weekday Luddenham Road and Mamre Road Merge from Right]

Network: N102 [Network PM EX + DEV]

Luddenham Road and Mamre Road Merge from Right Merge From Exisitng Site
Weekday PM Peak Period
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

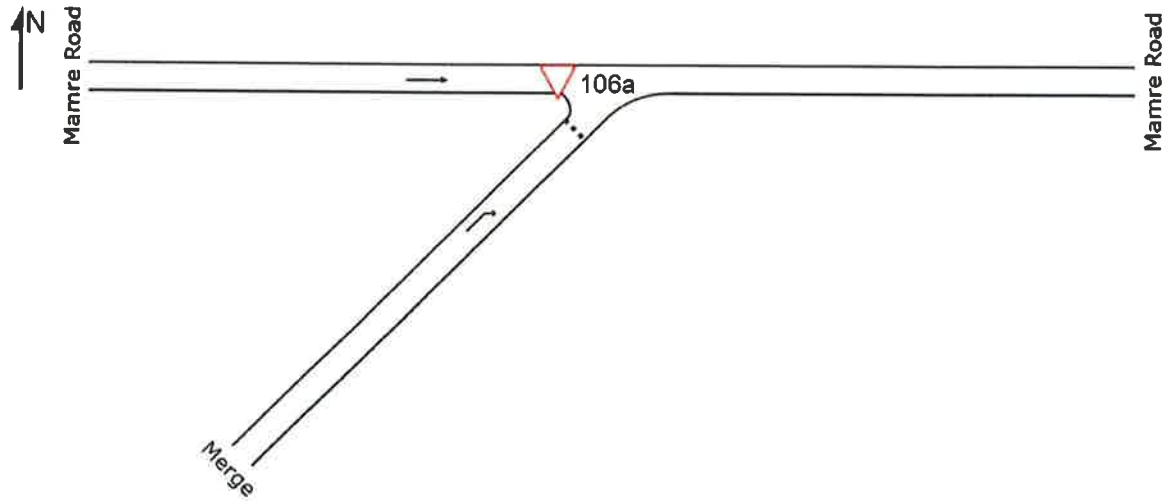
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
West: Mamre Road													
1	T1	375	2.0	375	2.0	0.195	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		375	2.0	375	2.0	0.195	0.0	NA	0.0	0.0	0.00	0.00	79.9
SouthWest: Merge													
2	R1	65	3.2	65	3.2	0.047	1.7	LOS A	0.1	1.0	0.31	0.50	63.4
Approach		65	3.2	65	3.2	0.047	1.7	LOS A	0.1	1.0	0.31	0.50	63.4
All Vehicles		**440**	**2.2**	**440**	**2.2**	**0.195**	**0.3**	**NA**	**0.1**	**1.0**	**0.05**	**0.07**	**78.9**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106a [FU PM Weekday Luddenham Road and Mamre Road Merge from Right]

Luddenham Road and Mamre Road Merge from Right Merge From Exisitng Site
Weekday PM Peak Period
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

▽ Site: 107a [FU PM Weekday Luddenham Road and Elizabeth Drive with Storage]

Network: N102 [Network PM EX + DEV]

Luddenham Road and Elizabeth Drive with Storage
Future Scenario
PM Wednesday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

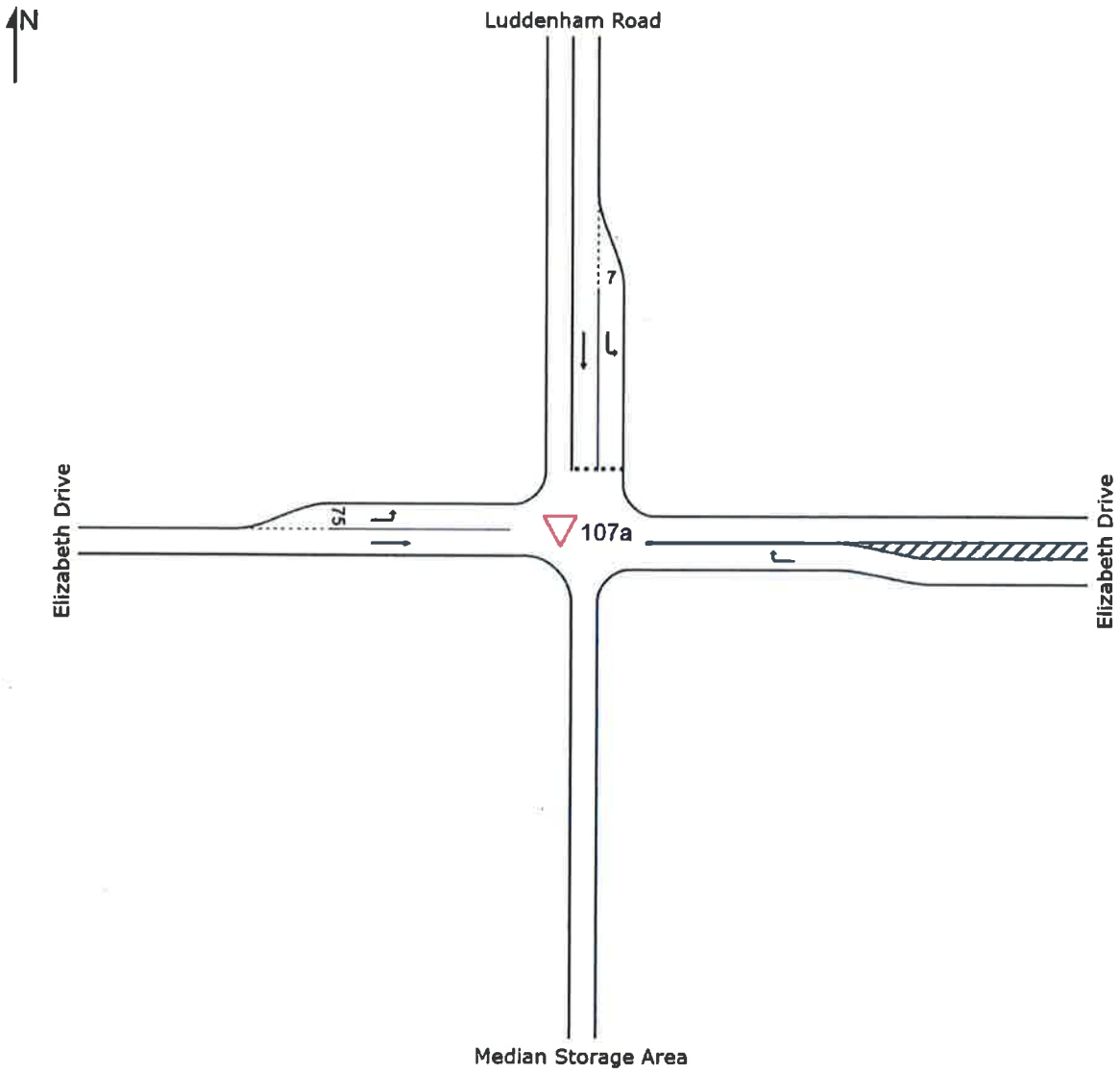
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
12	R2	127	3.3	127	3.3	0.090	5.4	LOS A	0.4	3.0	0.38	0.61	33.7
Approach		127	3.3	127	3.3	0.090	5.4	NA	0.4	3.0	0.38	0.61	33.7
North: Luddenham Road													
1	L2	168	1.3	168	1.3	0.119	8.1	LOS A	0.7	5.1	0.43	0.61	56.6
2	T1	227	3.7	227	3.7	0.172	7.1	LOS A	0.8	5.9	0.46	0.66	62.4
Approach		396	2.7	396	2.7	0.172	7.5	LOS A	0.8	5.9	0.44	0.64	59.6
West: Elizabeth Drive													
4	L2	74	2.9	74	2.9	0.040	7.0	LOS A	0.0	0.0	0.00	0.63	73.7
5	T1	207	10.7	207	10.7	0.114	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		281	8.6	281	8.6	0.114	1.9	NA	0.0	0.0	0.00	0.17	78.3
All Vehicles		804	4.8	804	4.8	0.172	5.2	NA	0.8	5.9	0.28	0.47	70.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

Site: 107a [FU PM Weekday Luddenham Road and Elizabeth Drive with Storage]

Luddenham Road and Elizabeth Drive with Storage
Future Scenario
PM Wednesday
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:20:28 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 106b [FU PM Weekday Luddenham Rd and Mamre Rd with Median Storage]

Network: N102 [Network PM EX + DEV]

Luddenham Road and Mamre Road with Storage
Exisitng Site
PM Peak Period
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

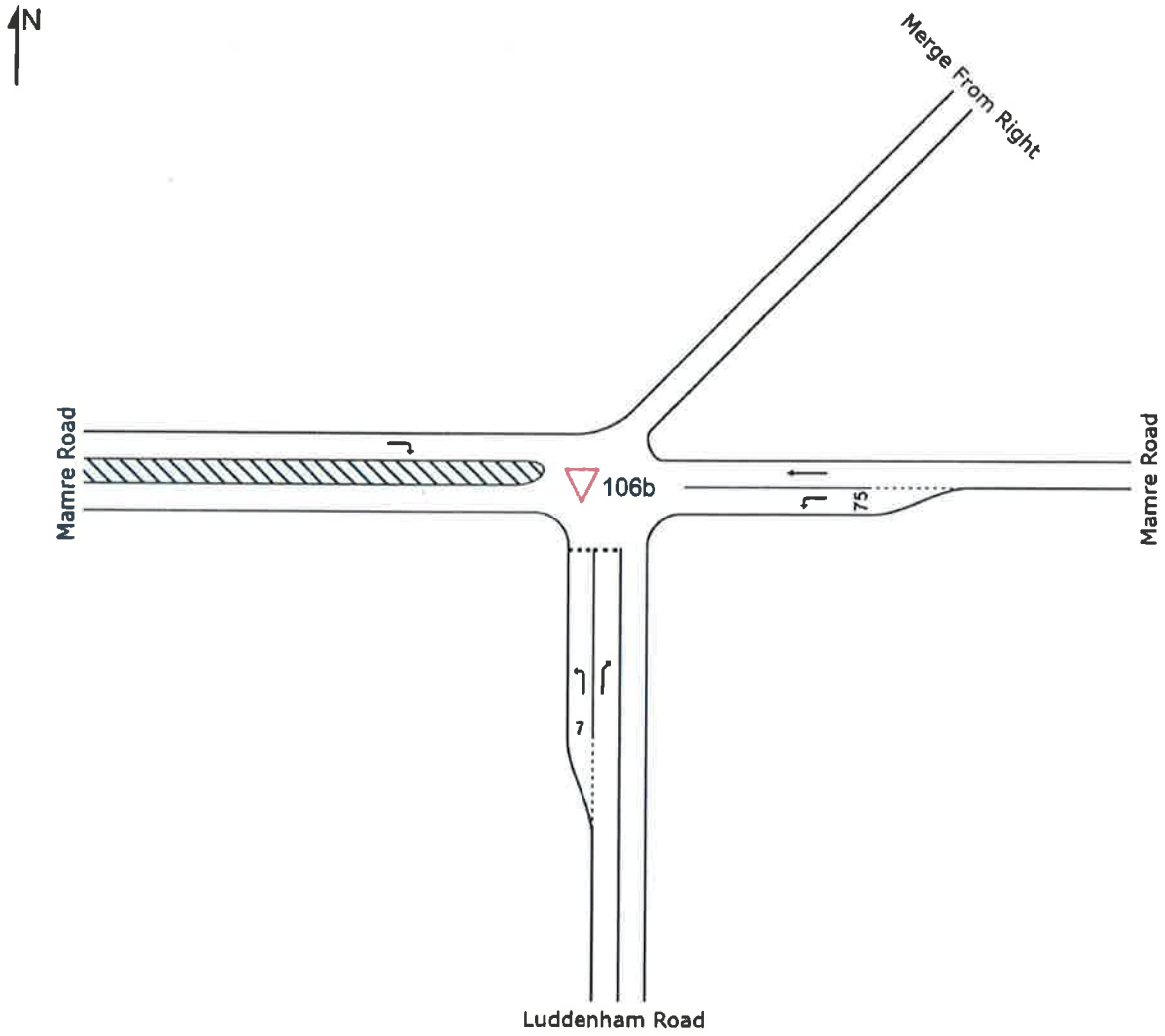
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
1	L2	273	2.6	273	2.6	0.514	19.6	LOS B	3.4	24.4	0.85	1.06	49.6
32a	R1	65	3.2	65	3.2	0.119	10.3	LOS A	0.3	1.9	0.66	0.86	61.0
Approach		338	2.7	338	2.7	0.514	17.8	LOS B	3.4	24.4	0.81	1.03	51.2
East: Mamre Road													
4	L2	172	1.7	172	1.7	0.094	7.0	LOS A	0.0	0.0	0.00	0.63	48.3
5	T1	859	5.5	859	5.5	0.456	0.0	LOS A	0.0	0.0	0.00	0.00	79.8
Approach		1031	4.8	1031	4.8	0.456	1.2	NA	0.0	0.0	0.00	0.11	74.2
West: Mamre Road													
12	R2	752	4.1	752	4.1	0.785	12.8	LOS A	5.8	42.3	0.84	1.21	26.8
Approach		752	4.1	752	4.1	0.785	12.8	NA	5.8	42.3	0.84	1.21	26.8
All Vehicles		**2121**	**4.2**	**2121**	**4.2**	**0.785**	**8.0**	**NA**	**5.8**	**42.3**	**0.43**	**0.64**	**52.0**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106b [FU PM Weekday Luddenham Rd and Mamre Rd with Median Storage]

Luddenham Road and Mamre Road with Storage
Exisitng Site
PM Peak Period
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:20:43 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 107b [FU PM Weekday Elizabeth Drive and Storage Lane]

Network: N102 [Network PM EX + DEV]

Elizabeth Drive and Storage Lane
Future Scenario
PM Weekday
Giveway / Yield (Two-Way)

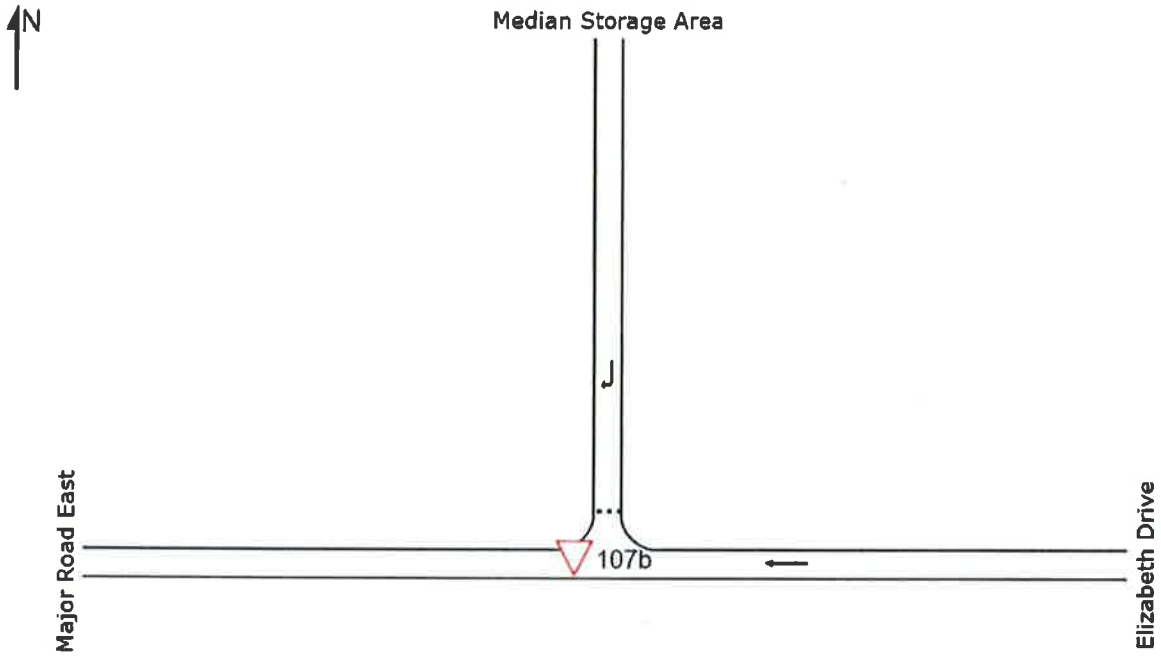
Movement Performance - Vehicles													
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
11	T1	483	8.5	483	8.5	0.261	0.1	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		483	8.5	483	8.5	0.261	0.1	NA	0.0	0.0	0.00	0.00	79.9
North: Median Storage Area													
3	R2	227	3.7	227	3.7	0.230	3.5	LOS A	0.8	4.5	0.45	0.67	18.3
Approach		227	3.7	227	3.7	0.230	3.5	LOS A	0.8	4.5	0.45	0.67	18.3
All Vehicles		711	7.0	711	7.0	0.261	1.1	NA	0.8	4.5	0.14	0.22	78.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107b [FU PM Weekday Elizabeth Drive and Storage Lane]

Elizabeth Drive and Storage Lane
Future Scenario
PM Weekday
Giveway / Yield (Two-Way)



Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:20:36 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 106a [FU Midday Saturday Luddenham Road and Mamre Road Merge from Right]

Network: N102 [Network SAT EX + DEV]

Luddenham Road and Mamre Road Merge from Right
Future Scenario
Midday Saturday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

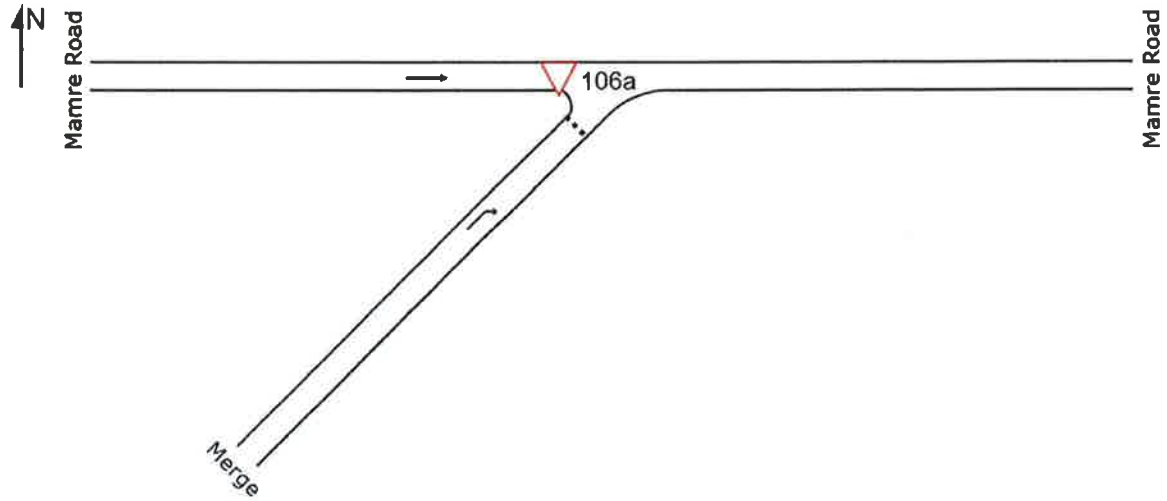
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
West: Mamre Road													
1	T1	176	1.2	176	1.2	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		176	1.2	176	1.2	0.091	0.0	NA	0.0	0.0	0.00	0.00	80.0
SouthWest: Merge													
2	R1	57	0.0	57	0.0	0.034	1.3	LOS A	0.1	0.7	0.19	0.44	66.3
Approach		57	0.0	57	0.0	0.034	1.3	LOS A	0.1	0.7	0.19	0.44	66.3
All Vehicles		**233**	**0.9**	**233**	**0.9**	**0.091**	**0.3**	**NA**	**0.1**	**0.7**	**0.05**	**0.11**	**78.5**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106a [FU Midday Saturday Luddenham Road and Mamre Road Merge from Right]

Luddenham Road and Mamre Road Merge from Right
Future Scenario
Midday Saturday
Giveway / Yield (Two-Way)



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Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

▽ Site: 107a [FU Midday Saturday Luddenham Road and Elizabeth Drive with Storage]

Network: N102 [Network SAT EX + DEV]

Luddenham Road and Elizabeth Drive with Storage
Future Scenario
PM Wednesday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

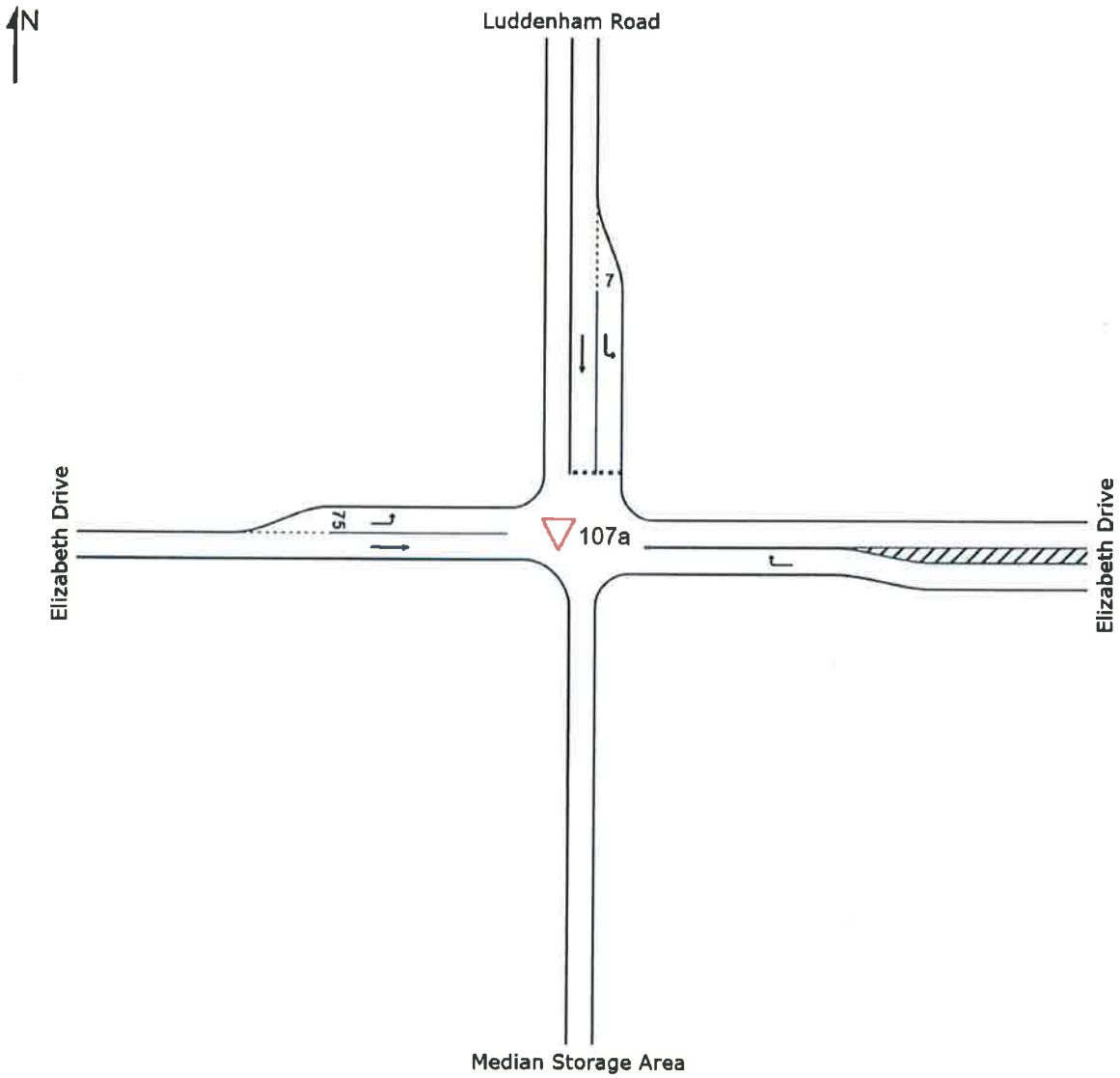
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
12	R2	104	1.0	104	1.0	0.071	5.3	LOS A	0.3	2.3	0.36	0.60	34.0
Approach		104	1.0	104	1.0	0.071	5.3	NA	0.3	2.3	0.36	0.60	34.0
North: Luddenham Road													
1	L2	101	2.1	101	2.1	0.070	8.0	LOS A	0.4	2.9	0.40	0.59	56.7
2	T1	85	6.2	85	6.2	0.063	6.9	LOS A	0.3	2.1	0.40	0.62	62.8
Approach		186	4.0	186	4.0	0.070	7.5	LOS A	0.4	2.9	0.40	0.60	59.2
West: Elizabeth Drive													
4	L2	68	0.0	68	0.0	0.037	7.0	LOS A	0.0	0.0	0.00	0.63	73.7
5	T1	193	8.2	193	8.2	0.104	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		261	6.0	261	6.0	0.104	1.8	NA	0.0	0.0	0.00	0.17	78.3
All Vehicles		**552**	**4.4**	**552**	**4.4**	**0.104**	**4.4**	**NA**	**0.4**	**2.9**	**0.20**	**0.39**	**72.4**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107a [FU Midday Saturday Luddenham Road and Elizabeth Drive with Storage]

Luddenham Road and Elizabeth Drive with Storage
Future Scenario
PM Wednesday
Giveway / Yield (Two-Way)



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Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

MOVEMENT SUMMARY

Site: 106b [FU Midday Saturday Luddenham Rd and Mamre Rd with Median Storage]

Network: N102 [Network SAT EX + DEV]

Luddenham Road and Mamre Road with Storage
Future Scenario
Midday Saturday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

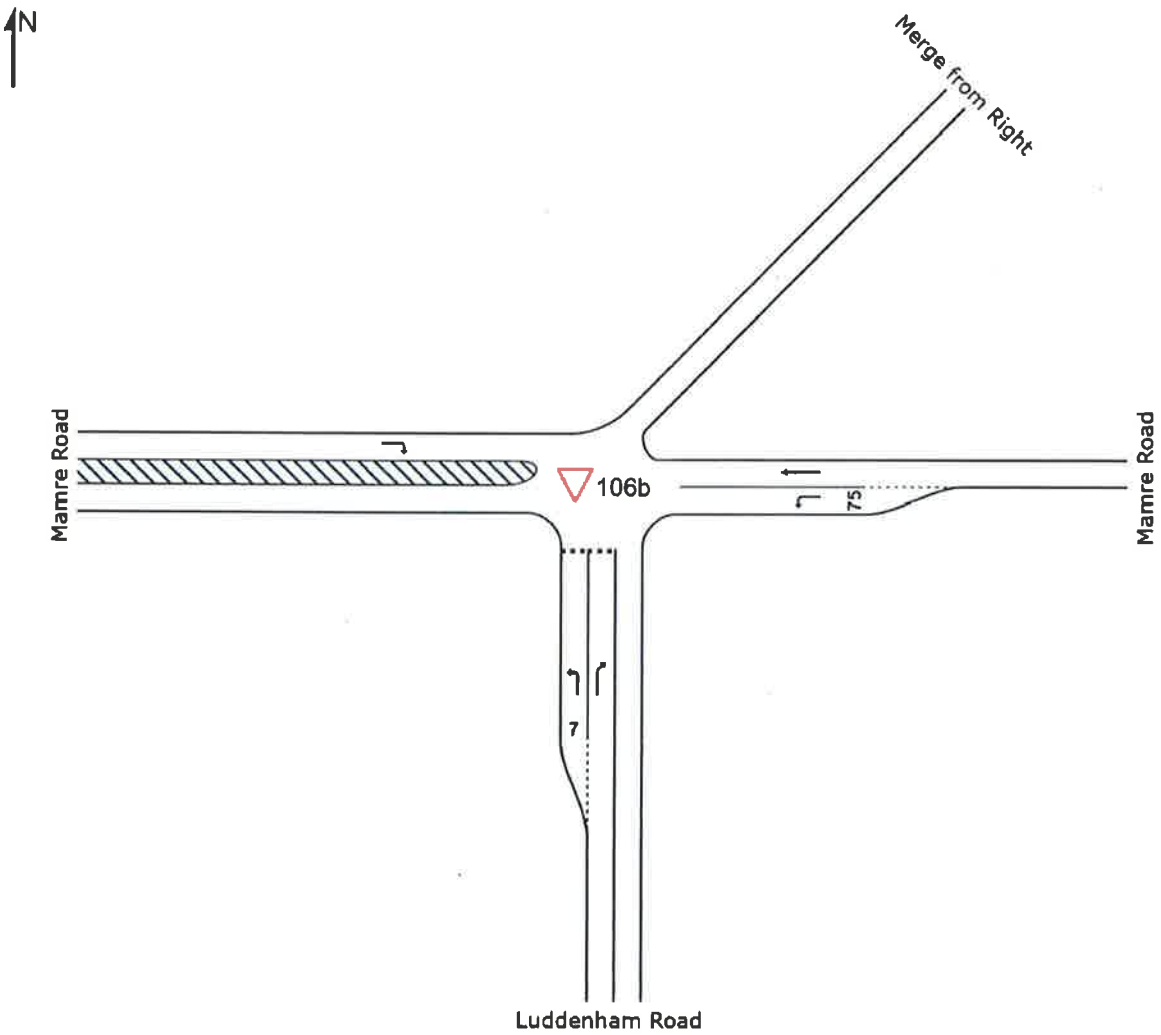
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Luddenham Road													
1	L2	211	2.0	211	2.0	0.194	9.7	LOS A	1.1	7.9	0.61	0.73	58.7
32a	R1	57	0.0	57	0.0	0.065	9.4	LOS A	0.3	1.8	0.61	0.78	62.3
Approach		267	1.6	267	1.6	0.194	9.6	LOS A	1.1	7.9	0.61	0.74	59.3
East: Mamre Road													
4	L2	66	1.6	66	1.6	0.036	7.0	LOS A	0.0	0.0	0.00	0.63	48.3
5	T1	425	4.5	425	4.5	0.224	0.0	LOS A	0.0	0.0	0.00	0.00	79.9
Approach		492	4.1	492	4.1	0.224	1.0	NA	0.0	0.0	0.00	0.09	75.0
West: Mamre Road													
12	R2	453	5.1	453	5.1	0.389	8.0	LOS A	2.4	17.9	0.59	0.82	31.2
Approach		453	5.1	453	5.1	0.389	8.0	NA	2.4	17.9	0.59	0.82	31.2
All Vehicles		**1212**	**3.9**	**1212**	**3.9**	**0.389**	**5.5**	**NA**	**2.4**	**17.9**	**0.36**	**0.50**	**57.5**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 106b [FU Midday Saturday Luddenham Rd and Mamre Rd with Median Storage]

Luddenham Road and Mamre Road with Storage
Future Scenario
Midday Saturday
Giveway / Yield (Two-Way)



MOVEMENT SUMMARY

Site: 107b [FU Midday Saturday Elizabeth Drive and Storage Lane]

Network: N102 [Network SAT EX + DEV]

Elizabeth Drive and Storage Lane
Future Scenario
PM Weekday
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

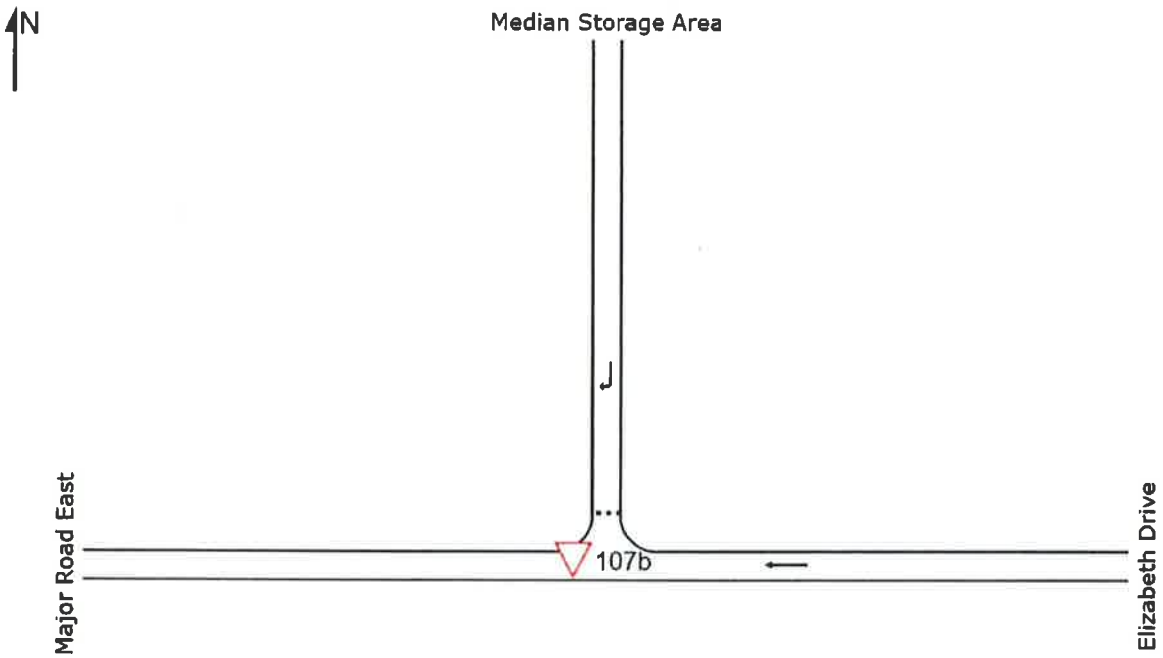
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
East: Elizabeth Drive													
11	T1	185	6.3	185	6.3	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		185	6.3	185	6.3	0.099	0.0	NA	0.0	0.0	0.00	0.00	80.0
North: Median Storage Area													
3	R2	85	6.2	85	6.2	0.069	2.2	LOS A	0.2	1.3	0.24	0.49	26.5
Approach		85	6.2	85	6.2	0.069	2.2	LOS A	0.2	1.3	0.24	0.49	26.5
All Vehicles		**271**	**6.2**	**271**	**6.2**	**0.099**	**0.7**	**NA**	**0.2**	**1.3**	**0.08**	**0.15**	**78.6**

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network 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.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 0.0 %
Number of Iterations: 5 (maximum specified: 10)

SITE LAYOUT

▽ Site: 107b [FU Midday Saturday Elizabeth Drive and Storage Lane]

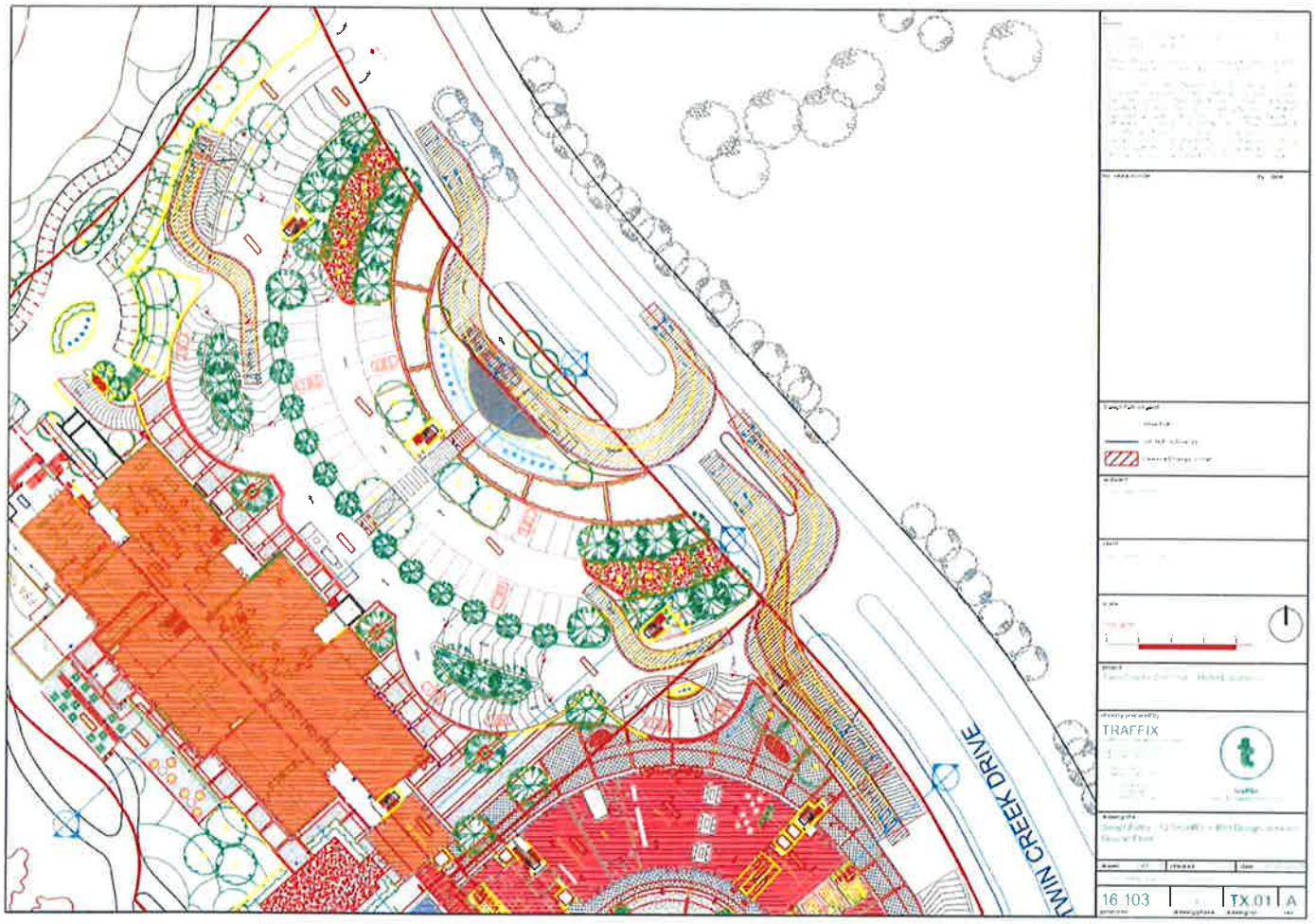
Elizabeth Drive and Storage Lane
Future Scenario
PM Weekday
Giveway / Yield (Two-Way)



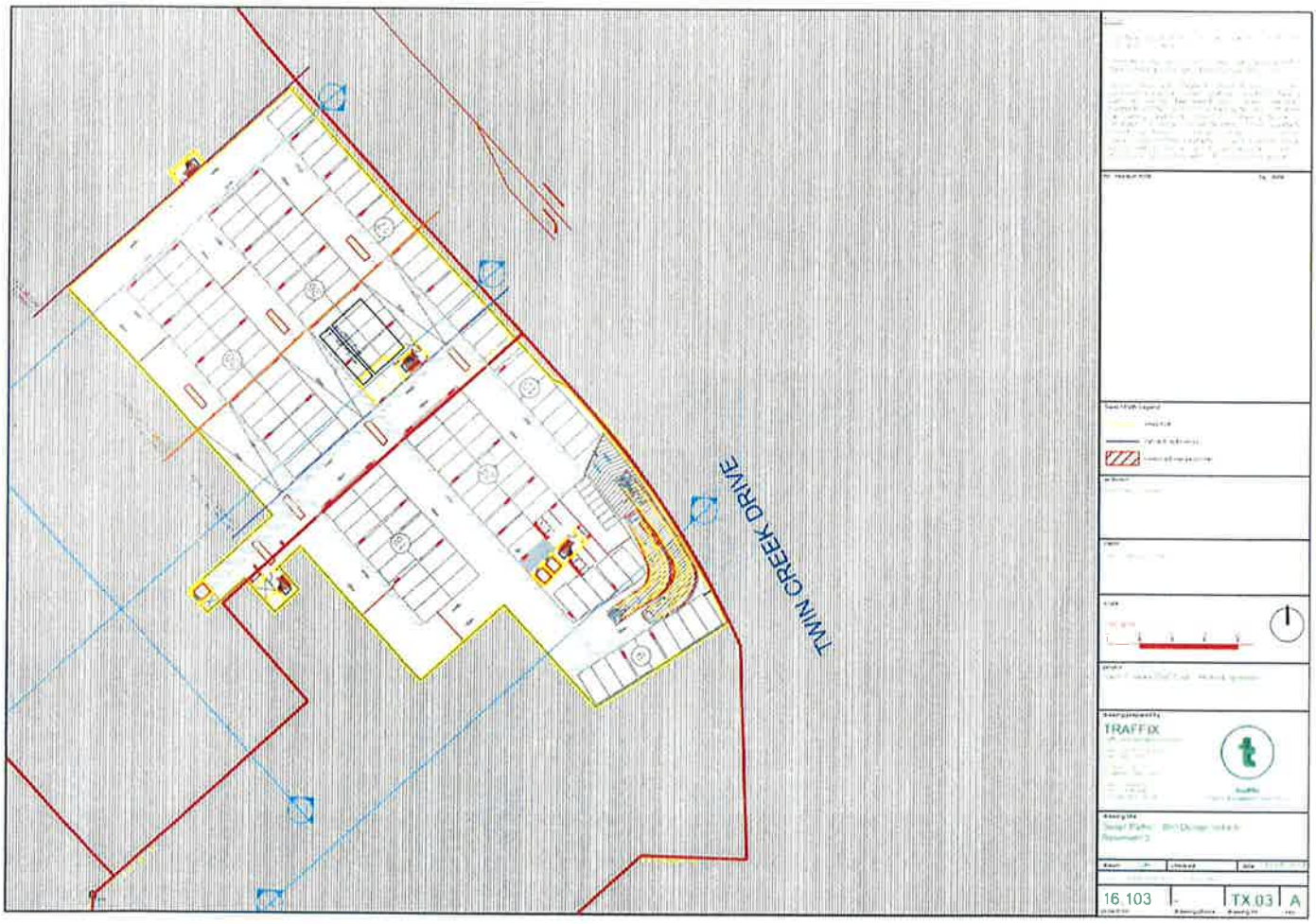
Organisation: TRAFFIX PTY LTD | Created: Friday, 26 May 2017 5:18:16 PM
Project: \\192.168.3.1\tdata\Synergy\Projects\16\16.103\Modelling\modelling\16.103s02v03 NETWORK.sip7

Appendix E

Swept Path Assessment


TWIN CREEK DRIVE
TRAFFIX
16.103
TX 01
A


TWIN CREEK DRIVE
EEK DRIVE
TRAFFIX
16 103
TX.02
A


TWIN CREEK DRIVE
TRAFFIX
16.103
TX.03
A