

HOPETOUN PARK NORTH

RESIDENTIAL PRECINCT DEVELOPMENT

TRAFFIC ENGINEERING REPORT



HOPETOUN PARK NORTH RESIDENTIAL PRECINCT DEVELOPMENT

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1 INTRODUCTION

SALT has been retained by Urban Land Developments to prepare a traffic engineering report that provides an overarching traffic impact assessment of works completed to date for a proposed residential precinct at Hopetoun Park North.

This revision (SALT Ref#20338TREP01F03, dated 19th April, 2022) has been prepared to include swept path assessments of B-Double and A-Triple vehicle movements at the proposed roundabout of Hopetoun Park Road and the Eastbound Western Freeway On-Ramp, and supersedes all previous revisions of the report.

The swept paths were requested by the Department of Transport in its correspondence dated 12th November, 2021 and have been inserted at **APPENDIX 2**, which has caused a renumbering of the latter appendices attached to this report.

In the course of preparing this report, the subject site and the surrounding road network have been inspected, plans and relevant information has been reviewed, and intersection analysis has been conducted using SIDRA Intersection v9.

2 PROPOSED DEVELOPMENT

The subject site includes the following properties of land and is shown in Figure 1:

- 124 Hopetoun Park Road;
- 150 Hopetoun Park Road;
- 97 Hopetoun Park Road;
- 189 Hopetoun Park Road;
- 219 Hopetoun Park Road;
- 249 Hopetoun Park Road;
- 259 Hopetoun Park Road; and
- 30 Kyle Lane.

The latest Land Budget Plan prepared by Millar Merrigan and attached in **APPENDIX 1**, shows that the total site area is 148.94 ha, comprised of the west precinct (64.72 ha) and the east precinct (84.29 ha). The west precinct is the area west of Hopetoun Park Road and the east precinct is the area east of Hopetoun Park Road. Of the total area, the net developable area is approx. 118.31 ha.

The subject site is currently zoned as Farming Zone (FZ). Directly south of the subject site is the existing Hopetoun Park estate, which is zoned as Low Density Residential Zone (LDRZ).



Figure 1 Location of subject site

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3 PREVIOUS TRAFFIC ENGINEERING ASSESSMENT

A Traffic Impact Assessment report (TIAR) was previously prepared by Cardno on March 24th, 2020, addressing the proposed Hopetoun Park residential precinct The previous report sought to support a town planning application to rezone the land and is attached in **APPENDIX 3**

The report noted that the rezoning of the land would be in line with the Bacchus Marsh Urban Design Framework, which outlined a distinct boundary for development to be contained within. The Hopetoun Park North Residential Expansion Area is included within the boundary specified by the Framework.

The report also analysed traffic generation, distribution and impact assessment. SIDRA intersection analysis aided with traffic impact assessment. In terms of traffic generation, the report noted that the proposed rezoning would be expected to generate up to 680 vehicle trips during the AM and PM peak periods, using a traffic generation rate of 0.8 vehicle movements per lot per peak hour or 8 vehicle movements per day. This equates to 6800 vehicle movements dailu.

For traffic distribution, the report contended that approximately 44% of generated traffic would be eastbound, towards Melton. Of the 44% eastbound traffic, 34% would travel via the Western Freeway and the remaining 10% would travel via the Old Western Highway. The remaining 56% of generated traffic would be westbound, to Bacchus Marsh.

It is noted that a 'Journey to Work' data analysis was conducted in the report and found that only 11% of Moorabool residents travelled to Ballarat for work. Given this statistic and the low magnitude of traffic volume that would be destined for Ballarat, the previous report found that the installation of a westbound on-ramp to the Western Freeway is not warranted.

The report concluded that the surrounding network would be "generally able to absorb the traffic generated by the proposed rezoning area" if a channelised right turn treatment would be implemented at the Hopetoun Park Road / Site Access intersection as well as if an additional right turning lane was implemented at the southern leg of the Hopetoun Park Road / Old Western Highway intersection.

4 PROGRESSION OF DEVELOPMENT PROPOSAL

The Hopetoun Park North development has progressed since Cardno prepared its Traffic Engineering report. Since that time, the project team has engaged with Regional Roads Victoria (RRV) and worked to refine traffic engineering and site access arrangements, amongst other matters. This report has been prepared in response to discussion with Council planners and engineers and is intended to capture and assess these ongoing works.

4.1 EXTERNAL INTERSECTION UPGRADES 4.1.1 WESTERN FREEWAY ON-RAMP EASTBOUND

The Hopetoun Park Road on-ramp to the Western Freeway currently incorporates channelised turn lanes and the previous traffic engineering assessment found that this would be adequate for future development. However, negotiations with Regional Roads Victoria (RRV) have resulted in the decision to install a roundabout at this intersection. Refer **APPENDIX 4** for the negotiations with RRV which led to the agreement for the roundabout.

Cardno prepared a Functional Layout Plan for a roundabout at this intersection. Given the conditions and constraints in the area, the Austroads' absolute minimum design criteria were adopted, requiring approval by RRV. The design of the roundabout incorporates a central island with a 14 metre radius and a 6 metre circulating carriageway. A 12.5m heavy rigid truck was adopted as the design vehicle (as this is a local road interchange) with a semi-trailer adopted as the checking vehicle. Review of the design prepared by Cardno indicates that it is adequate and appropriate for a roundabout in this location, and that the roundabout will be able to fit within the land boundaries without encroaching upon the bridge structure.

The Functional Layout Plan (FLP) for the roundabout, which has been approved by RRV, is attached in **APPENDIX 5**.



Additionally, the swept path diagrams of B-Double and A-Triple turning movements at the roundabout, which may occur in the unlikely scenario that Western Freeway is closed and traffic is diverted through the Hopetoun Park freeway ramps, are included at APPENDIX 2 as requested by the Department of Transport.

SALT prepared a letter on 5th October 2020, which investigated when lot numbers within new residential development would "trigger" the requirement for the new mitigating works – refer **APPENDIX 6**. As a result of the investigation, RRV has agreed to the implementation of the roundabout at the Western Freeway on–ramp prior to the development of the 250th lot in Hopetoun Park North. Refer **APPENDIX 4** for RRV agreement to construction of roundabout prior to development of 250th lot.

The construction of a new roundabout at the eastbound Western Freeway on-ramp will create a convenient and efficient travel route for traffic to and from the east. It is therefore contended that most eastbound traffic generated will be distributed to the Western Freeway on-ramp.

4.1.2 OLD WESTERN HIGHWAY INTERSECTION

At the T-intersection of Hopetoun Park Road and the Old Western Highway, Cardno has prepared an FLP, approved by RRV, which details the construction of a right and left turning lane at the Hopetoun Park Road leg in place of the existing single lane.

As a result of SALT's investigative letter on 5^{th} October 2020, RRV has agreed to the implementation of these turning lanes prior to the development of the 50^{th} lot in Hopetoun Park North.

4.1.3 WESTERN FREEWAY ON-RAMP WESTBOUND

Part of the previous report addressed whether a westbound entrance ramp was required for the Western Freeway along Hopetoun Park Road. As discussed in Section 5.5 of the report, approximately 11% of Moorabool Shire residents travel to Ballarat for work. Conservatively adopting this rate for Hopetoun Park residents would equate to 59 vehicle movements generated by the development in the AM peak hour that would utilise a westbound on-ramp. The magnitude of these volumes generated does not warrant the implementation of a westbound on-ramp.

As a result of ongoing discussions, RRV has agreed that a westbound on-ramp is not required – refer email dated Tuesday 8th December 2020 in **APPENDIX 4**.

4.1.4 INTERNAL ROADS AND INTERSECTIONS

Since the original application, works have been undertaken into reviewing cross sections for the proposed residential precinct. Millar Merrigan has prepared a Typical Internal Road Cross Sections plan – refer plan no. 21702–00–TR1 in APPENDIX 1. These cross sections have been updated in response to feedback from Council in a meeting on Tuesday 15th December 2020. Local roads will have a road reserve width of 17.3m with a 7.3m wide carriageway (back of kerb to back of kerb), with footpath on both sides. A shared path may be required on one side of some local roads to provide an off road bike connection between open space. Local roads adjoining open space may be able to have a reduced road reserve width (subject to Council approval upon review of landscape masterplan).

Internal collector roads are to have a 24m wide road reserve with an 11.7m wide carriageway (back of kerb to back of kerb), with 2.5m wide shared path on both sides.

4.1.5 HOPETOUN PARK ROAD INTERSECTIONS

Millar Merrigan has provided updated FLPs detailing the construction of basic auxiliary left and right turn lanes for the residential precinct. Refer **APPENDIX 1**, plan no. **21702E-00-F1** for the updated FLPs.

Council has agreed to retain rural characteristics of Hopetoun Park Road where possible, such as informal drainage to preserve roadside vegetation. Additionally, the applicant has agreed to resheet the section of Hopetoun Park Road that runs in a north-south direction where it abuts the future proposed development.

4.1.6 INTERNAL COLLECTOR ROADS

SALT has conducted a review of Millar Merrigan's Land Budget Plan and it has been assessed that the location of proposed future collector roads is logical and appropriate.

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5 TRAFFIC IMPACT ASSESSMENT

A revised traffic impact assessment has been prepared due to the changes outlined in the previous sections of this report. The following traffic impact assessment provides an updated traffic generation and distribution discussion and uses SIDRA modelling software to analyse the traffic impacts of the development.

5.1 TRAFFIC GENERATION RATES

The Infrastructure Design Manual (IDM) provides guidance on daily traffic generate rates for residential allotments for use in road classification and road design. It also states that volume projections should be based upon accepted multipliers of existing traffic movements (measured), through traffic, and an estimate of traffic generated by proposed and future development.

Notably, the IDM recommends a daily rate for road and pavement design purposes, but does not specify a peak period generation rate, which is what is typically used for intersection capacity analysis.

In the absence of peak period guidance, SALT has referred to peak period data collected by Cardno for the existing Hopetoun Park residential subdivision. The Cardno report included assessment of the turning movements at the intersections of Hopetoun Park Road and Western Freeway and at the intersection of Hopetoun Park Road and Old Western Highway, and subsequently included peak period turning movement surveys at these intersections.

Based on the surveys undertaken by Cardno, on a typical Thursday in May 2019 outside of holidays and special events, Cardno observed existing traffic generation rates to be 0.84 vehicle movements per dwelling during the AM peak hour and 0.76 during the PM peak hour.

Given that the existing Hopetoun Park residential estate is effectively a closed system, with all access in and out via Hopetoun Park Road, and that the proposed development is expected to exhibit similar generation characteristics, the date derived from the Cardno surveys is considered to be ideal for projecting the future traffic generation of the proposal.

In addition, SALT is satisfied that the rates observed by Cardno are appropriate for use in assessing peak period development traffic generation based on:

- Surveys undertaken and presented in the RTA (RMS) Guide to Traffic Generating Developments in 2013, which are typically relied upon by traffic engineers and managers, which observed:
- Weekday average morning peak hour vehicle trips = 0.71 per dwelling in regional areas.
- Weekday average evening peak hour vehicle trips = 0.78 per dwelling in regional areas.
- VPA and traffic modellers typically adopt a rate of 0.8 vehicle movements hour per dwelling per for traffic modelling purposes. Recent examples include Sunbury South PSP and Clyde North PSP.
- Residents of low-density and comparatively remote areas such as Hopetoun Park and nearby Longforest
 are more likely to combine multiple trips into urban areas such as Bacchus Marsh and Melton. Journeys
 such as school collection and shopping trips are more likely to be combined to avoid repeat journeys
 across a single day.
- Survey data collected by Regional Roads Victoria for Hopetoun Park Road, south of Western Freeway, over three typical weekdays (Tuesday 27th to Thursday 29th in November 2018) determined daily traffic generation rates of approximately 7.71 to 8.26 vehicle movements per dwelling per day. Assuming that 10% of this traffic occurred during the AM and PM peak periods would equate to approximately 0.8 vehicle movements per hour per dwelling.

It is considered that the data observed in Cardno's surveys in 2019 is likely to be conservative when used for projecting future traffic generation for Hopetoun Park considering:

- More people currently work from home as a result of the Covid-19 pandemic and flexible working arrangements are offered and encouraged by many employers; and
- Hopetoun Park North will provide a retail offering, community room and onsite kindergarten within the precinct, which will further reduce reliance on vehicle based trips to and from external areas.



Based on the foregoing, it is considered appropriate to adopt the peak period traffic generation rates used in Cardno's assessment (0.8 vehicle movements per dwelling during each peak hour) for this assessment of peak period operating conditions at nearby key intersections.

5.2 TRAFFIC DISTRIBUTION

SALT concurs with Cardno's assumptions regarding inbound and outbound traffic generation distributions, as presented in its report (no. V190737), and has adopted these for the purposes of this assessment. Specifically, this means that 80% of traffic generated by the development will be expected to be outbound in the morning peak and 20% of traffic will be expected to be inbound. In the evening peak hour, 40% of traffic generated will be expected to be outbound and 60% of traffic will be expected to be inbound. The inbound and outbound traffic volumes expected to be generated by the development are shown in **Table 1**.

Table 1 Traffic volumes expected to be generated by the residential precinct development

Time Period	Inbound	Outbound	Total
AM Peak	136	544	680
PM Peak	442	238	680

The eastbound and westbound (and return traffic flows) traffic distribution outlined in Cardno's report (no. V190737) has been adopted for this assessment. **Table 2** details the expected peak hour external traffic distribution.

Table 2 Traffic distribution

Time Period	To/from Melton (eastbound)	To/from Bacchus Marsh (westbound)
AM Peak	44%	56%
PM Peak	44%	56%

It is noted that the Cardno report assumed that ~23% of eastbound traffic (10% of overall traffic) would travel to Melton via the Old Western Highway and the remaining 77% of eastbound traffic would travel to Melton via the Western Freeway. Since the Cardno report was prepared, RRV has agreed to the implementation of a roundabout at the intersection of Hopetoun Park Road and the Western Freeway entrance ramp. It is assumed that the construction of this roundabout will result in a much greater percentage of residents choosing to travel to and from the east via the Western Freeway. As such, it is assumed that 95% of traffic to and from the east generated by the development will travel to Melton via the Western Freeway and only 5% of traffic to and from the east will travel to Melton via the Old Western Highway. Table 3 shows these numbers in tabulated form.

Table 3 Outbound traffic travel route

Time Period	To/from Melton via Western Freeway	To/from Melton via Old Western Highway	To/from Bacchus Marsh	TOTAL
Percentage of eastbound traffic	95%	5%	N/A	100%
Percentage of overall traffic	41.8%	2.2%	56%	100%

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The updated traffic distribution in this assessment apportions a greater number of eastbound movements to the Western Freeway at the proposed roundabout intersection than to the right-turn movement at the Old Western Highway but maintains the westbound traffic distribution percentage as westbound travel must travel via the Old Western Highway.

5.3 TRAFFIC IMPACT

The future traffic impact of the Hopetoun Park North development has been assessed using SIDRA intersection analysis at the following intersections, post construction of the proposed mitigating works:

- Hopetoun Park Road / Western Freeway on-ramp; and
- Hopetoun Park Road / Old Western Highway.

SIDRA is an advanced micro-analytical traffic evaluation tool that provides estimates of capacity and performance statistics (delay, queue lengths etc) on a lane-by-lane basis. Key performance criteria include:

Degree of Saturation (DOS): This represents the ratio of traffic volume to capacity. A DOS of 1.0 or above

means that the applicable movement is at or exceeding capacity.

Level of Service (LOS): An index of the operational performance of traffic based on service measures

such as delay, degree of saturation, density and speed during a given flow period. A rough quide to approximate LOS ratings is provided in **Table 4**.

Average Delay: The average delay time that can be expected for a given movement.

95th Percentile Queue: The maximum queue length that can be expected in 95% of all observed queue

lengths during the hour.

Table 4 Level of Service Ratings

	ion Degree of Saturat	ion (DOS)		
Level of Service		Unsignalised Intersection	Signalised Intersection	Roundabout
A	Excellent	<=0.60	<=0.60	<=0.60
В	Very Good	0.60-0.70	0.60-0.70	0.60-0.70
С	Good	0.70-0.80	0.70-0.90	0.70-0.85
D	Acceptable	0.80-0.90	0.90-0.95	0.85-0.95
Е	Poor	0.90-1.00	0.95-1.00	0.95-1.00
F	Very Poor	>=1.0	>=1.0	>=1.0

It is noted that the previous report included a SIDRA assessment of the Hopetoun Park Road / Western Freeway intersection prior to the agreement with RRV for the construction of a roundabout. Additionally, the previous assessment modelled the intersection as a single T-intersection, including the entrance and exit ramp to the Western Freeway as a singular leg of the intersection.

SALT's revised SIDRA assessment has used a different methodology. Instead, two separate intersections were modelled to reflect future traffic conditions more accurately. The Hopetoun Park Road / Western Freeway entrance ramp intersection has been modelled as a roundabout and the Hopetoun Park Road / Western Freeway exit ramp intersection has been modelled as a T-intersection.

A summary of the key outputs is provided in **Table 5 - Table 10**. Refer **APPENDIX 7** for detailed SIDRA outputs, including intersection models and output summaries.



Table 5 SIDRA outputs - post-development (Hopetoun Park Road / Western Freeway exit ramp AM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
Hopetoun	Hopetoun Park Road (south)	Т	0.254	0.0	LOS A	0.0
Park Road / Western	Western	L	0.067	7.5	LOS A	1.7
Freeway exit	Freeway exit ramp (east)	R	0.038	16.5	LOS A	0.9
ramp [AM]	Hopetoun Park Road (north)	Т	0.061	0.0	LOS A	0.0

Table 6 SIDRA outputs - post-development (Hopetoun Park Road / Western Freeway exit ramp PM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
Hopetoun	Hopetoun Park Road (south)	Т	0.109	0.0	LOS A	0.0
Park Road / Western	Western	L	0.302	9.7	LOS A	9.2
Freeway exit	Freeway exit ramp (east)	R	0.087	15.4	LOS A	2.1
ramp [PM]	Hopetoun Park Road (north)	Т	0.190	0.0	LOS A	0.0

Table 7 SIDRA outputs - post-development (Hopetoun Park Road / Western Freeway roundabout AM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
Hopetoun	Hopetoun	L	0.258	7.1	LOS A	10.5
Park Road / Western	Park Road (north)	Т	0.258	7.4	LOS A	10.5
Freeway	Hopetoun	Т	0.451	5.7	LOS A	0
roundabout Park Road (south)	R	0.451	11.4	LOS A	0	

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Table 8 SIDRA outputs - post-development (Hopetoun Park Road / Western Freeway roundabout PM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
Hopetoun	Hopetoun	L	0.419	6.2	LOS A	20.4
Park Road / Western	Park Road (north)	Т	0.419	6.6	LOS A	20.4
Freeway roundabout	Hopetoun	Т	0.195	5.7	LOS A	0
LULIDUSDOLIE I '	Park Road (south)	R	0.195	11.4	LOS A	0

Table 9 SIDRA outputs - post-development (Hopetoun Park Road / Old Western Highway AM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
	Old Western	L	0.009	7.0	LOS A	0.0
Hopetoun	Highway Hopetoun (south-east)	Т	0.057	0.0	LOS A	0.0
Park Road /	Old Western	Т	0.071	0.0	LOS A	0.0
Old Western Highway	Highway (north-west)	R	0.261	8.4	LOS A	8.9
[AM]	[AM] Hopetoun Park Road (south-west)	L	0.386	9.1	LOS A	14.3
		R	0.152	24.4	LOS A	3.8

Table 10 SIDRA outputs - post-development (Hopetoun Park Road / Old Western Highway PM)

Intersection	Leg	Movement	Degree of Saturation (DOS)	Average Delay (S)	Level of Service (LOS)	95% Back of Queue (metres)
	Old Western	L	0.022	7.0	LOS A	0.0
Hopetoun	Highway (south-east)	T	0.059	0.0	LOS A	0.0
Park Road /	Old Western	Т	0.110	0.0	LOS A	0.0
Old Western Highway	Highway (north-west)	R	0.486	9.6	LOS A	27.0
[AM]	Hopetoun	L	0.173	8.9	LOS A	5.1
	Park Road (south-west)	R	0.388	66.5	LOS A	9.3

As can be seen from the SIDRA outputs in **Table 5 – Table 10** all legs of all intersections will operate with LOS A and appropriate saturations, queues and delays. The analysis demonstrates results that are equivalent or better than those obtained in the previous Cardno assessment, predominantly due to the more attractive and higher capacity intersection created by the roundabout at the entrance to the Hopetoun Park Road Freeway on ramp.

It is therefore concluded that post development and construction of the proposed mitigating works, all affected intersections will continue to operate in a convenient, safe, and efficient manner.



6 SUMMARY

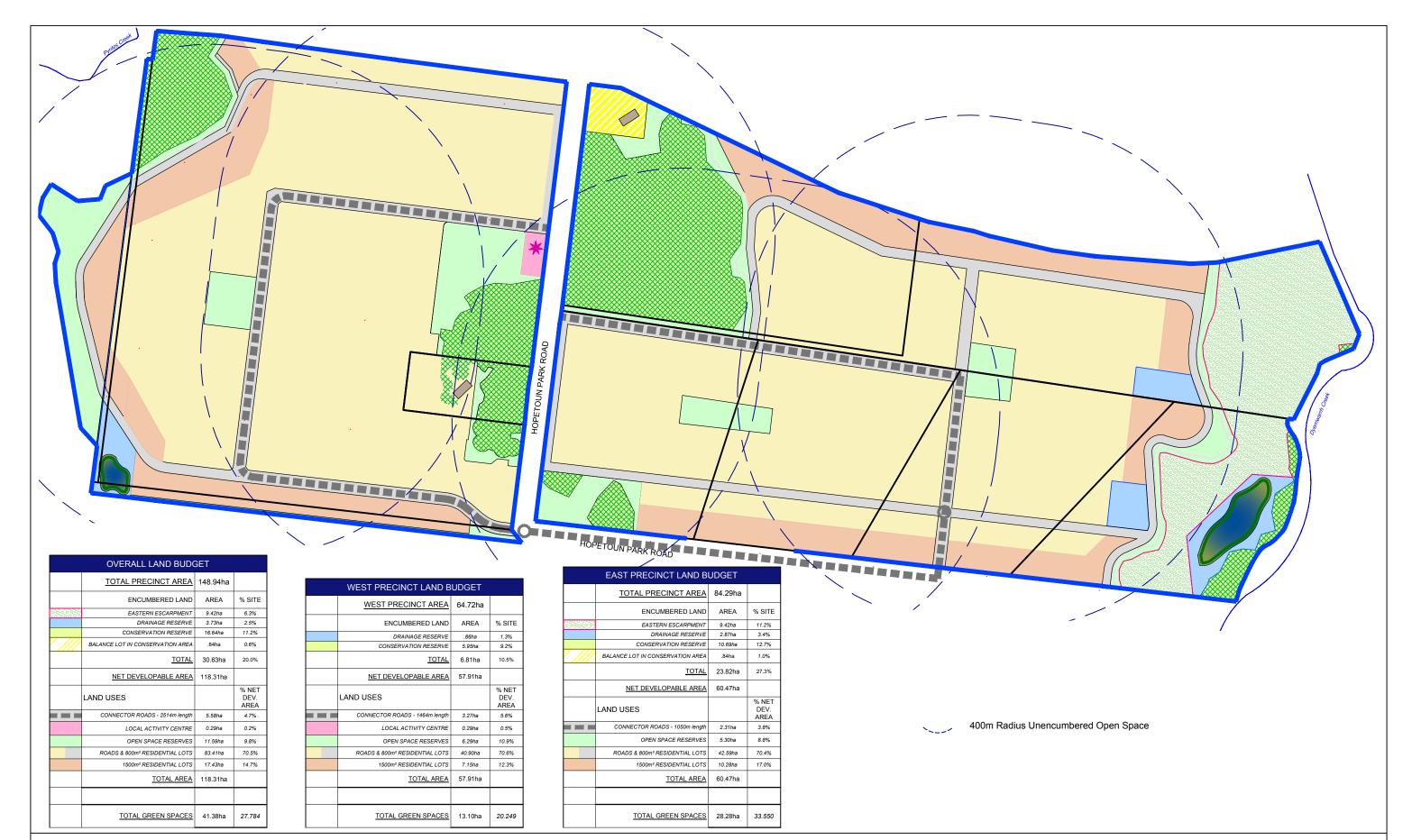
Based on the assessment provided in this report, it is concluded that:

- The proposal is for a residential development comprising approximately 850 lots on the subject site in Hopetoun Park North;
- A Traffic Impact Assessment report previously prepared by Cardno found that the development and associated mitigating traffic works were satisfactory from a traffic engineering perspective;
- Since the former Cardno assessment was completed, there has been progression on various aspects of the proposal, including;
 - The outcomes of discussion with Regional Roads Victoria have determined that a roundabout will be constructed at the Hopetoun Park Road / Western Freeway entry ramp intersection and an additional turn lane will be constructed at the Hopetoun Park Road leg at the Hopetoun Park Road / Old Western Highway intersection;
 - RRV has agreed that a westbound entry ramp to the Western Freeway is not required to support the development, given the relatively minor traffic volumes that would use the westbound entry ramp;
 - Millar Merrigan has developed updated Internal Road Cross Sections for the residential development, including local road widths of 17.30m and collector road widths of 24m. This has been agreed to by Council;
- SALT has reviewed the location of proposed internal collector roads and found them to be logical and satisfactory;
- SALT has provided a revised traffic impact assessment, given that the agreed mitigating works have been proposed and confirmed since the preparation of Cardno's traffic engineering assessment;
- In line with the previous Traffic Impact Assessment, it is expected that the proposed residential development will generate approximately 680 vehicle movements in each peak hour;
- The revised traffic impact assessment apportions a greater amount of traffic to and from the east via the upgraded Western Freeway entry ramp than the previous assessment did; and
- The revised SIDRA analyses demonstrates that the surrounding key intersections will have sufficient capacity to accommodate peak period traffic generated by the proposal once the approved staged mitigating works have been completed.

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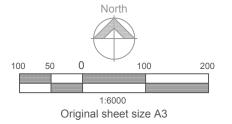
APPENDIX 1 MILLAR MERRIGAN DRAWINGS





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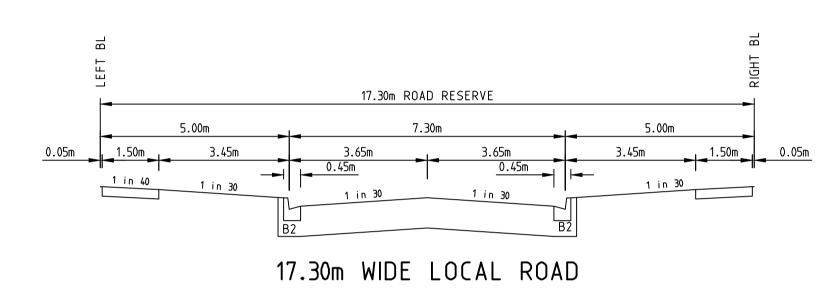
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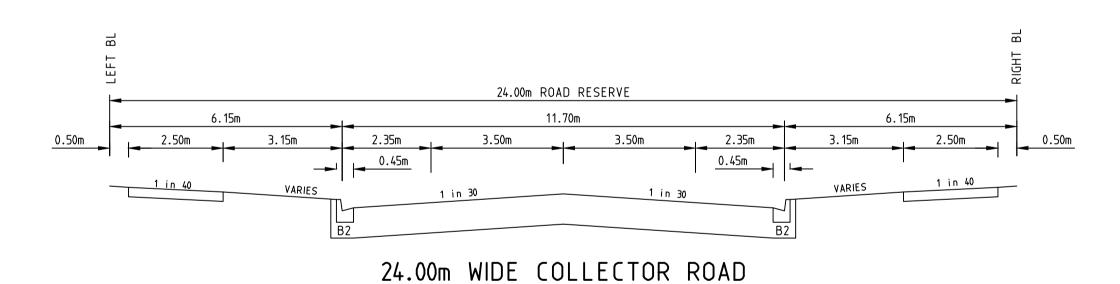
LAND BUDGET PLAN

Hopetoun Park North

Hopetoun Park Road, Hopetoun Park Moorabool Shire Council

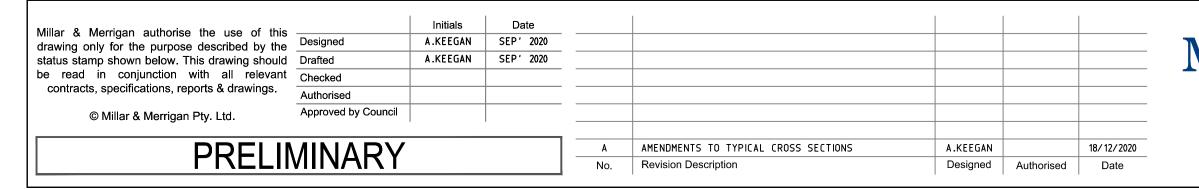
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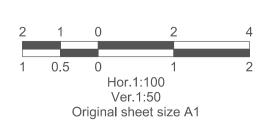
NOTES:

- 1. SHARED PATHS MAY BE REQUIRED ON ONE SIDE OF SOME LOCAL ROADS TO FACILITATE A BICYCLE CONNECTION WITHIN THE ESTATE.
- 2. FOR LOCAL ROADS ADJACENT TO PARKLANDS THE ROAD CROSS SECTION MAY BE NARROWED DUE TO THE ONE SIDED SERVICING AND THE RE-LOCATION OF THE SHARED PATH FROM THE ROAD RESERVE INTO THE PARKLAND TO MATCH THE OPEN SPACE DEVELOPMENT CONCEPTS.



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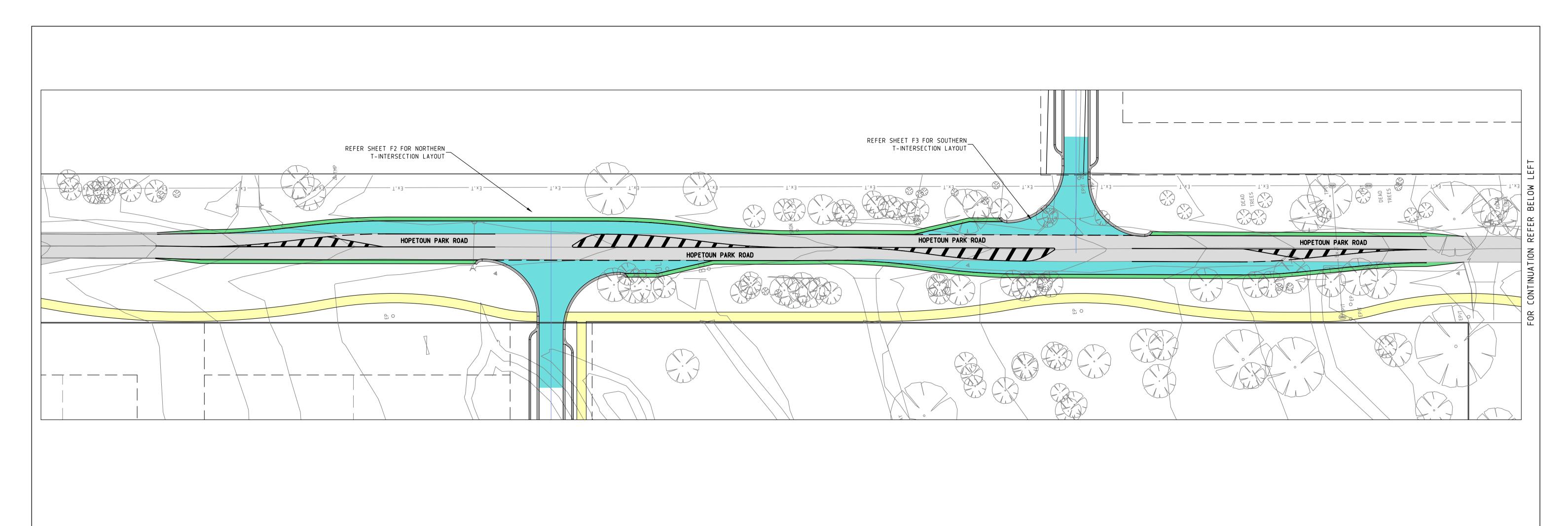


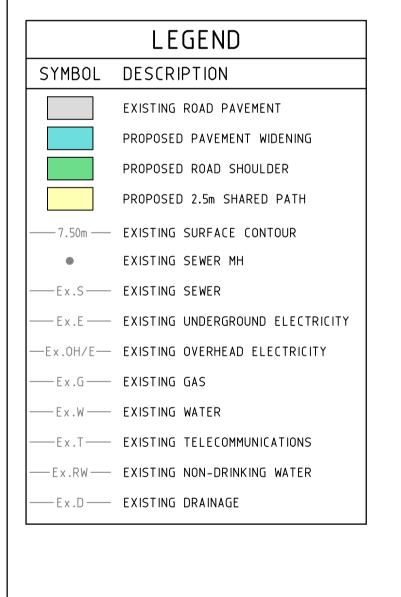
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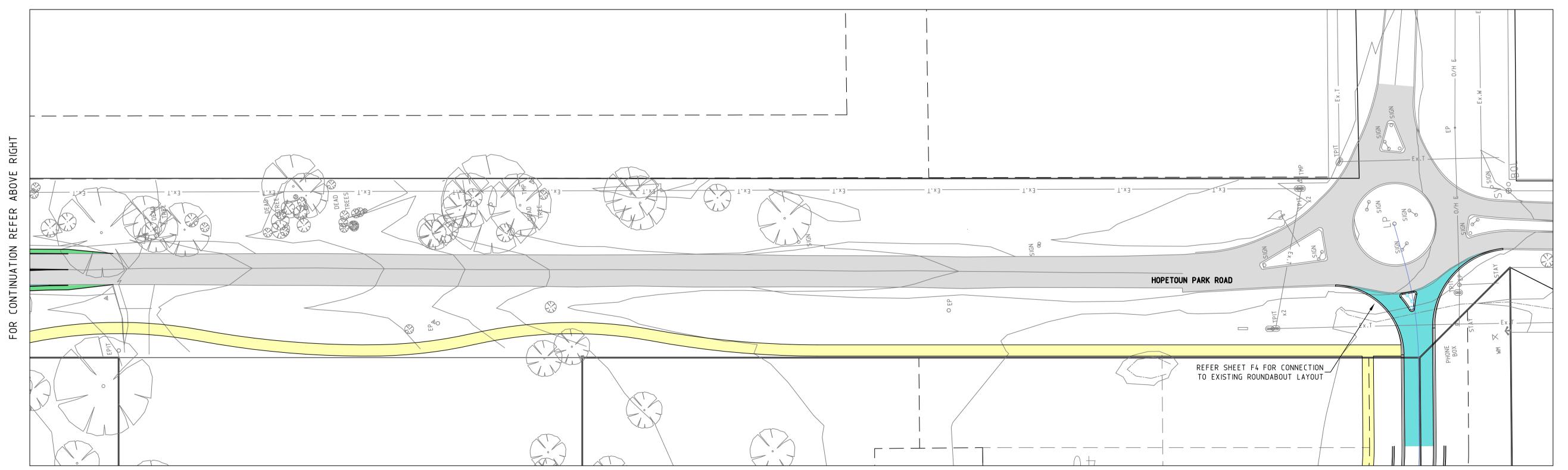
Typical Internal Road Cross Sections Hopetoun Park Road, Hopetoun Park Moorabool Shire Council

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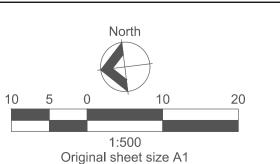


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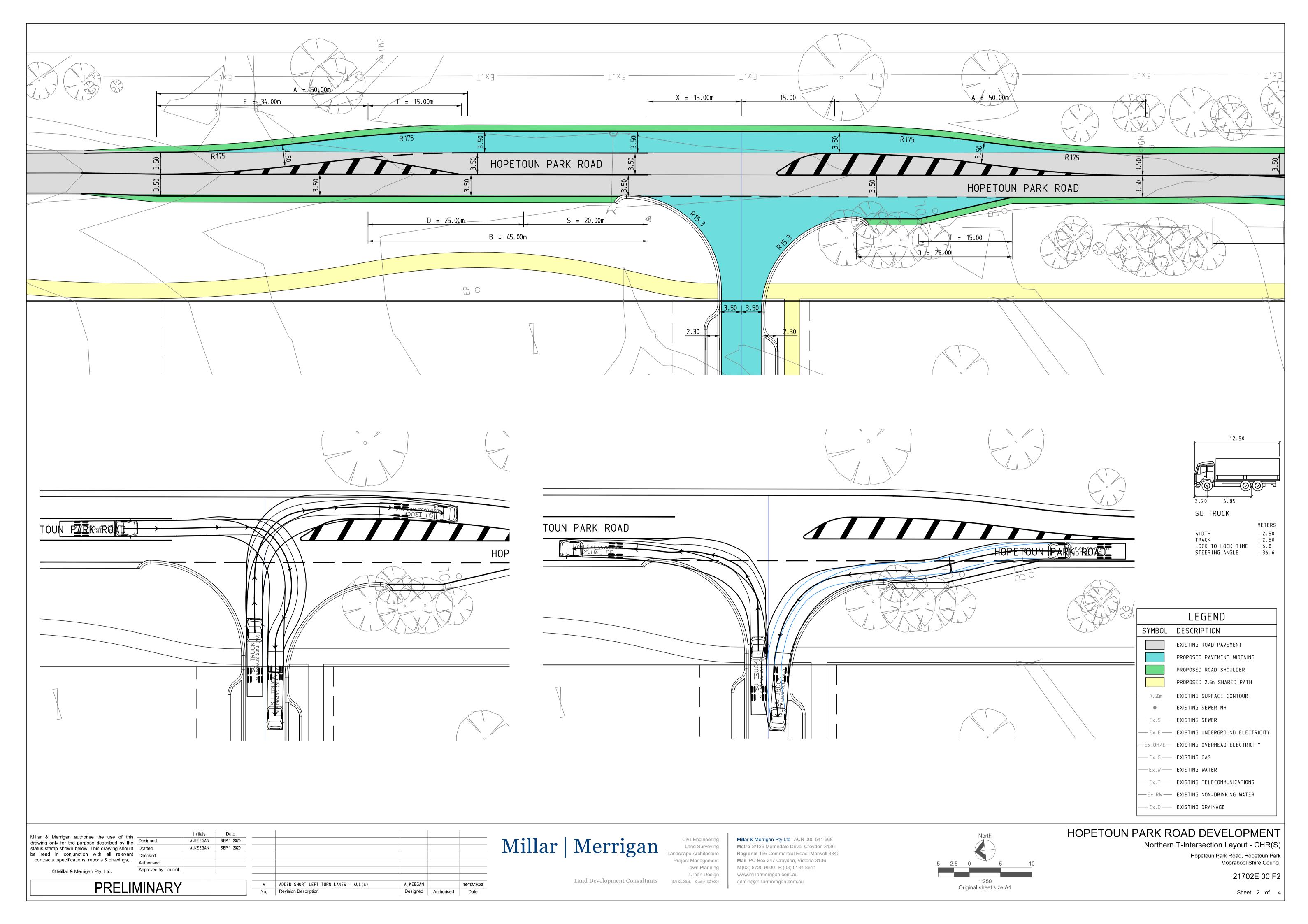


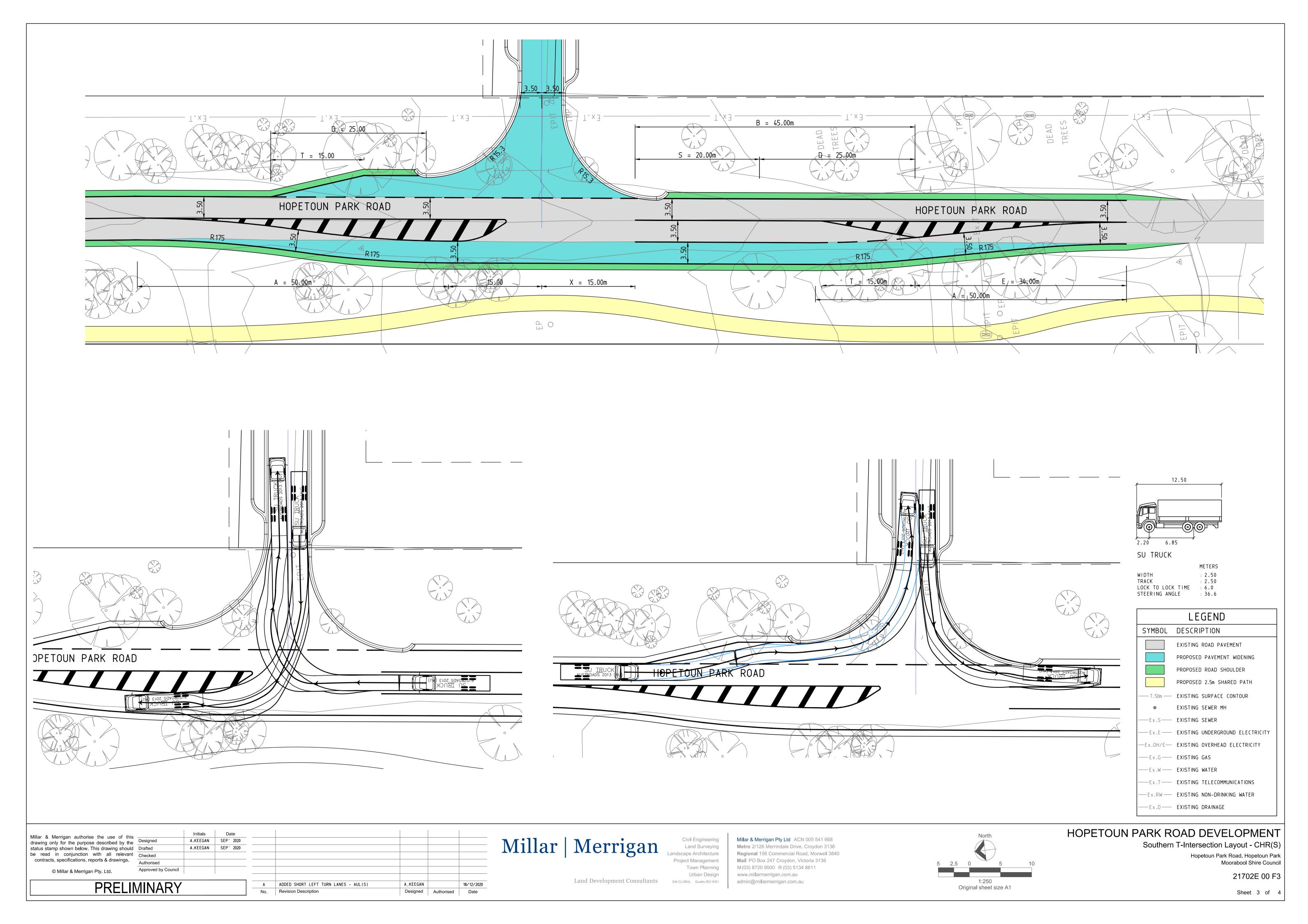
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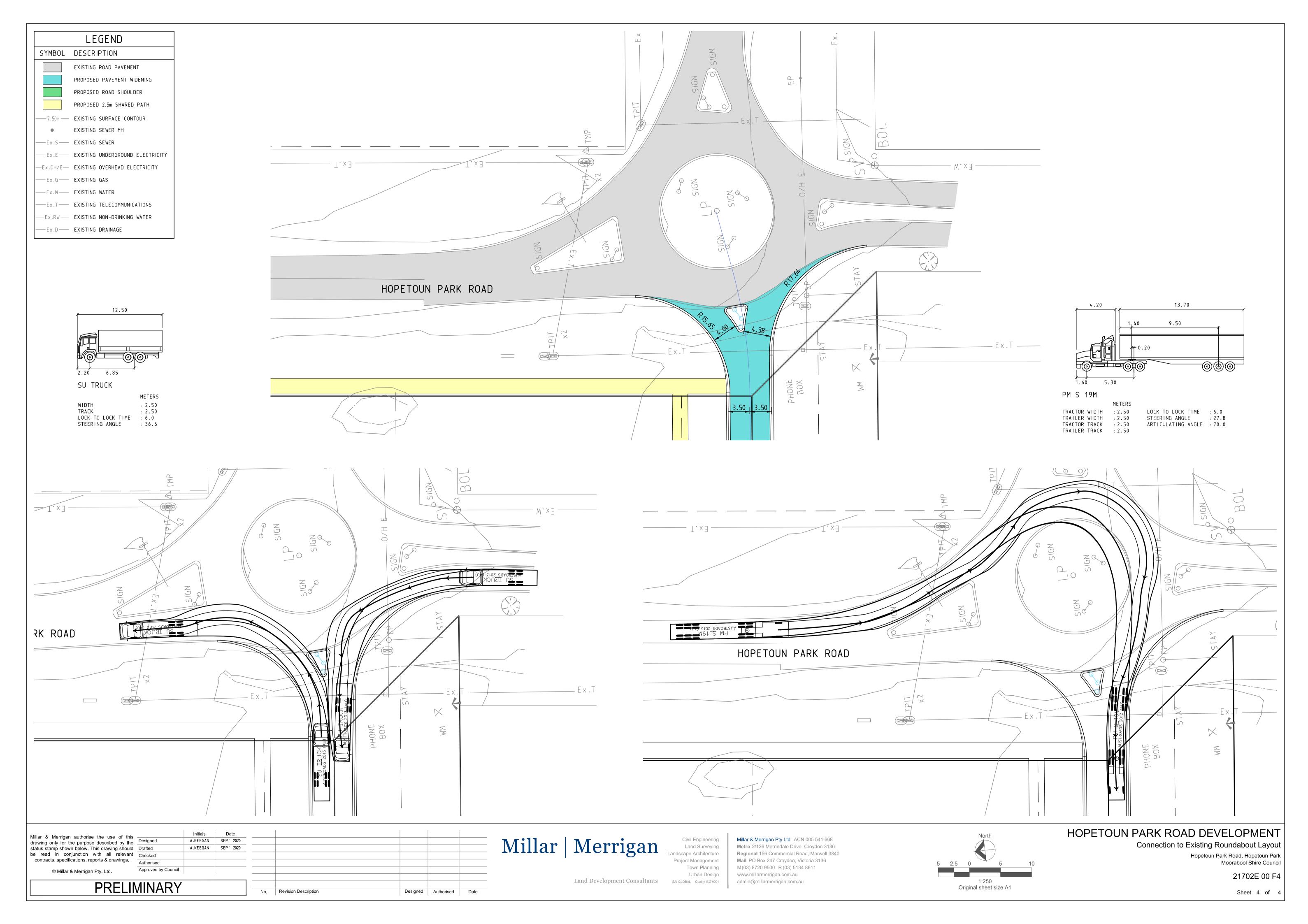
Hopetoun Park Road Layout Hopetoun Park Road, Hopetoun Park Moorabool Shire Council

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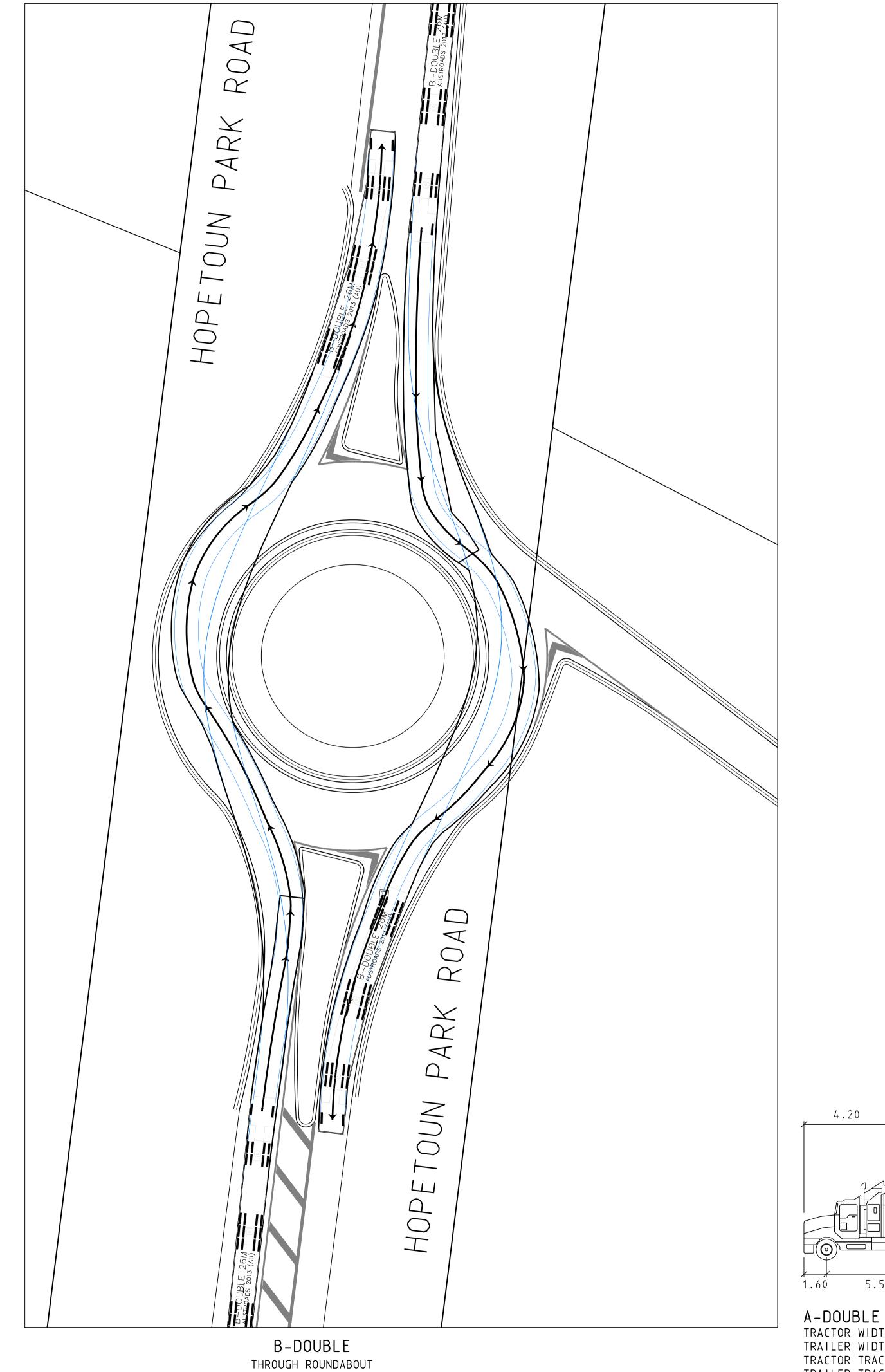




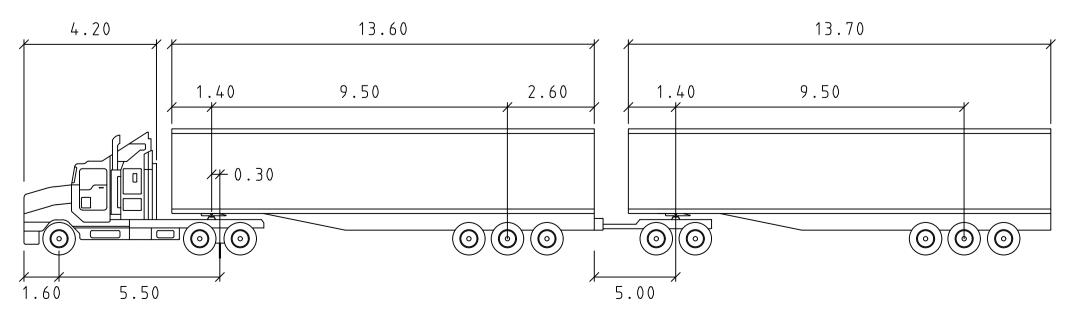


APPENDIX 2 MILLAR MERRIGAN SWEPT PATHS

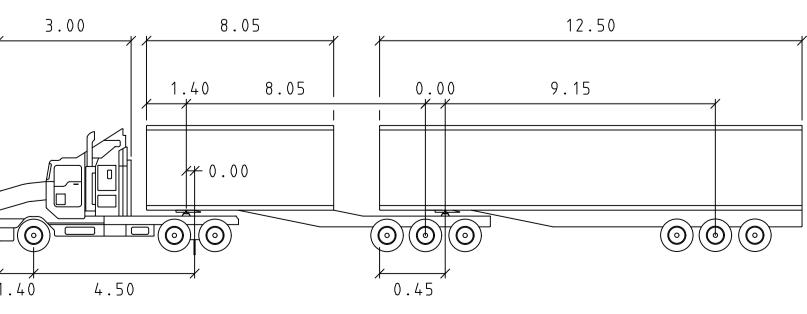




A-DOUBLE LEFT TURN ONTO HIGHWAY ON-RAMP

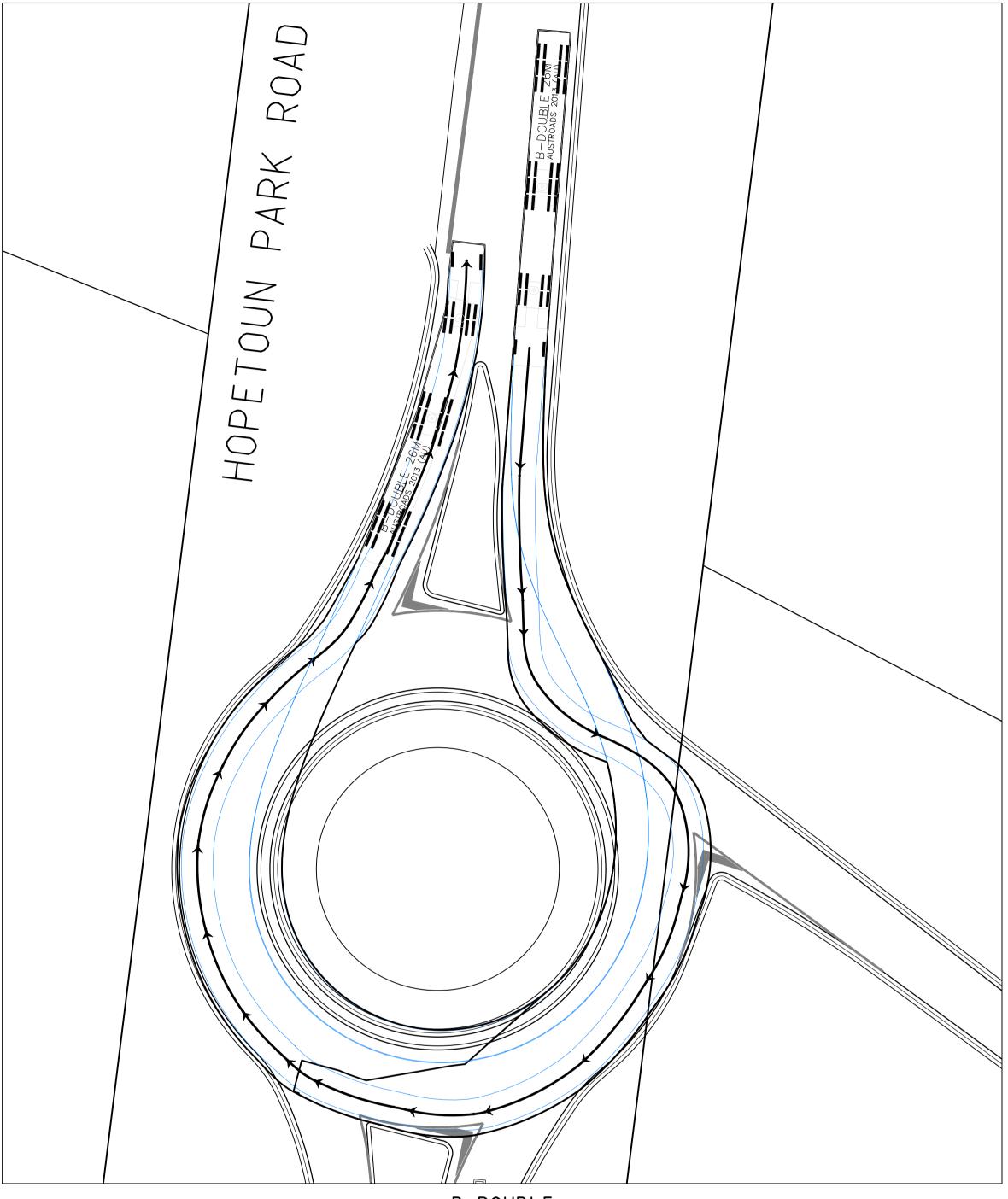


TRACTOR WIDTH : 2.50m LOCK TO LOCK TIME : 6.0
TRAILER WIDTH : 2.50m STEERING ANGLE : 23.4
TRACTOR TRACK : 2.50m ARTICULATING ANGLE : 70.0
TRAILER TRACK : 2.50m

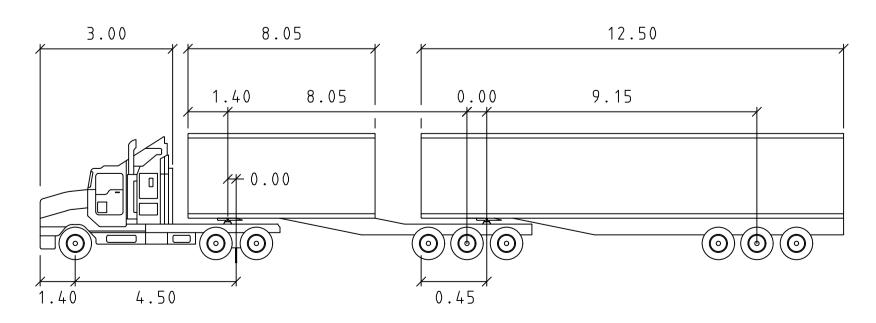


B-DOUBLE 26M

TRACTOR WIDTH : 2.50m LOCK TO LOCK TIME : 6.0 TRAILER WIDTH : 2.50m STEERING ANGLE : 23.4 TRACTOR TRACK : 2.50m ARTICULATING ANGLE : 70.0 TRAILER TRACK : 2.50m

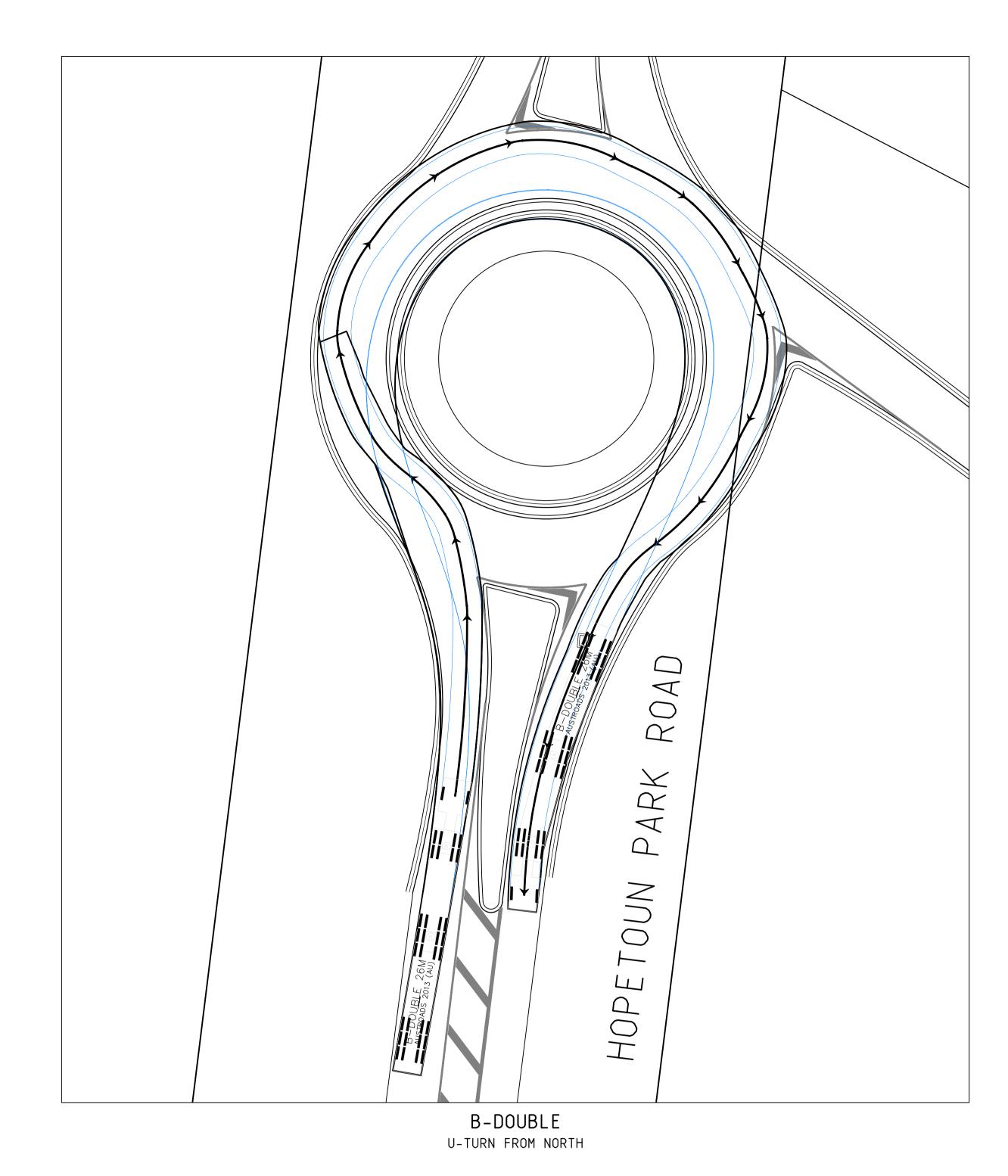


B-DOUBLE U-TURN FROM SOUTH



B-DOUBLE 26M

TRACTOR WIDTH : 2.50m LOCK TO LOCK TIME : 6.0
TRAILER WIDTH : 2.50m STEERING ANGLE : 23.4
TRACTOR TRACK : 2.50m ARTICULATING ANGLE : 70.0
TRAILER TRACK : 2.50m



APPENDIX 3 CARDNO REPORT V190737 MARCH 2020



Traffic and Transport Assessment

Hopetoun Park Rezoning

V190737

Prepared for Bacchus Marsh Proprty Group P/L

24 March 2020







Document Information

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Document Control

Version	Date	Author	Author Reviewer Initials	Reviewer Initials
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1 Introduction

Cardno was retained by Bacchus Marsh Proprty Group P/L to undertake a traffic and transport assessment of the proposed rezoning of land at Hopetoun Park Road, Hopetoun Park, currently zoned "Farming Zone" to a residential zone within Hopetoun Park.

In the course of preparing this assessment, the subject site and its environs have been inspected, preliminary plans of the development examined, and all relevant traffic and parking data collected and analysed.

2 Background

2.1 Bacchus Marsh Urban Design Framework

The Victorian Planning Authority and Moorabool Shire Council jointly prepared the *Bacchus Marsh Urban Growth Framework* (UGF), which was approved by the Minister for Planning in November 2018. The framework identifies new areas for jobs, housing and infrastructure, while protecting valuable cultural and environmental assets. With Bacchus Marsh's population anticipated to more than double to 50,000 residents by 2041, this plan will ensure growth is logical, sequenced and holistic.

Key features of the plan include the Parwan employment precinct, to the south of the town, which is anticipated to create 1500 new agribusiness jobs. Important infrastructure upgrades, including the proposed future Parwan Train Station and the Eastern Link arterial road, will play a crucial role in facilitating travel to and from Bacchus Marsh.

The plan also includes a district boundary for Bacchus Marsh, to contain development to suitable areas.

The UGF identifies the following growth areas:

- > Merrimu Residential Growth Precinct
- > Parwan Employment Growth Precinct
- > Parwan Station Residential & Commercial Precinct
- > Hopetoun Park North Residential Expansion Area

The UGF is a strategic document to guide growth in the Bacchus Marsh area, and includes a significant transport element to establish a future strategic transport network in the district for all transport modes.

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3 Existing Conditions

3.1 Location and Land Use

The subject site is located on land at the following addresses:

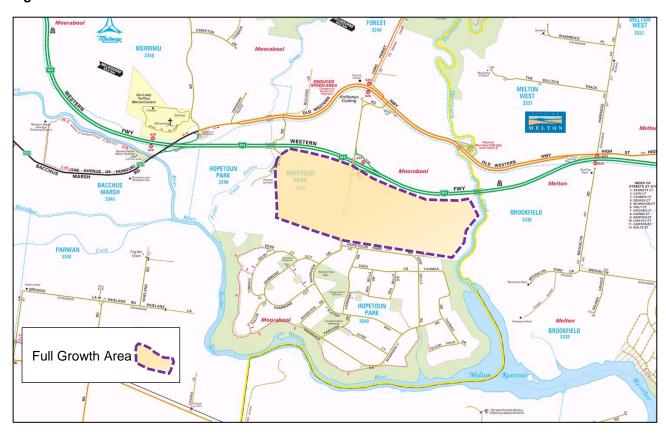
- 124 Hopetoun Park Road
- 150 Hopetoun Park Road
- 97 Hopetoun Park Road
- 189 Hopetoun Park Road
- 219 Hopetoun Park Road
- 249 Hopetoun Park Road
- 259 Hopetoun Park Road
- 30 Kyle Lane.

This parcel of land is situated adjacent Hopetoun Park Road and south of the Western Fwy, as shown in Figure 3-1. The subject area sits within the Hopetoun Park North Residential Expansion Area. The site area is approximately 146 ha and is currently within a Farming Zone as defined by the Moorabool Planning Scheme.

Hopetoun Park currently contains large acreage residential developments in the order of 260 lots ranging in size between 4,000 m² to 20,000 m². Most of the residential lots are located south of the Western Fwy, and are only accessible via Hopetoun Park Road.

The site is generally flat and undeveloped, and was previously utilised for farming purposes. Land surrounding the site is generally residential to the south with farming land to the west. The Western Freeway abuts the site at its northern boundary.

Figure 3-1 Site Location





3.2 Planning Zones

Figure 3-2 demonstrates that the subject site is located within the Farming Zone (FZ). It is proposed to rezone this area into a residential zone, noting the existing Low Density Residential Zone immediately to the south.

Figure 3-2 Planning Scheme Zones



3.3 Integrated Transport Strategy

Various road and intersection improvements have been earmarked within the *Bacchus Marsh Integrated Transport Strategy,* inclusive of:

- A planning study to set an alignment of the eastern bypass of Bacchus Marsh;
- Delivery of an Eastern Bypass/ Eastern Link Road of Bacchus Marsh;
- Investigation and implementation of capacity improvements on Grant Street, Gisborne Road and Bacchus Marsh Road.



3.4 Road Network

3.4.1 Hopetoun Park Road

Hopetoun Park Road is a local road generally running north-south between Old Western Highway in the north and Riverview Drive to the south, abutting the eastern boundary of the site, before continuing east until its termination near Djerriwarrh Creek.

It forms a half Diamond Interchange (east facing) at the Western Freeway midway along its length.

Within the vicinity of the site, Hopetoun Park Road is a sealed rural type road, as shown in Figure 3-3 with occasional sealed or gravel shoulders and direct proprty access. Hopetoun Park Road has a posted speed limit of 60km/h in the south and 80km/h to the north of the Freeway.

Figure 3-3 Hopetoun Park Road, looking north from the subject site





3.4.2 Western Freeway

Western Freeway is part of the National Highway Route 8 forming part of the Melbourne – Adelaide link. This section of Freeway opened in 2011 to replace the Anthoys Cutting section of the Western Highway

Within the vicinity of the site, Western Freeway provides for a dual carriageway separated by a wide median, inclusive of sealed shoulders. It has a posted speed limit of 110 km/h.

Western Freeway includes a half diamond interchange at Hopetoun Park Road, catering for traffic to/from Melton and Melbourne, with the on ramp shown in Figure 3-4.

Figure 3-4 Hopetoun Park Road, looking south near the Freeway on ramp





3.4.3 Old Western Highway

Old Western Highway was the former Melbourne-Adelaide Route which has now been downgraded to a local road, generally connecting Melton to Bacchus Marsh.

Within the vicinity of the site, Old Western Highway provides for two traffic lanes in each direction separated by a medain, and supplemented by auxillary left and right turn lanes at Hopetoun Park Road and Long Forest Road.

A typical cross section of Old Western Highway is shown in Figure 3-5, an aerial of the intersection of Old Western Highway / Hopetoun Park Road is shown in Figure 3-6.

Figure 3-5 Old Western Highway, looking west from Hopetoun Park Road

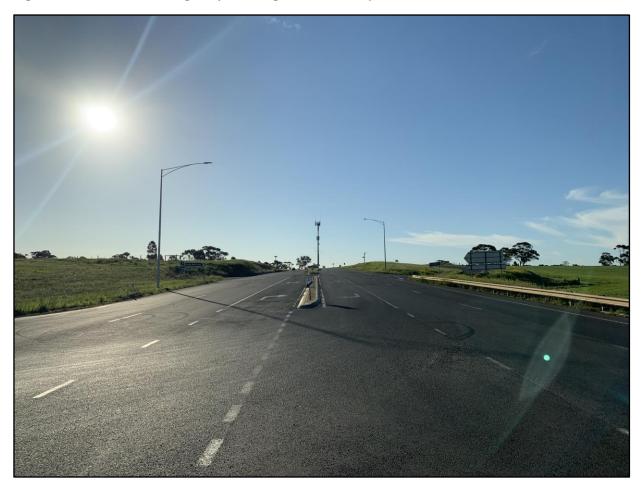




Figure 3-6 Aerial – Old Western Highway with Long Forest Road and Hopetoun Park Road





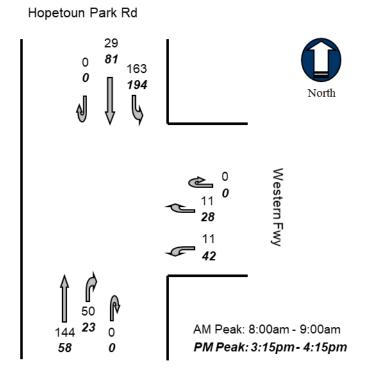
3.5 Traffic Volumes

Hopetoun Park Rd

Traffic movement counts for the Hopetoun Park exit ramp and entry, and Hopetoun Park Rd / Old Western Hwy intersection were undertaken in order to estimate the current traffic generated by the existing residential lots and establish current traffic volumes utilising the ramps and intersection on a typical weekday. The surveys were undertaken on Thursday 30th May 2019, between 6:30am and 9:30am, and between 3:00pm and 6:30pm.

The peak hour results of the surveys are shown in Figure 3-7 and Figure 3-8.

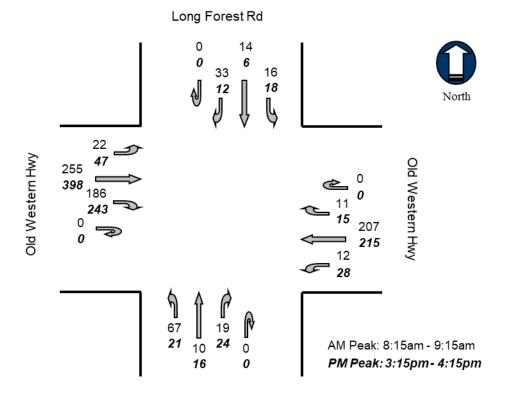
Figure 3-7 Existing Traffic Volumes - Hopetoun Park Road / Western Freeway



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Figure 3-8 Existing Traffic Volumes – Hopetoun Park Road / Old Western Highway



Hopetoun Park Rd



4 Proposed Development

4.1 General

It is proposed to rezone the growth area to a residential zone with a lot yield of approximately 850 lots, as well as a number of open space reserves and water basins.

4.2 Vehicle and Pedestrian Access

Access to the site from the surrounding road network is to be provided via access points along Hopetoun Park Road at trunk connector streets.

The development is to include road shoulder sealing to keep the rural characteristics of this road (as opposed of kerb and channel which are urban characteristics) adjacent the sites boundary to Hopetoun Park Road. No parking is proposed along Hopetoun Park Road.

The width associated with traffic and parking along Hopetoun Park Road is to be confirmed at the detailed design stage.

Pedestrian paths are should be provided along Hopetoun Park Road, given the current lack of connectivity to any facilities in the north and south. It is of note that a footpath forms on the eastern side of the bridge over Western Freeway and therefore future pedestrian paths would be better suited to the eastern side of Hopetoun Park Road.

4.3 Internal Road Network

It is proposed that Hopetoun Park Road will retain its rural character and all properties will be accessed from an internal road network, with a loop road providing an interface with Hopetoun Park Road. Any access point will form T-intersections with Hopetoun Park Road, with a channelised right turn installed from the north.

The road network for the subdivision is recommneded to comprise of Access Streets and a Connector Road. The indicative road hierarchy proposed road cross sections are shown in Table 4-1. The internal access street for the residential subdivision is recommended to be designed generally in accordance with the requirements Clause 56 of the Moorabool Planning Scheme and/or the Infrastructure Design Manual. The site will provide a number of connections for pedestrians and cyclists, additional to the road connections.

Table 4-1 Internal Road Network Street Types

Туре	Road Reserve	Indicative Capacity	Carriageway	Cyclists / Pedestrians
Level 2 Access Street (Adjacent	13.5m	2,000-3,000 vpd	7.3m	1 x 1.5m wide footpath within road reserve
Open Space)				1 x 1.5m wide footpath within open space
Level 2 Access Street	16.0m	2,000-3,000 vpd	7.3m	2 x 1.5m wide footpath
Level 1 Connector Street	20.0m-24.0m	3,000 vpd-7,000vpd	3.5m lane in each direction plus parking lane	1 x 2.5m wide shared path 1 x 1.5m footpath



5 Traffic Considerations

5.1 Traffic Generation

Traffic generation rates associated with standard density residential subdivisions are generally accepted to fall within the range 8 to 10 vehicle movements per dwelling per day. Factors affecting these rates are proximity to schools, shops, public transport nodes and other community services.

Based on the traffic movement counts and the number of existing residential lots on the southern side of Western Fwy, the current traffic generation rates are estimated to be 0.84 per dwelling during AM peak hour and 0.76 during PM peak hour. For the purposes of the assessment, a traffic generation rate of 0.8 per dwelling or 8 vehicle movements per lot per day will be adopted.

Traffic distribution for residential subdivisions is typically 70% outbound in the morning peak, and 60% inbound in the afternoon peak. Based on the traffic movement counts, the traffic distribution of the existing residential subdivision is 80% outbound in the morning peak and 65% inbound in the afternoon peak. The increase in outbound traffic in the morning peak is mainly attributed to the subdivision's reliance on private motor vehicles for transport due to the lack of public transport services. It is foreseen that the size of the proposed residential development is insufficient to support either significant community infrastructure or provision of public transport. As such, it is presumed that the traffic distribution of the future residential development would be similar to the existing traffic distribution.

Based upon the above assumptions, it is anticipated that the entire Hopetoun Park North growth area will generate traffic shown in Table 5-1.

Table 5-1 Development Traffic Generation

Period	Inbound	Outbound	Total
AM Peak	136	544	680
PM Peak	442	238	680
24 Hour	3,400	3,400	6,800

5.2 Traffic Distribution

The off-site traffic distribution of the development was determined by adopting the traffic distribution from the survey results and applying the percentages on the traffic generated by the future development. The peak hour traffic distribution is shown in Table 5-2.

Table 5-2 Off Site Traffic Distribution

Distribution Period	To Western Freeway (Entrance Ramp)	To Bacchus Marsh (Old Western Fwy)	To Melton (Old Western Fwy)
AM Peak	34%	56%	10%
PM Peak	34%	56%	10%

5.3 Generated Traffic Volumes

Applying the traffic distribution percentages from the survey, the anticipated traffic volumes at the intersections of the Freeway exit/entrance ramps and Old Western Hwy have been calculated. All turning movements are shown within the SIDRA results in Appendix A.



5.4 Traffic Impact

On the basis of the future peak hour turning movements, the design requirements and operation of the external intersections have been assessed using the SIDRA Intersection 7 modelling software package has been used. It is of note that it is proposed to provide an additional right turn lane on the southern leg of the Hopetoun Park Road / Old Western Highway intersection in order for right turners to not impact upon left turners at this intersection.

SIDRA Intersection is a computer package, originally developed by the Australian Road Research Board, provides information about the capacity of an intersection in terms of a range of parameters, as described below:

Degree of Saturation (D.O.S.) is the ratio of the volume of traffic observed making a particular movement compared to the maximum capacity for that movement. Various values of degree of saturation and their rating are shown in Table 5-3.

Table 5-3 Rating of Degrees of Saturation

D.O.S.	Rating
Up to 0.6	Excellent
0.6 to 0.7	Very Good
0.7 to 0.8	Good
0.8 to 0.9	Fair
0.9 to 1.0	Poor
Above 1.0	Very Poor

It is considered acceptable for some critical movements in an intersection to operate in the range of 0.9 to 1.0 during the high peak periods, reflecting actual conditions in a significant proportion of suburban signalised intersections.

The **95th Percentile (95%ile) Queue** represents the maximum queue length, in metres, that can be expected in 95% of observed queue lengths in the peak hour; and

Average Delay is the delay time, in seconds, which can be expected over all vehicles making a particular movement in the peak hour.

Adopted intersection configurations based on this analysis and summarised SIDRA results are presented in the following sections.

The on ramp access and the Hopetoun Park Drive / Old Western Highway intersection were analysed for future conditions in the AM and PM peak periods. The results of the SIDRA analysis is summarised in Table 5-4 and Table 5-5.



Table 5-4 Western Freeway Exit/Entry Ramps SIDRA Analysis Summary

	Approach	Turn	Degree of Saturation	95 th Percentile (metres)	Average Delay (sec)
	Hopetoun Park Rd /	Through (N)	0.19	0.0	0.0
	Entry Ramp	Left	0.07	5.6	7.3
AM Peak Hour		Through (S)	0.29	0.0	0.0
¥ T		Right	0.20	6.6	6.3
Pe	Hopetoun Park Rd / Exit	Through (N)	0.02	0.0	0.0
Α	Ramp	Left	0.05	1.3	5.7
		Right	0.07	1.5	24.9
		Through (S)	0.40	0.0	0.0
	Hopetoun Park Rd /	Through (N)	0.20	5.9	6.3
	Entry Ramp	Left	0.21	0.0	0.0
'n		Through (S)	0.14	0.0	0.0
¥ Ĭ		Right	0.12	3.5	7.9
PM Peak Hour	Hopetoun Park Rd / Exit	Through (N)	0.20	0.0	0.0
B	Ramp	Left	0.27	7.4	8.4
		Right	0.12	2.8	18.7
		Through (S)	0.17	0.0	0.0



Table 5-5 Hopetoun Park Rd / Old Western Hwy Intersection SIDRA Analysis Summary

	Approach	Turn	Degree of Saturation	95 th Percentile (metres)	Average Delay (sec)
	Old Western Hwy (SE)	Through	0.02	0.0	0.0
nc		Left	0.06	0.0	7.0
AM Peak Hour	Old Western Hwy (NW)	Through	0.07	0.0	0.0
Pe		Right	0.27	9.1	8.4
Ą	Hopetoun Park Rd	Left	0.39	14.4	10.0
		Right	0.37	11.1	30.6
	Old Western Hwy (SE)	Through	0.06	0.0	0.0
onr		Left	0.04	0.0	7.0
Peak Hour	Old Western Hwy (NW)	Through	0.11	0.0	0.0
		Right	0.51	30.2	10.2
₽	Hopetoun Park Rd	Left	0.17	5.1	9.3
		Right	0.70	20	103

A review of Table 5-4 shows that the exit ramp and entrance ramp intersections are expected to operate satisfactorily with minimal delays, very small queues and ample spare capacity.

A review of Table 5-5 shows that all movements at the intersection of Old Western Highway / Hopetoun Park Road operate well within capacity, with no significant queuing. It is noted that there are long delays for right turning traffic to Old Melton Highway from Hopetound Park Road. It is therefore likley that traffic will therefore be redistributed onto the freeway and use the Coburns Road exit to reach Melton rather than wait in queues.

5.5 Hopetoun Park Road Ramp

Data sourced from 'Journey to Work' indicate that approximately 11% of the Moorabool residents travel to Ballarat for work. Applying this statistic to the proposal results in 59 Ballarat bound vehicle movements in the morning peak, and 75 vehicle movements generated in total.

The SIDRA results presented in the previous section show the existing intersection at Hopetoun Park Road / Old Western Highway functioning satisfactorily. Given the volumes (approximately 1 vehicle movement per minute for Ballarat traffic), it is unlikely that there is any need for ramps to be installed on the Freeway to the west.

There is no regional significance of Hopetoun Park Road (in relation to Ballarat) given it is not identified as an arterial road nor traffic volume warrant that would require additional ramps. The inclusion of Hopetoun Park Road ramps may also affect the long proposed eastern link bypass of Bacchus Marsh due to freeway spacing requirements.



6 Road Network Considerations

Having regard to the expected traffic volumes and road functions, the following road works are recommended.

6.1 External

External works considered necessary due to the proposal is for the provision of and additional storage lane for the right turn at the Hopetoun Park Road / Old Western Highway intersection.

It is unlikely any major works on the external road network would be required as the current capacity would accommodate development traffic. Given current traffic generation and distributions, the majority of traffic will head into Bacchus Marsh and increase traffic within the town, which is a long standing issue and would not be expected to be resolved by Hopetoun Park development (noting the Bacchus Marsh Integrated Transport Strategy).

6.2 Hopetoun Park Road Frontage and Access

Based on the anticipated traffic volumes illustrated in Table 5-1, at least two road access points to the subject site are recommended to be provided to Hopetoun Park Road. The primary access point should be designed to the standard of a Level 1 Connector Street with a carriageway width of 7.0 metres plus additional parking where required.

A channelised right turning treatment (Type CHR) would likely be required at the intersection of Hopetoun Park Road and any site access point, subject to analysis of the number of lots access is provided to.

6.3 Bicycle and Pedestrian Connectivity

The Bacchus Marsh Urban Growth Framework nominates Hopetoun Park Road as "Potential/Existing Pedestrian and Cycle Network" to connect into further pedestrian/bicyle links at Old Western Highway. It is recommended that any Hopetoun Park Road shared path is located along the eastern side of the road in the vicinity of the freeway to match into the existing path at that location.

6.4 Public Transport

The lower density development outcome in Hopetoun Park North limits the community expectation for bus services. The delivery of new local-level community facilities will result in a proportion of trips being internal to the precinct and reduce the need to travel into Melton or Bacchus Marsh. It is considwered unlikely a permanent bus route will be developed through Hopetoun Park. Notwithstanding this, Hopetoun Park Road as a Connector Street width would be capable of carrying buses along the subject site frontage should a bus route ever be established.



7 Conclusions

Based on the foregoing analysis it is concluded that;

- > The proposed growth area rezoning is expected to generate up to 680 vehicles trips during the AM and PM peak periods if fully occupied;
- > To retain the rural character of Hopetoun Park Road, it is not proposed to upgrade the site frontage to urban standards;
- > The subject site is recommended to contain new channelised vehicular access points to Hopetoun Park Road;
- > The internal site layout is recommended to be designed in accordance with Clause 56 of the Moorabool Planning Scheme to provide adequately for vehicles, pedestrians and cyclist connectivity; and
- > The roads surrounding the subject site are generally able to absorb the traffic generated by the proposed rezoning area with a channelised right turn treatment warranted at the Hopetoun Park Road / Site Access intersection and an additional right turning lane at the southern leg of the Hopetoun Park Road / Old Western Highway intersection.

Hopetoun Park Rezoning

APPENDIX



SIDRA ANALYSIS



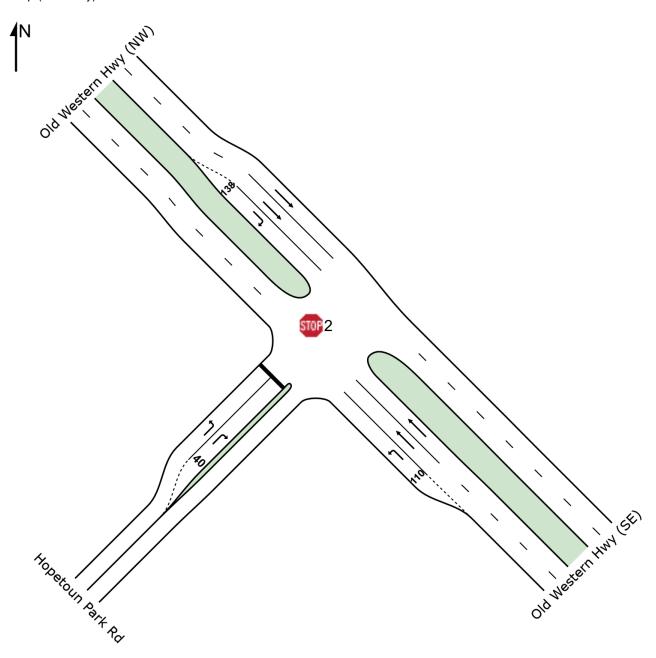


SITE LAYOUT



Site: 2 [HopetounPark-OldWestern AM 850 RTL]

Hopetoun Park Rd / Old Western Hwy Stop (Two-Way)



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MOVEMENT SUMMARY



Site: 2 [HopetounPark-OldWestern AM 850 RTL]

Hopetoun Park Rd / Old Western Hwy Stop (Two-Way)

Mover	nent Per	formance -	Vehic	les							
Mov	OD	Demand F	Flows	Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthE	ast: Old \	Nestern Hwy	(SE)								
21	L2	27	5.0	0.015	7.0	LOS A	0.0	0.0	0.00	0.63	63.7
22	T1	229	5.0	0.061	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approa	ich	257	5.0	0.061	8.0	LOS A	0.0	0.0	0.00	0.07	77.9
NorthW	Vest: Old \	Western Hwy	(NW)								
28	T1	268	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
29	R2	291	5.0	0.268	8.4	LOS A	1.3	9.1	0.41	0.67	61.9
Approa	ach	559	5.0	0.268	4.4	LOS A	1.3	9.1	0.22	0.35	69.4
SouthV	Vest: Hop	etoun Park R	Rd								
30	L2	402	5.0	0.388	10.0	LOS A	2.0	14.4	0.32	0.88	61.4
32	R2	77	5.0	0.372	30.6	LOS A	1.5	11.1	0.84	1.05	46.3
Approa	ich	479	5.0	0.388	13.3	LOS A	2.0	14.4	0.40	0.91	58.4
All Veh	icles	1295	5.0	0.388	7.0	LOS A	2.0	14.4	0.24	0.50	66.2

Site: 2 [HopetounPark-OldWestern PM 850 RTL]

Hopetoun Park Rd / Old Western Hwy Stop (Two-Way)

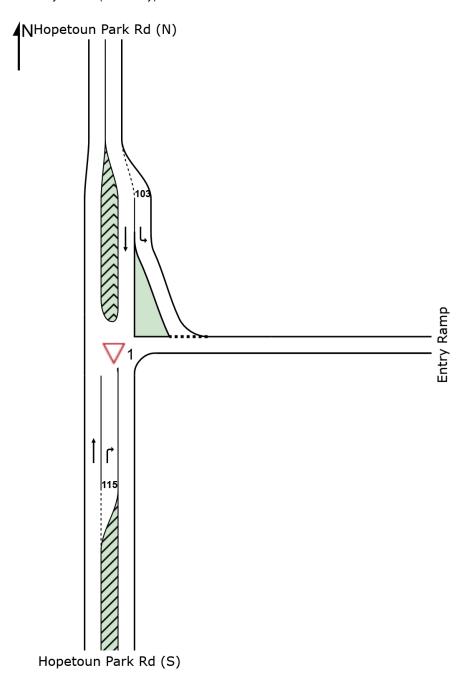
Mover	nent Per	formance -	Vehic	les							
Mov ID	OD Mov	Demand F Total		Deg. Satn	Average Delay	Level of Service	95% Back Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
SouthE	ast: Old \	Western Hwy	(SE)								
21	L2	76	5.0	0.042	7.0	LOS A	0.0	0.0	0.00	0.63	63.7
22	T1	242	5.0	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approa	ich	318	5.0	0.064	1.7	LOS A	0.0	0.0	0.00	0.15	75.4
NorthW	est: Old	Western Hwy	/ (NW)								
28	T1	419	5.0	0.111	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
29	R2	523	5.0	0.513	10.2	LOS A	4.1	30.2	0.57	0.81	60.3
Approa	ich	942	5.0	0.513	5.7	LOS A	4.1	30.2	0.31	0.45	67.7
SouthV	Vest: Hop	etoun Park R	₹d								
30	L2	179	5.0	0.174	9.8	LOS A	0.7	5.1	0.26	0.89	61.5
32	R2	51	5.0	0.702	103.0	LOS C	2.7	20.0	0.97	1.11	24.2
Approa	ich	229	5.0	0.702	30.3	LOS C	2.7	20.0	0.42	0.94	45.9
All Veh	icles	1489	5.0	0.702	8.6	LOS C	4.1	30.2	0.26	0.46	64.4



SITE LAYOUT

▽Site: 1 [Hopetoun-EntryRamp PM 850]

Hopetoun Park Rd / Entry Ramp Giveway / Yield (Two-Way)



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Project: M:\2019\0501_1000\V190737_Hopetoun_Park_North_Rezoning\Traffic\Engineering\SIDRA\V190737SID001.sip7



MOVEMENT SUMMARY

Site: 1 [Hopetoun-EntryRamp AM 850]

Hopetoun Park Rd / Entry Ramp Giveway / Yield (Two-Way)

Mover	Movement Performance - Vehicles												
Mov ID	OD Mov	Demand F Total	lows HV	Deg. Satn	Average Delay	Level of Service	95% Back Vehicles	of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed		
		veh/h	%	v/c	sec		veh	m		per veh	km/h		
South:	Hopetou	n Park Rd (S)											
2	T1	541	5.0	0.286	0.0	LOS A	0.0	0.0	0.00	0.00	59.9		
3	R2	247	5.0	0.200	6.3	LOS A	0.9	6.6	0.27	0.61	51.9		
Approa	ıch	788	5.0	0.286	2.0	LOS A	0.9	6.6	0.08	0.19	57.2		
North:	Hopetour	n Park Rd (N)											
7	L2	172	5.0	0.194	7.3	LOS A	0.8	5.6	0.39	0.63	52.7		
8	T1	125	5.0	0.066	0.0	LOS A	0.0	0.0	0.00	0.00	60.0		
Approa	ich	297	5.0	0.194	4.2	LOS A	0.8	5.6	0.23	0.36	55.5		
All Veh	icles	1085	5.0	0.286	2.6	LOS A	0.9	6.6	0.12	0.24	56.7		

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

MOVEMENT SUMMARY



ablaSite: 1 [Hopetoun-EntryRamp PM 850]

Hopetoun Park Rd / Entry Ramp Giveway / Yield (Two-Way)

Moven	nent Pe	rformance - '	Vehic	les							
Mov	OD	Demand F	lows	Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South:	Hopetou	n Park Rd (S)									
2	T1	256	5.0	0.135	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
3	R2	109	5.0	0.121	7.9	LOS A	0.5	3.5	0.47	0.72	51.0
Approa	ch	365	5.0	0.135	2.4	LOS A	0.5	3.5	0.14	0.21	57.0
North: I	Hopetour	n Park Rd (N)									
7	L2	204	5.0	0.196	6.3	LOS A	0.8	5.9	0.25	0.55	53.2
8	T1	393	5.0	0.208	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approa	ch	597	5.0	0.208	2.2	LOS A	0.8	5.9	0.09	0.19	57.4
All Veh	icles	962	5.0	0.208	2.2	LOS A	0.8	5.9	0.11	0.20	57.3

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

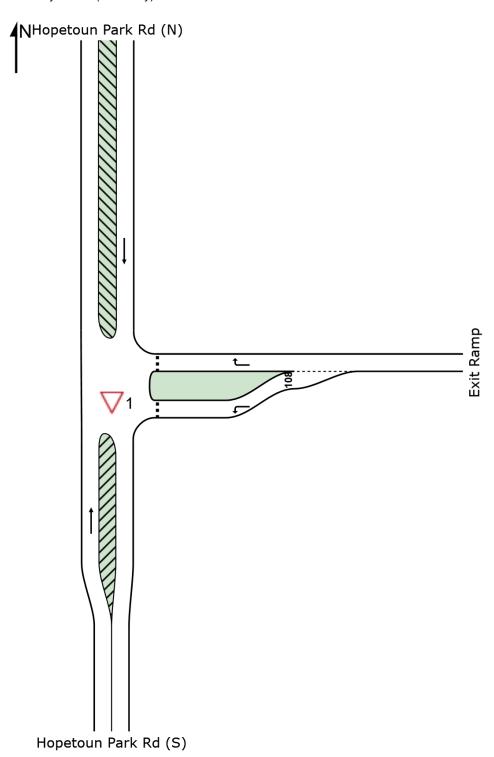
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).



SITE LAYOUT

▽Site: 1 [Hopetoun-ExitRamp PM 850]

Hopetoun Park Rd / Exit Ramp Giveway / Yield (Two-Way)



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 $Project: M: \color=10000\color=10000\color=10000\color=10000\color=10000\color=10000\c$



MOVEMENT SUMMARY



ablaSite: 1 [Hopetoun-ExitRamp AM 850]

Hopetoun Park Rd / Exit Ramp Giveway / Yield (Two-Way)

Moven	nent Per	formance -	Vehic	les							
Mov ID	OD Mov	Demand F Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Vehicles veh	of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South:	Hopetour	n Park Rd (S)									
2	T1	777	0.0	0.398	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
Approa	ch	777	0.0	0.398	0.1	LOS A	0.0	0.0	0.00	0.00	59.9
East: E	xit Ramp										
4	L2	60	0.0	0.052	5.7	LOS A	0.2	1.3	0.10	0.55	53.3
6	R2	12	0.0	0.066	24.9	LOS A	0.2	1.5	0.82	0.93	41.3
Approa	ch	72	0.0	0.066	8.8	LOS A	0.2	1.5	0.22	0.61	50.9
North: I	Hopetoun	Park Rd (N)									
8	T1	31	0.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approa	ch	31	0.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehi	icles	879	0.0	0.398	0.8	LOS A	0.2	1.5	0.02	0.05	59.0

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

MOVEMENT SUMMARY



Site: 1 [Hopetoun-ExitRamp PM 850]

Hopetoun Park Rd / Exit Ramp Giveway / Yield (Two-Way)

Moven	nent Per	formance - '	Vehic	les							
Mov	OD	Demand F	lows	Deg.	Average	Level of	95% Back	of Queue	Prop.	Effective	Average
ID	Mov	Total	HV	Satn	Delay	Service	Vehicles	Distance	Queued	Stop Rate	Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South:	Hopetour	n Park Rd (S)									
2	T1	336	0.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approa	ch	336	0.0	0.172	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
East: E	xit Ramp										
4	L2	202	0.0	0.266	8.4	LOS A	1.1	7.4	0.51	0.75	51.5
6	R2	29	0.0	0.117	18.7	LOS A	0.4	2.8	0.74	0.91	44.4
Approa	ch	232	0.0	0.266	9.7	LOS A	1.1	7.4	0.54	0.77	50.5
North: I	Hopetoun	Park Rd (N)									
8	T1	393	0.0	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approa	ch	393	0.0	0.201	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Veh	icles	960	0.0	0.266	2.4	LOS A	1.1	7.4	0.13	0.19	57.4

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.



APPENDIX 4 CORRESPONDENCE WITH RRV



Richard Bon

From: Simone Hutchings <simone.hutchings@roads.vic.gov.au>

Sent: Monday, 14 September 2020 5:03 PM

To: Ross Closter; tim.mckinley@cardno.com.au; Michael Jordon

Cc: Damien Kelly; Jan-Maree Fraser; Benjamin Anderson

Subject: RE: Hopetoun Park Road Intersections

Hi Ross,

Sorry I didn't quite get this out to you Friday.

In principle the concept submitted for the roundabout looks good. The minimum 14m radius for the central island is acceptable given the constraints of the site.

In managing the freeway we do feel that there is potential need for B-double movements through the roundabout and for A-double movements doing the left turn from Hopetoun Park Road into the Eastbound freeway on-ramp. We would be agreeable to these movements to be achieved through the use of concrete aprons and would look to ensure there was no physical barrier to these movements imposed by the construction of the roundabout.

Subject to detail design, we agree in principle to the layout for the T-intersection with Old Western Highway submitted.

If you have any further queries at this time please done hesitate to contact us.

Regards, Simone Hutchings

Senior Development Engineer - Integrated Transport & Land Use - Western Region Regional Roads Victoria

88 Learmonth Road
Wendouree VIC 3355
M 0438 243 486
simone.hutchings@roads.vic.gov.au
regionalroads.vic.gov.au

Part of the Department of Transport



I acknowledge the Traditional Aboriginal Owners of Country throughout Victoria and pay my respect to Elders past and present and emerging and to the ongoing living culture of Aboriginal people.

From: Ross Closter <ross@urbanld.com.au> Sent: Monday, 14 September 2020 9:33 AM

To: Simone Hutchings <simone.hutchings@roads.vic.gov.au>; tim.mckinley@cardno.com.au; Michael Jordon <mike@urbanld.com.au>

Cc: Damien Kelly <Damien.Kelly@roads.vic.gov.au>; Jan-Maree Fraser <Jan-Maree.Fraser@roads.vic.gov.au>; Benjamin

Anderson <Benjamin.Anderson@roads.vic.gov.au>

Subject: [External] RE: Hopetoun Park Road Intersections

Richard Bon

From: Simone Hutchings <simone.hutchings@roads.vic.gov.au>

Sent: Thursday, 22 October 2020 3:28 PM

To: Ross Closter

Cc: Damien Kelly; Benjamin Anderson; Jan-Maree Fraser

Subject: RE: Hopetoun Park Road Intersections

Hi Ross,

Thank you for the reminder. We met earlier in the week and agree that the proposed timing of Old Western Highway intersection prior to 50th lot and Western Freeway intersection prior to the 250th lot seems reasonable.

Thanks for providing information to inform the timing of works for the development.

If you have any other queries please let me know.

Regards, Simone Hutchings

Senior Development Engineer - Integrated Transport & Land Use - Western Region Regional Roads Victoria

88 Learmonth Road
Wendouree VIC 3355
M 0438 243 486
simone.hutchings@roads.vic.gov.au
regionalroads.vic.gov.au

Part of the Department of Transport



I acknowledge the Traditional Aboriginal Owners of Country throughout Victoria and pay my respect to Elders past and present and emerging and to the ongoing living culture of Aboriginal people.

From: Ross Closter <ross@urbanld.com.au> Sent: Thursday, 22 October 2020 3:17 PM

To: Simone Hutchings <simone.hutchings@roads.vic.gov.au> **Subject:** [External] RE: Hopetoun Park Road Intersections

Hi Simone,

A polite reminder regarding the below. If you could please respond early next week that would be great.

Regards,

Richard Bon

From: Simone Hutchings <simone.hutchings@roads.vic.gov.au>

Sent: Tuesday, 8 December 2020 4:05 PM

To: Ross Closter

Cc: Damien Kelly; Benjamin Anderson; Jan-Maree Fraser; Chris Butler; Michael Jordon

Subject: RE: Hopetoun Park Road Intersections

Follow Up Flag: Follow up **Flag Status:** Flagged

Good Morning Ross,

RRV have reviewed the TIAR by Cardo dated March 2020 and that report does not suggest a significant increase in traffic heading west from the development beyond Bacchus Marsh. We have not indicated that a westbound on ramp at Hopetoun Park is required by RRV as part of this development given the reports and information provided to date and provided there are no significant changes to the scope/type of development I don't anticipate that position changing.

Regards, Simone Hutchings

Senior External Works Engineer - Integrated Transport & Land Use - Grampians Region Regional Roads Victoria

88 Learmonth Road Wendouree VIC 3355 M 0438 243 486 simone.hutchings@roads.vic.gov.au regionalroads.vic.gov.au

Part of the Department of Transport



I acknowledge the Traditional Aboriginal Owners of Country throughout Victoria and pay my respect to Elders past and present and emerging and to the ongoing living culture of Aboriginal people.

From: Ross Closter <ross@urbanld.com.au> Sent: Thursday, 3 December 2020 2:08 PM

To: Simone Hutchings <simone.hutchings@roads.vic.gov.au>

Cc: Damien Kelly Co: Damien.Kelly@roads.vic.gov.au>; Benjamin Anderson Senjamin.Anderson@roads.vic.gov.au>; Jan-Maree Fraser Jan-Maree.Fraser@roads.vic.gov.au>; Chris Butler <chris.butler@salt3.com.au>; Michael Jordon <mike@urbanld.com.au>

Subject: [External] RE: Hopetoun Park Road Intersections

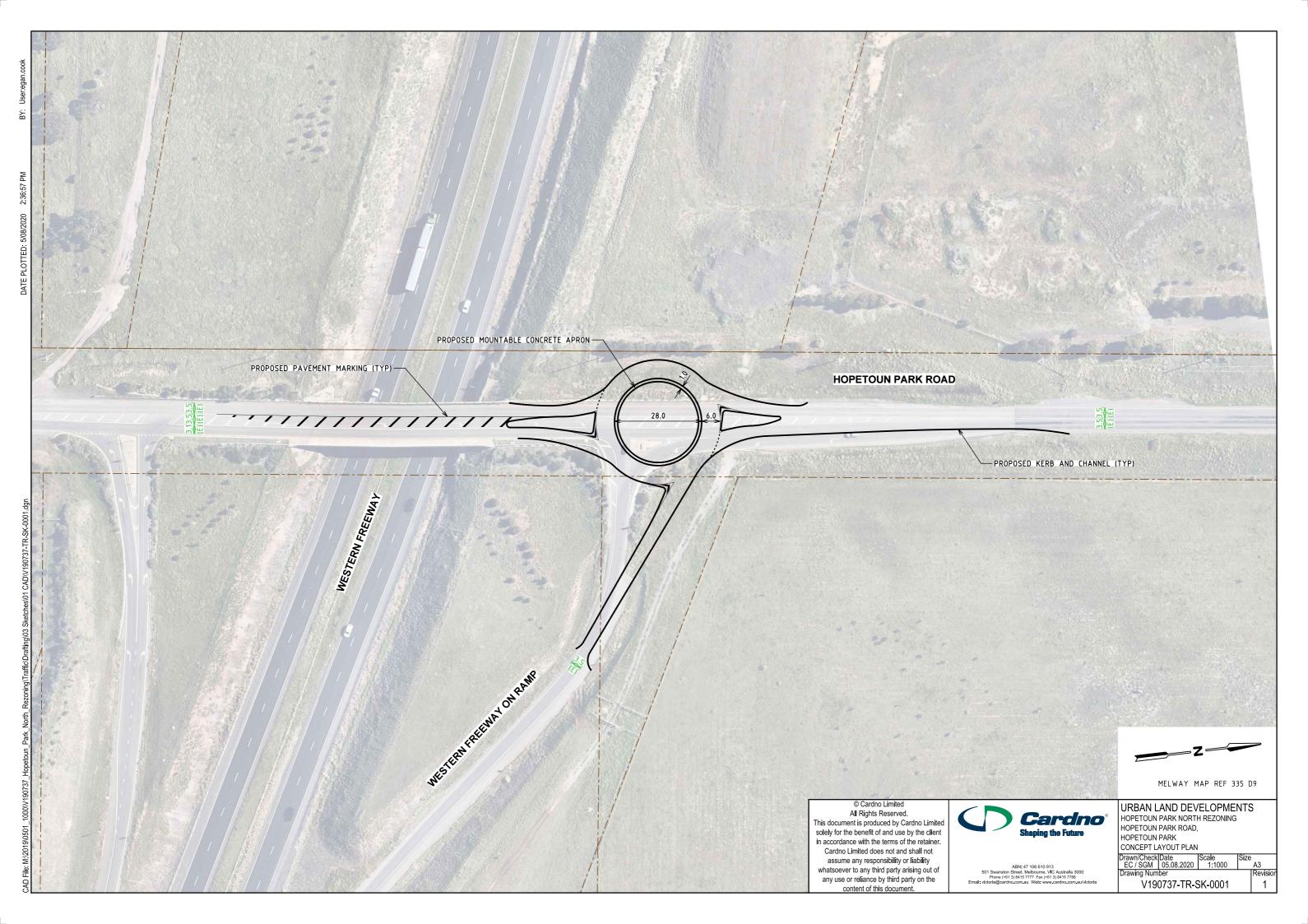
Hi Simone,

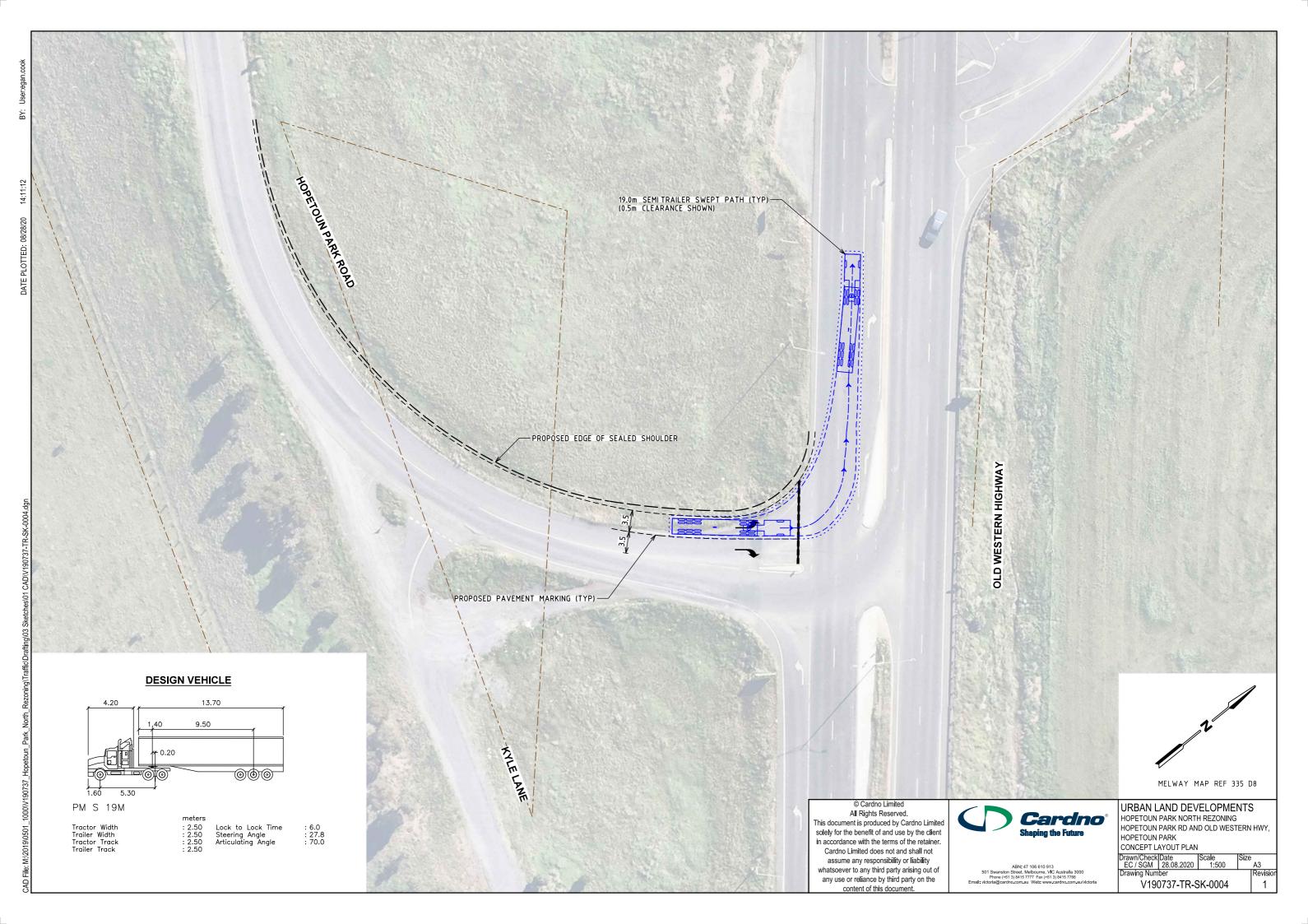
Can you please respond?

Regards,

APPENDIX 5 CARDNO FUNCTIONAL LAYOUT PLANS







APPENDIX 6 SALT INVESTIGATION OF TRIGGER FOR MITGATING WORKS



MELBOURNE Level 3/51 Queen Street, Melbourne VIC 3000 T: +61 3 9020 4225 SYDNEY Level 17/40 Mount Street, North Sydney NSW 2060 T: +61 2 8415 9781 HOBART Level 4, 116 Bathurst St Hobart TAS 7000 T: +61 400 535 634

5 October 2020

Ross Closter Director Urban Land Developments Level 1, 237 Ryrie Street Geelong VIC 3123 Sustainable Transport Surveys Pty Ltd
ABN: 18 439 813 274
www.salt3.com.au

Dear Ross.

RE: MITIGATING WORKS AT HOPETOUN PARK ROAD INTERSECTIONS - TRAFFIC ENGINEERING SERVICES

SALT has been retained by Urban Land Developments to assess the level of development that can occur prior to the requirement to undertake intersection improvements works at the intersections of the Western Freeway / Hopetoun Park Road and the Old Western Highway / Hopetoun Park Road.

Cardno prepared a TIAR for the development dated the 24th March 2020, (report no. **V190737**) which outlined the traffic generation and distribution of the proposed 850 lot subdivision at Hopetoun Park. After the submission of the Cardno traffic report, further negotiations were undertaken with Regional Roads Victoria (RRV), Western Region in Ballarat to agree on the extent of external works required to facilitate the development.

Cardno prepared a concept functional layout plan for a roundabout at the intersection of the Western Freeway / Hopetoun Park Road on ramp (plan no. V190737-TR-SK-0002) and a road widening at the intersection of Old Western Highway / Hopetoun Park Road (plan no. V1910737-TR-SK-0004). A copy of the concept FLP's are shown in APPENDIX 1. RRV provided an email on the 14th September 2020 agreeing to the Cardno plans subject to detailed design. A copy of the email is shown in APPENDIX 2.

A Shared Infrastructure Funding Plan (SIFP) is being prepared for the Hopetoun Park residential precinct. The works shown in the Cardno plans attached will be delivered by the SIFP. This letter outlines the trigger for the implementation of the works at the intersections. SIDRA has been used to model the operating conditions of the intersection for the existing conditions (existing traffic flows and geometry) and future scenarios with 200, 300 and 400 lots developed with the existing geometry. The SIDRA analysis gives an indication when the performance of the intersections deteriorates and the intersections should be upgraded with the works agreed by the RRV.

Key performance criteria include:

Degree of Saturation (DOS): This represents the ratio of traffic volume to capacity. Generally speaking,

a DOS of below 0.9 indicates acceptable performance. A DOS of over 1.0 $\,$

indicates that capacity has been exceeded.

Level of Service (LOS): An index of the operational performance of traffic based on service

measures such as delay, degree of saturation, density and speed during a

given flow period. A guide to LOS ratings is provided in **Table 1**.

Average Delay: The average delay time that can be expected for a given movement.

95th Percentile Queue: The maximum queue length that can be expected in 95% of all observed

queue lengths during the hour.

SALT

1 20338TLET01F01

Table 1 Level of Service Ratings

Level of Service							
Α	Excellent						
В	Very Good						
С	Good						
D	Acceptable						
E	Poor						
F	Very Poor						

The detailed SIDRA outputs are provided in APPENDIX 3 – Existing Conditions SIDRA Analysis and APPENDIX 4 – Trigger Points SIDRA Analysis and are summarised as follows:

Table 2 SIDRA Outputs - Hopetoun Park Rd / Western Fwy intersection- AM Peak Hour (8:15am - 9:15am)

No. lots developed	Approach	Movement	Degree of Saturation (DOS)	Average Delay (s)	Level of Service (LOS)	95% Back of Queue (no. vehicles)
	Hopetoun Park Road	T	0.081	0.0	Α	0.0
Existing Conditions	(south)	R	0.042	5.8	Α	0.1
	Hopetoun Park Road	L	0.071	5.8	А	0.4
	(north)	Т	0.016	0.0	А	0.0
	Hopetoun Park Road	Т	0.130	0.0	А	0.0
200 lots	(south)	R	0.079	5.9	Α	0.3
200 1008	Hopetoun Park Road (north)	L	0.073	5.8	А	0.4
		Т	0.028	0.0	Α	0.0
	Hopetoun Park Road	Т	0.154	0.0	А	0.0
300 lots	(south)	R	0.099	6.0	Α	0.4
300 1008	Hopetoun Park Road	L	0.074	5.9	А	0.4
	(north)	Т	0.034	0.0	Α	0.0
	Hopetoun Park Road	T	0.178	0.0	А	0.0
400 lots	(south)	R	0.119	6.1	Α	0.5
400 1005	Hopetoun Park Road	L	0.076	5.9	Α	0.4
	(north)	Т	0.040	0.0	А	0.0

Table 3 SIDRA Outputs - Hopetoun Park Rd / Western Fwy intersection- PM Peak Hour (3:15pm - 4:15pm)

No. lots developed	Approach	Movement	Degree of Saturation (DOS)	Average Delay (s)	Level of Service (LOS)	95% Back of Queue (no. vehicles)
	Hopetoun Park Road	Т	0.032	0.0	А	0.0
Existing Conditions	(south)	R	0.020	6.1	А	0.1
	Hopetoun Park Road	L	0.083	5.7	Α	0.4
	(north)	Т	0.045	0.0	А	0.0
	Hopetoun Park Road	T	0.057	0.0	Α	0.0
200 lots	(south)	R	0.040	6.4	Α	0.1
200 1005	Hopetoun Park Road	L	0.084	5.7	Α	0.4
	(north)	T	0.084	0.0	Α	0.0
	Hopetoun Park Road	T	0.069	0.0	А	0.0
300 lots	(south)	R	0.050	6.6	Α	0.2
300 1005	Hopetoun Park Road	L	0.084	5.8	А	0.4
	(north)	Т	0.103	0.0	Α	0.0
	Hopetoun Park Road	Т	0.081	0.0	А	0.0
400 lots	(south)	R	0.062	6.8	Α	0.2
400 1005	Hopetoun Park Road	L	0.085	5.8	Α	0.4
	(north)	Т	0.122	0.0	Α	0.0

The summary of the SIDRA outputs shown in **Table 2** and **Table 3** clearly show that the performance of the Hopetoun Park Road / Western Fwy intersection continues to operate at a level of service of A for both the AM and PM peaks as the number of lots develop.

The construction of the roundabout at the Hopetoun Park Road / Western Fwy intersection is more to address the safety of motorists using the intersection rather than to address a capacity issue. As the construction of the roundabout is relatively high cost item and it is not required till later in the development's life, it is recommended that it be constructed after 400 lots have been occupied at the proposed subdivision.

Table 4 SIDRA Outputs – Existing Conditions, Hopetoun Park Rd / Old Western Hwy intersection

AM / PM Peak Hour	Approach	Movement	Degree of Saturation (DOS)	Average Delay (s)	Level of Service (LOS)	95% Back of Queue (no. vehicles)
	Old Western	L	0.007	5.6	А	0.0
	Highway (South-east)	Т	0.058	0.0	Α	0.0
A14	Old Western	Т	0.071	0.0	Α	0.0
AM	Highway (North-west)	R	0.255	7.4	Α	1.0
	Hopetoun Park Road	L	0.155	8.8	Α	0.5
	(south)	R	0.155	22.8	С	0.5
	Old Western	L	0.016	5.6	А	0.0
	Highway (South-east)	Т	0.060	0.0	А	0.0
PM	Old Western	Т	0.112	0.0	Α	0.0
PM	Highway (North-west)	R	0.344	8.0	Α	1.6
	Hopetoun Park Road	L	0.199	8.8	В	0.6
	(south)	R	0.199	32.7	E	0.6

Table 5 SIDRA Outputs - 200 lots developed, Hopetoun Park Rd / Old Western Hwy intersection

AM / PM Peak Hour	Approach	Movement	Degree of Saturation (DOS)	Average Delay (s)	Level of Service (LOS)	95% Back of Queue (no. vehicles)
	Old Western	L	0.009	5.6	Α	0.0
	Highway (South-east)	T	0.058	0.0	А	0.0
A 3 4	Old Western	T 0.071 0.0 A		Α	0.0	
АМ	Highway (North-west)	R	0.285	7.5	Α	1.2
	Hopetoun	L	0.298	8.9	Α	1.2
	Park Road (south)	R	0.298	25.9	D	1.2
	Old Western	L	0.022	5.6	А	0.0
	Highway (South-east)	Т	0.060	0.0	Α	0.0
PM	Old Western	T	0.112	0.0	А	0.0
PM	Highway (North-west)	R	0.434	8.8.	А	2.5
	Hopetoun Park Road	L	0.322	10.7	В	1.2
	(south)	R	0.322	41.8	Е	1.2

The summary of the SIDRA outputs shown in **Table 4** demonstrate that the critical movement for this intersection is the right turn movement from Hopetoun Park Road into the Old Western Highway. This operates at a level of service of C and E under existing flows in the AM and PM, respectively. With the increased traffic flows generated by this development then the level of service decreases to D in the AM peak and remains at E in the PM peak. A level of service of E at a rural intersection represents unacceptable conditions that have the possibility of encouraging motorist to undertake risky manoeuvres. The widening of the Hopetoun Park Road approach to the intersection improves the performance of the intersection by separating the right and left turn movements.

It is therefore recommended that mitigating works (as per plan no. V190737-T**R-SK-0004**) be constructed at the Hopetoun Park Road / Old Western Highway intersection before 200 lots are occupied. It may be prudent to recommend that the road works at this intersection are completed before the 50th lot is occupied ensuring that it is constructed early in the program.

Please do not hesitate to contact me should you have any queries.

Yours sincerely,

Busk

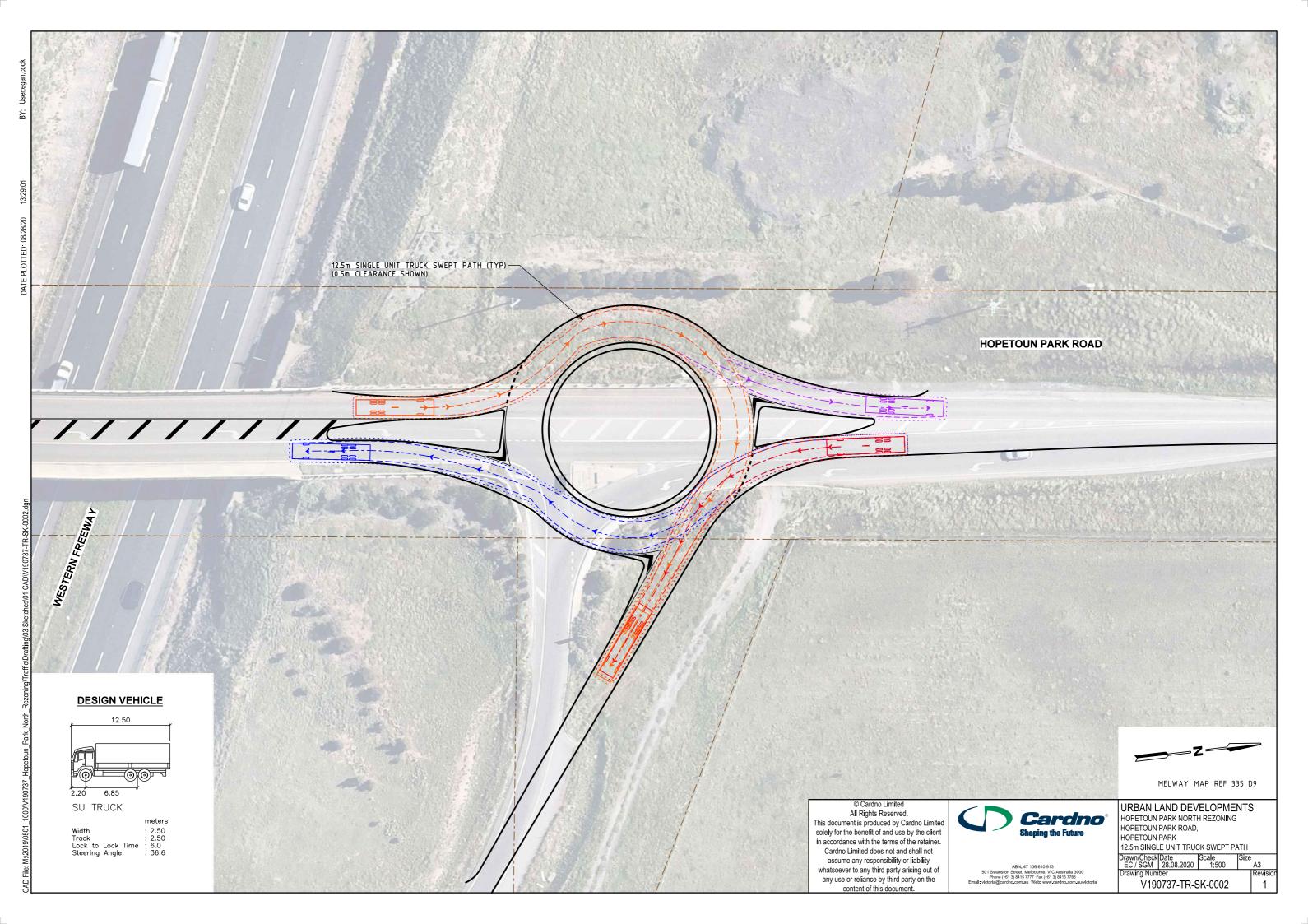
Chris Butler
Project Director
SALT
T +61 419 577 280

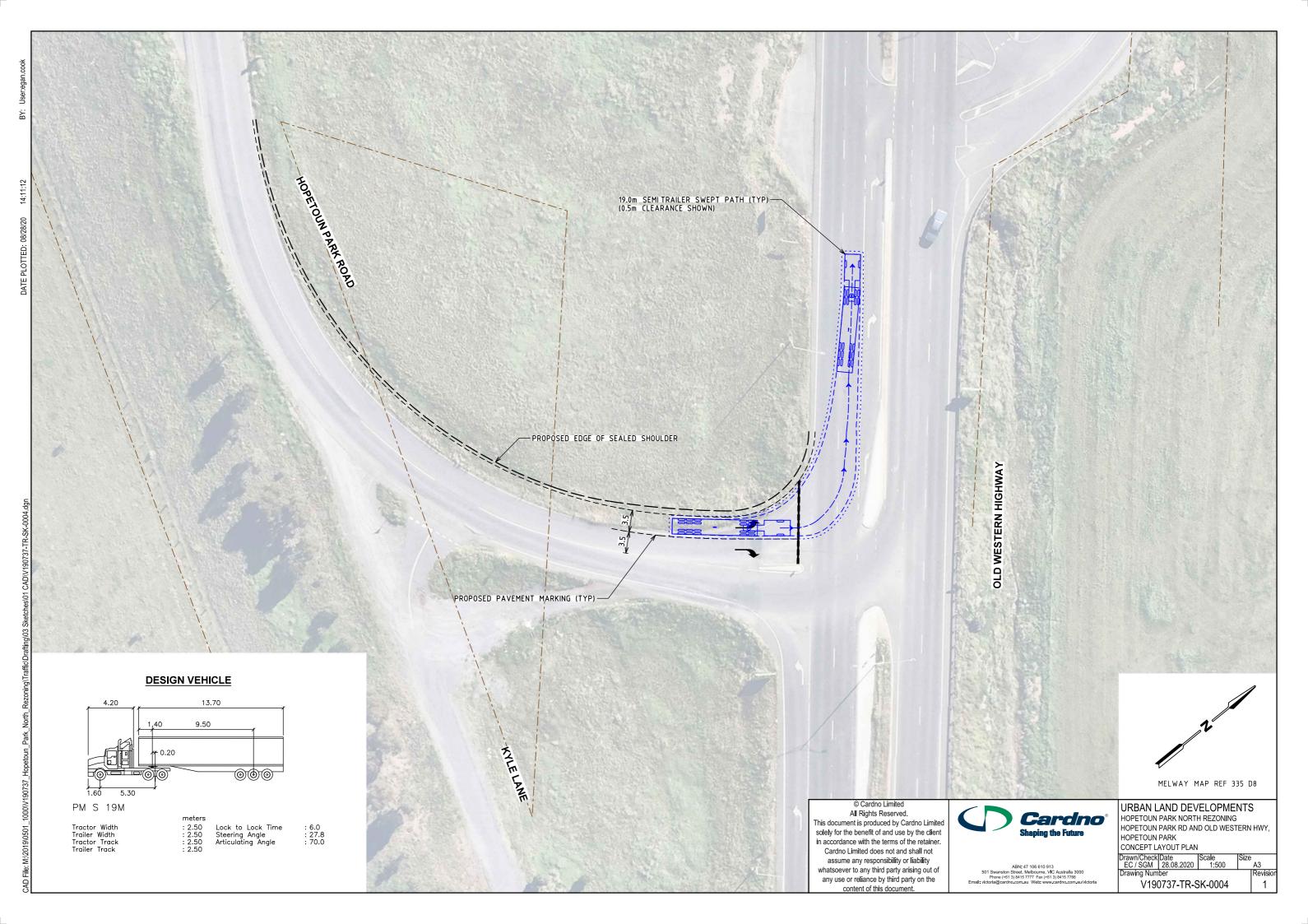
Chris.butler@salt3.com.au



APPENDIX 1 CARDNO FUNCTIONAL LAYOUT PLANS







APPENDIX 2 CORRESPONDENCE WITH REGIONAL ROADS VICTORIA





From: Simone Hutchings [mailto:simone.hutchings@roads.vic.gov.au]

Sent: Monday, September 14, 2020 5:03 PM

To: Ross Closter < ross@urbanld.com.au; tim.mckinley@cardno.com.au; Michael Jordon < mike@urbanld.com.au>
Cc: Damien Kelly Damien.Kelly@roads.vic.gov.au; Jan-Maree Fraser Jan-Maree.Fraser@roads.vic.gov.au; Benjamin

Anderson < Benjamin. Anderson@roads.vic.gov.au > Subject: RE: Hopetoun Park Road Intersections

Hi Ross,

Sorry I didn't quite get this out to you Friday.

In principle the concept submitted for the roundabout looks good. The minimum 14m radius for the central island is acceptable given the constraints of the site.

In managing the freeway we do feel that there is potential need for B-double movements through the roundabout and for A-double movements doing the left turn from Hopetoun Park Road into the Eastbound freeway on-ramp. We would be agreeable to these movements to be achieved through the use of concrete aprons and would look to ensure there was no physical barrier to these movements imposed by the construction of the roundabout.

Subject to detail design, we agree in principle to the layout for the T-intersection with Old Western Highway submitted.

If you have any further queries at this time please done hesitate to contact us.

Regards, Simone Hutchings

Senior Development Engineer - Integrated Transport & Land Use - Western Region Regional Roads Victoria

88 Learmonth Road
Wendouree VIC 3355
M 0438 243 486
simone.hutchings@roads.vic.gov.au
regionalroads.vic.gov.au

Part of the Department of Transport



I acknowledge the Traditional Aboriginal Owners of Country throughout Victoria and pay my respect to Elders past and present and emerging and to the ongoing living culture of Aboriginal people.

APPENDIX 3 EXISTING CONDITIONS SIDRA ANALYSIS

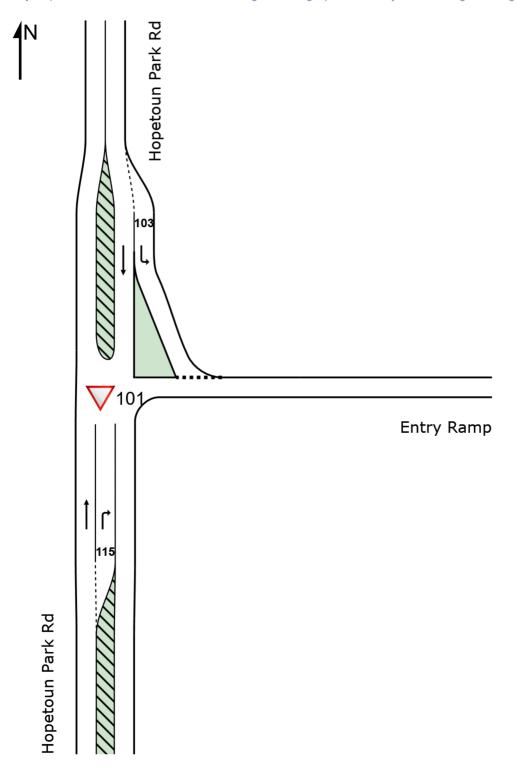


SITE LAYOUT

∇ Site: 101 [Hopetoun Park Rd - Entry Ramp (Site Folder: General)]

New Site Site Category: (None) Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT SUMMARY

VSite: 101 [Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPU VOLUI [Total		DEMA FLO\ [Total		Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [Veh.		Prop. Que	Effective Stop Rate	Aver. No. s Cycles	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	ı: Hope	toun Par	k Rd											
2	T1	144	5.0	152	5.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	50	5.0	53	5.0	0.042	5.8	LOS A	0.1	1.1	0.10	0.59	0.10	52.3
Appro	oach	194	5.0	204	5.0	0.081	1.5	NA	0.1	1.1	0.02	0.15	0.02	57.8
North	: Hope	toun Par	k Rd											
7	L2	163	5.0	172	5.0	0.071	5.8	LOS A	0.4	2.7	0.13	0.51	0.13	53.6
8	T1	29	5.0	31	5.0	0.016	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	192	5.0	202	5.0	0.071	4.9	LOS A	0.4	2.7	0.11	0.43	0.11	54.5
All Vehic	les	386	5.0	406	5.0	0.081	3.2	NA	0.4	2.7	0.07	0.29	0.07	56.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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∇Site: 101 [Hopetoun Park Rd - Entry Ramp PM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mo	vement	Perfor	mance										
Mov ID	Turn	INPL VOLUI		DEMA FLOV		Deg.	Aver.	Level of		EUE	Prop. Que	Effective Stop	Aver. No.	Aver. Speed
		[Total	HV]	[Total	HV]	Catil	Delay	of Service	[Veh.	Dist]	Que	Rate	Cycles	peccu
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	n: Hope	etoun Par	k Rd											
2	T1	58	5.0	61	5.0	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	23	5.0	24	5.0	0.020	6.1	LOS A	0.1	0.5	0.18	0.59	0.18	52.1
Appr	oach	81	5.0	85	5.0	0.032	1.7	NA	0.1	0.5	0.05	0.17	0.05	57.5
North	: Норе	toun Par	k Rd											
7	L2	194	5.0	204	5.0	0.083	5.7	LOS A	0.4	3.1	0.08	0.52	0.08	53.8
8	T1	81	5.0	85	5.0	0.045	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appr	oach	275	5.0	289	5.0	0.083	4.0	LOS A	0.4	3.1	0.06	0.37	0.06	55.5
All Vehic	cles	356	5.0	375	5.0	0.083	3.5	NA	0.4	3.1	0.06	0.32	0.06	55.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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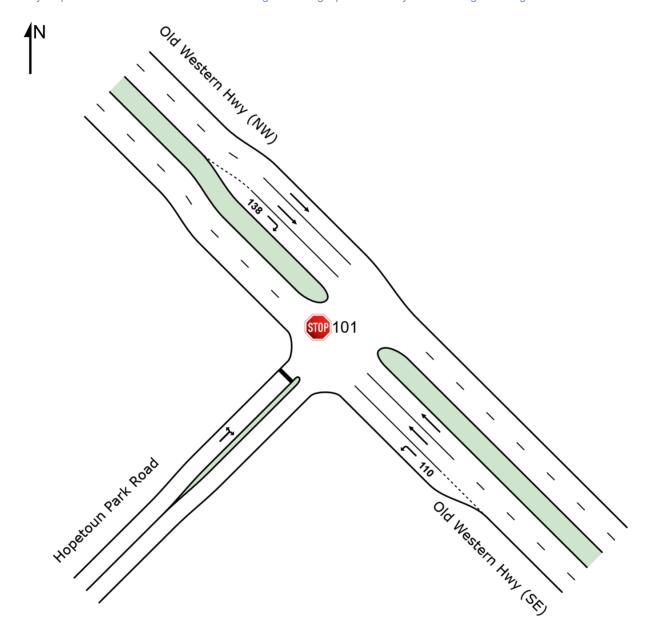
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Site: 101 [Hopetoun/OldWestern (Site Folder: General)]

New Site Site Category: (None) Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.





Site: 101 [Hopetoun/OldWestern AM (Site Folder: General)]

New Site

Site Category: (None) Stop (Two-Way)

Vehi	cle Mo	vement	Perfor	mance										
Mov ID	Turn	INPU VOLUI I Total		DEMA FLOV [Total		Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [Veh.	UE	Prop. Que	Effective Stop Rate	Aver. No. c Cycles	Aver. Speed
		veh/h	пv ј %	veh/h	пv ј %	v/c	sec	OCI VICE	veh	Dist] m		Nate	Cycles	km/h
South	nEast: (Old West	ern Hwy	(SE)										
21	L2	12	5.0	13	5.0	0.007	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
22	T1	207	5.0	218	5.0	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	219	5.0	231	5.0	0.058	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.6
North	West:	Old West	tern Hw	y (NW)										
28	T1	255	5.0	268	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
29	R2	186	5.0	196	5.0	0.255	7.4	LOS A	1.0	7.3	0.40	0.66	0.40	51.8
Appro	oach	441	5.0	464	5.0	0.255	3.1	NA	1.0	7.3	0.17	0.28	0.17	56.2
South	nWest:	Hopetou	n Park l	Road										
30	L2	67	5.0	71	5.0	0.155	8.8	LOS A	0.5	4.0	0.30	0.90	0.30	49.4
32	R2	19	5.0	20	5.0	0.155	22.8	LOS C	0.5	4.0	0.30	0.90	0.30	49.5
Appro	oach	86	5.0	91	5.0	0.155	11.9	LOS B	0.5	4.0	0.30	0.90	0.30	49.4
All Vehic	eles	746	5.0	785	5.0	0.255	3.3	NA	1.0	7.3	0.13	0.28	0.13	56.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Site: 101 [Hopetoun/OldWestern PM (Site Folder: General)]

New Site

Site Category: (None) Stop (Two-Way)

Vehic	cle Mo	vement	Perfor	mance										
Mov	Turn	INPL VOLUM		DEMA FLOV			Aver. Delay	Level of		ACK OF EUE	Prop. Que	Effective Stop	Aver. No.	Aver. Speed
		[Total	HV] %	[Total	HV]	v/c		Service	[Veh.	Dist]	Que	Rate	Cycles	
South	nEast: (veh/h Old West		veh/h / (SE)	70	V/C	sec		veh	m	_	_		km/h
21	L2	28	5.0	29	5.0	0.016	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
22	T1	215	5.0	226	5.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	243	5.0	256	5.0	0.060	0.7	NA	0.0	0.0	0.00	0.07	0.00	59.1
North	West:	Old West	ern Hw	y (NW)										
28	T1	398	5.0	419	5.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
29	R2	243	5.0	256	5.0	0.344	8.0	LOS A	1.6	11.4	0.45	0.71	0.48	51.3
Appro	oach	641	5.0	675	5.0	0.344	3.1	NA	1.6	11.4	0.17	0.27	0.18	56.4
South	West:	Hopetou	n Park F	Road										
30	L2	21	5.0	22	5.0	0.199	8.8	LOS A	0.6	4.6	0.49	0.90	0.49	43.9
32	R2	24	5.0	25	5.0	0.199	32.7	LOS D	0.6	4.6	0.49	0.90	0.49	44.0
Appro	oach	45	5.0	47	5.0	0.199	21.6	LOS C	0.6	4.6	0.49	0.90	0.49	43.9
All Vehic	eles	929	5.0	978	5.0	0.344	3.3	NA	1.6	11.4	0.14	0.25	0.15	56.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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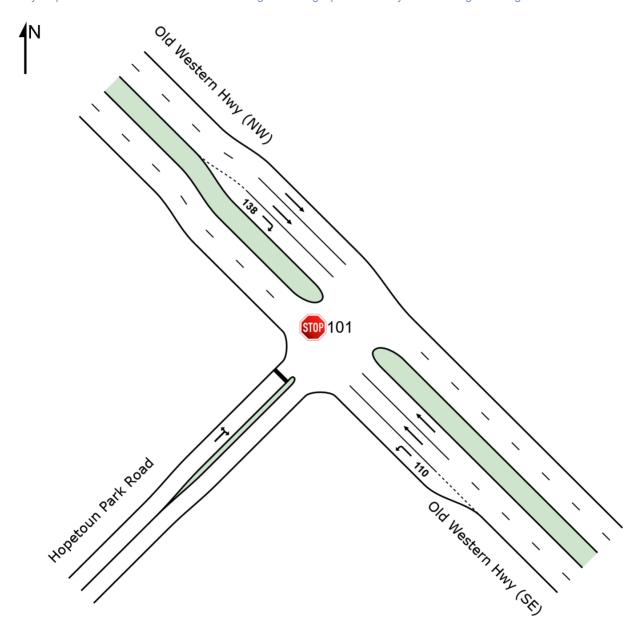
APPENDIX 4 TRIGGER POINTS SIDRA ANALYSIS



Site: 101 [(200 lots) Hopetoun/OldWestern (Site Folder: General)]

New Site Site Category: (None) Stop (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.





Site: 101 [(200 lots) Hopetoun/OldWestern AM (Site Folder: General)]

New Site

Site Category: (None) Stop (Two-Way)

Vehic	cle Mo	vement	Perfor	mance										
Mov ID	Turn	INPL VOLUI	MES	DEMA FLOV	VS	Deg. Satn	Aver. Delay	Level of Service	QUI	ACK OF EUE	Prop. Que	Effective Stop Rate	Aver.	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec	Service	[Veh. veh	Dist] m		Nate	Cycles	km/h
South	East:	Old West	ern Hwy	/ (SE)										
21	L2	15	5.0	16	5.0	0.009	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
22	T1	207	5.0	218	5.0	0.058	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	ach	222	5.0	234	5.0	0.058	0.4	NA	0.0	0.0	0.00	0.04	0.00	59.5
North	West:	Old West	tern Hw	y (NW)										
28	T1	255	5.0	268	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
29	R2	207	5.0	218	5.0	0.285	7.5	LOS A	1.2	8.4	0.41	0.67	0.41	51.7
Appro	ach	462	5.0	486	5.0	0.285	3.4	NA	1.2	8.4	0.18	0.30	0.18	56.0
South	West:	Hopetou	n Park F	Road										
30	L2	141	5.0	148	5.0	0.298	8.9	LOS A	1.2	8.4	0.31	0.90	0.31	49.4
32	R2	32	5.0	34	5.0	0.298	25.9	LOS D	1.2	8.4	0.31	0.90	0.31	49.4
Appro	ach	173	5.0	182	5.0	0.298	12.0	LOS B	1.2	8.4	0.31	0.90	0.31	49.4
All Vehic	les	857	5.0	902	5.0	0.298	4.3	NA	1.2	8.4	0.16	0.35	0.16	55.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Site: 101 [(200 lots) Hopetoun/OldWestern PM (Site Folder: General)]

New Site

Site Category: (None) Stop (Two-Way)

Vehi	cle Mo	vement	Perfor	mance										
Mov ID	Turn	INPL VOLUI	MES	DEMA FLOV	VS	Deg. Satn	Aver. Delay	Level of Service	95% BA QUE	EUE	Prop. Que	Effective Stop	Aver.	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec	Service	[Veh. veh	Dist] m		Rate	Cycles	km/h
South	nEast:	Old West	ern Hwy	/ (SE)										
21	L2	38	5.0	40	5.0	0.022	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	53.4
22	T1	215	5.0	226	5.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	253	5.0	266	5.0	0.060	0.9	NA	0.0	0.0	0.00	0.09	0.00	58.9
North	West:	Old West	tern Hw	y (NW)										
28	T1	398	5.0	419	5.0	0.112	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
29	R2	303	5.0	319	5.0	0.434	8.8	LOS A	2.5	18.2	0.50	0.77	0.61	50.8
Appro	oach	701	5.0	738	5.0	0.434	3.8	NA	2.5	18.2	0.21	0.33	0.26	55.6
South	nWest:	Hopetou	n Park F	Road										
30	L2	56	5.0	59	5.0	0.322	10.7	LOS B	1.2	9.1	0.45	0.91	0.54	43.9
32	R2	30	5.0	32	5.0	0.322	41.8	LOS E	1.2	9.1	0.45	0.91	0.54	43.9
Appro	oach	86	5.0	91	5.0	0.322	21.5	LOS C	1.2	9.1	0.45	0.91	0.54	43.9
All Vehic	les	1040	5.0	1095	5.0	0.434	4.6	NA	2.5	18.2	0.18	0.32	0.22	55.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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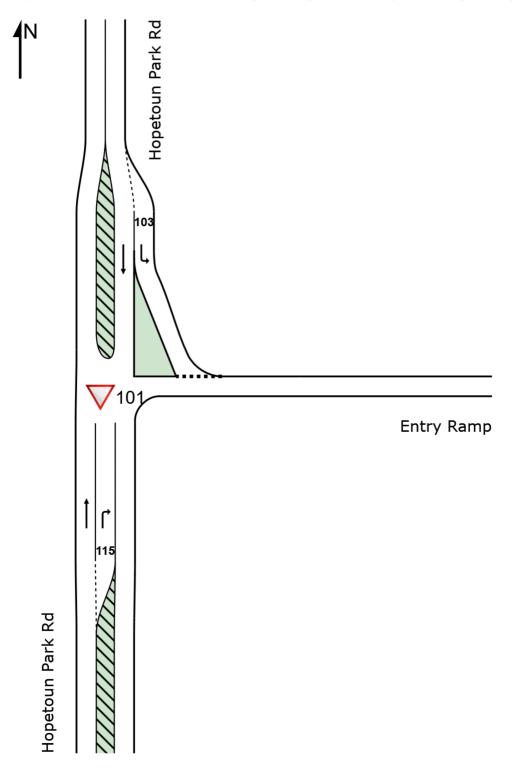
September 2020 9:29:30 AM



∇ Site: 101 [(200 lots) Hopetoun Park Rd - Entry Ramp (Site Folder: General)]

New Site Site Category: (None) Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



VSite: 101 [(200 lots) Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mo	vemen	t Perfo	rmance										
Mov ID	Turn	INPL VOLUI	MES	DEMA FLO	WS	Deg. Satn		Level of Service	95% BA QUE	EUE	Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m			Cycles	km/h
South	n: Hope	etoun Pa	rk Rd											
2	T1	231	5.0	243	5.0	0.130	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	93	5.0	98	5.0	0.079	5.9	LOS A	0.3	2.1	0.14	0.59	0.14	52.2
Appro	oach	324	5.0	341	5.0	0.130	1.7	NA	0.3	2.1	0.04	0.17	0.04	57.5
North	: Hope	toun Par	k Rd											
7	L2	163	5.0	172	5.0	0.073	5.8	LOS A	0.4	2.7	0.19	0.51	0.19	53.4
8	T1	50	5.0	53	5.0	0.028	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	213	5.0	224	5.0	0.073	4.5	LOS A	0.4	2.7	0.14	0.39	0.14	54.8
All Vehic	eles	537	5.0	565	5.0	0.130	2.8	NA	0.4	2.7	0.08	0.26	0.08	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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VSite: 101 [(200 lots) Hopetoun Park Rd - Entry Ramp PM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mo	vemen	t Perfo	rmance										
Mov ID	Turn	INPL VOLUI		DEMA FLO	WS	Deg. Satn		Level of Service	95% BA QUE [Veh.	EUE	Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed
		[Total veh/h	пv ј %	[Total veh/h	HV] %	v/c	sec		veh	Dist] m			Cycles	km/h
South	n: Hope	etoun Pa	rk Rd											
2	T1	102	5.0	107	5.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	42	5.0	44	5.0	0.040	6.4	LOS A	0.1	1.0	0.26	0.60	0.26	51.9
Appro	oach	144	5.0	152	5.0	0.057	1.9	NA	0.1	1.0	0.07	0.18	0.07	57.4
North	: Hope	toun Par	k Rd											
7	L2	194	5.0	204	5.0	0.084	5.7	LOS A	0.4	3.2	0.12	0.51	0.12	53.7
8	T1	150	5.0	158	5.0	0.084	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	344	5.0	362	5.0	0.084	3.2	LOS A	0.4	3.2	0.07	0.29	0.07	56.2
All Vehic	eles	488	5.0	514	5.0	0.084	2.8	NA	0.4	3.2	0.07	0.26	0.07	56.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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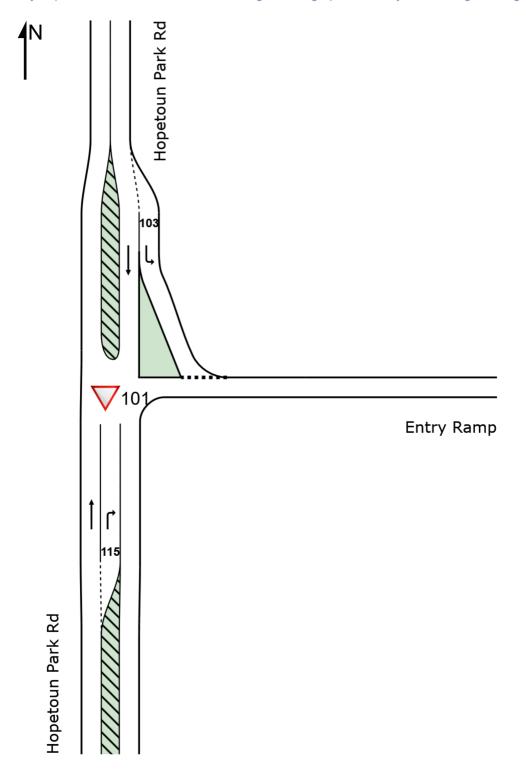
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∇ Site: 101 [(300 lots) Hopetoun Park Rd - Entry Ramp (Site Folder: General)]

New Site Site Category: (None) Give-Way (Two-Way)

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∇ Site: 101 [(300 lots) Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mo	ovemen	t Perfo	rmance)									
Mov ID	Turn	INPL VOLUI		DEM/ FLO		Deg. Satn		Level of Service	95% BA Que		Prop. Que	Effective Stop Rate	Aver. No. S	Aver.
טו		[Total	HV]	[Total	HV]	Jaiii	Delay	Service	[Veh.	Dist]	Que	Stop Mate	Cycles	ppeeu
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	n: Hope	etoun Pa	rk Rd											
2	T1	275	5.0	289	5.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	115	5.0	121	5.0	0.099	6.0	LOS A	0.4	2.7	0.16	0.59	0.16	52.2
Appro	oach	390	5.0	411	5.0	0.154	1.8	NA	0.4	2.7	0.05	0.17	0.05	57.4
North	: Норе	etoun Par	k Rd											
7	L2	163	5.0	172	5.0	0.074	5.9	LOS A	0.4	2.7	0.21	0.51	0.21	53.3
8	T1	61	5.0	64	5.0	0.034	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	224	5.0	236	5.0	0.074	4.3	LOS A	0.4	2.7	0.15	0.37	0.15	55.0
All Vehic	cles	614	5.0	646	5.0	0.154	2.7	NA	0.4	2.7	0.09	0.25	0.09	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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∇Site: 101 [(300 lots) Hopetoun Park Rd - Entry Ramp PM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mo	ovemen	t Perfo	rmance)									
Mov	Turn	INPL VOLUI		DEM/ FLO		Deg. Satn		Level of Service	95% BA Que		Prop. Que	Effective Stop Rate	Aver. No. S	Aver.
טו		[Total	HV]	[Total	HV]	Jaiii	Delay	Service	[Veh.	Dist]	Que	Stop Mate	Cycles	ppeeu
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	h: Hope	etoun Pa	rk Rd											
2	T1	123	5.0	129	5.0	0.069	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	51	5.0	54	5.0	0.050	6.6	LOS A	0.2	1.3	0.29	0.61	0.29	51.8
Appro	oach	174	5.0	183	5.0	0.069	1.9	NA	0.2	1.3	0.08	0.18	0.08	57.3
North	і: Норе	etoun Pai	k Rd											
7	L2	194	5.0	204	5.0	0.084	5.8	LOS A	0.4	3.2	0.13	0.51	0.13	53.6
8	T1	184	5.0	194	5.0	0.103	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	378	5.0	398	5.0	0.103	3.0	LOS A	0.4	3.2	0.07	0.26	0.07	56.5
All Vehic	cles	552	5.0	581	5.0	0.103	2.6	NA	0.4	3.2	0.07	0.24	0.07	56.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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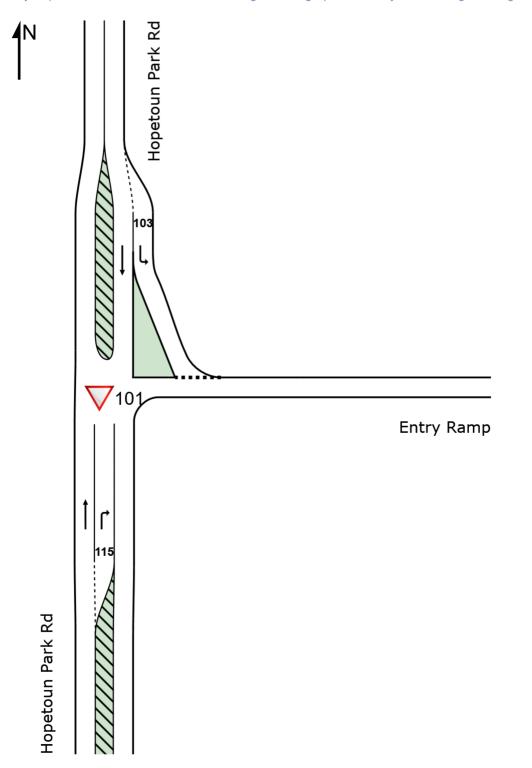
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∇ Site: 101 [(400 lots) Hopetoun Park Rd - Entry Ramp (Site Folder: General)]

New Site Site Category: (None) Give-Way (Two-Way)

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



ablaSite: 101 [(400 lots) Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

V/-l-:	-1- NA		Donto											
veni	CIE IVIC	ovement	Perto	rmance	!									
Mov ID	Turn	INPL VOLUI		DEM/ FLO\		Deg. Satn		Level of Service	95% BA QUE	ACK OF EUE	Prop.	Effective Stop Rate	Aver. No. _S Cycles	Aver.
טו		[Total	HV]	[Total	HV]	Oaur	Delay	OCIVICE	[Veh.	Dist]	Que	Otop Nate	Cycles	pecu
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	і: Норе	etoun Pa	rk Rd											
2	T1	318	5.0	335	5.0	0.178	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
3	R2	137	5.0	144	5.0	0.119	6.1	LOS A	0.5	3.3	0.18	0.59	0.18	52.1
Appro	oach	455	5.0	479	5.0	0.178	1.9	NA	0.5	3.3	0.05	0.18	0.05	57.3
North	: Норе	toun Par	k Rd											
7	L2	163	5.0	172	5.0	0.076	5.9	LOS A	0.4	2.8	0.23	0.52	0.23	53.3
8	T1	71	5.0	75	5.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Appro	oach	234	5.0	246	5.0	0.076	4.1	LOS A	0.4	2.8	0.16	0.36	0.16	55.1
All Vehic	les	689	5.0	725	5.0	0.178	2.6	NA	0.5	3.3	0.09	0.24	0.09	56.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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September 2020 12:36:30 PM



VSite: 101 [(400 lots) Hopetoun Park Rd - Entry Ramp PM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehi	cle Mc	waman	Porfo	rmance										
Mov ID		INPL VOLUI [Total	JT	DEMA FLO	AND	Deg. Satn		Level of Service	95% BA QUE [Veh.		Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
Soutl	h: Hope	etoun Pa	rk Rd											
2	T1	145	5.0	153	5.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	61	5.0	64	5.0	0.062	6.8	LOS A	0.2	1.6	0.32	0.63	0.32	51.8
Appr	oach	206	5.0	217	5.0	0.081	2.0	NA	0.2	1.6	0.10	0.19	0.10	57.3
North	ı: Hope	toun Par	k Rd											
7	L2	194	5.0	204	5.0	0.085	5.8	LOS A	0.4	3.2	0.15	0.51	0.15	53.6
8	T1	219	5.0	231	5.0	0.122	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Appr	oach	413	5.0	435	5.0	0.122	2.7	LOS A	0.4	3.2	0.07	0.24	0.07	56.7
All Vehic	cles	619	5.0	652	5.0	0.122	2.5	NA	0.4	3.2	0.08	0.22	0.08	56.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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APPENDIX 7 DETAILED SIDRA **OUTPUTS**

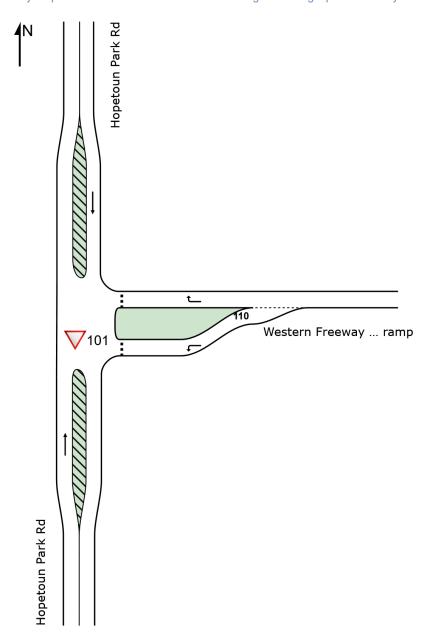


VSite: 101 [Hopetoun Park Rd - Exit Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

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▽Site: 101 [Hopetoun Park Rd - Exit Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

Vehic	cle Mo	vement	Perfor	mance										
Mov ID	Turn	INPL VOLUI	MES	DEMA FLOV	VS		Aver. Delay	Level	95% BA QUE	UE	Prop. Que	Effective Stop	Aver.	Aver. Speed
		[Total	HV]	[Total	HV]			Service	[Veh.	Dist]		Rate	Cycles`	
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	: Норе	etoun Par	k Rd											
2	T1	461	5.0	485	5.0	0.254	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
Appro	ach	461	5.0	485	5.0	0.254	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.8
East:	Weste	rn Freew	ay exit	ramp										
4	L2	68	0.0	72	0.0	0.067	7.5	LOS A	0.2	1.7	0.23	0.60	0.23	64.3
6	R2	11	0.0	12	0.0	0.038	16.5	LOS A	0.1	0.9	0.67	0.87	0.67	55.3
Appro	ach	79	0.0	83	0.0	0.067	8.7	LOS A	0.2	1.7	0.29	0.64	0.29	62.9
North	: Норе	toun Par	k Rd											
8	T1	108	5.0	114	5.0	0.061	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Appro	ach	108	5.0	114	5.0	0.061	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
All Vehic	les	648	4.4	682	4.4	0.254	1.1	LOS A	0.2	1.7	0.04	0.08	0.04	77.3

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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∇Site: 101 [Hopetoun Park Rd - Exit Ramp PM (Site Folder: General)]

New Site

Site Category: (None) Give-Way (Two-Way)

OIVC-	·vvay	i wo-vva	<i>()</i>											
Vehi	cle Mo	vement	Perforr	nance										
Mov ID	Turn	INPU VOLUI [Total veh/h		DEMA FLOV [Total veh/h		Deg. Satn	Aver. Delay sec	Level of Service	95% BA QUE [Veh. veh		Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed km/h
South	ı: Hope	toun Parl			- , ,	.,,								
2	T1	197	5.0	207	5.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Appro	ach	197	5.0	207	5.0	0.109	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
East:	Wester	n Freewa	ay exit ra	amp										
4	L2	227	0.0	239	0.0	0.302	9.7	LOS A	1.3	9.2	0.50	0.78	0.53	62.3
6	R2	28	0.0	29	0.0	0.087	15.4	LOS A	0.3	2.1	0.64	0.88	0.64	56.2
Appro	ach	255	0.0	268	0.0	0.302	10.3	LOS A	1.3	9.2	0.52	0.79	0.55	61.6
North	: Hopet	toun Park	Rd											
8	T1	338	5.0	356	5.0	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
Appro	ach	338	5.0	356	5.0	0.190	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
All Vehic	les	790	3.4	832	3.4	0.302	3.4	LOS A	1.3	9.2	0.17	0.25	0.18	72.9

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

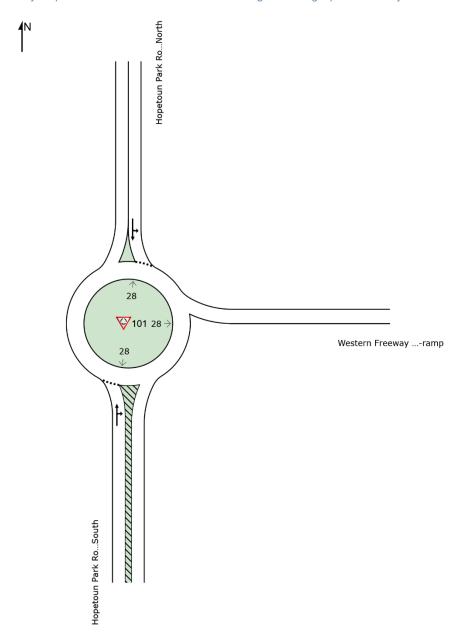
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♥Site: 101 [Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

Site Category: (None) Roundabout

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♥Site: 101 [Hopetoun Park Rd - Entry Ramp AM (Site Folder: General)]

New Site

Site Category: (None) Roundabout

Vehi	Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV]		DEMAND FLOWS [Total HV]		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh. Dist]		Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed	
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h	
South	า: Норе	etoun Pai	k Road	South											
2	T1	461	5.0	485	5.0	0.451	5.7	LOS A	0.0	0.0	0.00	0.60	0.00	62.4	
3	R2	277	5.0	292	5.0	0.451	11.4	LOS A	0.0	0.0	0.00	0.60	0.00	61.7	
Appro	oach	738	5.0	777	5.0	0.451	7.9	LOS A	0.0	0.0	0.00	0.60	0.00	62.1	
North	: Hope	toun Par	k Road	North											
7	L2	163	5.0	172	5.0	0.258	7.1	LOS A	1.4	10.5	0.48	0.62	0.48	64.3	
8	T1	108	5.0	114	5.0	0.258	7.4	LOS A	1.4	10.5	0.48	0.62	0.48	63.1	
Appro	oach	271	5.0	285	5.0	0.258	7.2	LOS A	1.4	10.5	0.48	0.62	0.48	63.9	
All Vehic	cles	1009	5.0	1062	5.0	0.451	7.7	LOS A	1.4	10.5	0.13	0.60	0.13	62.7	

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on degree of saturation per movement.

Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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♥Site: 101 [Hopetoun Park Rd - Entry Ramp PM (Site Folder: General)]

New Site

Site Category: (None)

Roundabout

Vehi	Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total HV]		DEMAND FLOWS [Total HV]		Deg. Aver. Level of Satn Delay Service		95% BACK OF QUEUE [Veh. Dist]		Prop. Que	Effective Stop Rate	Aver. No. _S Cycles	Aver. Speed		
		veh/h	%	veh/h	%	v/c	sec		veh	m			J ,	km/h	
South	า: Норе	toun Parl	k Road S	South											
2	T1	197	5.0	207	5.0	0.195	5.7	LOS A	0.0	0.0	0.00	0.60	0.00	62.3	
3	R2	122	5.0	128	5.0	0.195	11.4	LOS A	0.0	0.0	0.00	0.60	0.00	61.6	
Appro	oach	319	5.0	336	5.0	0.195	7.9	LOS A	0.0	0.0	0.00	0.60	0.00	62.1	
North	: Hope	toun Park	Road N	North											
7	L2	194	5.0	204	5.0	0.419	6.2	LOS A	2.8	20.4	0.37	0.53	0.37	64.7	
8	T1	338	5.0	356	5.0	0.419	6.6	LOS A	2.8	20.4	0.37	0.53	0.37	63.7	
Appro	oach	532	5.0	560	5.0	0.419	6.4	LOS A	2.8	20.4	0.37	0.53	0.37	64.1	
All Vehic	eles	851	5.0	896	5.0	0.419	7.0	LOS A	2.8	20.4	0.23	0.55	0.23	63.4	

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter

Settings dialog (Site tab).

Roundabout LOS Method: SIDRA Roundabout LOS.

Vehicle movement LOS values are based on degree of saturation per movement.

Intersection and Approach LOS values are based on worst degree of saturation for any vehicle movement.

Roundabout Capacity Model: SIDRA Standard.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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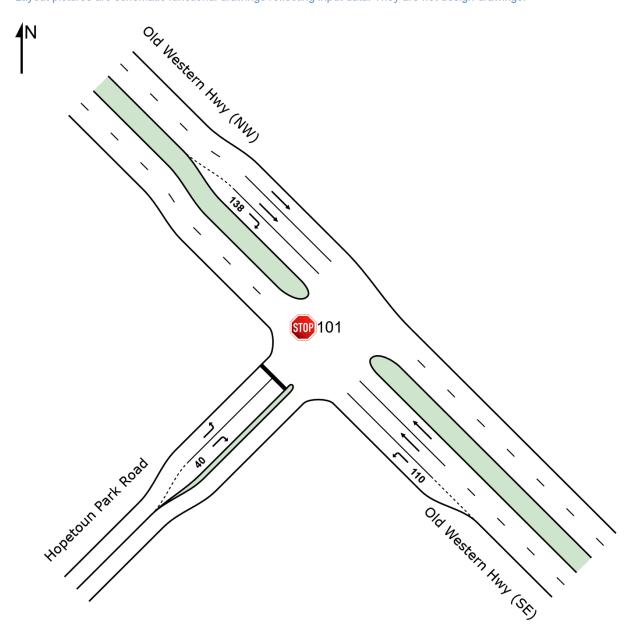
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Site: 101 [Hopetoun/OldWestern AM (Site Folder: General)]

New Site Site Category: (None) Stop (Two-Way)

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Site: 101 [Hopetoun/OldWestern AM (Site Folder: General)]

Site Category: (None) Stop (Two-Way)

Vehic	le Mo	vement	Perfo	rmance										
Mov ID	Turn	INPU VOLUI [Total	MES	DEMA FLO\ [Total		Deg. Satn	Aver. Delay	Level of Service		ACK OF EUE Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
South	East: C	ld Weste	ern Hw	y (SE)										
21	L2	15	5.0	16	5.0	0.009	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.7
22	T1	207	5.0	218	5.0	0.057	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Appro	ach	222	5.0	234	5.0	0.057	0.5	LOS A	0.0	0.0	0.00	0.04	0.00	78.6
North\	West: C	old West	ern Hw	y (NW)										
28	T1	255	5.0	268	5.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
29	R2	276	5.0	291	5.0	0.261	8.4	LOS A	1.2	8.9	0.39	0.65	0.39	62.0
Appro	ach	531	5.0	559	5.0	0.261	4.3	LOS A	1.2	8.9	0.20	0.34	0.20	69.5
South'	West: F	Hopetour	Park	Road										
30	L2	382	5.0	402	5.0	0.386	9.1	LOS A	2.0	14.3	0.31	0.88	0.31	51.4
32	R2	31	5.0	33	5.0	0.152	24.4	LOS A	0.5	3.8	0.79	1.00	0.79	43.0
Appro	ach	413	5.0	435	5.0	0.386	10.2	LOS A	2.0	14.3	0.34	0.89	0.34	50.7
All Vel	hicles	1166	5.0	1227	5.0	0.386	5.7	LOS A	2.0	14.3	0.21	0.48	0.21	62.6

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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Site: 101 [Hopetoun/OldWestern PM (Site Folder: General)]

New Site

Site Category: (None) Stop (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPU VOLUI I Total		DEMA FLOV [Total		Deg. Satn	Aver. Delay	Level of Service	95% BA QUE [Veh.		Prop. Que	Effective Stop Rate	Aver. No. c	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
SouthEast: Old Western Hwy (SE)														
21	L2	38	5.0	40	5.0	0.022	7.0	LOS A	0.0	0.0	0.00	0.63	0.00	63.7
22	T1	215	5.0	226	5.0	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	80.0
Appro	oach	253	5.0	266	5.0	0.059	1.1	LOS A	0.0	0.0	0.00	0.09	0.00	77.0
North	West:	Old West	tern Hw	y (NW)										
28	T1	398	5.0	419	5.0	0.110	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	79.9
29	R2	497	5.0	523	5.0	0.486	9.6	LOS A	3.7	27.0	0.52	0.74	0.63	61.1
Appro	oach	895	5.0	942	5.0	0.486	5.3	LOS A	3.7	27.0	0.29	0.41	0.35	68.3
South	nWest:	Hopetou	n Park F	Road										
30	L2	170	5.0	179	5.0	0.173	8.9	LOS A	0.7	5.1	0.25	0.89	0.25	51.4
32	R2	29	5.0	31	5.0	0.388	66.5	LOS A	1.3	9.3	0.94	1.04	1.12	28.8
Appro	oach	199	5.0	209	5.0	0.388	17.3	LOS A	1.3	9.3	0.35	0.91	0.38	46.2
All Vehic	les	1347	5.0	1418	5.0	0.486	6.3	LOS A	3.7	27.0	0.24	0.43	0.29	65.0

Site Level of Service (LOS) Method: Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Vehicle movement LOS values are based on degree of saturation per movement.

Minor Road Approach LOS values are based on worst degree of saturation for any vehicle movement.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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