Transport Impact Assessment

Proposed Small Holding Subdivision, Lot 2 Harold Douglas Drive and Lot 185 Venn Road, Shire of Dardanup

CW1200033

Prepared for

Dardanup Park Pty Ltd

12 January 2022

Cardno

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Table of Contents

Tables

Figures

1 Introduction

1.1 Background

Cardno was commissioned by Dardanup Park Pty Ltd ('the Client') to prepare a Transport Impact Assessment (TIA) for a proposed small holding subdivision for Lot 2 Harold Douglas Drive and Lot 185 Venn Road, within the Shire of Dardanup.

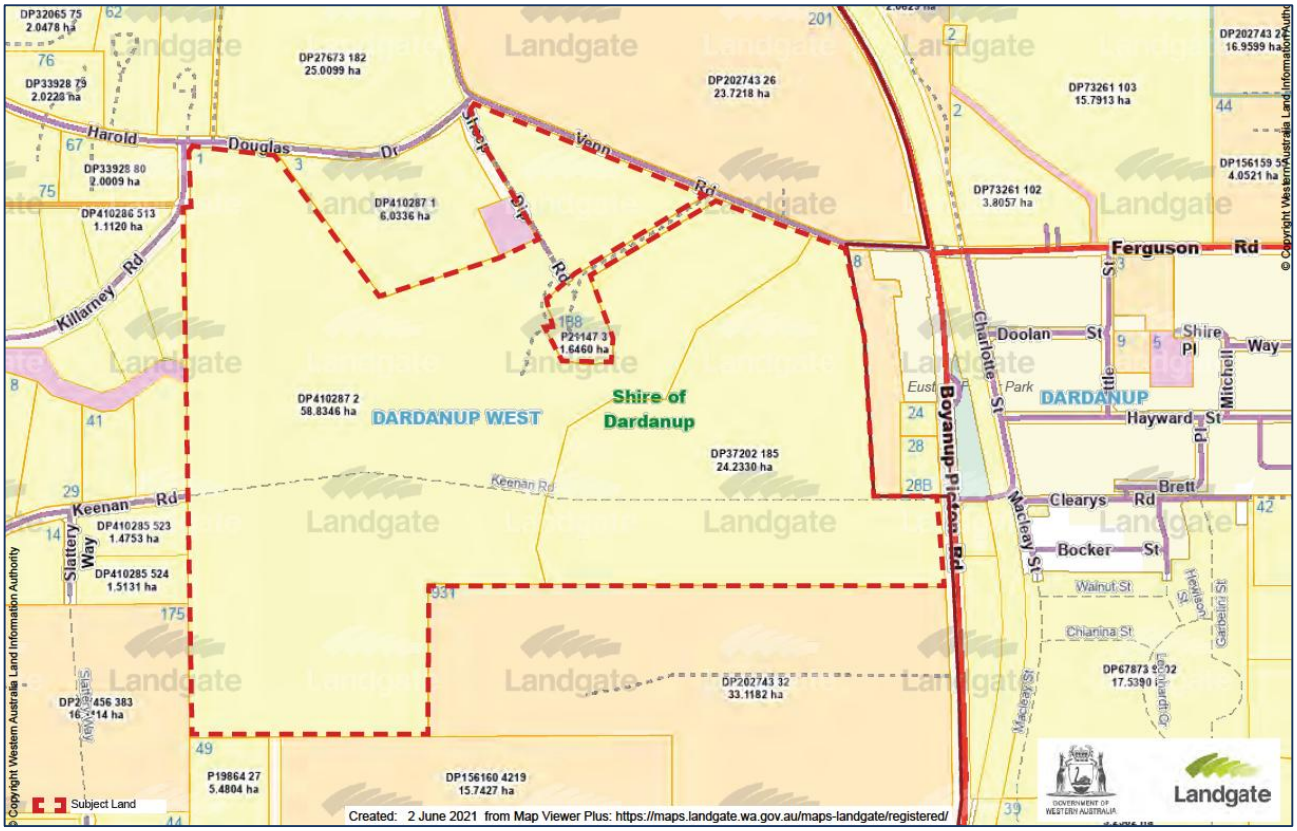
This TIA has been prepared in accordance with the Western Australian Planning Commission (WAPC) Transport Impact Assessment Guidelines for Developments: Volume 3 – Subdivisions (2016) and the checklist is included at **Appendix A**.

1.2 Existing Site

The site is located on multiple lots at Lot 2 Harold Douglas Drive and Lot 185 Venn Road, west of Boyanup – Picton Road within the Shire of Dardanup. Lot 2 Harold Douglas Drive includes a rural residential dwelling and a few adjacent agricultural buildings (e.g. sheds), while there are no buildings on Lot 185 Venn Road.

Figure 1-1 shows an image of the subject sites, while an aerial image of the lots is shown in **Figure 1-2**.

Figure 1-1 Subject Sites

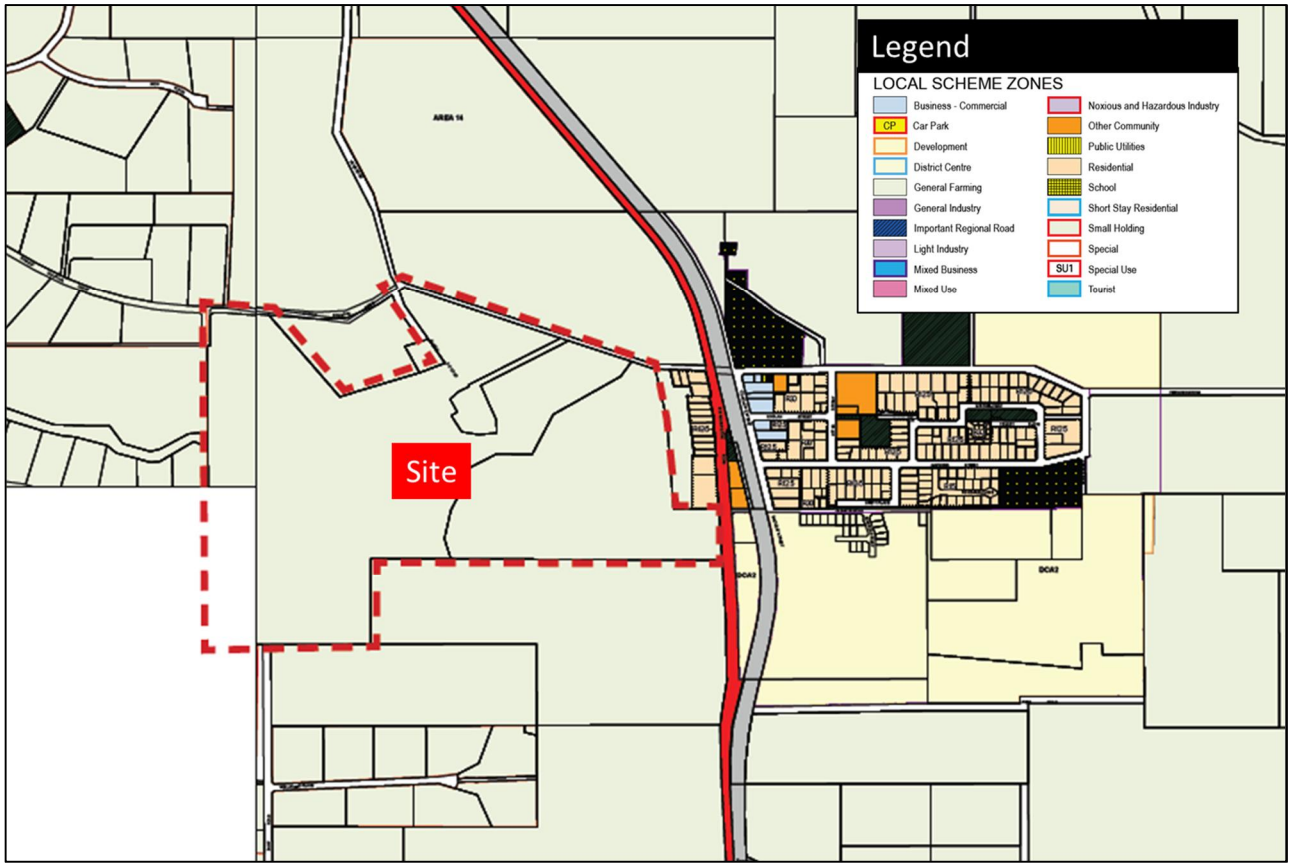


Source: Across Planning (2021)

Figure 1-2 Aerial Image of Lot 2 Harold Douglas Drive and Lot 185 Venn Road

The Sites are currently zoned as 'General Farming under the *Local Planning Scheme No. 3 of the Shire of Dardanup* as shown in **Figure 1-3** and the western portion is proposed to be rezoned as 'Small Holding'**.**

Figure 1-3 Zoning



Source: Shire of Dardanup Local Planning Scheme No. 3

2 Road Network

2.1 Existing Road Network

Road classifications are defined in the Main Roads Functional Hierarchy as follows:

- Primary Distributors (light blue): Form the regional and inter-regional grid of MRWA traffic routes and carry large volumes of fast-moving traffic. Some are strategic freight routes, and all are National or State Roads WA.
- Regional Distributors (red): Roads that are not Primary Distributors, but which link significant destinations and are designed for efficient movement of people and goods within and beyond regional areas. They are managed by Local Government.
- District Distributor A (green): These carry traffic between industrial, commercial and residential areas and connect to Primary Distributors. These are likely to be truck routes and provide only limited access to adjoining properties. They are managed by Local Government.
- District Distributor B (dark blue): preform a similar function to District Distributor A but with reduced capacity due to flow restrictions from access to and roadside parking alongside adjoining property. These are often older roads with traffic demand in excess of that originally intended. District Distributor A and B roads run between land-use cells and not through them, forming a grid that would ideally be around 1.5 kilometres apart. They are managed by Local Government.
- Local Distributors (orange): Carry traffic within a cell and link District Distributors at the boundary to access roads. The route of the Local Distributor discourages through traffic so that the cell formed by the grid of District Distributors only carries traffic belonging to or serving the area. These roads should accommodate buses but discourage trucks. They are managed by Local Government.
- Access Roads (grey): Provide access to abutting properties with amenity, safety and aesthetic aspects having priority over the vehicle movement function. These roads are bicycle and pedestrian friendly. They are managed by Local Government.

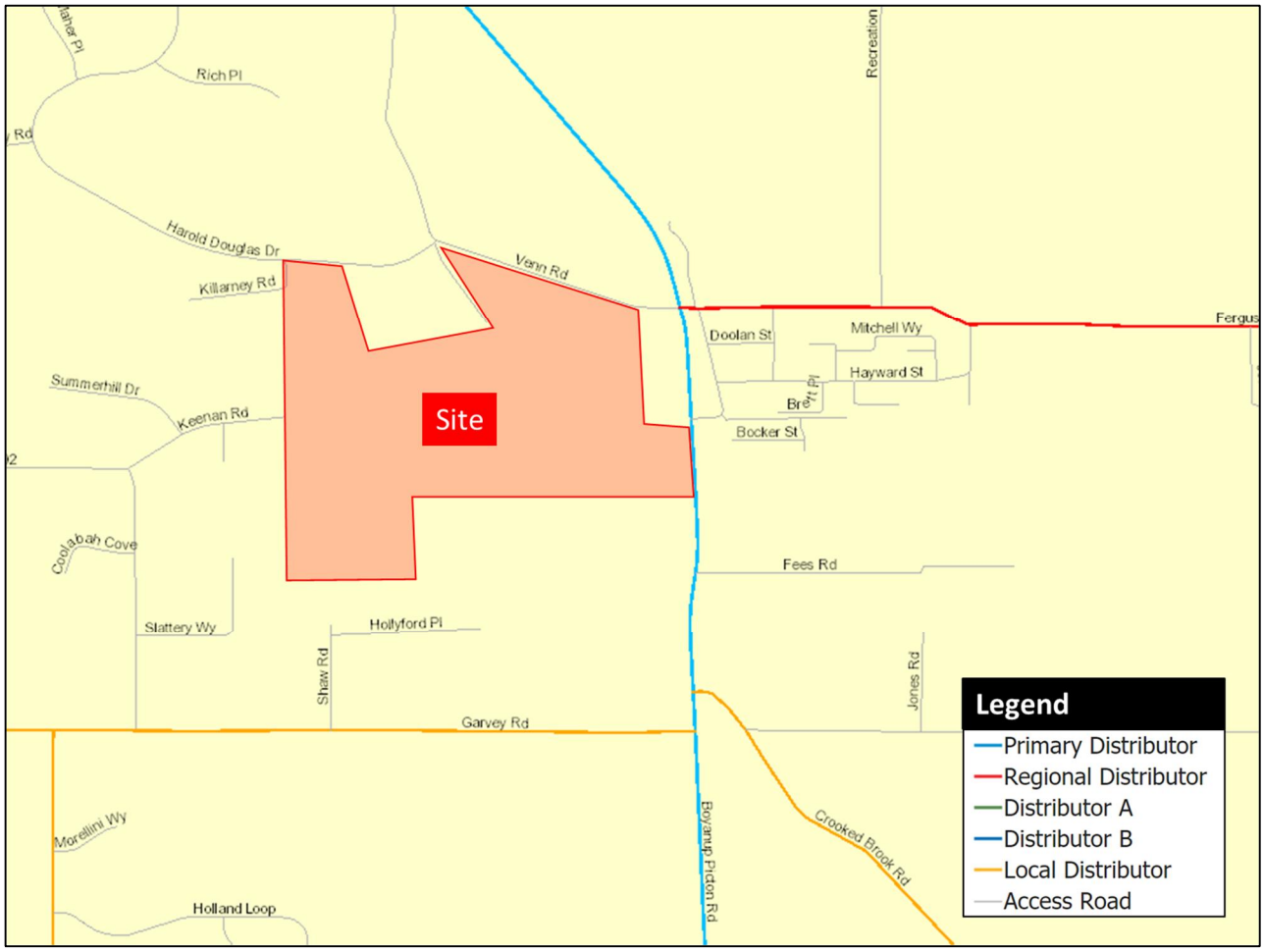
The surrounding road network is further described in **Table 2-1** and **Figure 2-1** shows the road hierarchy as per the *Main Roads WA Road Information Mapping System.*

Table 2-1 Road Network Classification

Street Names	Road Hierarchy		Road Network			
	Road Hierarchy	Jurisdiction	No. of Lanes	No. of Footpaths	Width (m)	Posted Speed (km/h)
Boyanup-Picton Road	Primary Distributor	Main Roads	2	0	6.8	80 km/hr – prior to Ferguson Road Intersection 70 km/hr – at Ferguson Road Intersection 90km/hr – South of Clearys Road 110km/hr – at Fees Road
Venn Road	Access Road	Local Government	1	0	6.0 (3.0m sealed road)	50
Harold Douglas Drive	Access Road	Local Government	2	0	6.34	70

Source: Main Roads Road Information Mapping System

Figure 2-1 Road Hierarchy



Source: Main Roads Road Information Mapping System

2.2 Traffic Volumes

Daily traffic volume information for the roads adjacent to the Site was sourced from the *Main Roads Traffic Map* and summarised in **Table 2-2**.

Table 2-2 Daily Traffic Volumes

Road Name	Date	Average Weekday Daily Traffic Volume
Boyanup-Picton Road South of Martin Pelusey Road	2020/21	4,513
Boyanup-Picton Road South of Collins Road	2020/21	2,838
Ferguson Road East of Waterloo Road	2017/18	1,876

Source: Main Roads WA Traffic Map

Intersection traffic surveys were also commissioned by Cardno in November 2021 for the AM and PM peak hours, for the 3 intersections shown in **Figure 2-2**.

Figure 2-2 Traffic Survey Intersections

The resulting AM and PM peak hour traffic volumes are shown in **Figure 2-3** and **Figure 2-4** for the AM and PM peak hours respectively, while the peak hour intersection turn volumes are included in Appendix C.

Figure 2-3 AM Peak Hour (08:00 - 09:00) Traffic Flows

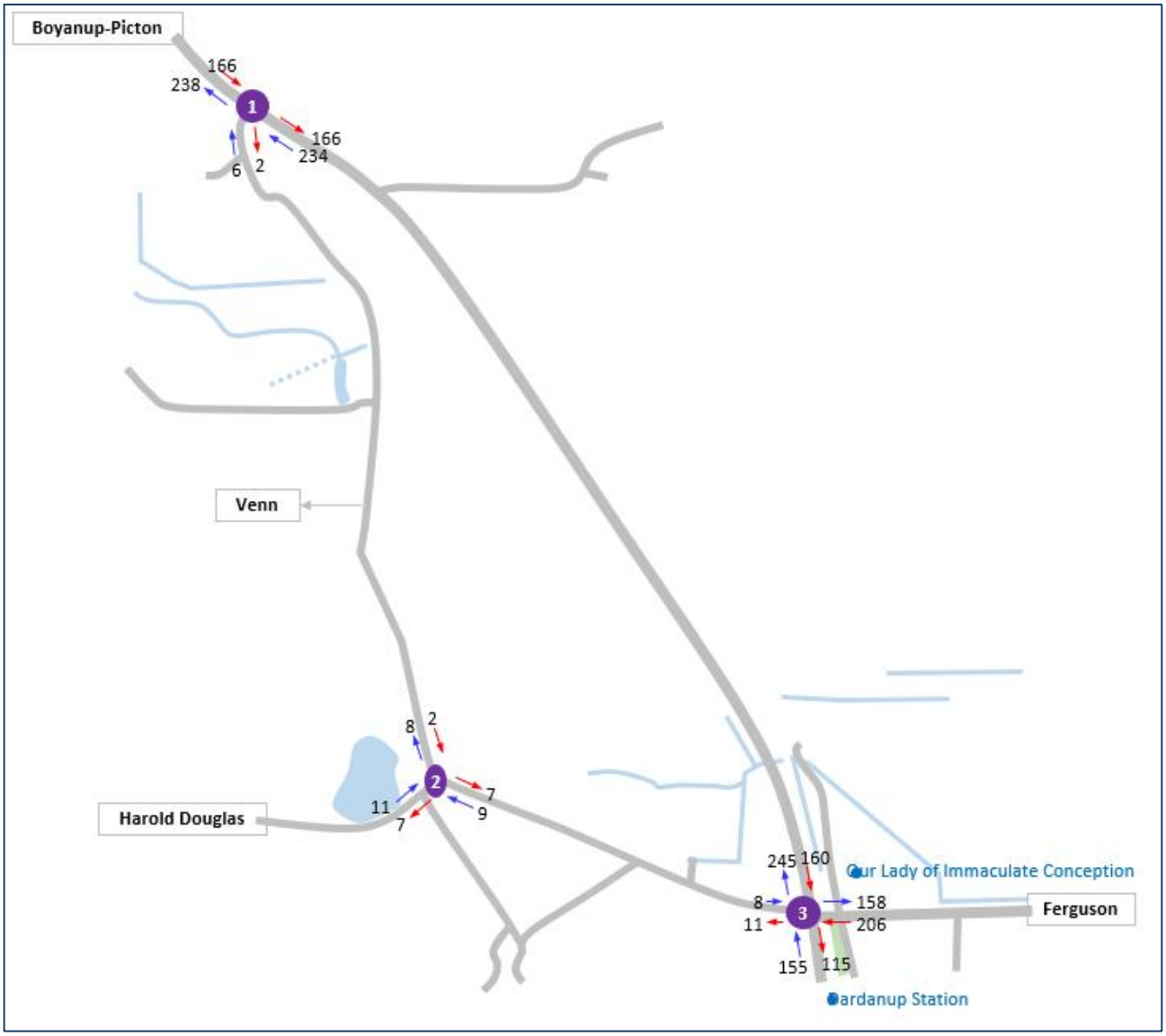
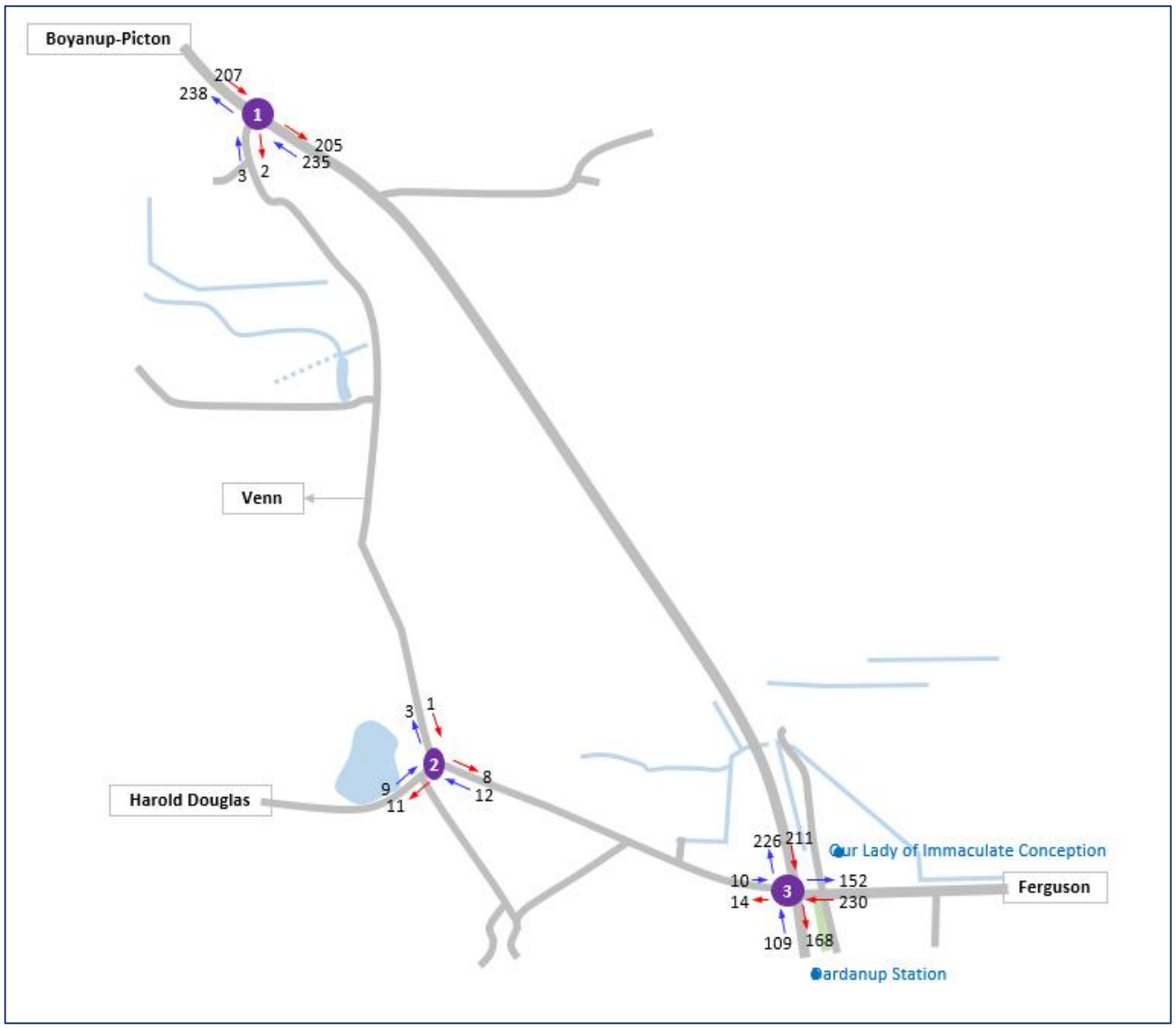


Figure 2-4 PM Peak Hour (14:45 - 15:45) Traffic Flows



2.3 Existing Public Transport Facilities

The Site does not have any access to public transport as there are no public transport services available within the area.

2.4 Existing Pedestrian/Cycle Network Facilities

While Boyanup-Picton Road includes sealed shoulders that can be used for on-road cycling, there is no other dedicated cycling or pedestrian infrastructure adjacent to the Site.

3 Proposed Development

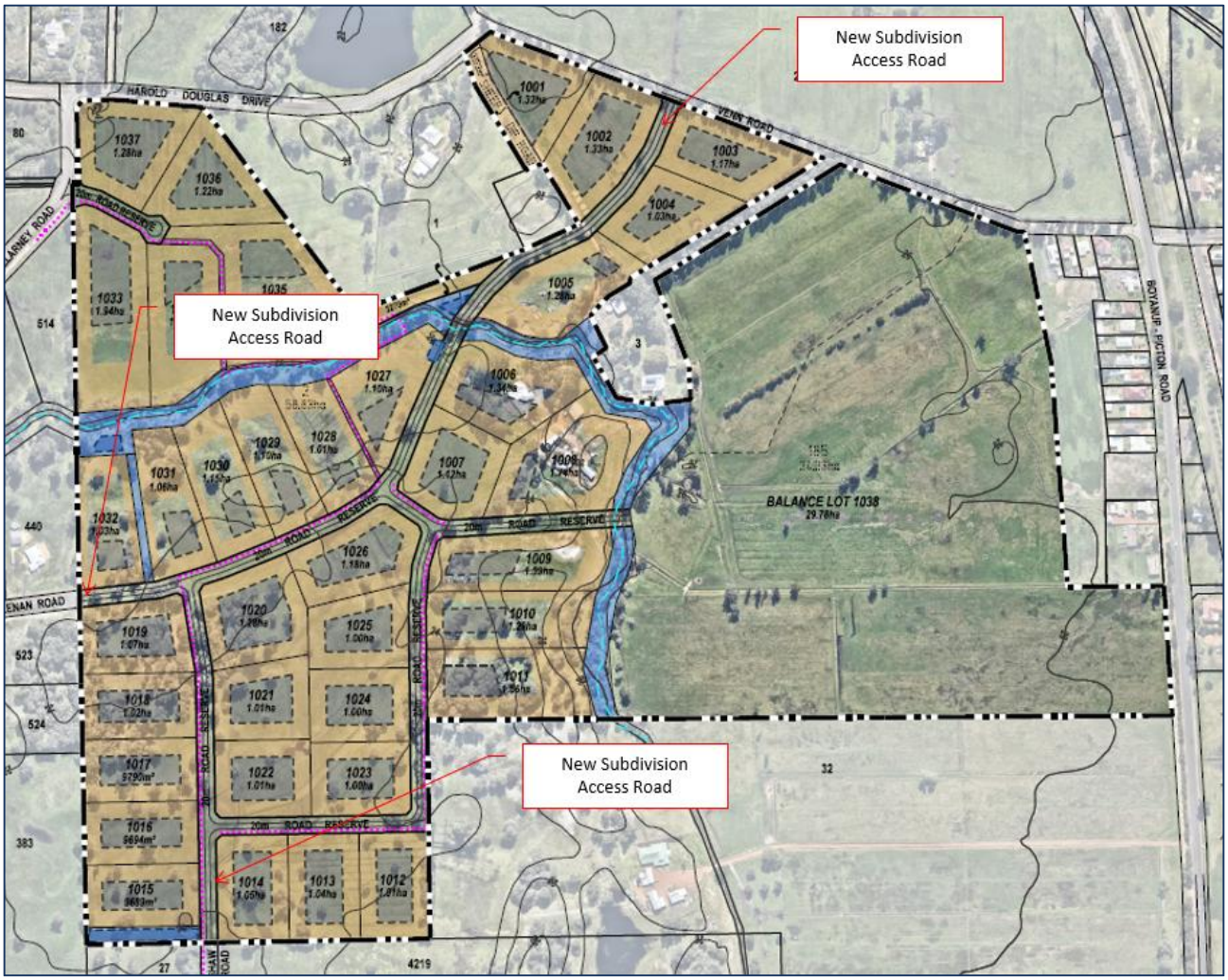
3.1 Lot 2 Harold Douglas Drive and Lot 185 Venn Road

The proposal is for a small holding sub-division comprising of a total of 37 single dwelling rural living Lots for the following lot sizes:

- 16 rural living lots with an area ranging from 10,000 sqm to 11,000sqm;
- 5 rural living lots with an area ranging from 11,000 sqm to 12,000sqm;
- 8 rural living lots with an area ranging from 12,000 sqm to 13,000sqm;
- 3 rural living lots with an area ranging from 13,000 sqm to 14,000sqm;
- 2 rural living lots with an area ranging from 14,000 sqm to 15,000sqm;
- 3 rural living lots with an area ranging from 18,000 to 20,550sqm; and
- 20m wide road reserve within the rural lots for road circulation.

Figure 3-1 shows the conceptual plan for the above development.

Figure 3-1 Conceptual Structure Plan



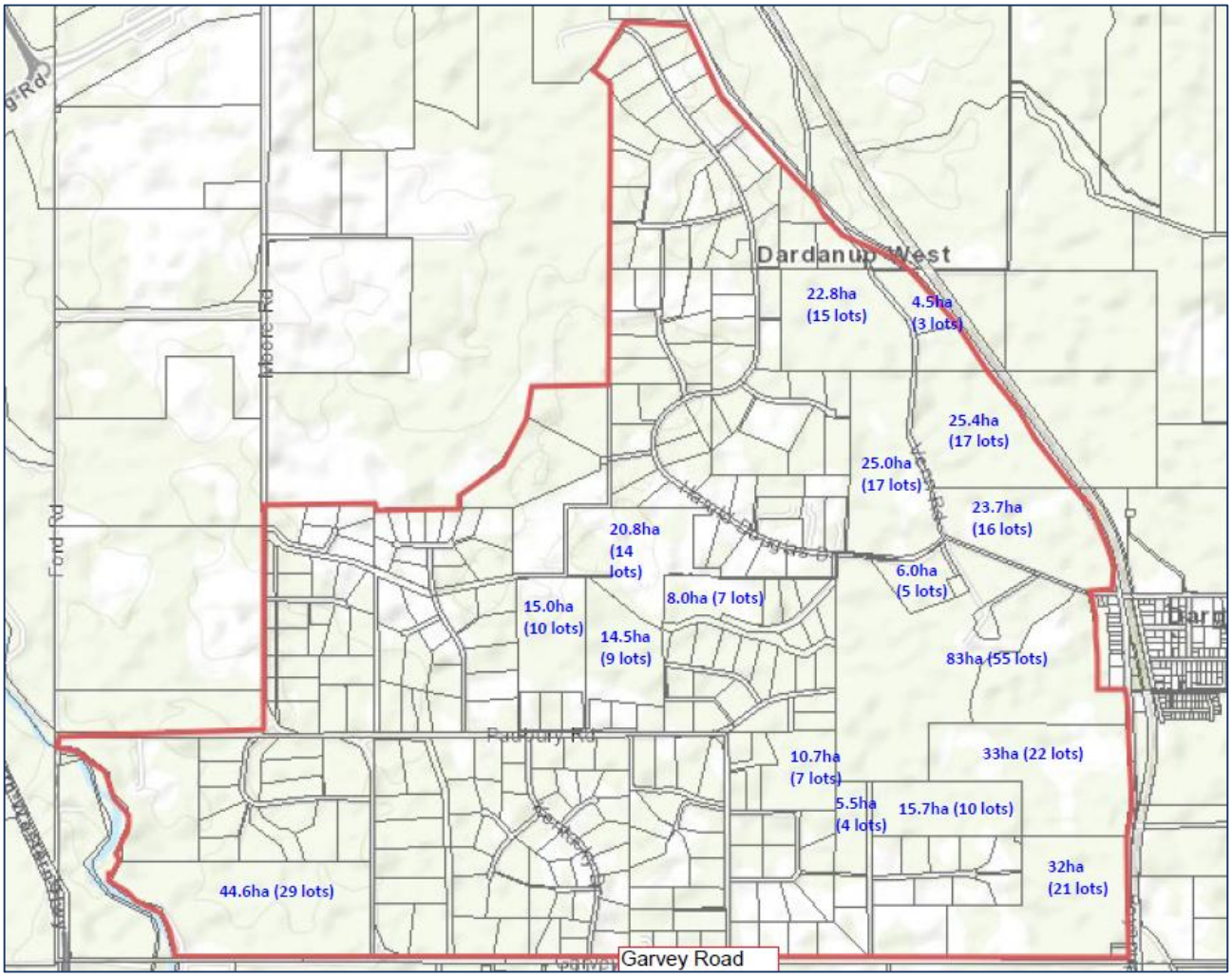
Source: Across Planning

3.2 Small Holdings Structure Plan (North of Garvey Road)

Within the Small Holdings Structure Plan area (north of Garvey Road), there remain a number of un-developed lots that potentially could be sub-divided and developed in to additional rural living lots.

Based on information provided by Across Planning and the Shire of Dardanup (refer to **Figure 3-2**), Cardno understands that there is a potential of 261 additional lots within the Small Holdings Structure Plan area, including a total of 55 lots on Lot 2 Harold Douglas Drive and 185 Venn Road (noting that only 37 lots are proposed on these lots as part of this development application).

Figure 3-2 Potential Additional Small Holding Lots (Total of 261)



Source: Across Planning and Shire of Dardanup

3.3 Access Arrangements

3.3.1 Short-Term Access Arrangements

In the short-term (i.e. within the next 5 years, or upon development of Lot 26) the primary access to the Site is proposed via the existing Boyanup-Picton Road/ Venn Road intersection.

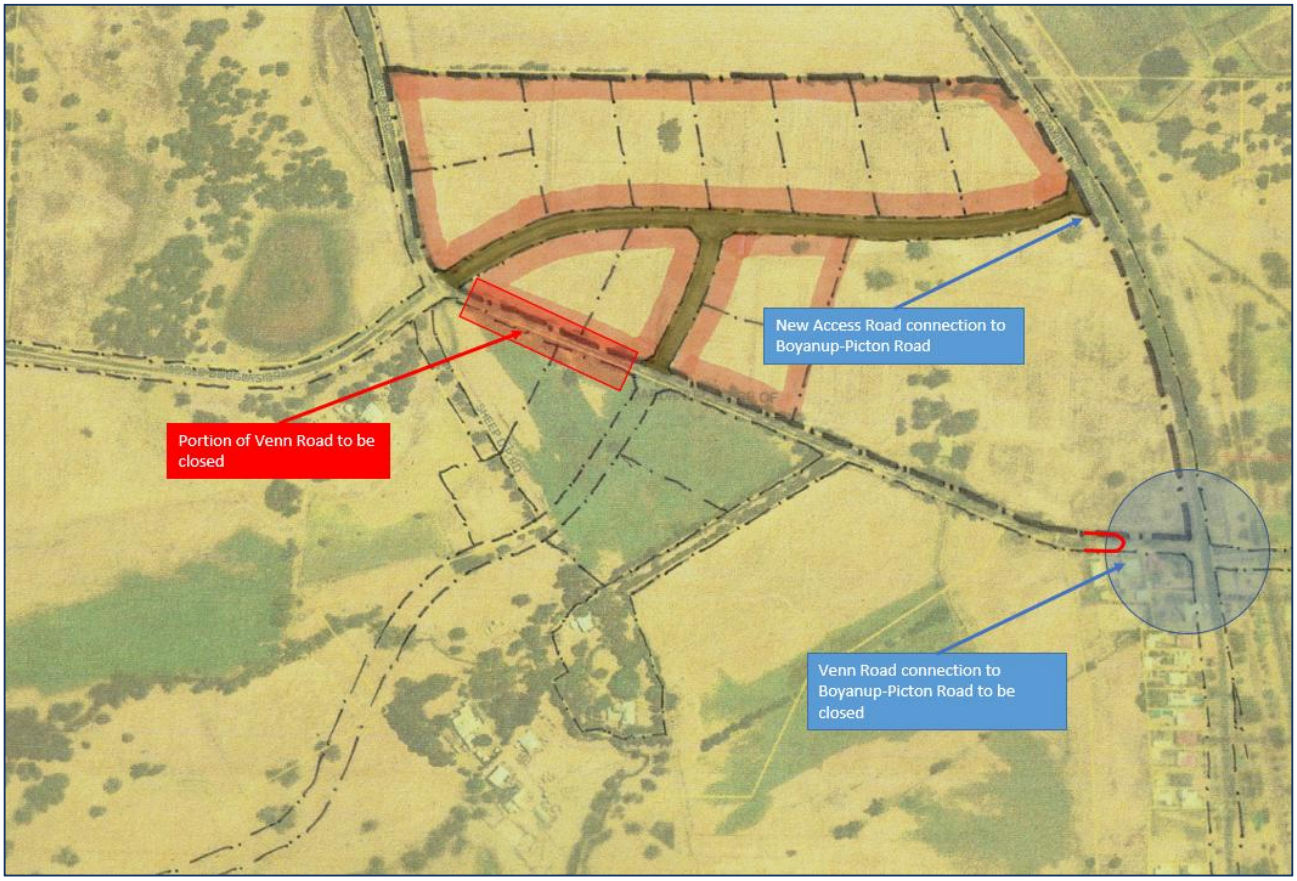
3.3.2 Medium-to-Long-Term Access Arrangements

Upon development of Lot 26, it is understood that Harold Douglas Avenue would be extended through Lot 26 and connect to Boyanup-Picton Road. This connection will allow the existing Venn Road (west) connection to Boyanup-Picton Road to be closed for vehicular through-traffic (although local vehicular access, pedestrian and cycling connectivity could still be maintained, subject to further design investigations), thus removing the 4-way intersection of Boyanup-Picton Road / Venn Road/ Ferguson Road.

It is understood that while both the Shire of Dardanup and Main Roads WA have expressed in-principle support of the extension of Harold Douglas Avenue through Lot 26 and the resulting intersection at Boyanup-Picton Road, this extension is likely to be landowner/developer-driven.

This access arrangement is indicatively shown in **Figure 3-3**.

Figure 3-3 Potential Medium-to-Long Term Access Arrangement



Upon development of the wider Small Holdings Structure Plan area, it is also proposed that Keenan Road be extended to Boyanup-Picton Road. While a section of the Keenan Road extension is included as part this development application, this does not include the full extension and proposed new connection to Boyanup-Picton Road.

4 Road Safety Review

4.1 Crash Assessment

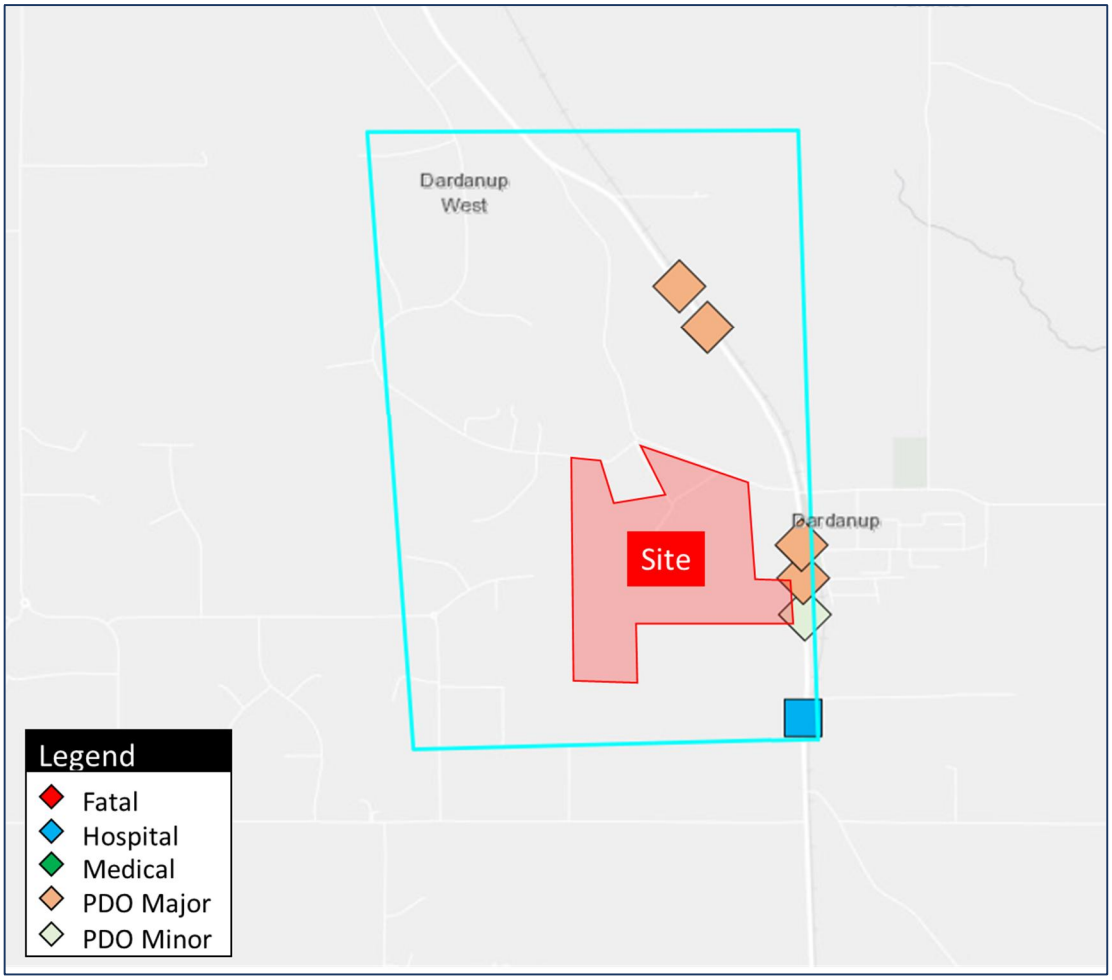
A crash assessment for the surrounding road network of the Subject Site has been completed using the Main Roads WA Reporting Centre. The assessment covers all the recorded accidents for the 5-year period between 1 January 2016 to 31 December 2020 for the following locations:

- Venn Road Midblock;
- Harold Douglas Drive Midblock;
- Boyanup – Picton Road Midblock;
- Intersection of Boyanup-Picton Road and Venn Road; and
- Intersection of Boyanup – Picton Road, Venn Road, and Ferguson Road

Figure 4-1 Boyanup-Picton Road Midblock

Type of Crash (RUM Code)	Fatal	Hospital	Medical	Major Property Damage	Minor Property Damage	Total Crashes
Hit Object	-	1	-	2	1	**4**
Rear End	-	-	-	2	-	**2**
Total	**-**	**1**	**-**	**4**	**1**	**6**

Figure 4-2 Crash Map



Source: Main Roads Crash Map

In summary:

- No crashes have been reported at along either Venn Road or Harold Douglas Drive.
- No crashes have been reported at the intersections of Boyanup-Picton Road/Ferguson and Boyanup-Picton Road/ Venn Road.
- 1 crash is was reported along Boyanup-Picton Road, which involved a vehicle hitting an object and resulted in hospital admission.
- 2 rear-end crashes were reported along Boyanup-Picton Road that resulted in major property damage.

Due to the low traffic generation by the proposed development and the low crash rates in the area, it is considered unlikely that the proposed development will have any material impact on the traffic safety of the surrounding road network.

5 Analysis of Transport Network

5.1 Analysis Overview

5.1.1 Key Intersections

A SIDRA analysis has been undertaken for the following intersections to assess the potential impact of Site-generated traffic on the surrounding road network:

- Boyanup-Picton Road/Venn Road
- Harold Douglas/ Venn Road
- Boyanup-Picton Road/ Ferguson

5.2 Assessment Years and Time Period

The development is proposed to be delivered in a staged approach and is expected to reach full development in 2031, with full development of the entire Small Holdings Structure Plan Area assumed to occur by 2046.

Due to the potential changes to the access and intersection configurations and potential build-out scenarios, Cardno has assessed the scenarios described in the following sections.

5.2.1 Scenario 1 – 2021 – Existing Conditions

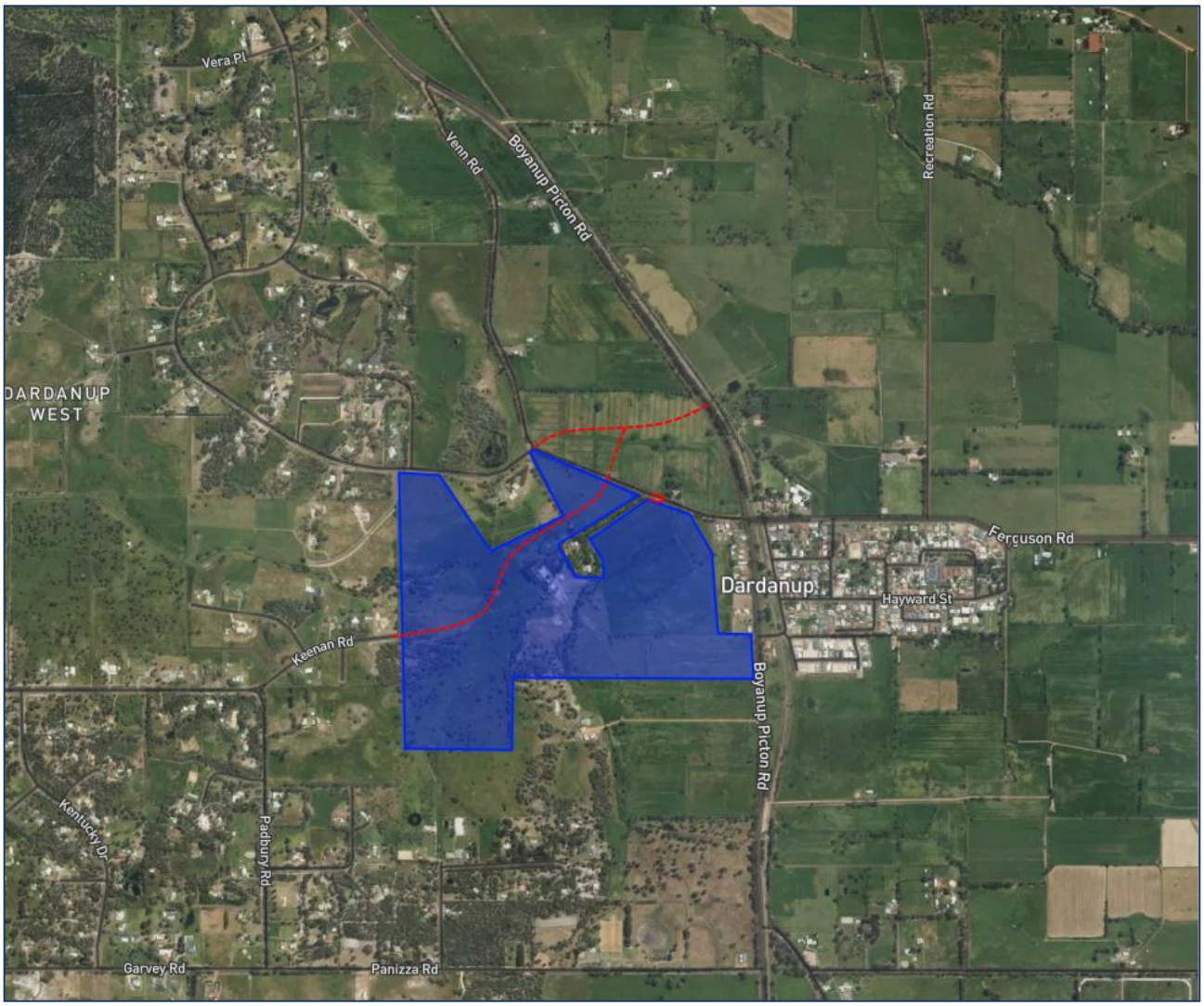
Scenario 1 represents the 2021 existing network conditions and provides a baseline for comparison.

5.2.2 Scenario 2 – 2031 – Build-out of Lot 2 Harold Douglas Drive and Lot 185 Venn Road - Access Option 1

Scenario 2 represents the year of assumed full build-out of Lot 2 Harold Douglas Drive and Lot 185 Venn Road for a 2031 horizon year. The road network assumptions for Scenario 2 are shown in **Figure 5-1** and assume that Venn Road (east) has been modified to not provide a connection through to the intersection of Boyanup-Picton Road / Ferguson Road / Venn Road and that Harold Douglas Drive has been extended to Boyanup-Picton Road. A conservative background (non-development) traffic growth rate of 5.0% per annum was applied to the 2021 volumes to estimate the 2031 volumes for this scenario.

This scenario is considered to represent the most likely development and access scenario for the 10-year horizon.

Figure 5-1 Road Network Assumptions for 2031 - Scenario 2

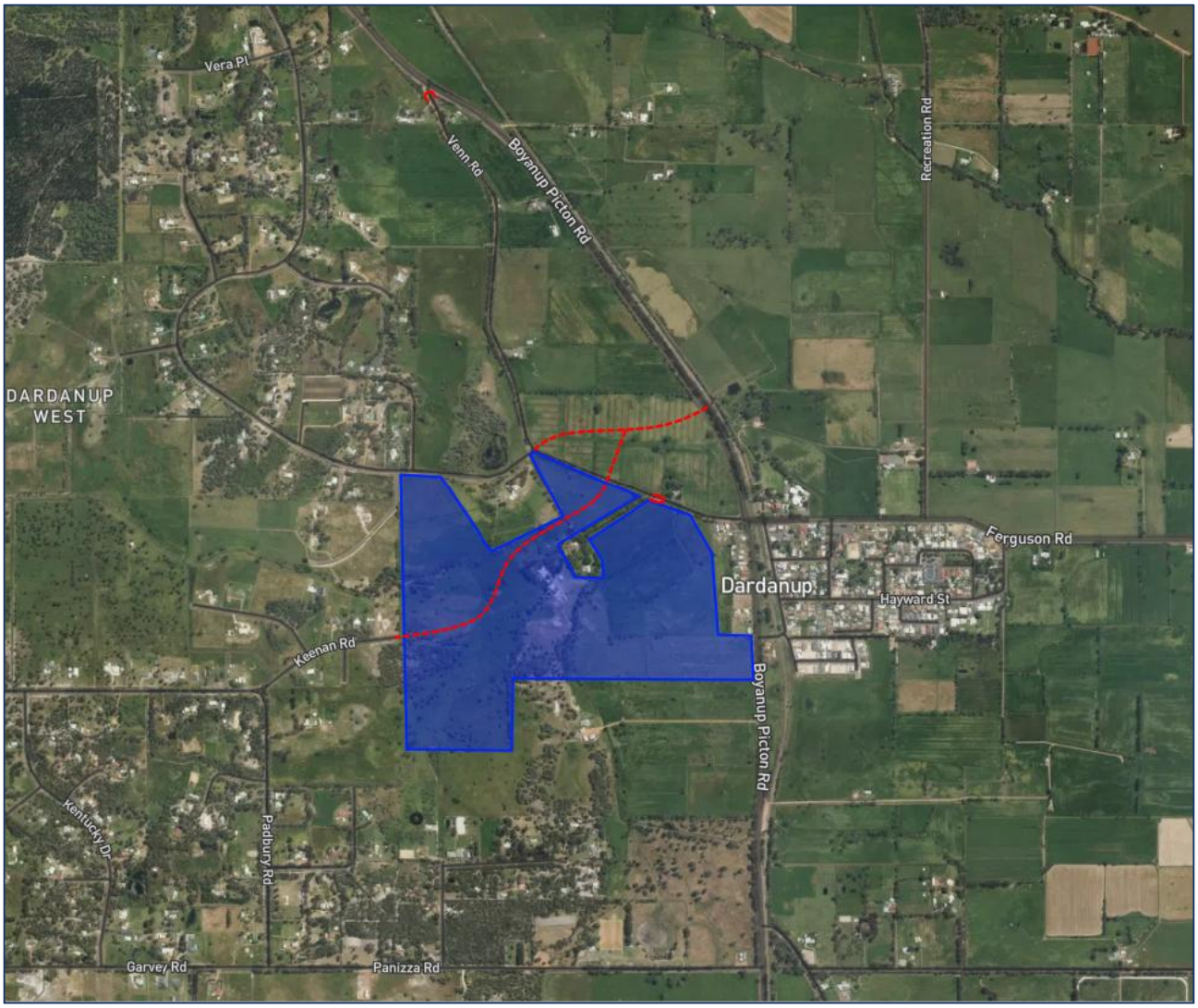


5.2.3 Scenario 3 – 2031 – Build-out of Lot 2 Harold Douglas Drive and Lot 185 Venn Road - Access Option 2

The road network assumptions for Scenario 3 are shown in **Figure 5-2** and are generally similar to Scenario 2, with the exception that the intersection of Boyanup-Picton Road / Venn Road (north) has also been assumed to have been closed.

This scenario is considered to represent a more conservative access scenario for the 10-year horizon as access to Boyanup-Picton Road is more restricted under this scenario.

Figure 5-2 Road Network Assumptions for 2031 - Scenario 3

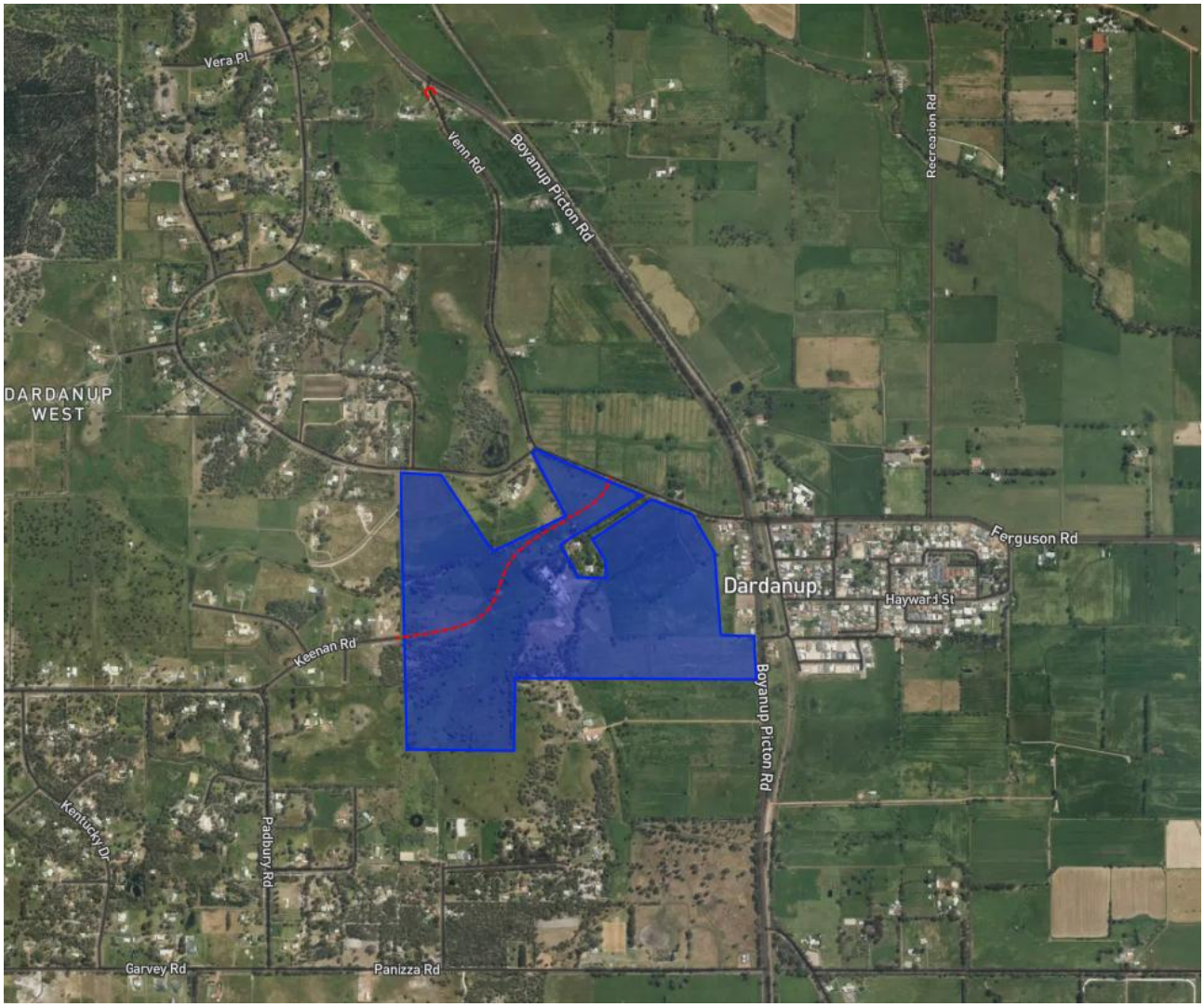


5.2.4 Scenario 4 – 2031 – Build-out of Lot 2 Harold Douglas Drive and Lot 185 Venn Road - Access Option 3

The road network assumptions for Scenario 4 are shown in **Figure 5-3** and assumes the only access to Boyanup-Picton Road will be provided via the existing Boyanup-Picton Road / Ferguson Road / Venn Road (east) intersection.

This scenario is considered to represent the worst-case scenario in terms of access to the Dardanup West locality, as access to/from Boyanup-Picton Road would be restricted to the intersection of Boyanup-Picton Road / Ferguson Road / Venn Road (east).

Figure 5-3 Road Network Assumptions for 2031 - Scenario 4

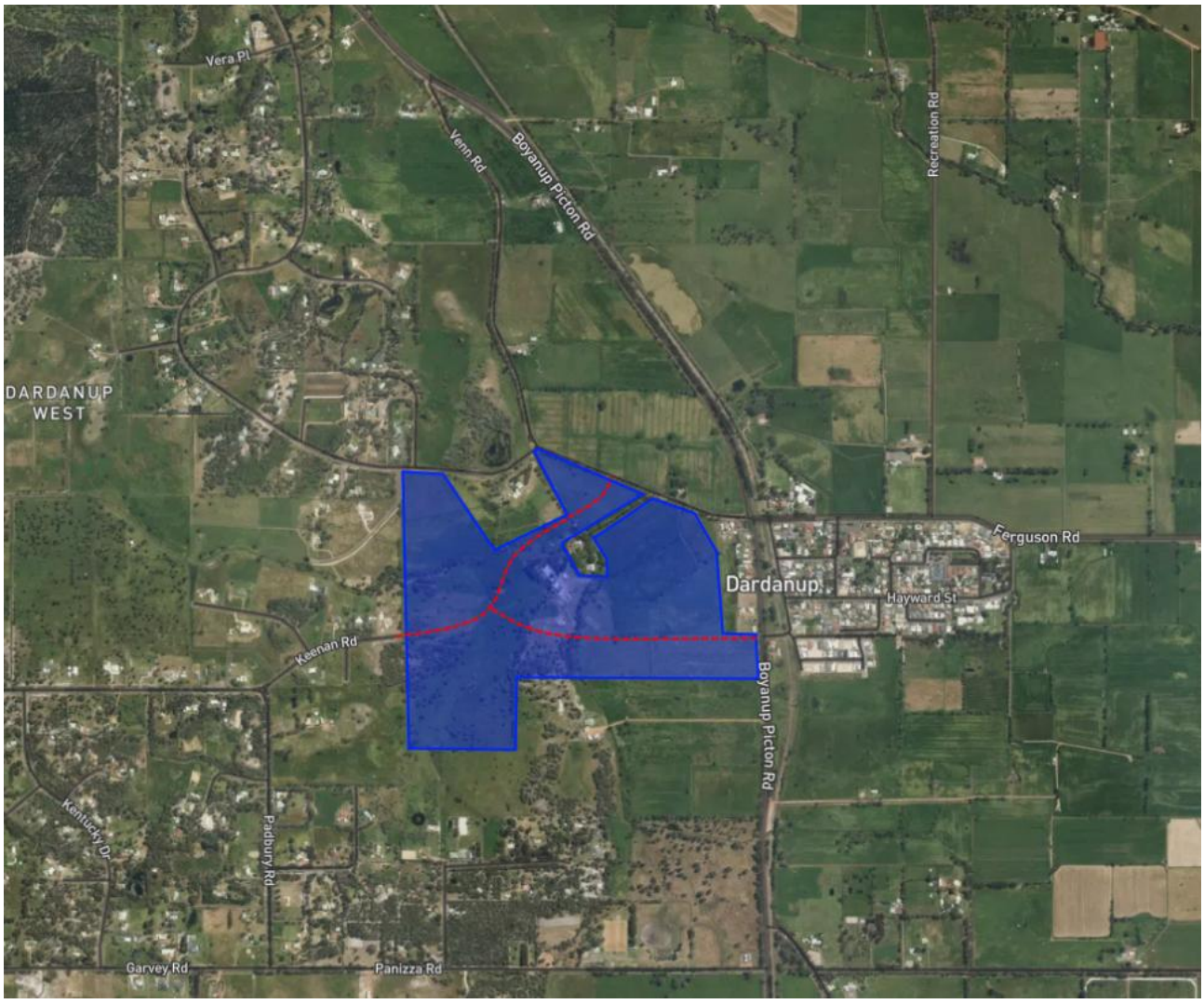


5.2.5 Scenario 5a – 2046 – Build-out Small Holdings Structure Plan Area - Access Option 4

Scenario 5a represents the year of assumed full build-out of the Small Holdings Structure Plan Area for a 2046 horizon year, with the exception of Lot 26 (i.e.a total of 245 additional lots; 261 lots in the entire structure plan, minus 16 lots in Lot 26) and the associated Harold Douglas Drive extension to Boyanup-Picton Road.

The road network assumptions for Scenario 5a are shown in **Figure 5-4** and while the road network doesn't include the Harold Douglas Drive extension to Boyanup-Picton Road, the Keenan Road extension to Boyanup-Picton Road is assumed to have been constructed, and the existing connections between Venn Road and Boyanup-Picton Road are assumed to have been retained.

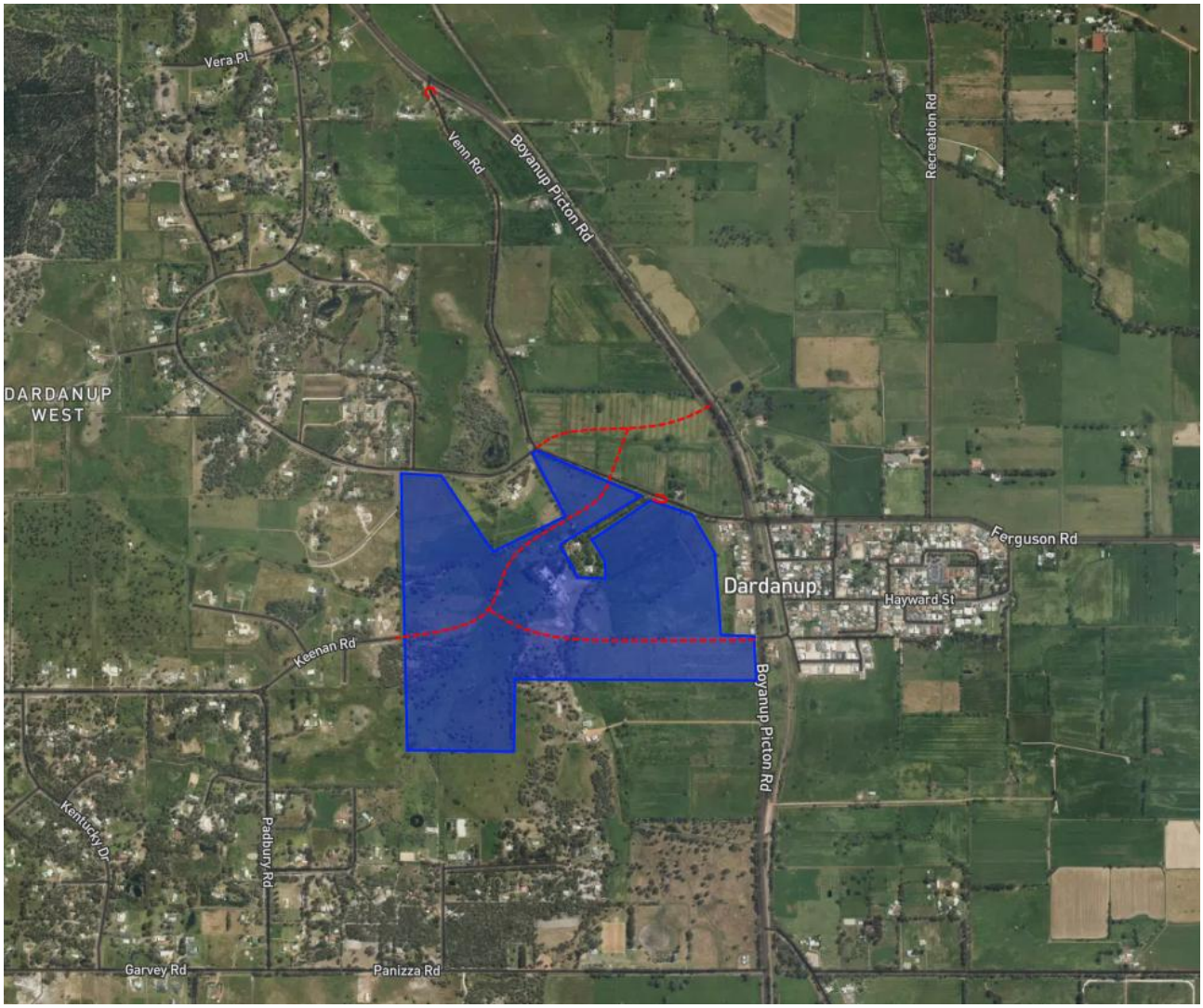
Figure 5-4 Road Network Assumptions for 2031 - Scenario 5a



5.2.6 Scenario 5b – 2046 – Build-out Small Holdings Structure Plan Area - Access Option 5

Scenario 5b represents the year of assumed full build-out of the entire Small Holdings Structure Plan Area for a 2046 horizon year, including all proposed new road connections to Boyanup-Picton Road and closure of the existing Venn Road connections to Boyanup-Picton Road.

Figure 5-5 Road Network Assumptions for 2031 - Scenario 5b



5.3 Development Trip Generation

5.3.1 Lot 2 Harold Douglas Drive and Lot 185 Venn Road

Trip generation rates from the *Institute of Transportation Engineers (ITE) "Trip Generation" 10th* as detailed in **Table 5-1** were used to calculate the estimated trip generation for the proposed development. **Table 5-2** shows the directional distribution and **Table 5-3** shows the total expected trips to be generated by the proposed development.

Table 5-1 Trip Generation Rates

Land Use	ITE CODE	Yield	AM Peak Rate	PM Peak Rate	Daily Rate
Residential	ITE 210	37 dwellings	0.76 trips per dwelling	1 trip per dwelling	9.44 trips per dwelling

Table 5-2 Directional Distribution

Land Use	AM		PM		Daily	
	IN	OUT	IN	OUT	IN	OUT
Residential (ITE 210)	26%	74%	64%	36%	50%	50%

Table 5-3 Total Trip Generation for Lot 2 Harold Douglas Drive and Lot 185 Venn Road

Land Use	AM Peak		PM Peak		Daily	
	IN	OUT	IN	OUT	IN	OUT
Residential (ITE 210)	7	21	24	13	175	175
Total	**28**		**37**		**350**	

Based on the above, the proposed is expected to generate a total of 28 trips during the AM peak hour and 37 trips during the PM peak hour. In accordance with the WAPC Transport Impact Assessment Guidelines, developments that are expected to generate less than 100 trips during either of the peak hours are considered to have a negligible impact on the surrounding road network.

5.3.2 Small Holdings Structure Plan

Adopting the same trip generation rates for the balance of the potential lots within Small Holdings Structure Plan area, the total trip generation for the remaining potential lots are summarised in **Table 5-4**.

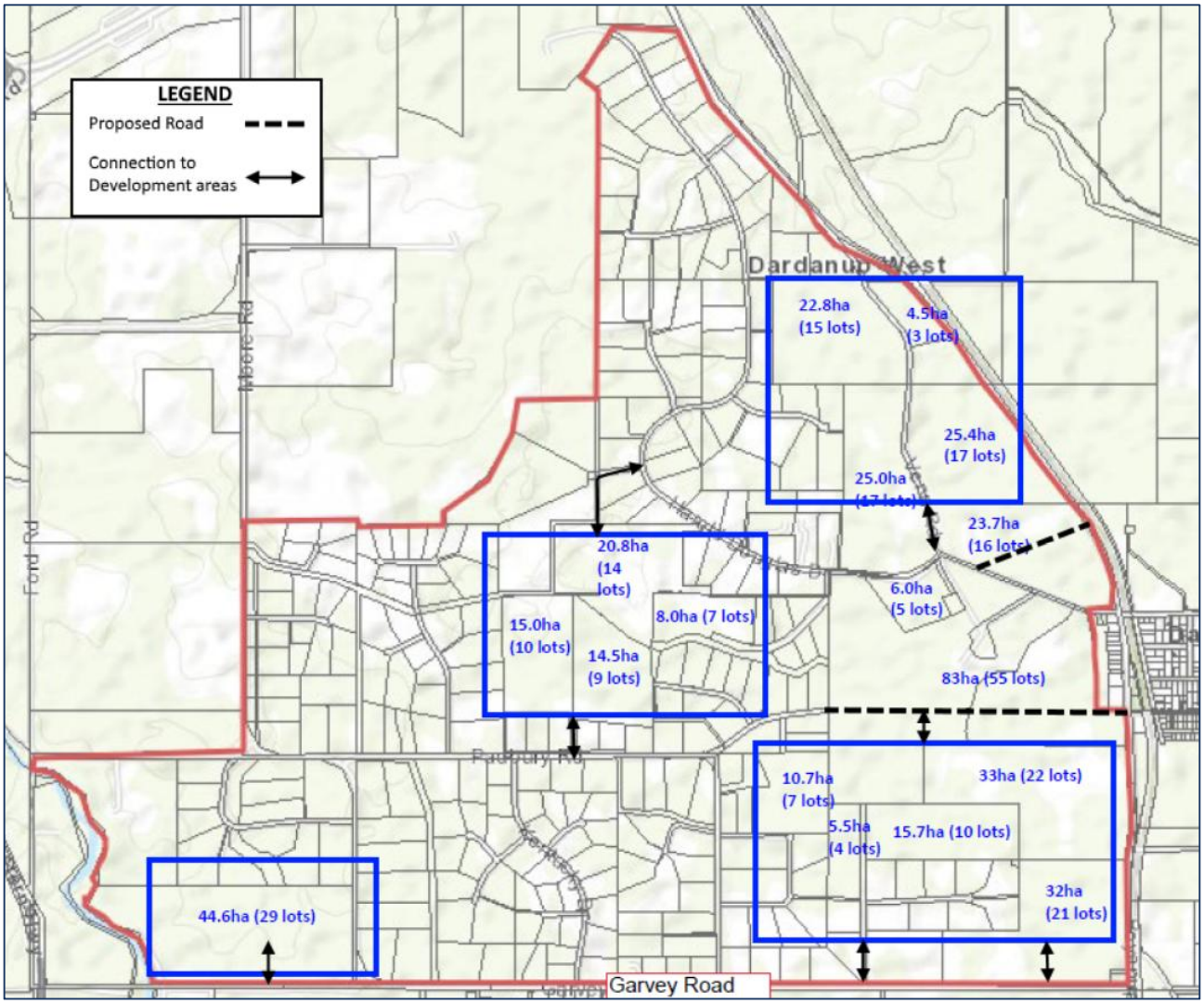
Table 5-4 Total Trip Generation for Lot 2 Harold Douglas Drive and Lot 185 Venn Road

Land Use	AM Peak		PM Peak		Daily	
	IN	OUT	IN	OUT	IN	OUT
Lot 2 Harold Douglas Drive and Lot 185 Venn Road – 37 lots	7	21	24	13	175	175
Balance for Lot 2 Harold Douglas Drive and Lot 185 Venn Road – 18 lots	4	10	12	6	85	85
3 Harold Douglas Drive – 5 lots	1	3	3	2	24	24
Lot 26 – 16 lots	3	9	10	6	76	76
SW area of Small Holdings Structure Plan – 29 lots	6	16	19	10	137	137
SE area of Small Holdings Structure Plan – 64 lots	13	36	41	23	302	302
NE area of Small Holdings Structure Plan – 52 lots	10	29	33	19	245	245
Central area of Small Holdings Structure Plan – 40 lots	8	22	26	14	189	189
Total	**198**		**261**		**2,466**	

5.4 Development Trip Distribution

The trip Distribution for the development-generated traffic was based on the existing counts along Venn Road and Boyanup-Picton Road, while the trip distribution assumptions for each of the remaining potential development areas within the Small Holdings Structure Plan area are shown in **Figure 5-6**.

Figure 5-6 Assumed Trip Distribution Assumptions for Small Holdings Structure Plan



5.5 Total Traffic Volumes

The resulting traffic volumes used in this assessment are summarised in **Figure 5-7** to **Figure 5-16** for the assessed scenarios.

Figure 5-7 Existing Traffic Volumes – Boyanup-Picton Road/Venn Road – Scenario 1

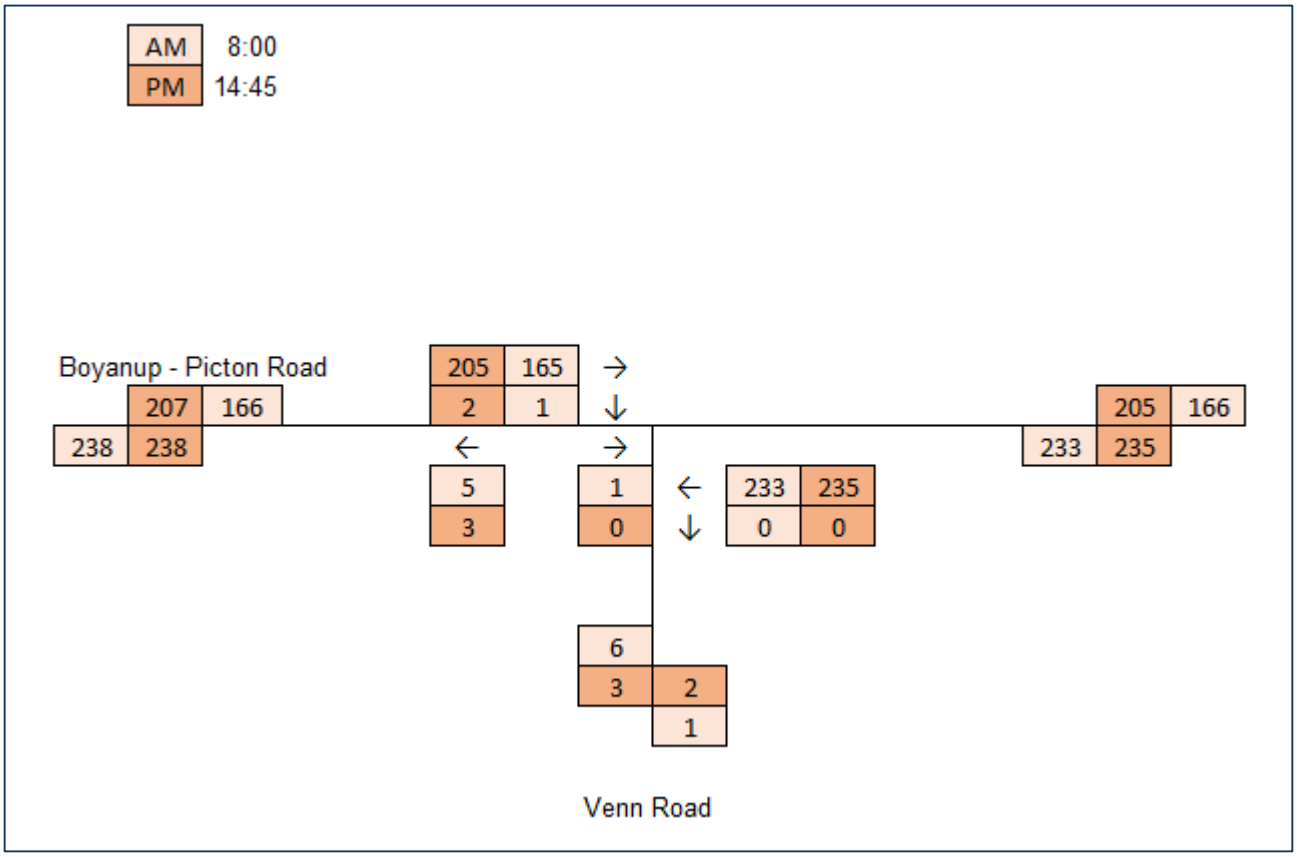


Figure 5-8 Existing Traffic Volumes – Harold Douglas/Venn Road – Scenario 1

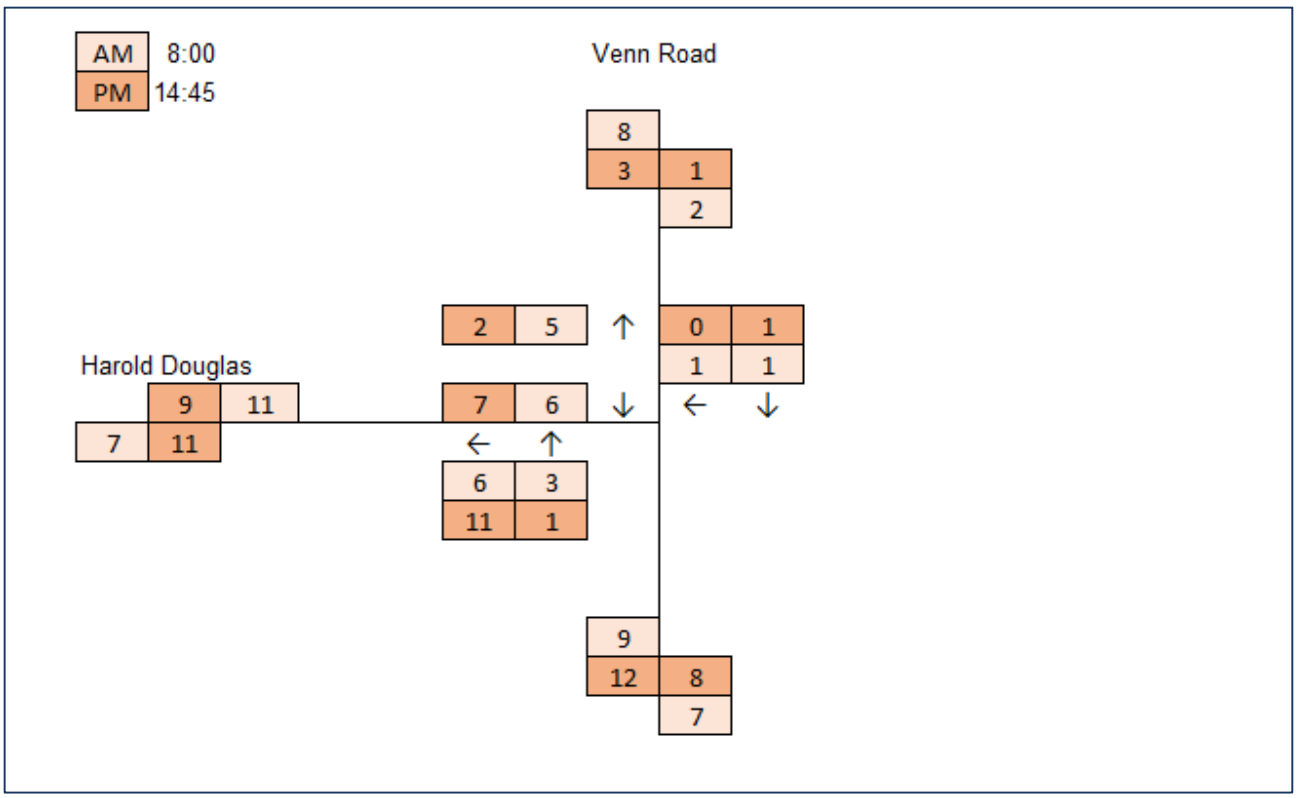


Figure 5-9 Existing Traffic Volumes - Boyanup-Picton Road / Venn Road / Ferguson Road – Scenario 1

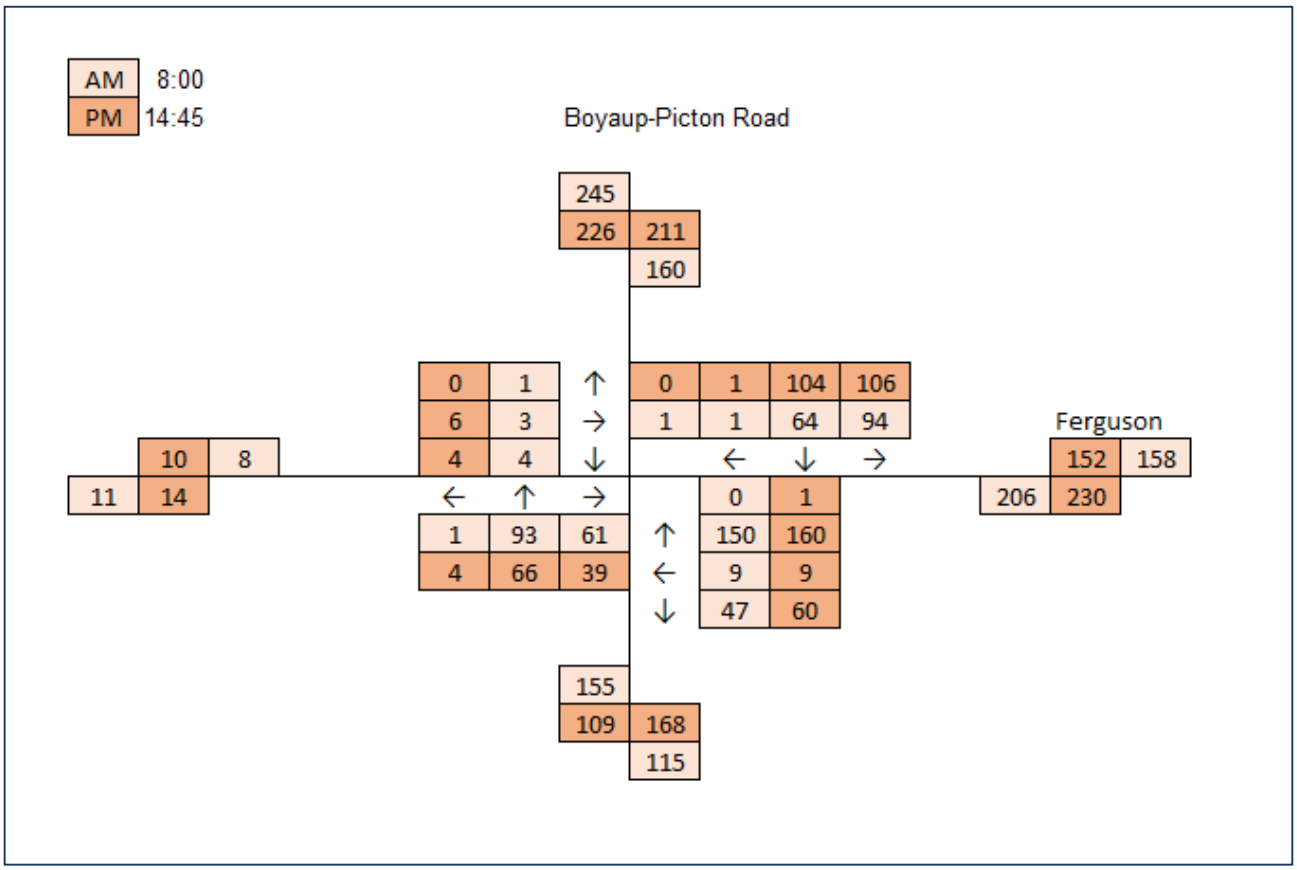


Figure 5-10 Development-Generated Traffic Volumes – Boyanup-Picton Road/ Venn Road – Scenario 2

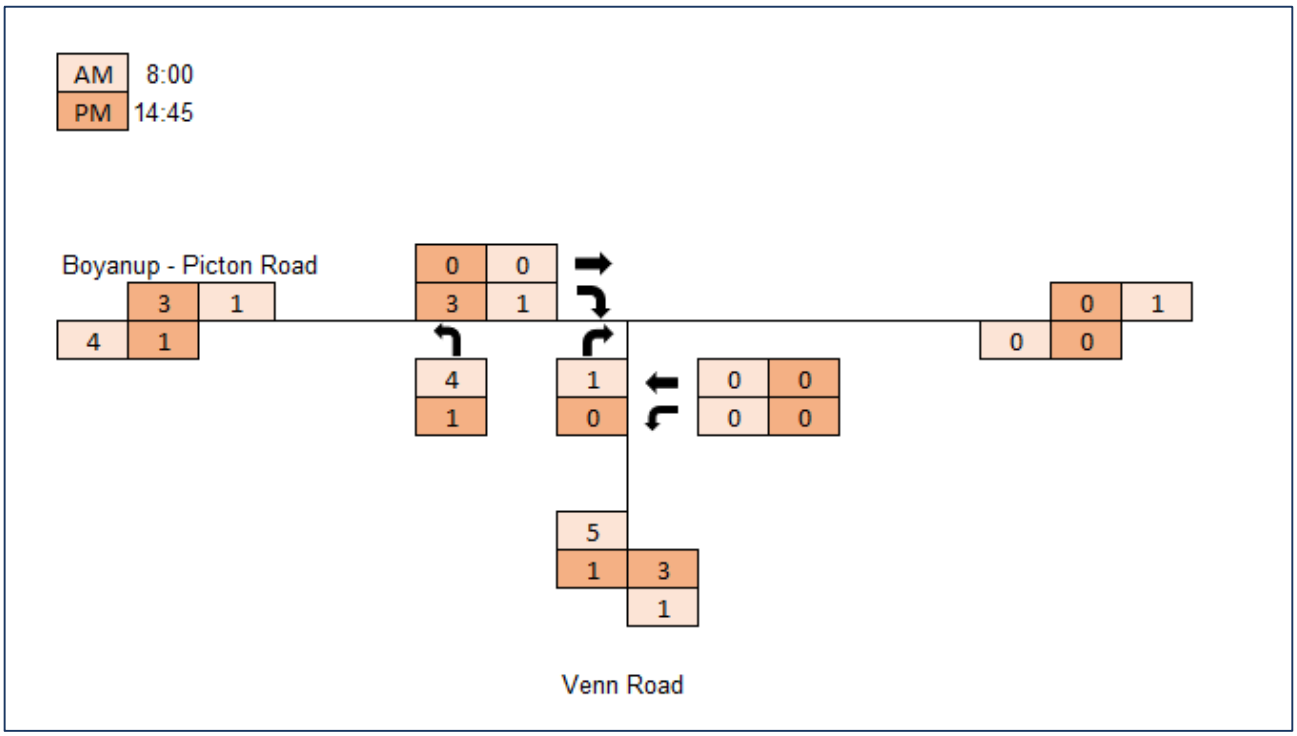


Figure 5-11 Development Traffic Volumes – Boyanup-Picton Road/ Harold Douglas Drive Extension – Scenario 2

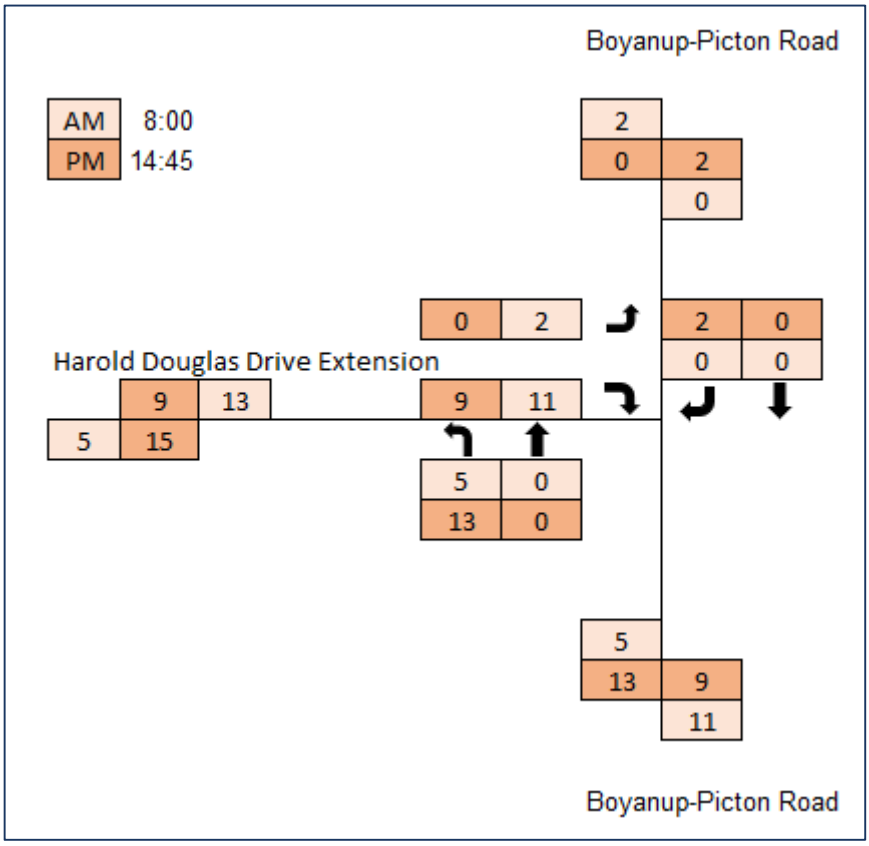


Figure 5-12 Combined 2031 Background and Development Traffic Volumes – Boyanup-Picton Road/ Venn Road – Scenario 2

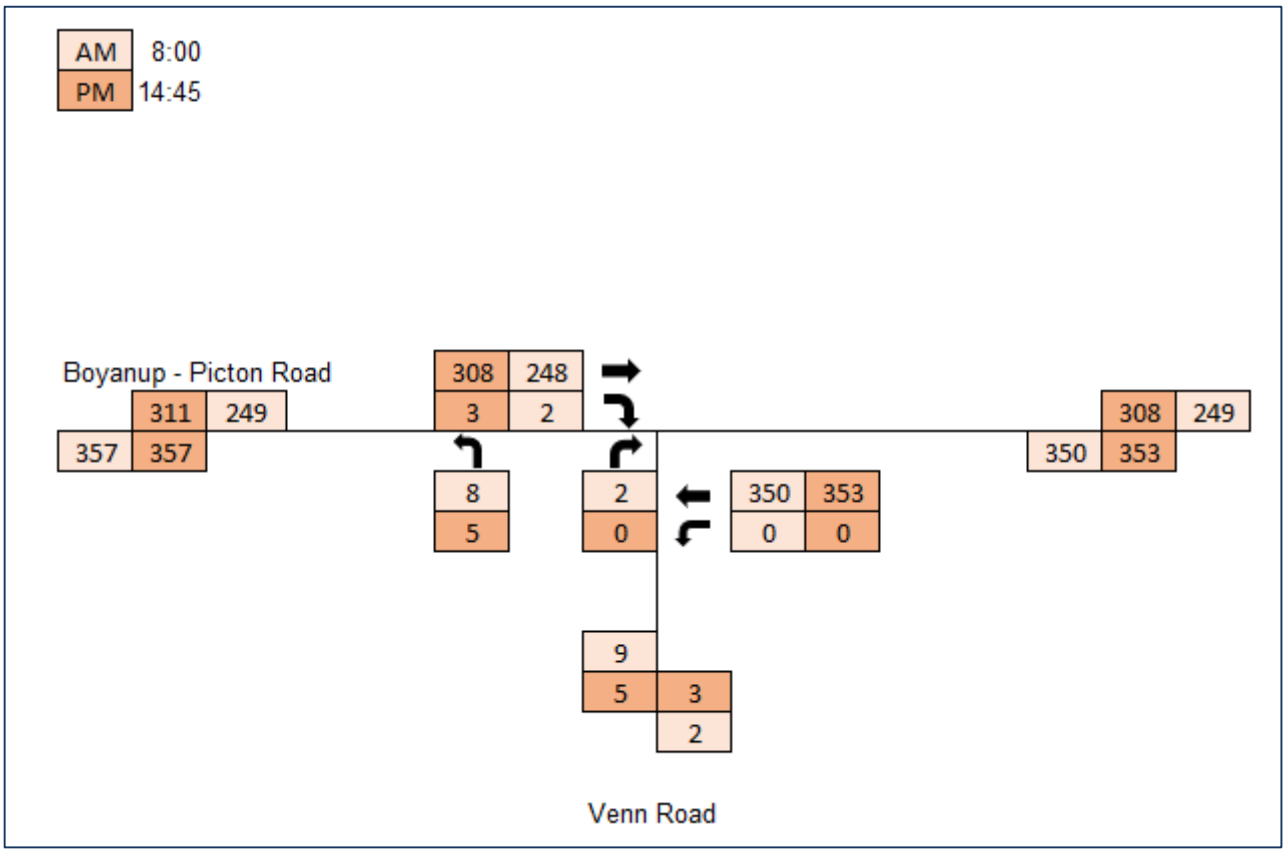


Figure 5-13 Combined 2031 Background and Development Traffic Volumes – Boyanup-Picton Road/ Harold Douglas Drive Extension – Scenario 2

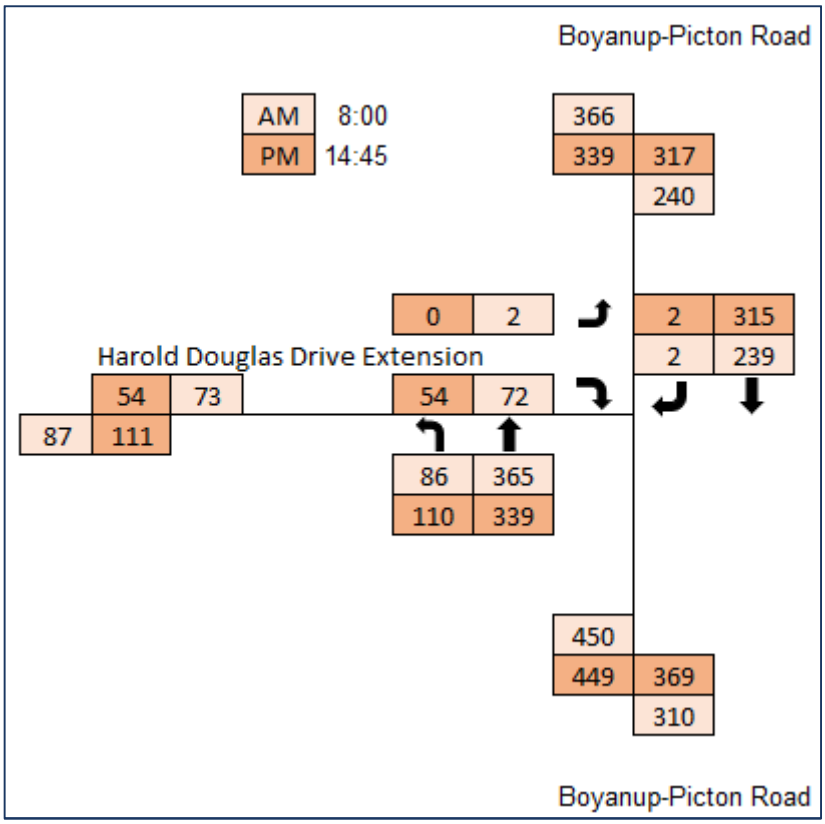


Figure 5-14 Development Traffic Volumes – Boyanup-Picton Road/ Harold Douglas Drive Extension – Scenario 3

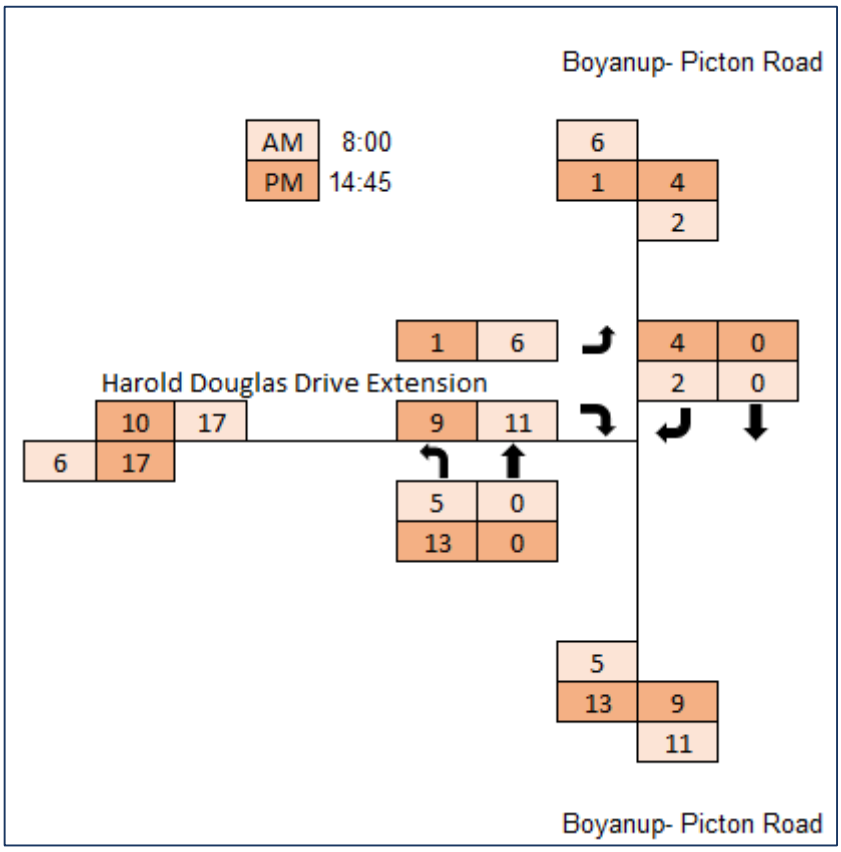


Figure 5-15 Combined 2031 Background and Development Traffic Volumes – Boyanup-Picton Road/ Harold Douglas Drive Extension – Scenario 3

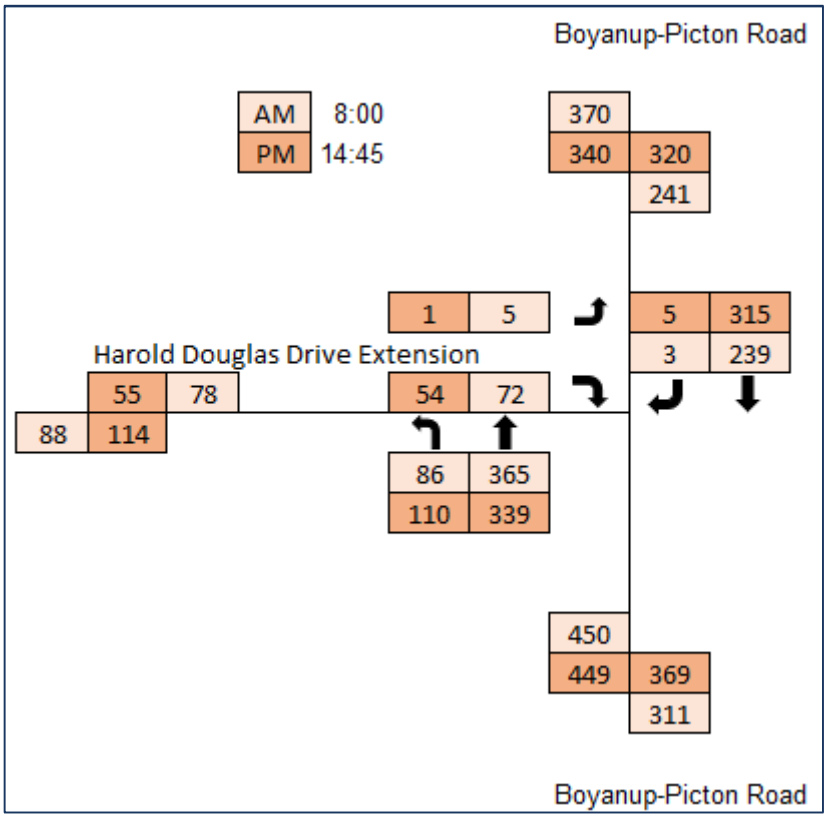


Figure 5-16 Combined 2031 Background and Development Traffic Volumes – Boyanup-Picton Road / Venn Road / Ferguson Road – Scenario 4

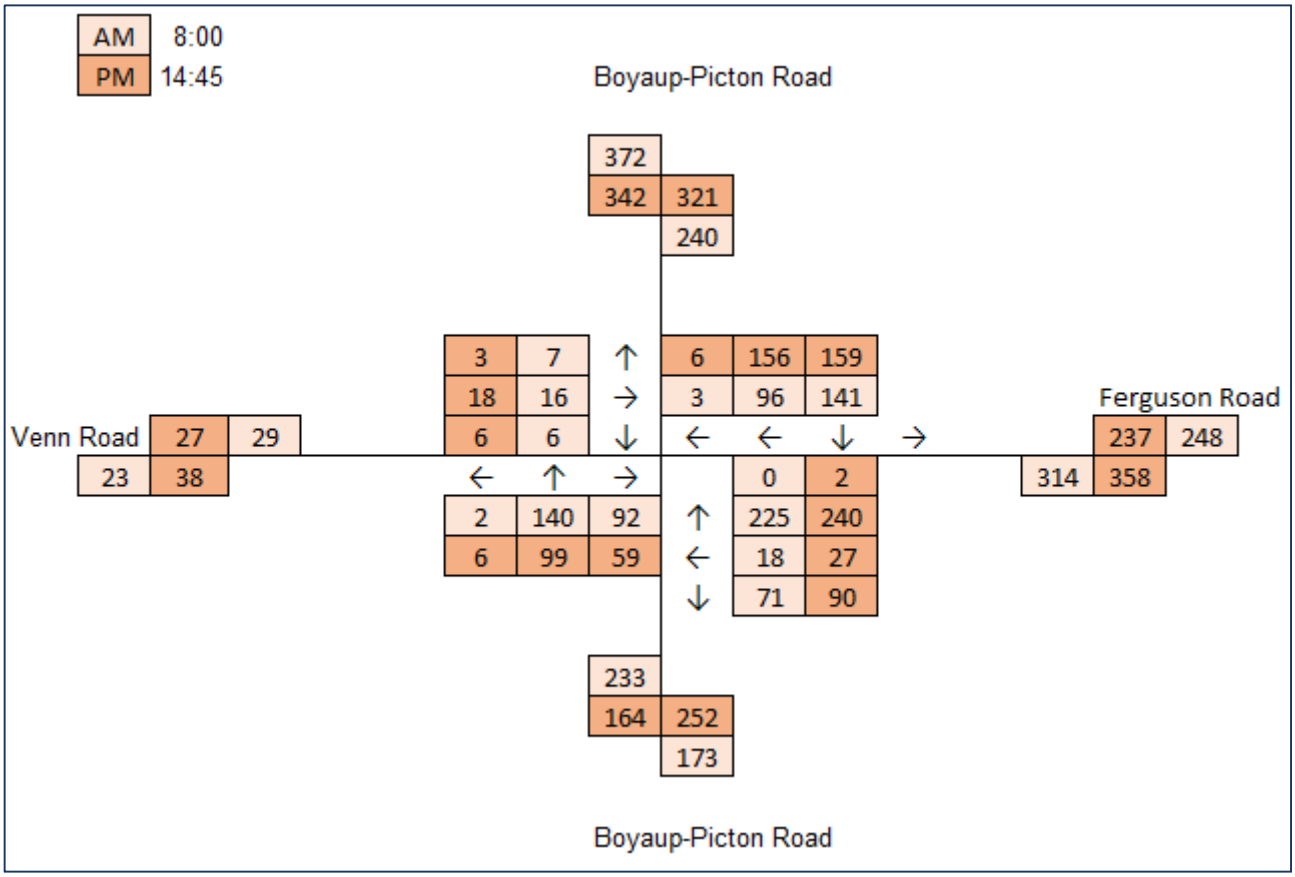


Figure 5-17 Combined 2046 Background and Development Traffic Volumes – Boyanup-Picton Road/ Venn Road – Scenario 5a

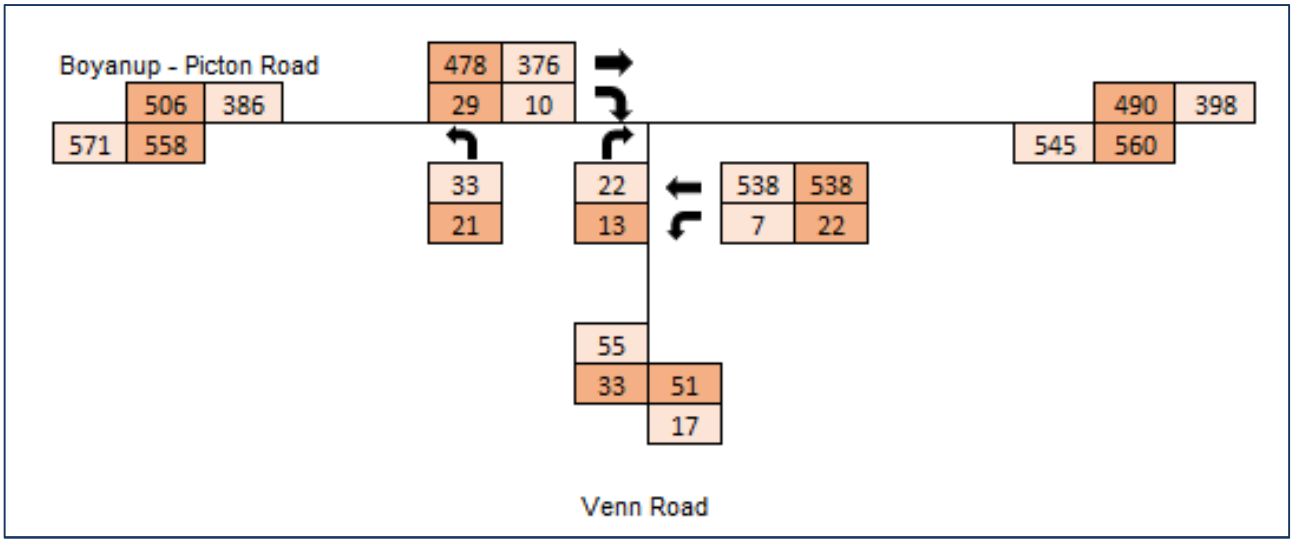


Figure 5-18 Combined 2046 Background and Development Traffic Volumes – Boyanup-Picton Road / Venn Road / Ferguson Road – Scenario 5a

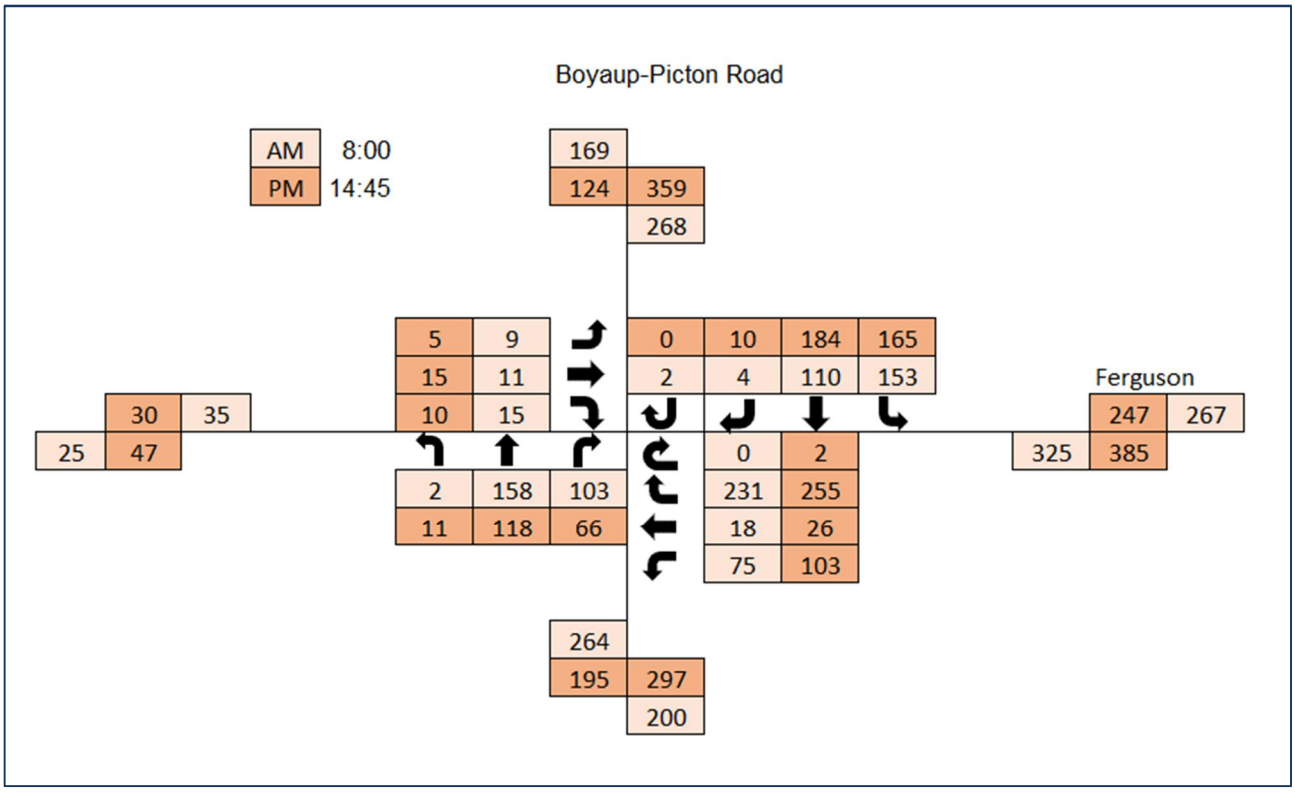


Figure 5-19 Combined 2046 Background and Development Traffic Volumes – Boyanup-Picton Road / Keenan Road Extension – Scenario 5a

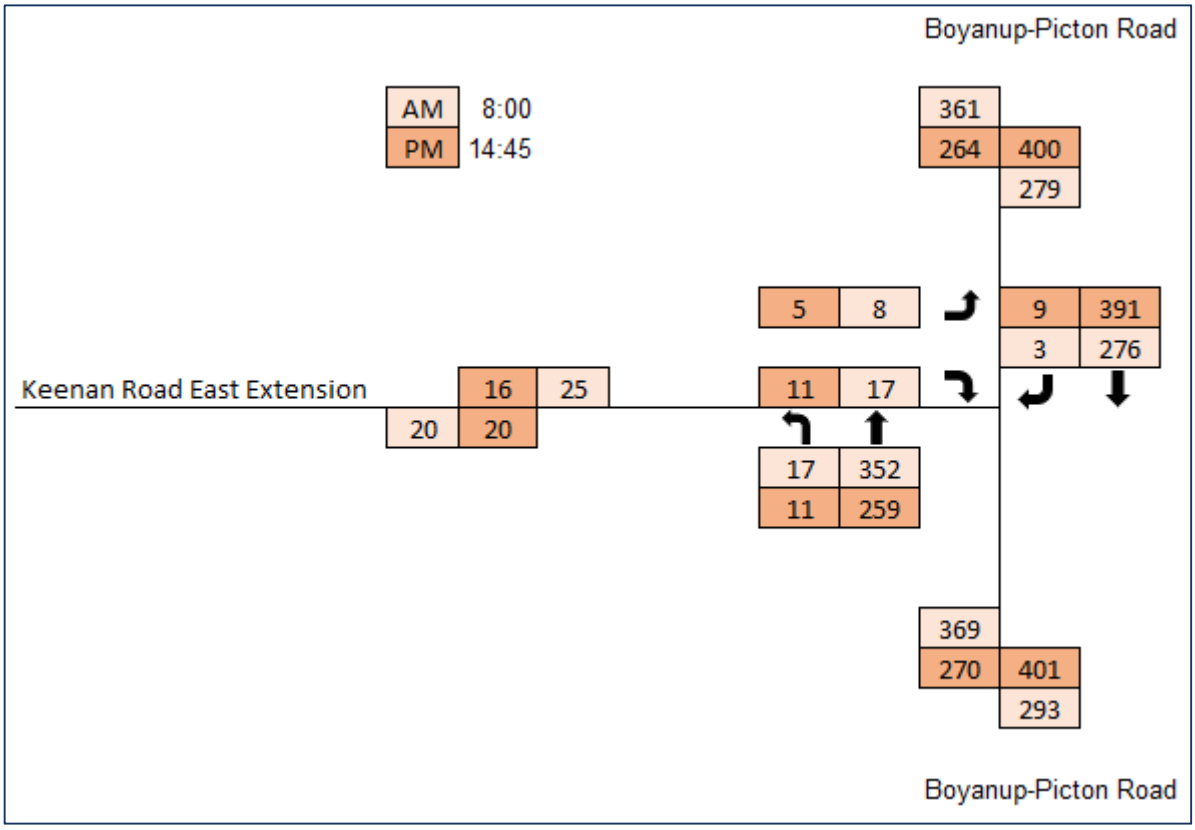


Figure 5-20 Combined 2046 Background and Development Traffic Volumes – Boyanup-Picton Road / Harold Douglas Drive Extension – Scenario 5b

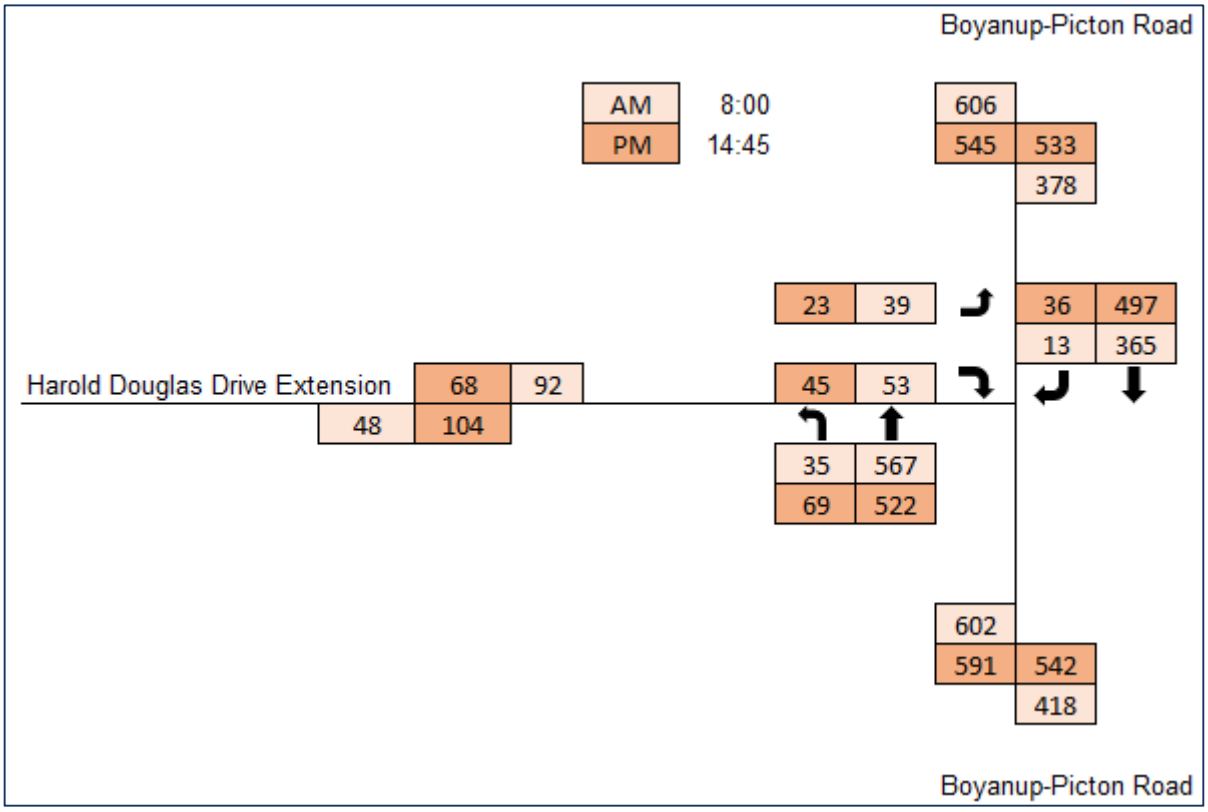
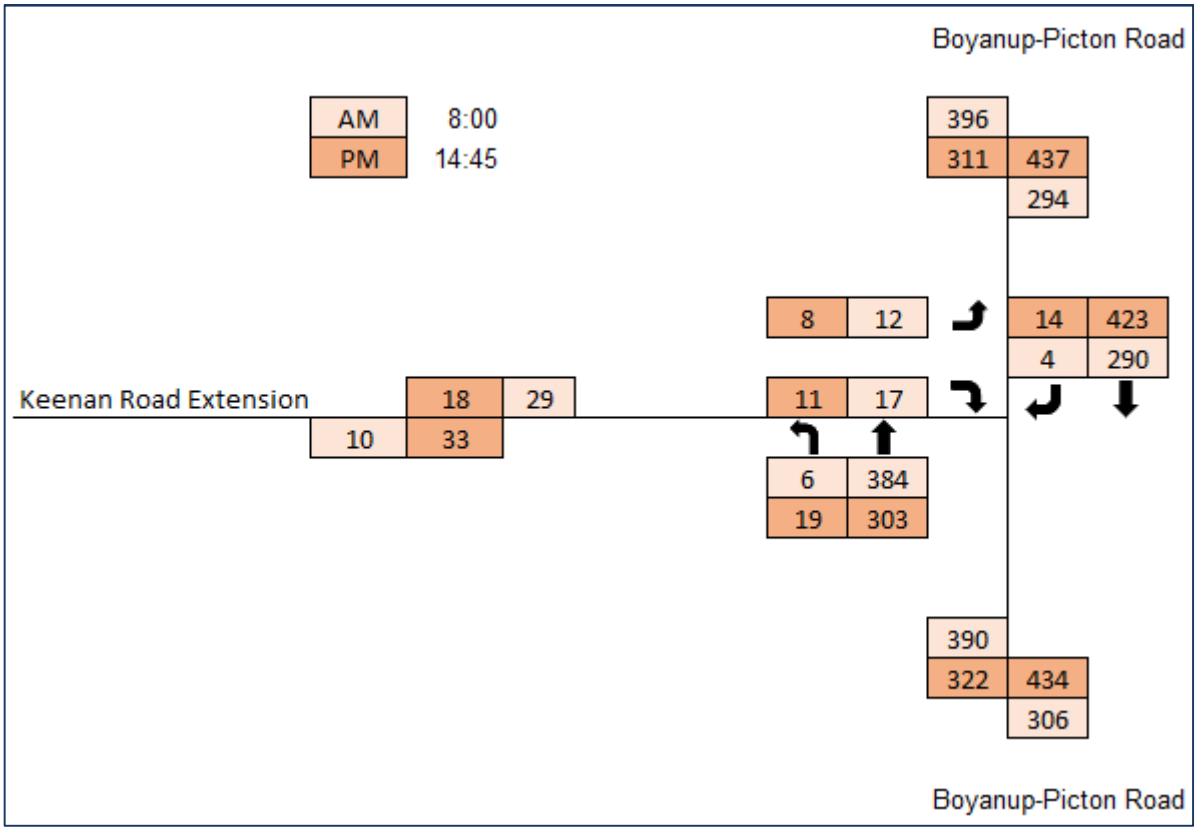


Figure 5-21 Combined 2046 Background and Development Traffic Volumes – Boyanup-Picton Road / Keenan Road Extension – Scenario 5b



5.6 Intersection Performance

The key intersections have been analysed using the SIDRA analysis program. SIDRA calculates the performance of the intersection based on input parameters, including geometry and traffic volumes. As an output SIDRA provides values for the Degree of Saturation (DOS), queue lengths, delays, level of service, and 95th Percentile Queue. These parameters are defined as follows:

- **Degree of Saturation (DOS)**: is the ratio of the arrival traffic flow to the capacity of the approach during the same period. The theoretical intersection capacity is exceeded for an un-signalized intersection where DOS > 0.80;
- **95% Queue**: is the statistical estimate of the queue length up to or below which 95% of all observed queues would be expected;
- **Average Delay**: is the average of all travel time delays for vehicles through the intersection. An unsignalised intersection can be considered to be operating at capacity where the average delay exceeds 40 seconds for any movement; and
- **Level of Service (LOS)**: is the qualitative measure describing operational conditions within a traffic stream and the perception by motorists and/or passengers. The different levels of service can generally be described as shown in **Table 5-5**.

Table 5-5 Level of Service (LoS) Performance Criteria

LOS	Description*	Signalised Intersection	Unsignalised Intersection
A	No or minimal delays (best condition). Queues are rarely more than one vehicle	≤10 sec	≤10 sec
B	Short traffic delays. Occasionally more than one queued vehicle.	10-20 sec	10-15 sec
C	Average traffic delays. Often more than one queued.	20-35 sec	15-25 sec
D	Long traffic delays. Regularly more than one queued vehicle.	35-55 sec	25-35 sec
E	Very long traffic delays. Traffic demand is near or equal to the practical capacity of the intersection. Almost always more than one queued vehicle.	55-80 sec	35-50 sec
F	Forced flow conditions with extensive delays caused by geometric and/or operational constraints external to the intersection.	≥80 sec	≥50 sec

** Source: Highway Capacity Manual, 1997*

A LOS exceeding these values indicates that the road section is exceeding its practical capacity. Above these values, users of the intersection are likely to experience unsatisfactory queueing and delays during the peak hour periods.

5.6.2 Scenario 1 – 2021 Existing Traffic

The SIDRA layout for each of the intersections is illustrated in **Figure 5-22** to **Figure 5-24**. The model results for Scenario 1 are summarised in **Table 5-6** to **Table 5-8** and suggest that all intersections currently perform satisfactorily with minimal delays and queue lengths

Figure 5-22 SIDRA Layout –Boyanup-Picton Road/ Venn Road – Scenario 1

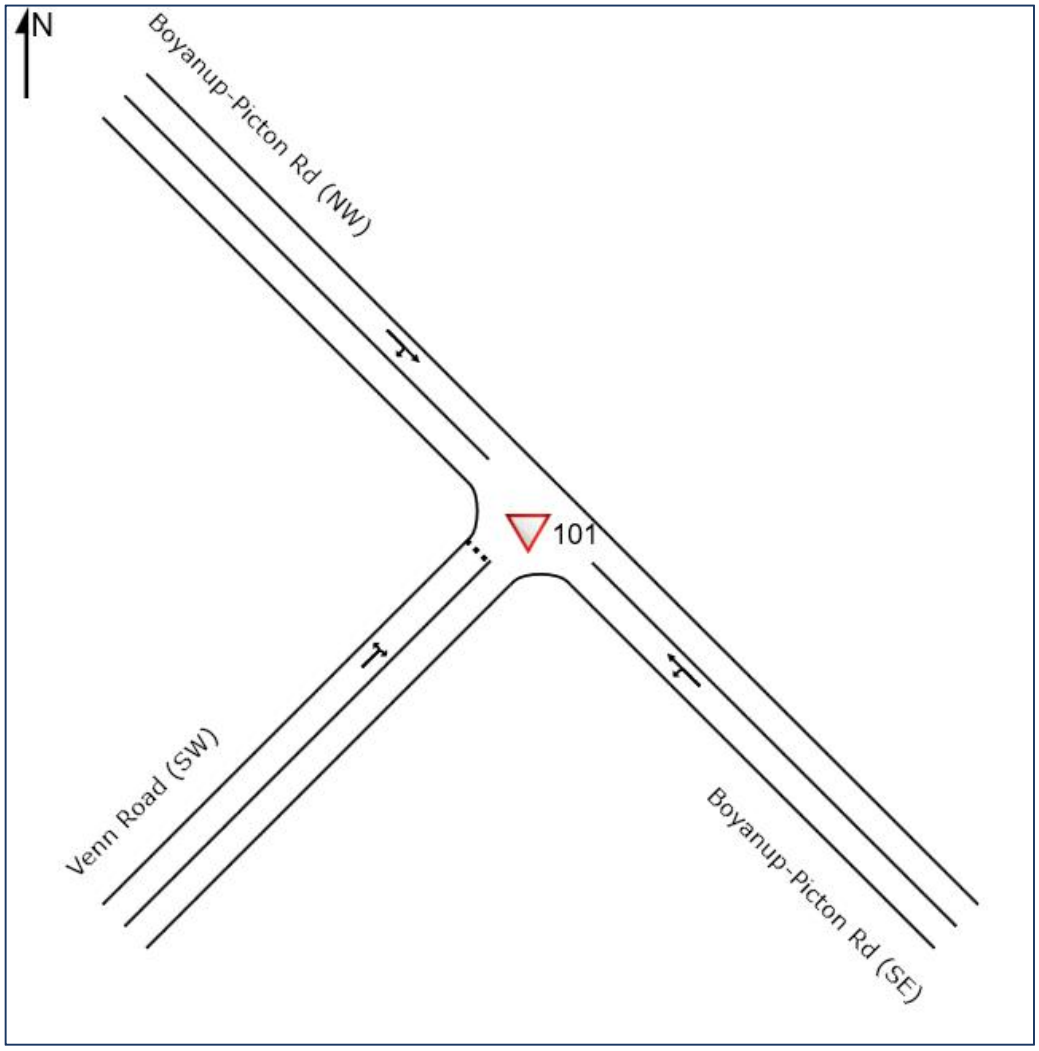


Table 5-6 Boyanup-Picton Road / Venn Road Intersection Performance – Scenario 1

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Venn Road (SW)	L	0.01	5	A	0	0.01	5	A	0
	R	0.01	5	A	0	0.01	5	A	0
Boyanup-Picton Road (SE)	L	0.14	8	A	0	0.14	8	A	0
	T	0.14	0	A	0	0.14	0	A	0
Boyanup-Picton Road (NW)	T	0.10	0	A	0	0.12	0	A	0
	R	0.10	8	A	0	0.12	8	A	0
All Vehicles		0.14	0	-	0	0.14	0	-	0

Figure 5-23 SIDRA Layout – Harold Douglas/ Venn Road – Scenario 1

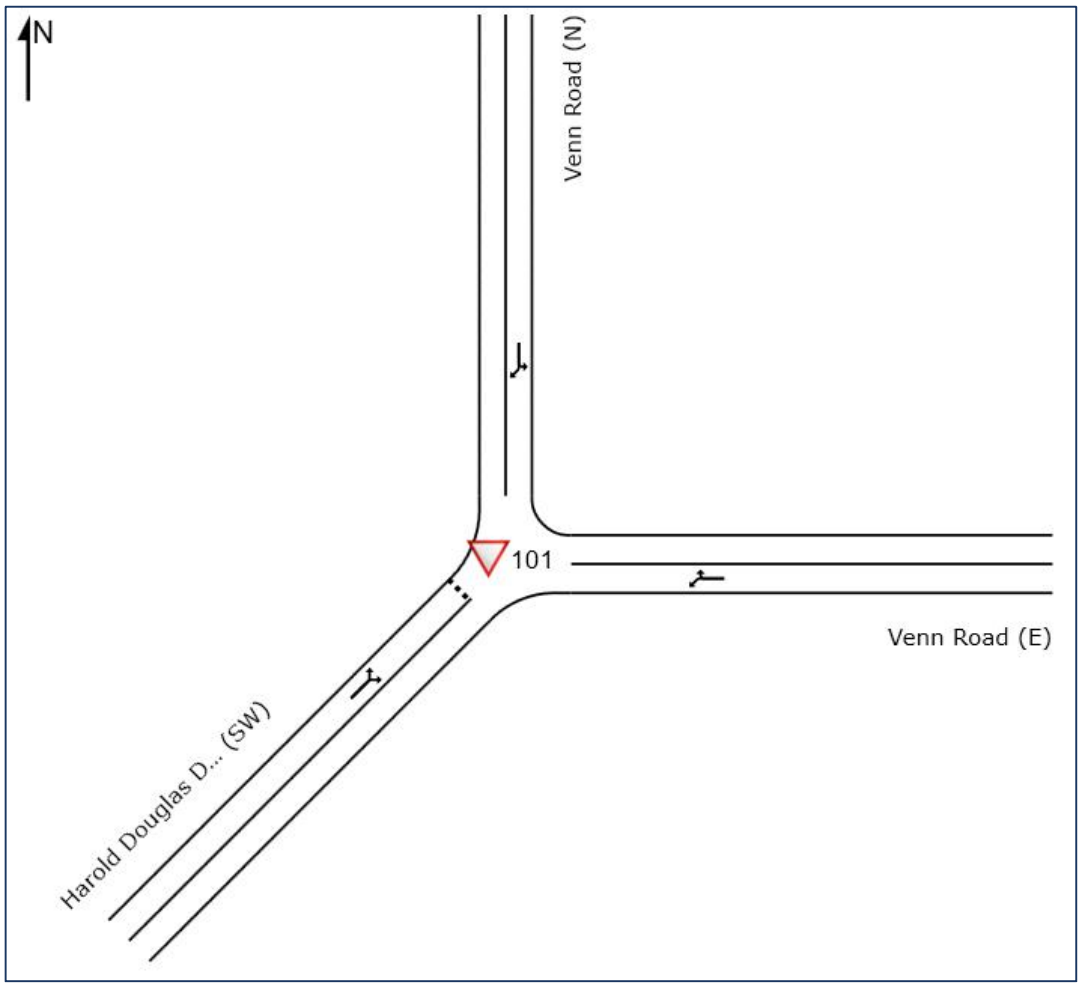


Table 5-7 Harold Douglas / Venn Road - Intersection Performance – Scenario 1

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Venn Road (E)	L	0.01	5	A	0	0.01	5	A	0
	T	0.01	0	A	0	0.01	0	A	0
Venn Road (N)	T	0.01	0	A	0	0.01	0	A	0
	R	0.01	5	A	0	0.01	5	A	0
Harold Douglas Drive (SW)	L	0.01	5	A	0	0.01	5	A	0
	R	0.01	5	A	0	0.01	5	A	0
All Vehicles		0.01	4	-	0	0.01	4	-	0

Figure 5-24 SIDRA Layout – Boyanup-Picton Road/ Venn Road/ Ferguson Road – Scenario 1

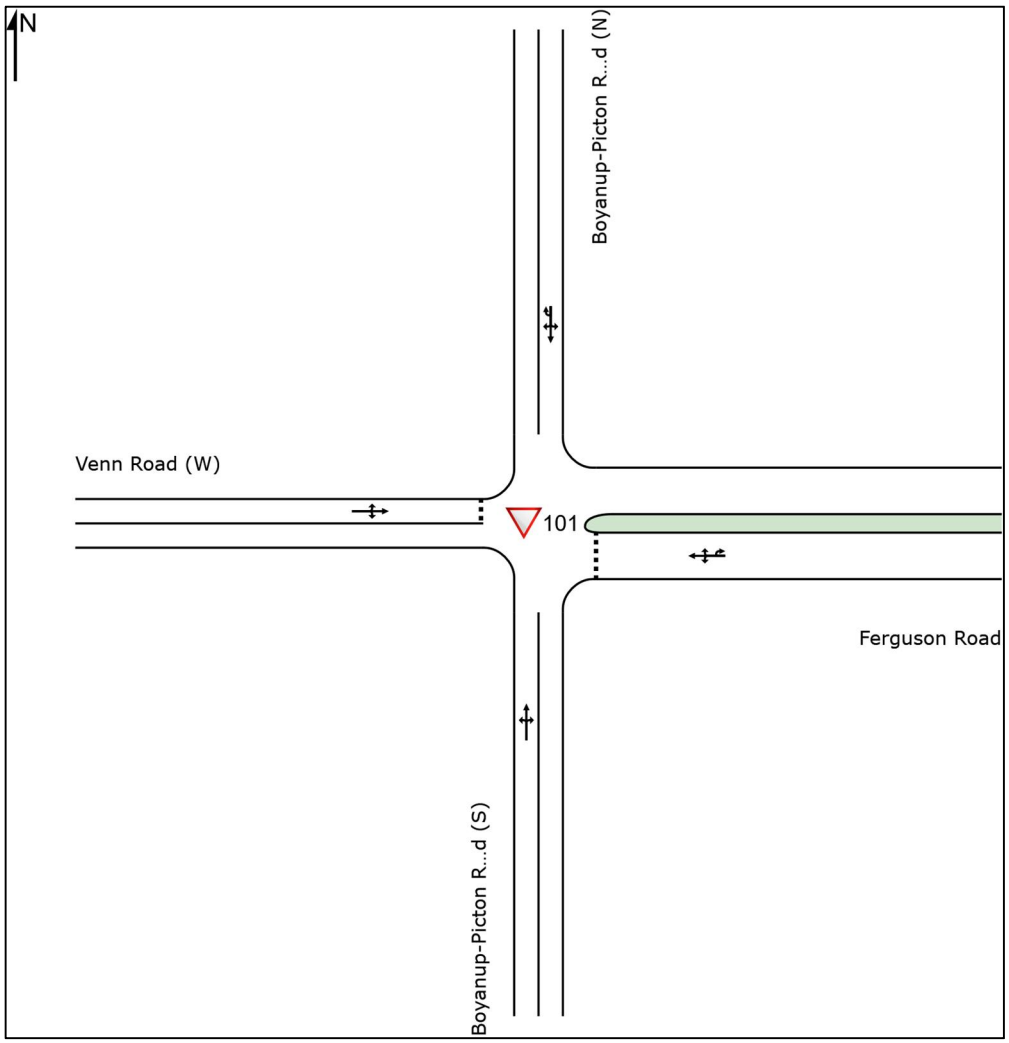


Table 5-8 Boyanup-Picton Road / Venn Road / Ferguson Road – Intersection Performance – Scenario 1

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Boyanup-Picton Road (S)	L	0.09	7	A	3	0.07	7	A	2
	T	0.09	0	A	3	0.07	0	A	2
	R	0.09	7	A	3	0.07	7	A	2
Ferguson Road (E)	L	0.16	4	A	4	0.18	4	A	5
	T	0.16	3	A	4	0.18	3	A	5
	R	0.16	4	A	4	0.18	4	A	5
	U	0.16	5	A	4	0.18	5	A	5
Boyanup-Picton Road (N)	L	0.09	6	A	0	0.12	6	A	0
	T	0.09	0	A	0	0.12	0	A	0
	R	0.09	7	A	0	0.12	7	A	0
	U	0.09	9	A	0	0.12	7	A	0
Venn Road (W)	L	0.01	5	A	0	0.01	5	A	0
	T	0.01	4	A	0	0.01	4	A	0
	R	0.01	5	A	0	0.01	5	A	0
All Vehicles		0.16	4	-	4	0.18	4	-	5

5.6.3 Scenario 2

For Scenario 2, the Harold Douglas Drive Extension is assumed to have been constructed, along with the new intersection at Boyanup-Picton Road. The assumed SIDRA layout for this intersection is shown in **Figure 5-25**, while the performance of this intersection for Scenario 2 is shown in **Table 5-10** and in Table 5-10 for the intersection of Boyanup-Picton Road / Venn Road. The model results suggest that both intersections will perform satisfactorily with the assumed 2031 traffic volumes.

Figure 5-25 SIDRA Layout – Boyanup-Picton Road / Harold Douglas Drive Extension – Scenarios 2 and 3

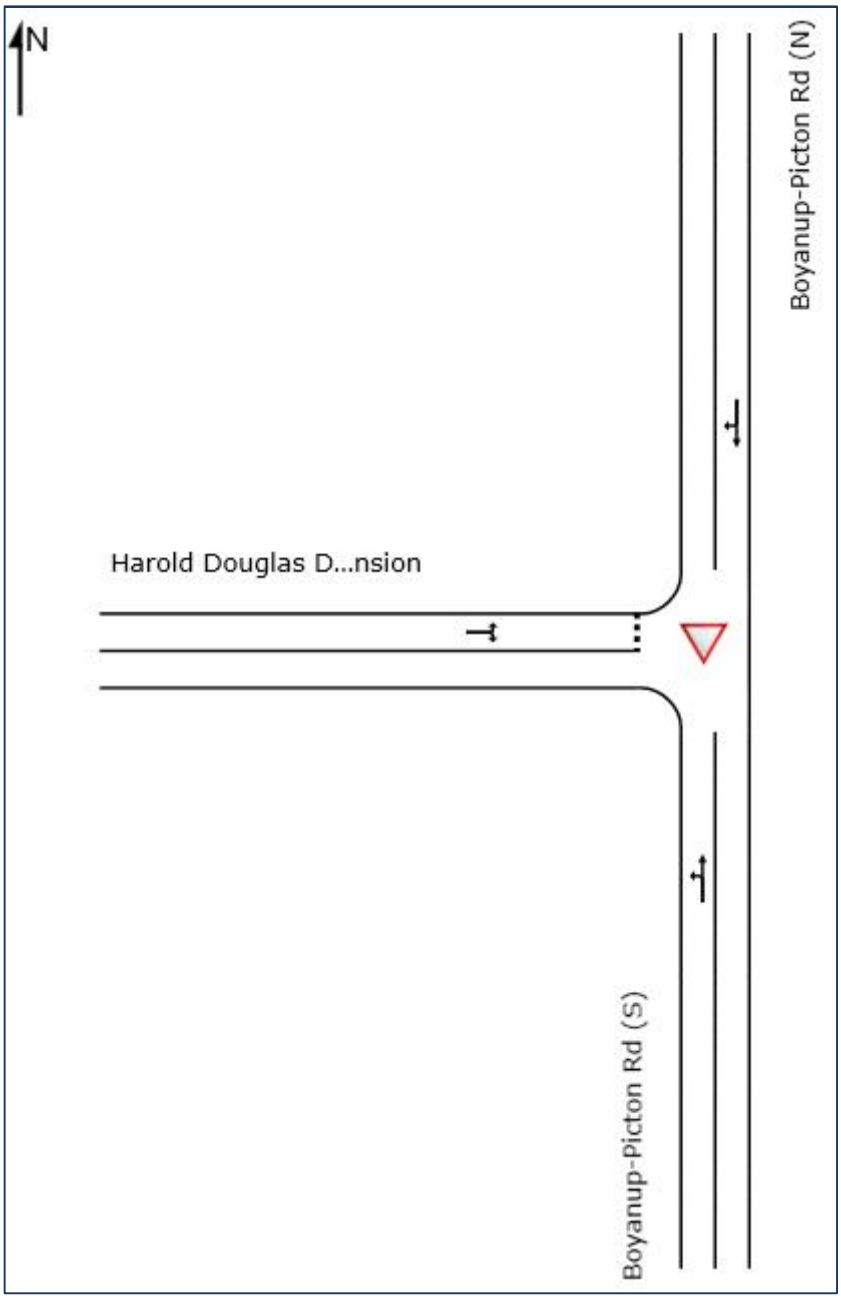


Table 5-9 Boyanup-Picton Road / Access Road – Intersection Performance – Scenario 2

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Boyanup-Picton Rd (S)	L	0.26	8	A	0	0.27	7	A	0
	T	0.26	2	A	0	0.27	0	A	0
North: Boyanup-Picton Rd (N)	T	0.14	0	A	0	0.19	0	A	0
	R	0.14	8	A	0	0.19	8	A	0
Harold Douglas Drive Extension (W)	L	0.06	6	A	1	0.04	6	A	1
	R	0.06	6	A	1	0.04	6	A	1
All Vehicles		0.26	2	-	1	0.27	1	-	1

Table 5-10 Boyanup-Picton Road / Venn Road – Intersection Performance – Scenario 2

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Venn Road (SW)	L	0.20	8	A	0	0.21	8	A	0
	T	0.20	0	A	0	0.21	0	A	0
Boyanup-Picton Road (SE)	T	0.15	0	A	0	0.18	0	A	0
	R	0.15	9	A	0	0.18	9	A	0
Boyanup-Picton Road (NW)	L	0.01	6	A	0	0.01	6	A	0
	R	0.01	5	A	0	0.01	5	A	0
All Vehicles		0.20	1	-	0	0.21	0	-	0

5.6.4 Scenario 3

For Scenario 3, the intersection of Boyanup-Picton Road/ Venn Road (north) is assumed to have been closed and all development traffic is therefore required to utilise the new Boyanup-Picton Road/ Access Road intersection. The performance of the intersection is summarised in **Table 5-11** and suggests that impact of closing Boyanup-Picton Road/ Venn Road (north) intersection will be minimal.

Table 5-11 Boyanup-Picton Road / Access Road – Intersection Performance – Scenario 3

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Boyanup-Picton Rd (S)	L	0.26	8	A	0	0.27	7	A	0
	T	0.26	2	A	0	0.27	0	A	0
North: Boyanup-Picton Rd (N)	T	0.14	0	A	0	0.19	0	A	0
	R	0.14	8	A	0	0.19	8	A	0
Harold Douglas Drive Extension (W)	L	0.06	6	A	1	0.04	6	A	1
	R	0.06	5	A	1	0.04	6	A	1
All Vehicles		0.26	2	NA	1	0.27	1	NA	1

5.6.5 Scenario 4

For Scenario 4, it is assumed that the Harold Douglas Drive Extension hasn't been constructed and that the intersection of Boyanup-Picton Road/ Venn Road (north) is assumed to have been closed. For Scenario 4, the intersection of Boyanup-Picton Road/ Ferguson Road/ Venn Road will therefore remain as the main access for the proposed subdivision.

The performance of the intersection for this Scenario is summarised in **Table 5-12** and suggests that the intersection has sufficient capacity to accommodate the additional traffic volumes through the intersection under this scenario.

Table 5-12 Boyanup-Picton Road / Venn Road / Ferguson Road – Intersection Performance – Scenario 4

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Boyanup-Picton Road (S)	L	0.14	7	A	5	0.10	7	A	3
	T	0.14	1	A	5	0.10	1	A	3
	R	0.14	7	A	5	0.10	8	A	3
Ferguson Road (E)	L	0.27	4	A	8	0.31	4	A	9
	T	0.27	3	A	8	0.31	3	A	9
	R	0.27	5	A	8	0.31	5	A	9
	U	0.27	6	A	8	0.31	6	A	9
Boyanup-Picton Road (N)	L	0.14	6	A	1	0.19	6	A	9
	T	0.14	0	A	1	0.19	0	A	1
	R	0.14	7	A	1	0.19	7	A	1
	U	0.14	11	B	1	0.19	10	B	1
Venn Road (W)	L	0.02	5	A	1	0.02	5	A	1
	T	0.02	4	A	1	0.02	4	A	1
	R	0.02	5	A	1	0.02	5	A	1
All Vehicles		0.27	4	-	8	0.31	4	-	9

5.6.6 Scenario 5a

For Scenario 5a, it is assumed that the entire Small Holdings Structure Plan Area (with the exception of Lot 26) has been built-out. While Scenario 5a doesn't include the Harold Douglas Extension to Boyanup-Picton Road, it is assumed that the existing Venn Road connection have been retained and that Keenan Road has been extended to Boyanup-Picton Road.

The performance of the key intersection for Scenario 5a are summarised in **Table 5-13** to **Table 5-15** and suggests that all intersections have sufficient capacity to accommodate the additional traffic volumes through the intersection under this scenario.

It is noted that this scenario relies on access to Boyanup-Picton Road via the existing Venn Road connections and therefore would increase the daily traffic volumes on Venn Road to more than 150 Passenger Car Units (PCUs) per day. As such, Venn Road therefore would need to be upgraded to a minimum 9.0m sealed width (2 x 3.5m traffic lanes + 2x 1.0m shoulders) in accordance with Table 4-5 of the Main Roads WA Supplement to Austroads Guide to Road Design – Part 3.

Table 5-13 Boyanup-Picton Road / Venn Road - Intersection Performance – Scenario 5a

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Venn Road (SW)	L	0.06	7	A	1	0.04	7	A	1
	R	0.06	6	A	1	0.04	6	A	1
Boyanup-Picton Road (SE)	L	0.31	8	A	0	0.34	8	A	0
	T	0.31	0	A	0	0.34	0	A	0
Boyanup-Picton Road (NW)	T	0.23	0	A	1	0.30	0	A	3
	R	0.23	10	B	1	0.30	10	B	3
All Vehicles		0.31	1	NA	1	0.34	1	NA	3

Table 5-14 Boyanup-Picton Road / Venn Road / Ferguson Road – Intersection Performance – Scenario 5a

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Boyanup-Picton Road (S)	L	0.23	8	A	9	0.18	8	A	7
	T	0.23	1	A	9	0.18	1	A	7
	R	0.23	8	A	9	0.18	9	A	7
Ferguson Road (E)	L	0.49	5	A	21	0.57	6	A	29
	T	0.49	5	A	21	0.57	6	A	29
	R	0.49	7	A	21	0.57	7	A	29
	U	0.49	8	A	21	0.35	8	A	29
Boyanup-Picton Road (N)	L	0.27	7	A	1	0.29	6	A	1
	T	0.27	0	A	1	0.29	0	A	1
	R	0.27	7	A	1	0.29	7	A	1
	U	0.27	13	B	1	0.29	8	A	1
Venn Road (W)	L	0.04	5	A	1	0.04	5	A	1
	T	0.04	5	A	1	0.04	6	A	1
	R	0.04	6	A	1	0.04	6	A	1
All Vehicles		0.49	5	NA	21	0.57	5	NA	29

Table 5-15 Boyanup-Picton Road / Keenan Road Extension - Intersection Performance – Scenario 5a

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Boyanup-Picton Road (S)	L	0.22	8	A	0	0.16	8	A	0
	T	0.22	0	A	0	0.16	0	A	0
Boyanup-Picton Road (N)	T	0.17	0	A	0	0.24	0	A	1
	R	0.17	8	A	0	0.24	8	A	1
Keenan Road Extension (W)	L	0.02	6	A	0	0.01	5	A	0
	R	0.02	5	A	0	0.01	5	A	0
All Vehicles		0.22	1	NA	0	0.24	0	NA	1

5.6.7 Scenario 5b

For Scenario 5b, both Venn Road connections to Boyanup-Picton Road have been assumed to have been closed (or restricted to only local use), while the Harold Douglas Drive and Keenan Road extensions, along with their associated connections to Boyanup-Picton Road, are assumed to have been constructed.

The performance of the key intersection for Scenario 5b are summarised in **Table 5-16** and **Table 5-17** and suggests that both intersections have sufficient capacity to accommodate the traffic volumes through these new intersections under this scenario.

As the Venn Road connections to Boyanup-Picton Road are assumed to have been removed (or restricted to only local use) in Scenario 5b, the remaining sections of Venn Road could remain in their existing forms (i.e. no need to upgrade Venn Road) as the volumes would not exceed the threshold of 150 PCUs per day.

Table 5-16 Boyanup-Picton Road / Harold Douglas Extension – Intersection Performance – Scenario 5b

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
South: Boyanup-Picton Rd (S)	L	0.35	8	A	0	0.35	7	A	0
	T	0.35	2	A	0	0.35	0	A	0
North: Boyanup-Picton Rd (N)	T	0.22	0	A	1	0.32	0	A	4
	R	0.22	9	A	1	0.32	10	B	4
Harold Douglas Drive Extension (W)	L	0.10	7	A	2	0.07	7	A	2
	R	0.10	6	A	2	0.07	6	A	2
All Vehicles		0.35	2	NA	2	0.35	1	NA	4

Table 5-17 Boyanup-Picton Road / Keenan Road Extension - Intersection Performance – Scenario 5b

Intersection Approach		AM peak				PM Peak			
		DOS	Delay (s)	LOS	95% Queue (m)	DOS	Delay (s)	LOS	95% Queue (m)
Boyanup-Picton Road (S)	L	0.23	8	A	0	0.19	8	A	0
	T	0.23	0	A	0	0.19	0	A	0
Boyanup-Picton Road (N)	T	0.17	0	A	0	0.26	0	A	1
	R	0.17	8	A	0	0.26	8	A	1
Keenan Road Extension (W)	L	0.02	6	A	1	0.02	6	A	0
	R	0.02	6	A	1	0.02	6	A	0
All Vehicles		0.23	0	NA	1	0.26	0	NA	1

6 Summary and Conclusion

This report has been prepared in accordance with the Western Australian Planning commission (WAPC) *Transport Assessment Guidelines for Developments: Volume 3 – Subdivisions (2016)*.

The following conclusions have been made in regards to the proposed development:

- The proposed small holding sub-division is conservatively estimated to generate 28 trips in the AM peak hour and 37 trips in the PM peak hour. The number of trips generated by the proposed sub-division is not considered to have any substantial impact on the surrounding road network.
- The SIDRA analysis undertaken indicates that the traffic generated by the proposed small holding sub-division can be accommodated by the existing intersections and road network (Scenario 3 and Scenario 4).
- While the Harold Douglas Drive (Scenario 2) and Keenan Road (Scenario 5a) extensions would improve access to the wider Small Holdings structure plan areas, these extensions are not considered critical to accommodate the traffic generated by the proposed small holding sub-division.
- Under Scenario 5b, where both the Harold Douglas Drive and Keenan Road extensions to Boyanup-Picton Road are assumed to have been constructed, the remaining sections of Venn Road could remain in their existing forms (i.e. no need to upgrade Venn Road) as the traffic volumes would not exceed the threshold of 150 PCUs per day.
    - If both the Harold Douglas Drive and Keenan Road extensions to Boyanup-Picton Road are constructed, this would enable the closure of the existing Venn Road connections to Boyanup-Picton Road. While subject to further design investigations, the Venn Road (east) connection could potentially still be retained for local vehicular access, as well as for pedestrian and cycling connectivity purposes.

In conclusion, the proposed small holding subdivision can be adequately serviced by the existing Venn Road (east) and the Venn Road / Boyanup-Picton Road intersection. Overall traffic management in the Dardanup Small Holdings area would benefit from the Harold Douglas Drive and/or Keenan Road extensions to Boyanup-Picton Road. The proposed sub-division would also benefit from such extension(s), but is not dependent on them.

APPENDIX

A

WAPC CHECKLIST

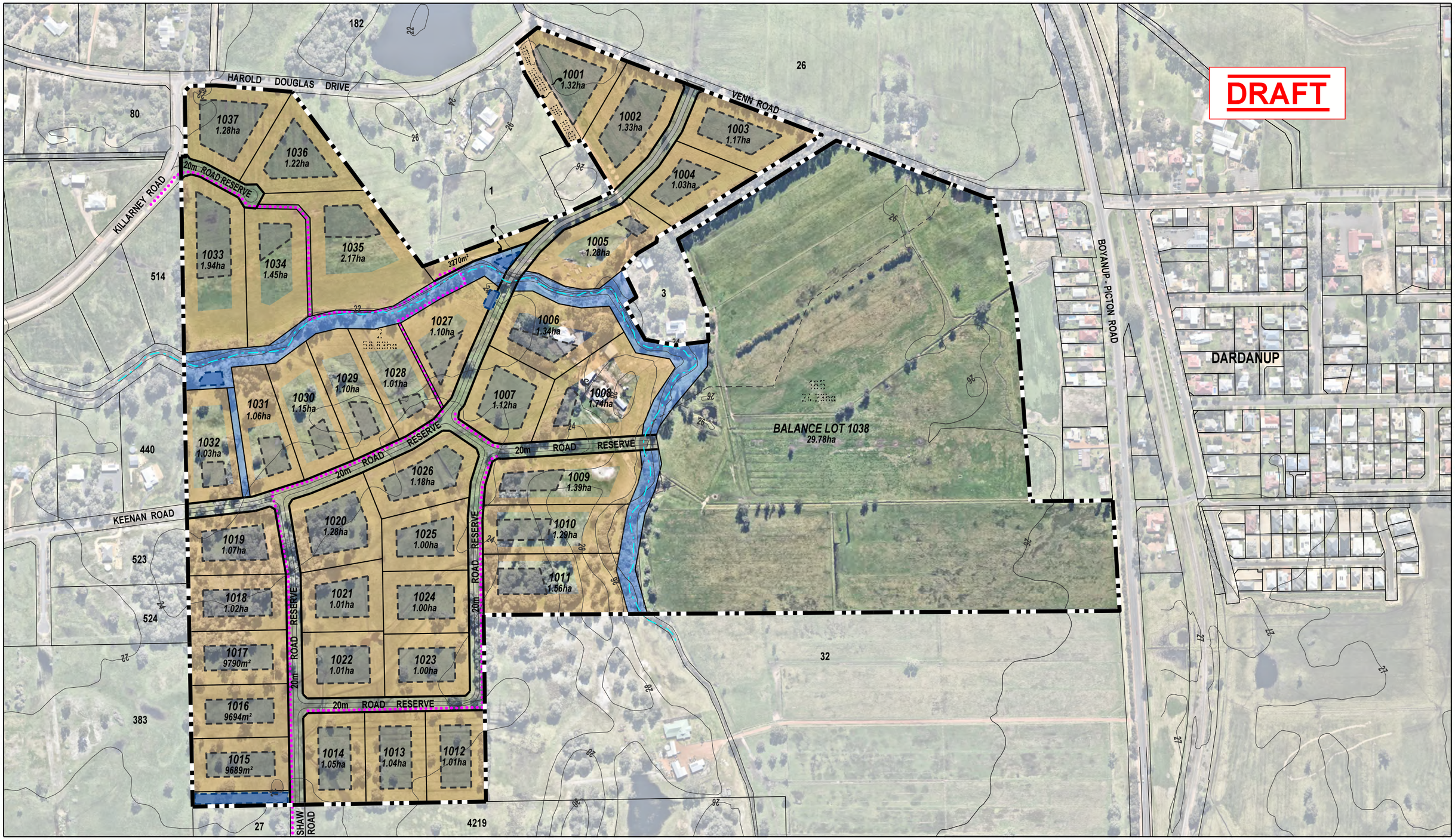
ITEM	PROVIDED	COMMENTS
Summary		
Introduction/Background	Section 1	
Subdivision proposal		
regional context	N/A	
proposed land uses	Section 3.1	
table of land uses and quantities	Section 3.1	
major attractors/generators	N/A	
specific issues	N/A	
Existing situation		
existing land uses within structure plan	Section 1.2	
existing land uses within 800 metres of subdivision	Section 1.2	
existing road network within subdivision	Section 2.1	
existing pedestrian/cycle networks within subdivision	Section 2.4	
existing public transport services within structure plan area	Section 2.3	
existing road network within 2 (or 5) km of subdivision	Section 2.1	
traffic flows on roads within subdivision area (PM and/or AM peak hours)	Section 2.2	
traffic flows on roads within 2 (or 5) km of within subdivision area (AM and/ or PM peak hours)	Section 2.2	
existing pedestrian/cycle networks within 800m of subdivision	Section 2.4	
existing public transport services within 800m of subdivision area	Section 2.3	
Proposed internal transport networks		
changes/additions to existing road network or proposed new road network	Section 3	
road reservation widths	N/A	
road cross-sections & speed limits	N/A	
intersection controls	N/A	
pedestrian/cycle networks and crossing facilities	N/A	
public transport routes	N/A	
Changes to external transport networks		
road network	Section 3	
intersection controls	Section 3.3	
pedestrian/cycle networks and crossing facilities	N/A	
public transport services	N/A	
Integration with surrounding area		
trip attractors/generators within 800 metres	N/A	
proposed changes to land uses within 800 metres	N/A	
travel desire lines from structure plan to these attractors/generators	N/A	
adequacy of external transport networks	N/A	
deficiencies in external transport networks	N/A	

ITEM	PROVIDED	COMMENTS
remedial measures to address deficiencies	N/A	
Analysis of internal transport networks		
assessment year(s) and time period(s)	Section 5	
subdivision generated traffic	Section 5	
extraneous (through) traffic	Section 5	
design traffic flows (that is, total traffic)	Section 5	
road cross-sections	N/A	
intersection sight distances	N/A	
intersection operation and method of control	N/A	
frontage access strategy	N/A	
pedestrian/cycle networks	N/A	
safe walk/cycle to school assessment (residential subdivisions only)	N/A	
pedestrian permeability & efficiency	N/A	
access to public transport	N/A	
Analysis of external transport networks		
base flows for assessment year(s)	Section 5	
total traffic flows	Section 5	
road cross-sections	N/A	
intersection layouts & controls	Section 5	
pedestrian/cycle networks	N/A	
Safety issues		
Identify issues	N/A	
Remedial measures	N/A	
Conclusions	Section 6	

APPENDIX

B

SITE PLANS



This plan has been prepared for planning purposes. Areas, contours and dimensions shown are subject to survey.

CONCEPT PLAN

Lot 2 Harold Douglas Drive and Lot 185 Venn Road, DARDANUP

LEGEND

- SUBJECT SITE
- PROPOSED BOUNDARY
- EXISTING BOUNDARY
- PROPOSED DRAIN RESERVE
- LAND APPLICATION AREA (Secondary treated effluent)
- BUILDING EXCLUSION ZONE
- PROPOSED SUMP
- BRIDLE TRAIL
- 1.0m CONTOURS
- EXISTING DRAIN

Plan No. 21008-1-01a

DATE	3.12.2021
CO-ORDINATES	MGA 50
AERIAL	5.8.2021
REVISION	A

N

50m 0 50 100 150 200

1 : 2500 @ A1 or 1 : 5000 @ A3
ALL DISTANCES ARE IN METRES

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APPENDIX C

INTERSECTION TURN VOLUME DIAGRAMS

Figure C 1 Boyanup-Picton Road/ Venn Road - Intersection Turn Volumes from Traffic Survey dated 2/11/2021

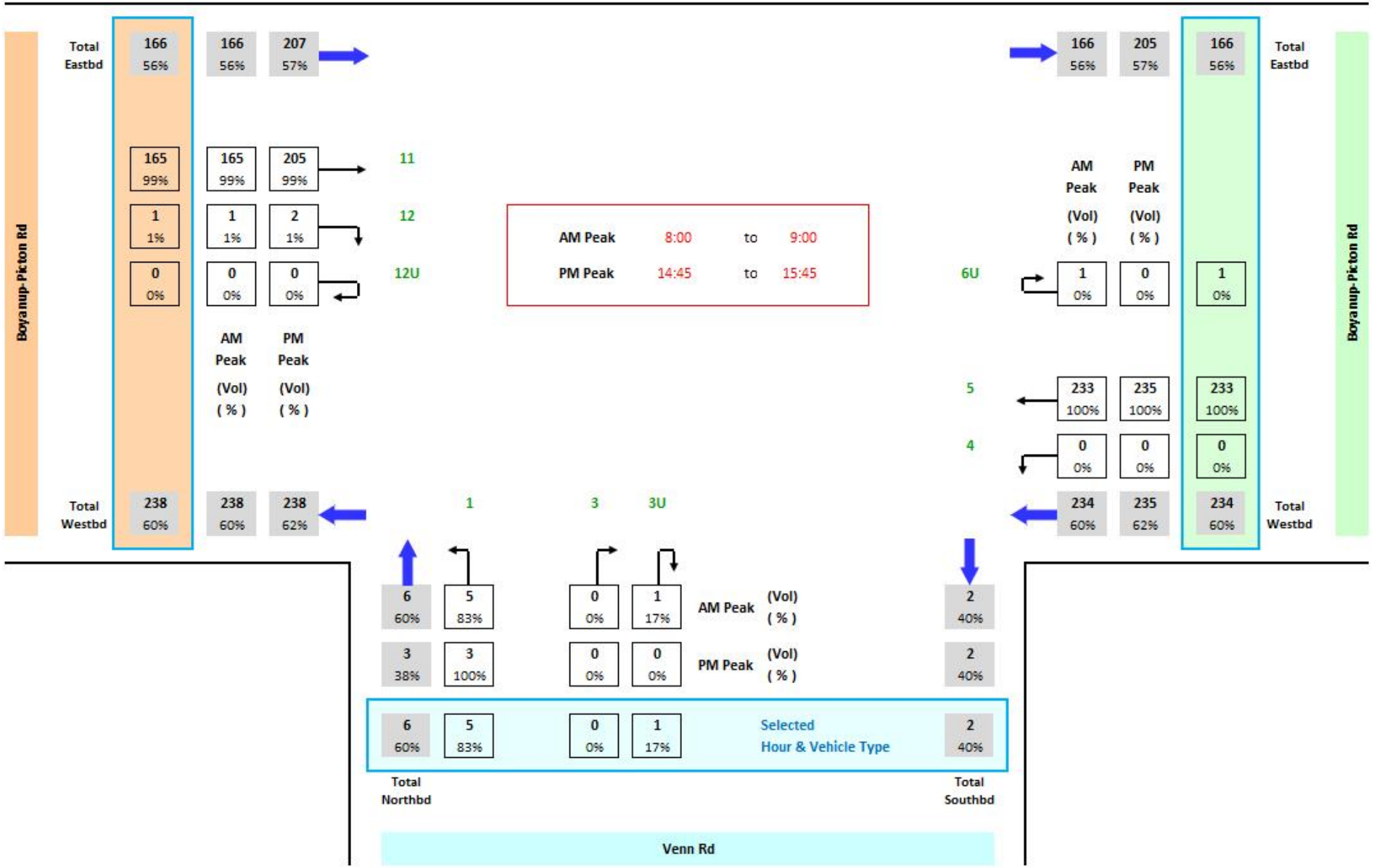

Figure C 2 Boyanup-Picton Road/ Ferguson Road/ Venn Road - Intersection Turn Volumes from Traffic Survey dated 2/11/2021

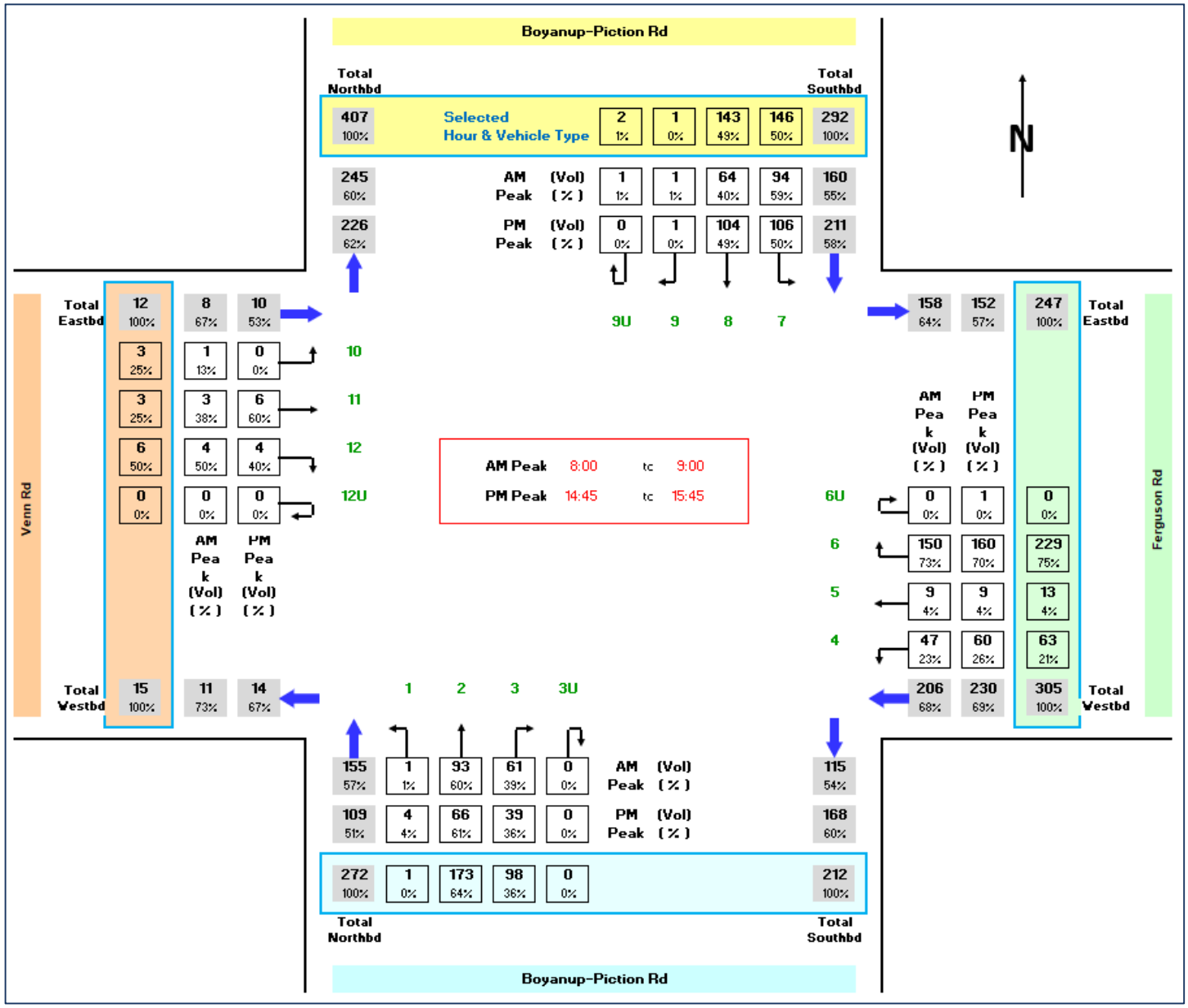

Figure C 3 Venn Road/ Harold Douglas Drive - Intersection Turn Volumes from Traffic Survey dated 2/11/2021