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PLANS AND DOCUMENTS
referred to in the ULDA
APPROVAL dated 20 / 9 / 12

Harvey Road Gladstone – Residential Subdivision

*Prepared for Urban Land
Development Authority*

July 2010

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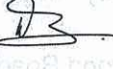
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Document Control Harvey Road Gladstone – Residential Subdivision					
Version	Date	Author		Reviewer	
		Name	Initials	Name	Initials
Final	27 July 2010	William Lee		Brett McClurg	
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1.0 INTRODUCTION

1.1 Background

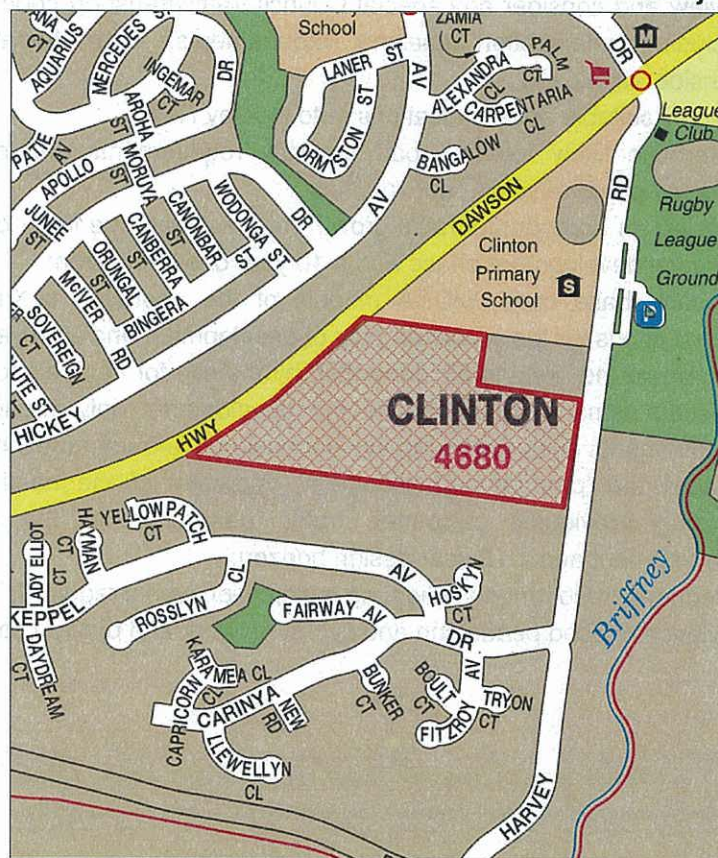
Cardno Eppell Olsen has been commissioned by the Urban Land Development Authority (ULDA) to undertake a Traffic Impact Assessment of a proposed residential subdivision located on Harvey Road, Gladstone in the suburb of Clinton.

The site is in proximity to the Gladstone Airport and is bounded by the Dawson Highway along the western site aspect and Harvey Road along the eastern aspect. The subject site is formerly described as Lot 193 on CTN1861.

The location of the site is shown below on Figure 1.1

Figure 1.1

Subject Site Location



The development proposes the provision of 254 residential lots containing a mixture of low and medium density dwellings within the subject site. The proposed development plan is attached at Appendix A. The currently proposed density represents 297 dwellings.

1.2 Scope of Work

This report has been prepared to document a review of the traffic impacts of the proposed development at Clinton. In the preparation of this report the following has been undertaken.

- review Council and Department of Transport and Main Roads (TMR) committed future road upgrades;
- obtain available intersection count data from TMR at subject intersections where available;
- conduct an inspection of the site and the surrounding road network to identify characteristics of existing roads and intersection form /layouts including a review of available sight distances at proposed access locations;
- undertake a desktop review and research exercise to determine the most appropriate traffic generation rates to use to assess the traffic generating potential of the proposed development;
- review and consider any special Council traffic/transport code compliance issues including intersection spacing requirements, road hierarchy and access considerations, etc;
- identify suitable access locations onto Harvey Road;
- determine likely internal road capacity requirements and design standard to accommodate development volumes;
- utilising an appropriate traffic growth rate, estimate the likely base traffic volumes for each development phase and a 10 year design horizon;
- prepare 'base case' SIDRA models of the operation of the abovementioned intersections for the predicted year of development and a 10 year design horizon;
- determine the likely traffic generated by the site for each stage, (in addition to the existing demand) to determine the development only impact and site access requirements (including indicative dimensions) and upgrade thresholds;
- assess the 'proposed development' operation of the nominated intersections utilising previously calculated traffic generation in the predicted year of development and a 10 year design horizon;
- if required, recommend mitigating intersection works required;
- review proposed pedestrian and cyclist network and provide comment.

1.3 References

In preparing this report the following background materials/reference documents have been reviewed:

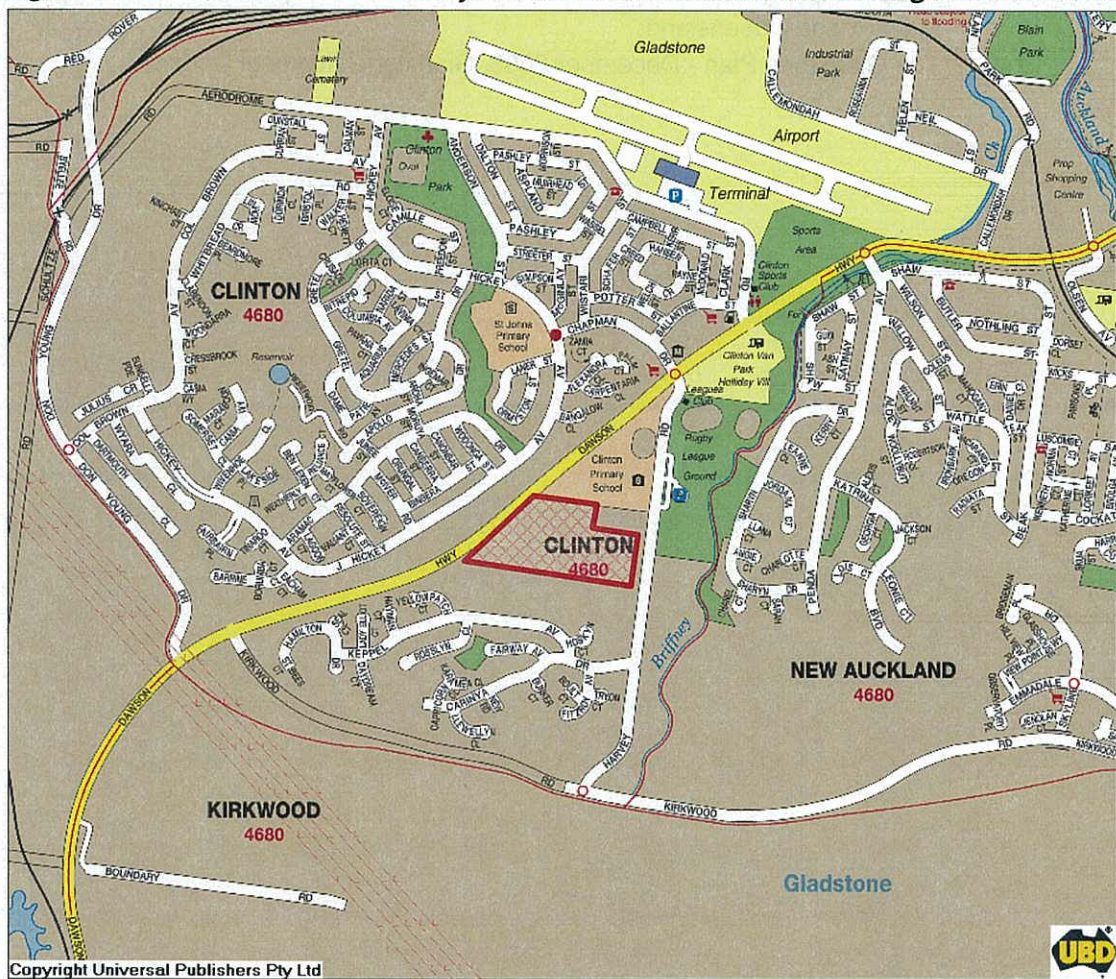
- Queensland Streets: Design Guidelines for Subdivisional Streetworks, Institute of Public Works Engineering Australia – Queensland Division (May 1993);
- Buslink Website (www.buslinkqld.com.au);
- Roads Implementation Plan 2009-10 to 2013-14, Department of Transport and Main Roads Queensland;
- The Gladstone Plan - December 2006, Gladstone Regional Council;

2.0 EXISTING SITUATION

2.1 Subject Site

The proposed development site is located in the suburb of Clinton within the Gladstone Regional Council. The site covers an area of approximately 17.3 hectares. The location of the development site in relation to the surrounding area is shown below on Figure 2.1.

Figure 2.1 Subject Site Location and Surrounding Road Network



The site is a greenfields development site with no existing land uses present on the site. The site neighbours existing detached residential on the southern site boundary and the Clinton primary school on the northern site boundary. The eastern and western site boundaries border Harvey Road and the Dawson Highway respectively. Access to the site would only be provided via Harvey Road as the Dawson Highway is a high order arterial road which precludes the provision of access from this frontage.

A shared pedestrian and cycle pathway is present along the length of the Harvey Road frontage, whereas no dedicated on-road cycle lanes are present in the vicinity of the site.

The site has been zoned as Residential under the Gladstone Regional Councils "The Gladstone Plan".

2.2 Surrounding Developments

Gladstone is likely to experience significant growth in the medium to long term as a result of a number of significant resource projects that are forecast to be developed in the region. The areas in the vicinity of Kirkwood Road to the south east of the subject site have been earmarked for residential development to cater for growth in the regional population. As a result of this, a significant number of residential developments in the area are in progress or in the application/approval stages.

Information regarding other developments in the surrounding area has been obtained from the Council and added to the forecast background 2021 volumes. For the purposes of this assessment it has been assumed that all surrounding developments will be fully developed by 2021 (interpolate linearly between 2010 and 2021). The location of each of the surrounding developments is shown on Figure 2.2, with the traffic generation characteristics adopted for this assessment shown below.

Table 2.1 *Surrounding Development Trip Generation*

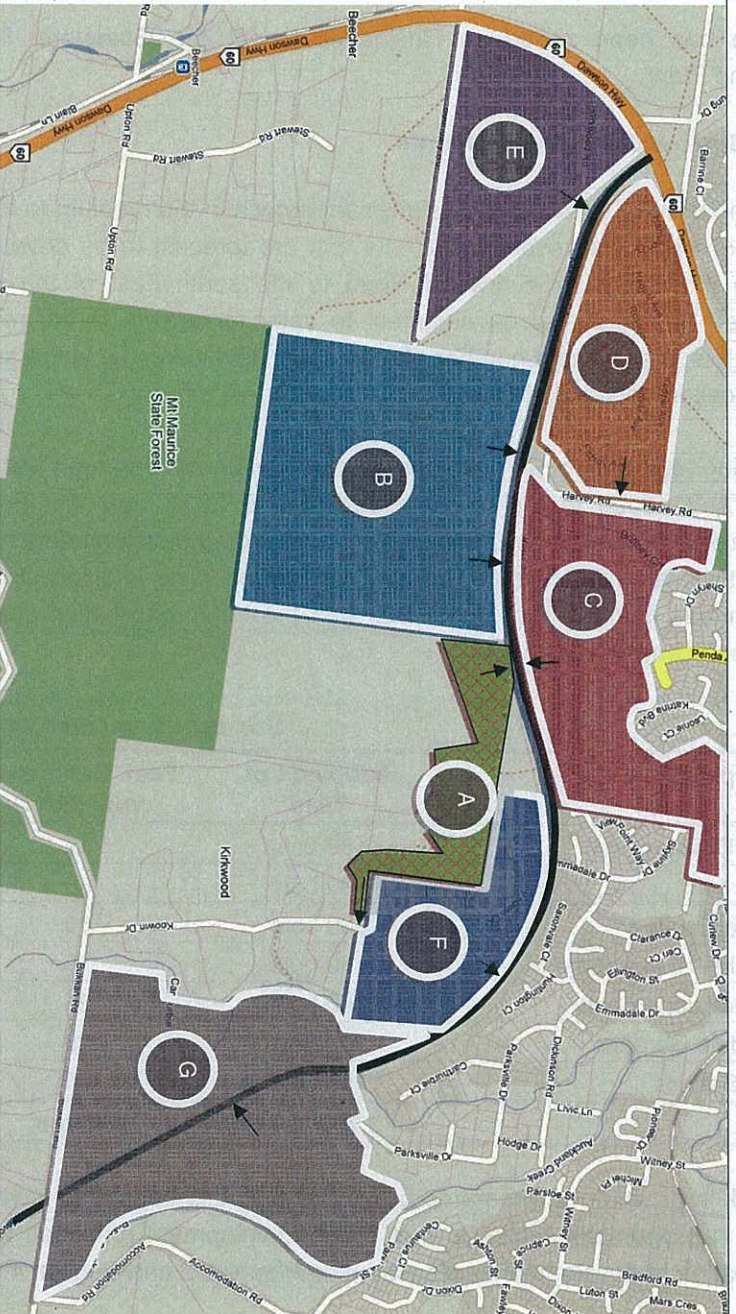
Development	Adopted Lot Yield	Peak Generation vpd (2011)	Peak Generation vpd (2021)
Davies Development	189 Lots	19	189
Little Creek	600 Lots	60	600
Vantage Estate	600 Lots	60	600
Carina Infill Development	150 Lots	15	150
Cove Developements	250 Lots	25	250
Emmadale Gardens	250 Lots	25	250
Forest Springs	750 Lots	75	750
TOTAL	2,789 Lots	279vph	2,789vph

The peak hour volumes generated by surrounding developments have been distributed to the network in proportions similar to that of the development proposal, with consideration of the likely location of development accesses (see Figure 2.2 and Section 4.3).

Harvey Road Gladstone – Residential Subdivision

Figure 2.2

Surrounding Developments



A) Davies Family	E) Cove Developments
B) Little Creek	F) Emmadale Gardens
C) Vantage Estate	G) Forest Springs
D) Carinya Infill Development	—> Indicates Adopted Development Access

2.3 Key Roads

2.3.1 Harvey Road

Harvey Road runs along the eastern frontage of the subject site and provides a direct north-south link between Kirkwood Road and the Dawson Highway to the north.

Harvey Road comprises a two lane cross section and is semi-rural in nature. The posted speed limit along the road is 60km/hr, with a 40km/hr school zone speed limit in effect in the vicinity of the Clinton Primary School directly north of the subject site. Direct frontage property access has been permitted for lots that front onto Harvey Road which has been designated as an urban major collector in the Gladstone road hierarchy. Pedestrian paths are present between the Dawson Highway and Carinya Drive, although there are no dedicated cycle facilities along the roadway.

Figure 2.3 shows the typical road environment south of the Clinton Primary School.

Figure 2.3

Harvey Road (Towards South)



2.3.2 Dawson Highway

The Dawson Highway is a state controlled roadway located along the western boundary of the subject site, and functions as one of the major north-south highway routes to Gladstone. The road cross section comprises two undivided lanes west of the Dawson Highway/Harvey Road roundabout and widens to a four lane divided cross section to the east of the roundabout. Speed limits along the Dawson Highway vary depending on the roadway environment, with urban portions posted at 60km/hr and rural portions (such as west of the Dawson Highway/Harvey Road roundabout) posted at 80km/hr. The western portion of the Dawson Highway has been designated as a rural and urban arterial within the Gladstone Road hierarchy.

Pedestrian and cyclist facilities are not present within the Dawson Highway road reserve in the vicinity of the subject site. Direct frontage access for lots adjacent to the roadway has not been provided, with access to such lots via the connecting lower order streets.

Figures 2.4 and 2.5 show the typical road environment present to the west and east of the Harvey Road roundabout.

Figure 2.4 Dawson Highway (West of Harvey Road Roundabout)



Figure 2.5 Dawson Highway (East of Harvey Road Roundabout)

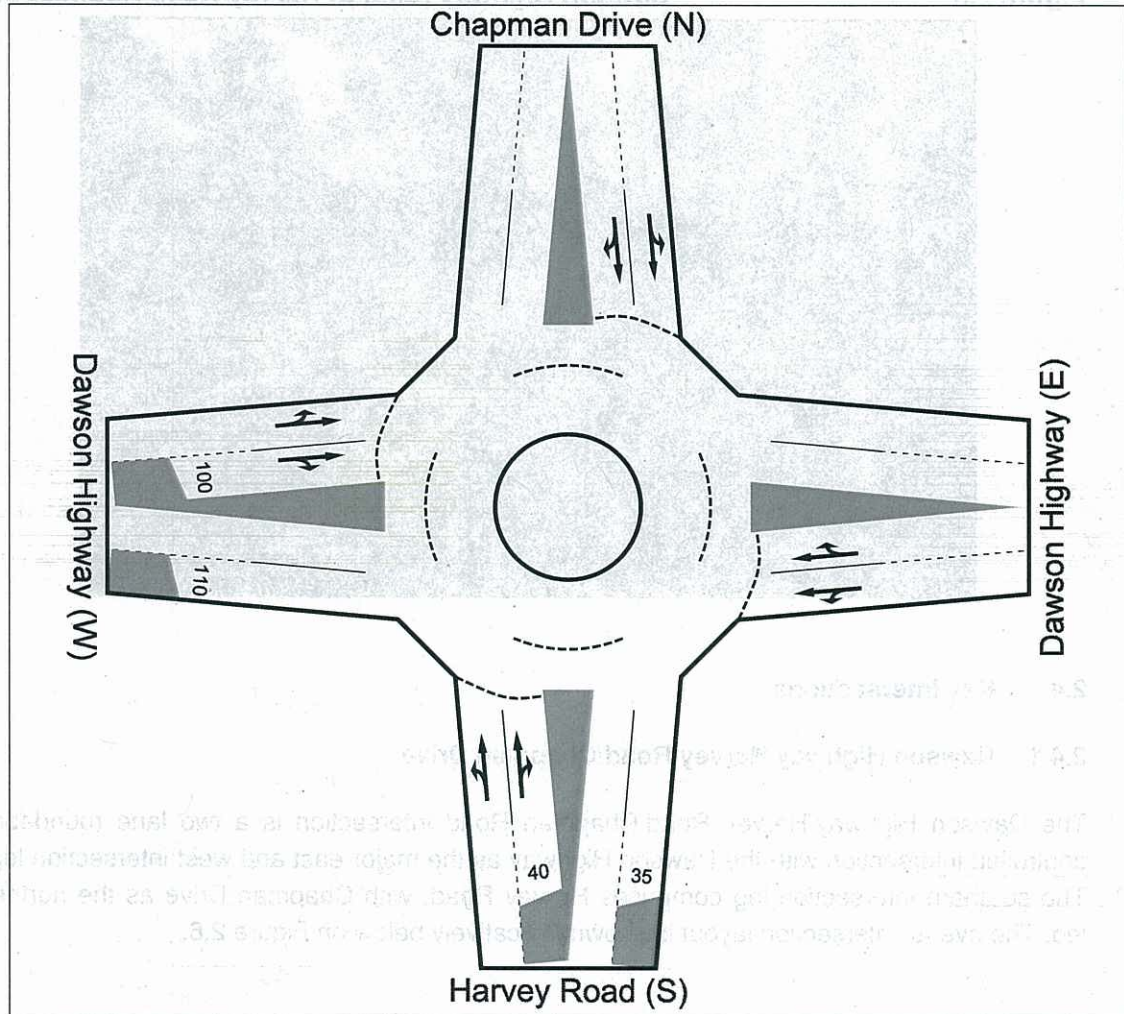


2.4 Key Intersections

2.4.1 Dawson Highway/Harvey Road/Chapman Drive

The Dawson Highway/Harvey Road/Chapman Road intersection is a two lane roundabout controlled intersection with the Dawson Highway as the major east and west intersection legs. The southern intersection leg comprises Harvey Road, with Chapman Drive as the northern leg. The overall intersection layout is shown indicatively below on Figure 2.6.

Figure 2.6 Dawson Highway/Harvey Road/Chapman Drive Intersection Geometry



Sections of formed pedestrian pathways are present at the intersection, with paths present on one side of the Chapman Drive, Harvey Road and Dawson Highway (East) intersection legs. The roadway environment at the intersection is shown on Figures 2.7 and 2.8.

Figure 2.7

**Dawson Highway/Harvey Road/Chapman Drive
(Dawson Highway East Approach)**



Figure 2.8

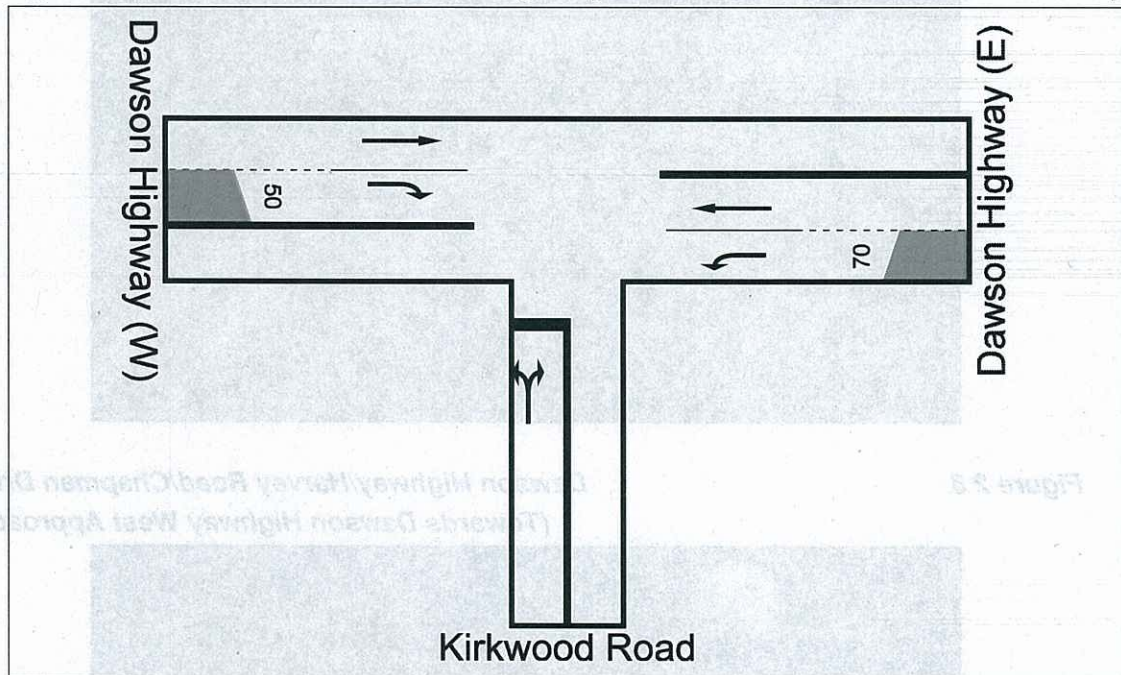
**Dawson Highway/Harvey Road/Chapman Drive
(Towards Dawson Highway West Approach)**



2.4.2 Dawson Highway/Kirkwood Road

The intersection of Dawson Highway/Kirkwood Road is a three way priority controlled intersection. The Dawson Highway forms the major north-south through movement, with the Kirkwood Road forming the minor eastern intersection leg. The northern and southern intersection approaches incorporate turning lanes for movements into Kirkwood Road. The overall layout of the intersection is shown indicatively on Figure 2.9.

Figure 2.9 Dawson Highway/Kirkwood Road Intersection Geometry



There are no specific facilities for cyclists or pedestrians at this intersection. Figures 2.10, 2.11 and 2.12 show the road environment in the vicinity of the intersection.

Figure 2.10 Dawson Highway/Kirkwood Road (Towards City)



Figure 2.11 Dawson Highway/Kirkwood Road (Towards Don Young Drive)



Figure 2.12

Dawson Highway/Kirkwood Road (Towards East)



2.5 Existing Background Traffic Volumes

Intersection volumes used for this assessment have been obtained from the Department of Transport and Main Roads for the key intersections described in Section 2.4. The counts were undertaken on:

- Wednesday, 16 July 2008 for the intersection of Dawson Highway/Kirkwood Drive;
- Thursday, 23 April 2009 for the intersection of Dawson Highway/Harvey Road/Chapman Drive.

2.6 Traffic Growth

Based on the information received from the TMR, the following traffic growth rates were adopted:

- 5%p.a Linear Growth Rate – 450m West of Chapman Drive;
- 3%p.a Linear Growth Rate – West of Penda Drive.

To forecast the future intersection volumes, the base 2008 or 2009 counts as described in Section 2.5 have been factored in accordance with the aforementioned annual growth rates. These annual growth rates have been applied only to the major through movements along the Dawson Highway at the subject intersections.

Proposed residential developments to the south-east of the site will result in a significant increase in through movements along Harvey Road (based on distribution patterns confirmed with TMR). Development traffic generated by these developments has been added to existing background traffic volumes along Harvey Road and Kirkwood Road to forecasts future traffic volumes.

It has been assumed that surrounding developments will be fully implemented by 2021.

2.7 Future Road Network Planning

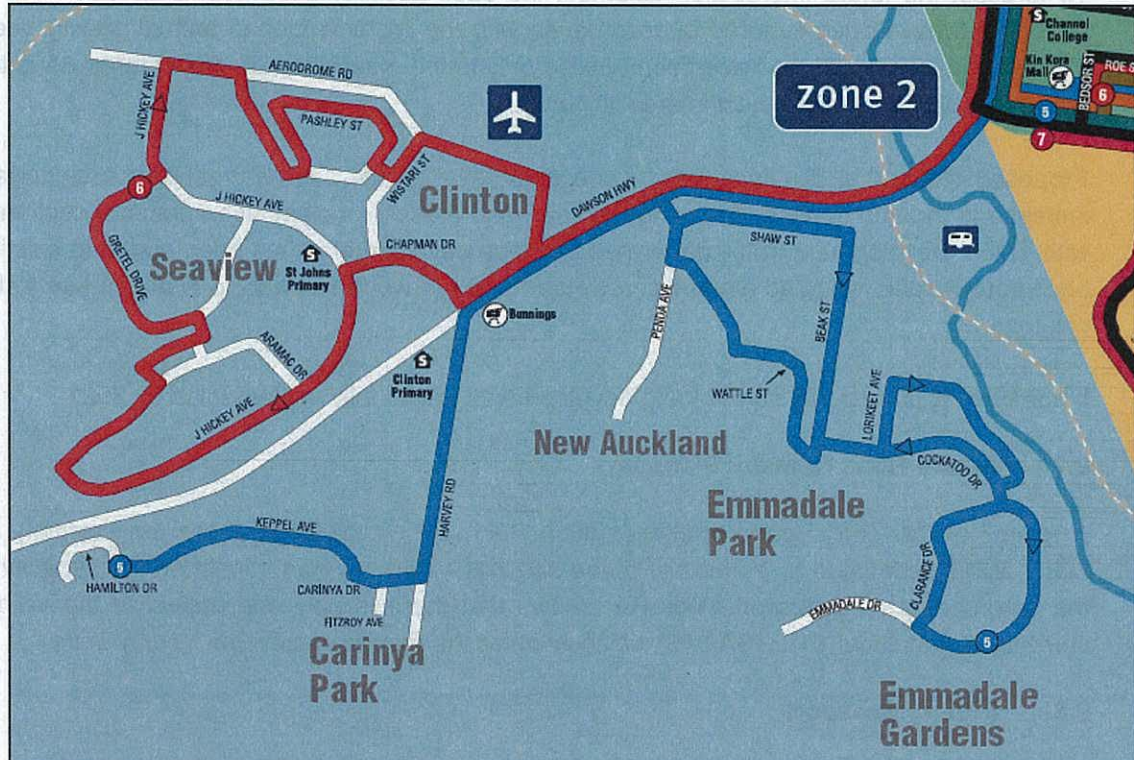
A review of the TMR Roads Implementation Plan (RIP) shows that there are currently no major works scheduled in the vicinity of the site that would have an impact on the capacity of the surrounding road network. The RIP shows that there is only one project in the vicinity currently scheduled (161/LGSA/016) which involves the resurfacing of Don Young Drive.

2.8 Public Transport

Bus services in Gladstone are operated by Buslink Queensland Pty Ltd. The proposed development is serviced by a single bus route (Route 5) which runs along Harvey Road and services existing residential areas to the south and east of the subject site. Figure 2.13 shows the route taken by the Route 5 service.

Figure 2.13

Existing Bus Services



Route 5 services users located within the existing residential developments to the south of the Dawson Highway who are travelling towards the Kin Kora mall approximately 2.4km north-east of the development site. Other services connect at the Kin Kora mall allowing for bus travel to other areas around Gladstone.

There are currently no bus stops located along the Harvey Road frontage of the proposed development site. The nearest bus stop locations are located to the north of the site (in front of the Clinton school) and to the south of the site within Carinya Gardens.

3.0 PROPOSED DEVELOPMENT

3.1 Site Use

The proposed development involves the subdivision of the existing single lot into 254 individual residential lots. These individual lots would cater for a mix of low density (detached) and medium density dwellings. The overall layout of the development and detailed lot yields have been prepared by RPS and are shown at Appendix A.

The proposed development yields are summarised below in Table 3.1.

Table 3.1

Proposed Lot Yield

Lot Type	Number of Lots	Percentage of total lot yield	Number of Dwellings	Percentage of total dwelling yield
Low Density (Detached)	53	21%	53	18%
Medium Density	180	70%	185	63%
Duplex	8	3%	16	5%
Triplex	9	3%	27	9%
Quadplex	4	2%	16	5%
TOTAL	254	100%	297	100%

The proposed lots will exit the site via the low order internal road network and two accesses proposed to be located along the Harvey Road frontage.

3.2 Car Parking

The Gladstone Planning Scheme applicable to the development site states the following parking rates shown in Table 3.2 are to be provided.

Table 3.2

Applicable Parking Rates

Land Use	Parking Rate	Supplementary Conditions
Duplex Unit	2 Spaces Per Residential Unit	1 space per unit must be covered
Dwelling House	2 Spaces	1 Space must be covered, 1 space may be provided in tandem

For the low density detached and medium density dwelling lots, the "Dwelling House" parking rate would be applicable, with the "Duplex Unit" parking rate applicable to the Duplex, Triplex and Quadplex lots.

Detailed dwelling layouts for the Medium Density lots have not as yet been finalised and as such, the onsite parking quantum available cannot be ascertained.

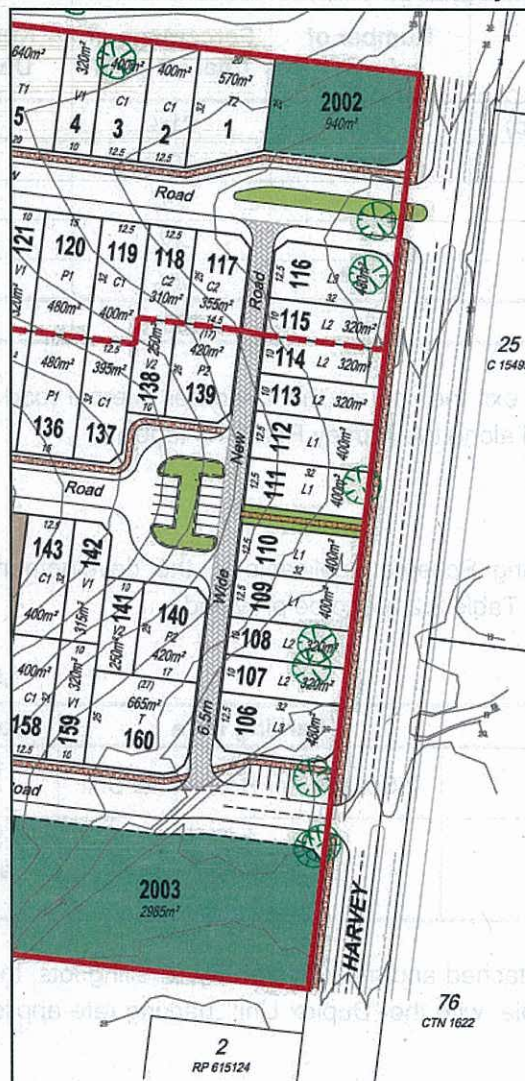
Visitor parking is to be provided at a rate of 1.5 spaces per 2 residential lots. In total, 191 visitor parking spaces should be provided.

3.3 Access

It is proposed to provide access to the site via two access intersections onto Harvey Road. The location of the accesses and indicative proposed internal form is shown below in Figure 3.1

Figure 3.1

Harvey Road Access Locations



The intersection access geometry proposed will be compatible with the ultimate form and will initially be under priority control. The intersections will be constructed to allow for future upgrades. Further details regarding the Harvey Road/site access intersection geometry required to provide safe and efficient access to the site is discussed in Section 4.5.

The internal road network layout results in the northern access functioning as the major access with the southern access functioning as the secondary or minor access.

All turning movements are proposed for at the northern access, whereas at the southern access the right turn onto Harvey Road from the southern access will not be permitted. This access arrangement will require that all right turns onto Harvey Road will be undertaken at the northern access.

Table 4.1
Forecast Development Traffic Generation

Land Use	Quantity (Dwellings)	Generation Rate/City	Generation Rate/City	Total Daily Generation	Total Peak Generation
Detached Houses	60	1.0 vpd/dwelling	1.0 vpd/dwelling	60	28
Medium Density	185	0.6 vpd/dwelling	0.6 vpd/dwelling	111	111
Complex	18	1.0 vpd/dwelling	1.0 vpd/dwelling	18	18
Triples	37	1.0 vpd/dwelling	1.0 vpd/dwelling	37	37
Quadruples	18	1.0 vpd/dwelling	1.0 vpd/dwelling	18	18
SUB TOTAL RESIDENTIAL				230	230

4.0 DEVELOPMENT TRAFFIC IMPACTS

4.1 Assessment Scenarios

The “With Development” assessment scenarios incorporate the full development proposal yield as the basis for the development traffic generated. The assessment scenarios adopted for this assessment are:

- 2010 Background Traffic;
- 2011 Background Traffic ;
- 2011 Background Traffic With Development;
- 2021 Background Traffic;
- 2021 Background Traffic With Development.

For the 2011 analysis year a linear portion of known 2021 surrounding development yields (as described in Section 2.2) has been incorporated in the 2011 Background Traffic.

4.2 Traffic Generation

The traffic generating potential of the site has been calculated based on the anticipated yield and applicable traffic generation rates for the proposed land uses. Table 1 shows the forecast traffic volumes as a result of the development proposal.

Table 4.1 Forecast Development Traffic Generation

Land Use	Quantity (Dwellings)	Generation Rate/Qty	Generation Rate/Qty	Total Daily Generation	Total Peak Generation
Detached Houses	53	10.0vpd/dwelling	1.0vph/dwelling	530	53
Medium Density	185	6.0vpd/dwelling	0.6vph/dwelling	1,110	111
Duplex	16	10.0vpd/dwelling	1.0vph/dwelling	160	16
Triplex	27	10.0vpd/dwelling	1.0vph/dwelling	270	27
Quadplex	16	10.0vpd/dwelling	1.0vph/dwelling	160	16
SUB TOTAL RESIDENTIAL				2230	223

For the detached residential lots, duplex lots, triplex lots and quadplex lots a daily generation of 10.0 vehicles/day/dwelling has been adopted which corresponds to a peak rate of 1.0 vehicle/hour/dwelling. For the medium density dwellings a daily generation of 6.0 vehicles/day/dwelling has been adopted along with a peak generation rate of 0.6 vehicles/hour/dwelling.

The adopted generation rates are moderately higher than that normally applied to residences located in more metropolitan areas and take into consideration the location of the proposed development to major attractors in the region and the availability of alternate modes of transport.

The adopted rates are consistent with the rates specified the Road and Transport Standard component of the Gladstone Planning Scheme.

4.3 Traffic Distribution

The traffic distribution adopted for the analysis is similar to that adopted for other similar residential subdivision works in the area (as agreed with TMR) and is based upon the count data received from TMR.

The distribution adopted for the proposed development and the surrounding developments considered are outlined below:

- North-eastern direction towards CBD (Dawson Highway North) – 60%;
- Northern direction towards Airport (Aerodrome Road) – 5%;
- Northern direction towards Clinton (Chapman Drive) – 10%;
- Southern direction towards Calliope (Dawson Highway South) – 5%;
- Eastern direction towards Glenlyon Road (Kirkwood Road East) – 20%.

In addition to the above, the adopted AM and PM peak splits adopted are:

- AM Peak: 20% In/80% Out;
- PM Peak: 60% In/40% Out.

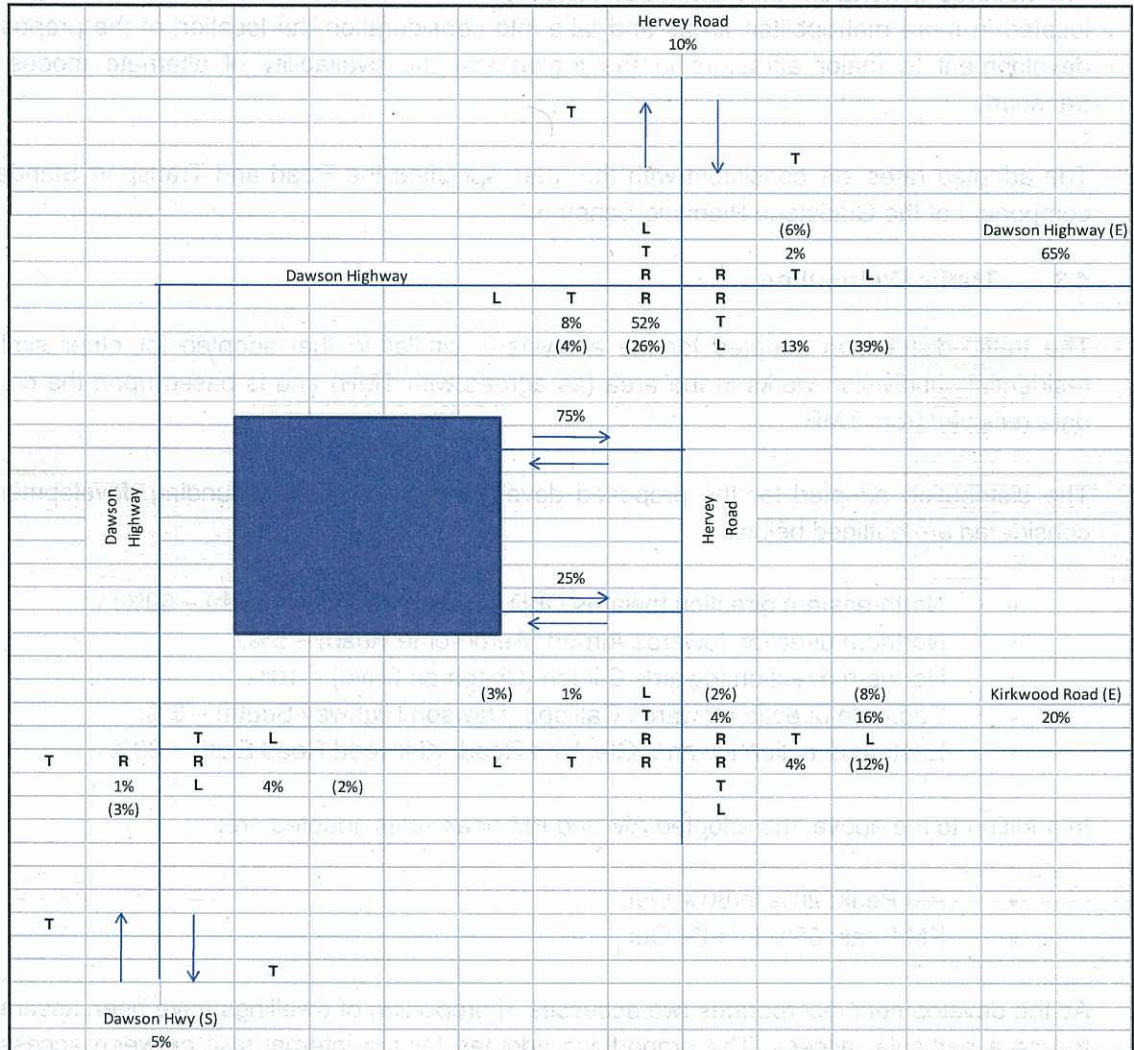
As the development incorporates two accesses, a proportion of dwellings have been assumed to use a particular access. The proportions adopted for the internal split between accesses are:

- Northern access: 75%;
- Southern Access: 25%.

The distribution pattern adopted for the proposed development is shown on Figure 4.1.

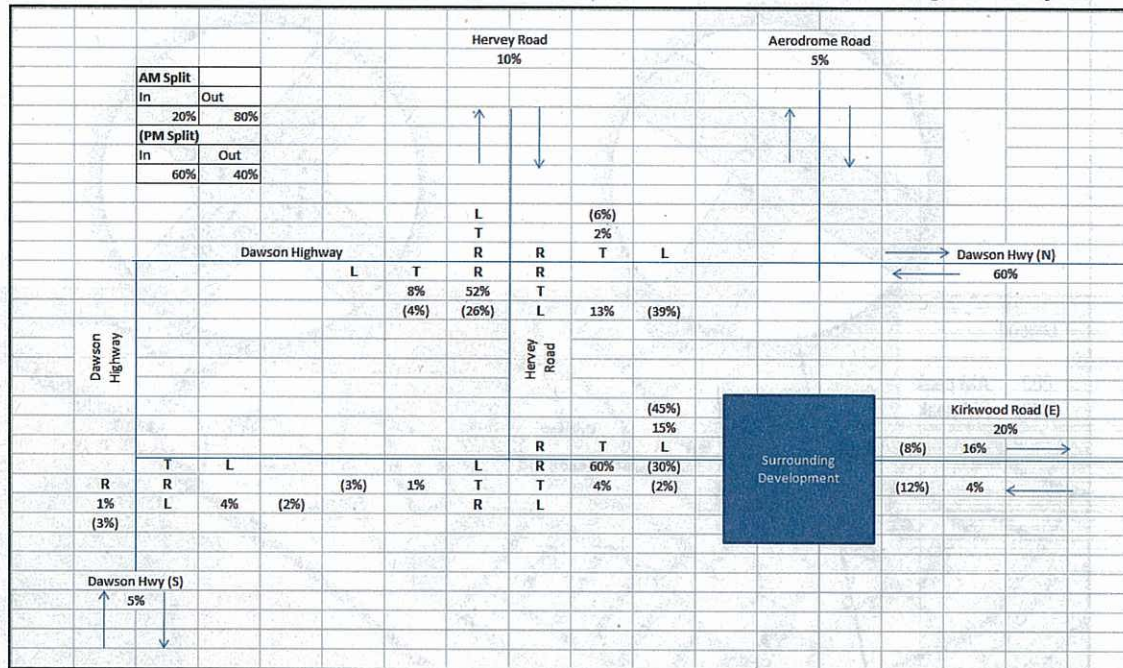
Figure 4.1

Adopted Distribution for Development Proposal



The distribution pattern adopted for the surrounding development is shown on Figure 4.2.

Figure 4.2 Adopted Distribution for Surrounding Development

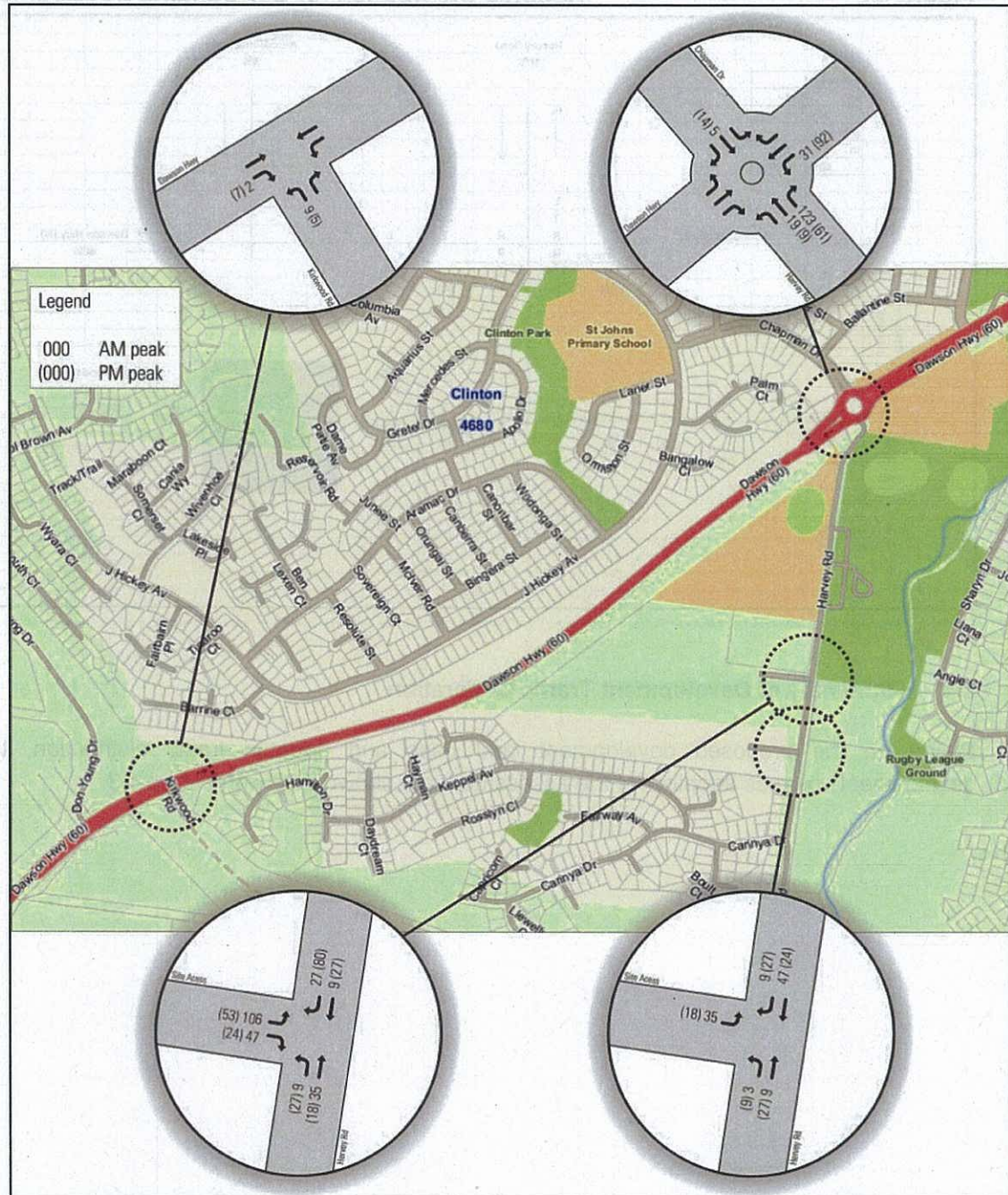


4.4 Summary of Development Traffic Generation

Based on the proposed development land uses and adopted traffic distribution, the development volumes adopted for the assessment are shown below on Figure 4.3.

Figure 4.3

Adopted Development Volumes



Volumes adopted for the 2010 Background Scenario and 2011/2021 Background scenarios have been attached at Appendix B.

4.5 Traffic Impacts

For the key intersections detailed at Section 2.4 and the proposed development accesses, the likely operating conditions at each of these locations has been established using SIDRA Intersection 3.2

This programme calculates the operation of intersections based on input parameters, including geometry and traffic volumes. As an output SIDRA Intersection 3.2 provides values for the degree of saturation (DOS), queues and delays. The DOS is a commonly used value, which is essentially a volume to capacity ratio. A DOS of 1.0 indicates that an intersection is operating at its maximum theoretical capacity. The typically adopted upper limits for the DOS, where it is considered that the operation of an intersection is constrained, are:

- unsignalised intersections: 0.80;
- roundabouts: 0.85; and
- signalised intersections: 0.90.

A DOS exceeding these values (herein referred to as the Practical DOS) indicates that the intersection is nearing its operational capacity. Above these values, users of the intersection are likely to experience unsatisfactory queuing and delays.

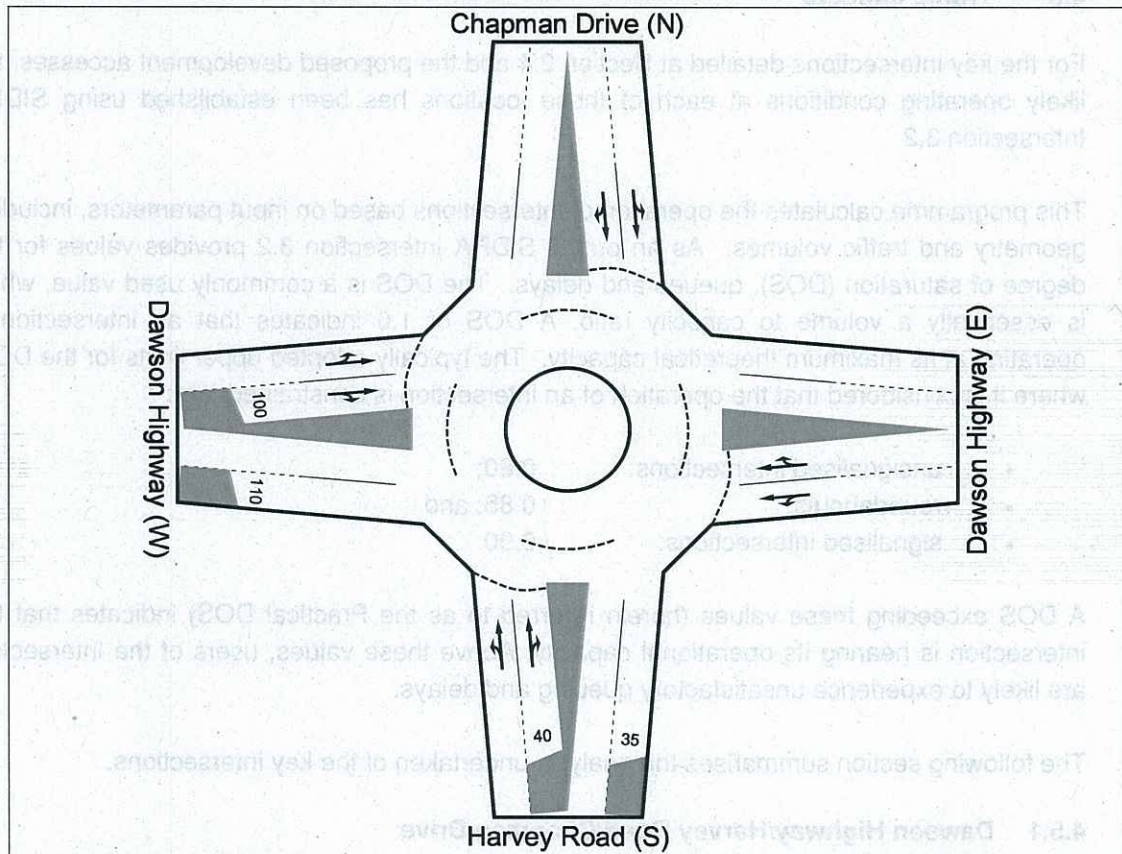
The following section summarises the analysis undertaken of the key intersections.

4.5.1 Dawson Highway/Harvey Road/Chapman Drive

The intersection of the Dawson Highway with Harvey Road and Chapman Drive is currently a four way roundabout controlled intersection. The existing intersection geometry is shown on Figure 4.4 below.

Scenario	Geometry	DOS	Avg Delay	95th Que	DOS	Avg Delay	95th Que
2010 Background	Existing	0.32	6 sec	12m	0.30	2 sec	8m
2011 Background	Existing	0.64	7 sec	14m	0.29	3 sec	12m
2011 Background With Development	Existing	0.37	6 sec	10m	0.31	6 sec	12m
2021 Background	Existing	1.85	273 sec	1503m	0.75	8 sec	12m
2021 Background Upgrade 1	Upgrade 1	0.88	27 sec	275m	0.77	27 sec	130m
2021 Background Upgrade 1 With Development	Upgrade 1	0.92	60 sec	317m	0.68	28 sec	168m

Figure 4.4 Existing Dawson Highway/Harvey Road/Chapman Drive Intersection



The scenarios modelled are as per Section 4.1 with the results of the analysis shown below in Table 4.2

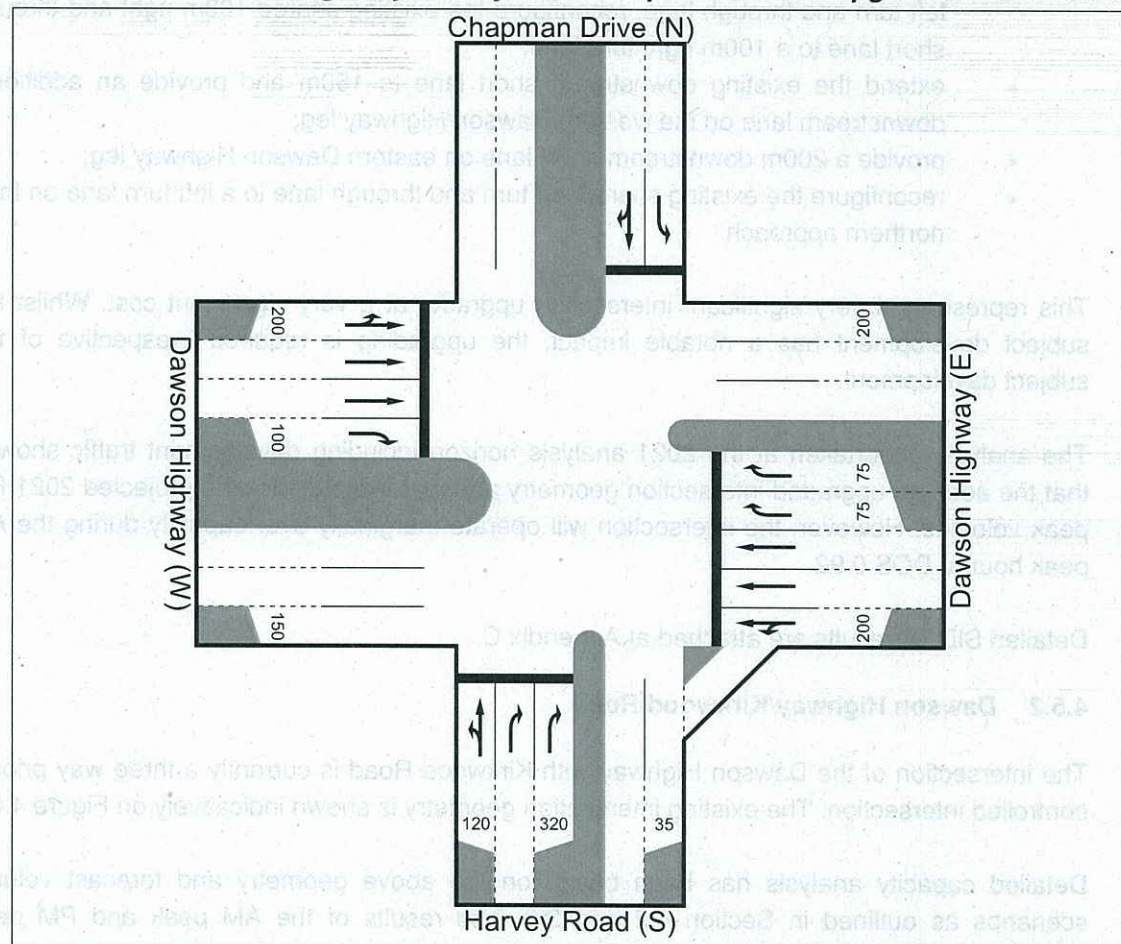
Table 4.2 Dawson Highway/Harvey Road/Chapman Drive – aaSIDRA Analysis Results

Scenarios	Geometry	AM Peak			PM Peak		
		DOS	Avg Delay	95 th %ile Queue	DOS	Avg. Delay	95 th %ile Queue
2010 Background	Existing	0.32	6 sec	15m	0.20	5 sec	9m
2011 Background	Existing	0.34	7 sec	16m	0.25	5 sec	12m
2011 Background With Development	Existing	0.37	8 sec	19m	0.31	6 sec	15m
2021 Background	Existing	1.65	253 sec	1508m	0.75	8 sec	72m
2021 Background	Upgrade 1	0.86	57 sec	278m	0.77	37 sec	159m
2021 Background With Development	Upgrade 1	0.92	60 sec	317m	0.85	38 sec	168m

The results summarised in Table 4.2 above show that the intersection is expected to operate within the desirable DOS for a roundabout controlled intersection for both AM and PM peak 2011 Background With Development scenarios. However, at 2021 the combination of regional growth and significant amounts of residential development in the vicinity of Kirkwood Road will result in the intersection exceeding the desirable maximum DOS during the AM peak period, irrespective of the proposed development traffic. The subject development does have a notable impact on the intersection performance, which is particularly significant in the AM peak.

To address capacity constraints an upgrade to a signal control has been tested at the intersection. The geometry adopted is shown on Figure 4.5.

Figure 4.5 Dawson Highway/Harvey Road/Chapman Drive – Upgraded Intersection



Possible improvements identified (required irrespective of the development) to eliminate capacity constraints include:

- signalisation of the intersection;
- on the southern approach, extend and reconfigure existing shared right and through lane to a 320m right turn short lane, reconfigure the existing shared through and left turn lane to a dedicated right turn lane and provide a shared 120m left and through short lane;
- on the eastern approach, provide two 75 m dual right turn lanes and a 200m shared left turn and through auxiliary lane (with a left turn slip), reconfigure the existing shared left turn and through lane and shared right turn and through lane to through lanes;
- on the western approach, provide an additional through lane and a 200m shared left turn and through lane, reconfigure the existing shared 100m right and through short lane to a 100m right turn lane;
- extend the existing downstream short lane to 150m and provide an additional downstream lane on the western Dawson Highway leg;
- provide a 200m downstream short lane on eastern Dawson Highway leg;
- reconfigure the existing shared left turn and through lane to a left turn lane on the northern approach.

This represents a very significant intersection upgrade, at a very significant cost. Whilst the subject development has a notable impact, the upgrading is required irrespective of the subject development.

The analysis undertaken at the 2021 analysis horizon including development traffic showed that the adopted upgraded intersection geometry adequately caters for the projected 2021 PM peak volumes. However, the intersection will operate marginally over capacity during the AM peak hour at DOS 0.92.

Detailed SIDRA results are attached at Appendix C.

4.5.2 Dawson Highway/Kirkwood Road

The intersection of the Dawson Highway with Kirkwood Road is currently a three way priority controlled intersection. The existing intersection geometry is shown indicatively on Figure 4.6.

Detailed capacity analysis has been based on the above geometry and forecast volume scenarios as outlined in Section 4.2 and 2.2. The results of the AM peak and PM peak analysis are shown below in Table 4.3.

Figure 4.6 Existing Dawson Highway/Kirkwood Road Geometry

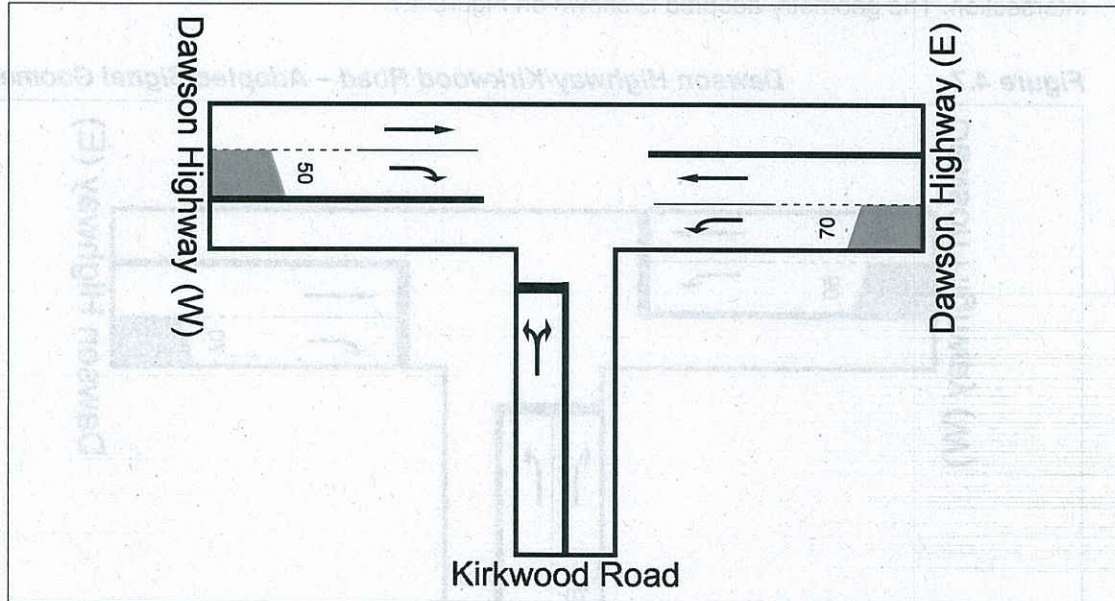


Table 4.3 Dawson Highway/Kirkwood Road – aaSIDRA Analysis Results

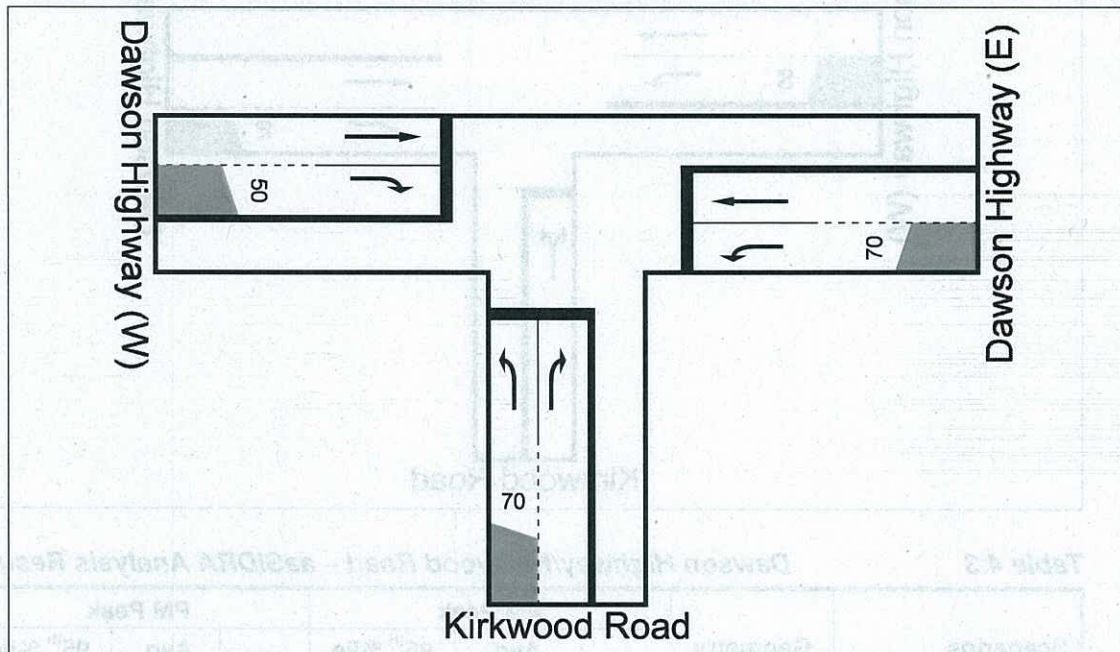
Scenarios	Geometry	AM Peak			PM Peak		
		DOS	Avg Delay	95 th %ile Queue	DOS	Avg. Delay	95 th %ile Queue
2010 Background	Existing	0.23	1 sec	2m	0.18	2 sec	2m
2011 Background	Existing	0.24	3 sec	9m	0.19	3 sec	5m
2011 Background With Development	Existing	0.24	3 sec	10m	0.19	3 sec	5m
2021 Background	Existing	1.39	164 sec	880m	0.69	7 sec	38m
2021 Background	Upgrade 1	0.60	19 sec	139m	0.45	14 sec	90m
2021 Background With Development	Upgrade 1	0.60	19 sec	142m	0.47	14 sec	90m

Tables 4.3 shows that the intersection is operating within the desirable DOS for a priority controlled intersection for both AM and PM peak 2011 Background With Development volume scenarios. However, at 2021 the combination of background growth and surrounding development traffic will result in the intersection exceeding the desirable maximum DOS during the AM peak period, irrespective of the proposed development traffic.

It is noted that the proposed development traffic will have an insignificant impact on the operating conditions of the intersection with the DOS increasing from 0.45 to 0.47 during the 2021 Background With Development PM peak scenario while the DOS remains the same during the 2021 AM peak Background With Development scenario.

To address capacity constraints an upgrade to a signal control has been tested at the intersection. The geometry adopted is shown on Figure 4.7.

Figure 4.7 Dawson Highway/Kirkwood Road – Adopted Signal Geometry



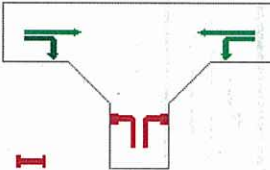
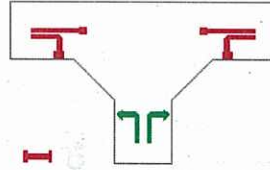
The adopted intersection geometry is similar to that currently in place, with the addition of a short left turn lane on the Kirkwood Road approach, plus signalisation

The analysis undertaken at the 2021 analysis horizon with the proposed development traffic shows that the adopted upgraded intersection geometry adequately caters for both the projected 2021 AM and PM peak volumes. Similar to the 2011 analysis horizon, the proposed development has a minor impact on the operating characteristics of the intersection at the 2021 analysis year.

Detailed SIDRA results are attached at Appendix C.

The phasing adopted for the analysis is shown on Figure 4.8.

Figure 4.8 Dawson Highway/Kirkwood Road - Adopted Intersection Phasing

Phase A					Phase B				
									
Green	Time	=	59	seconds	Green	Time	=	19	seconds
Phase	Time	=	65	seconds	Phase	Time	=	25	seconds
Phase Split = 72 %					Phase Split = 28 %				

4.5.3 Harvey Road/Northern Access

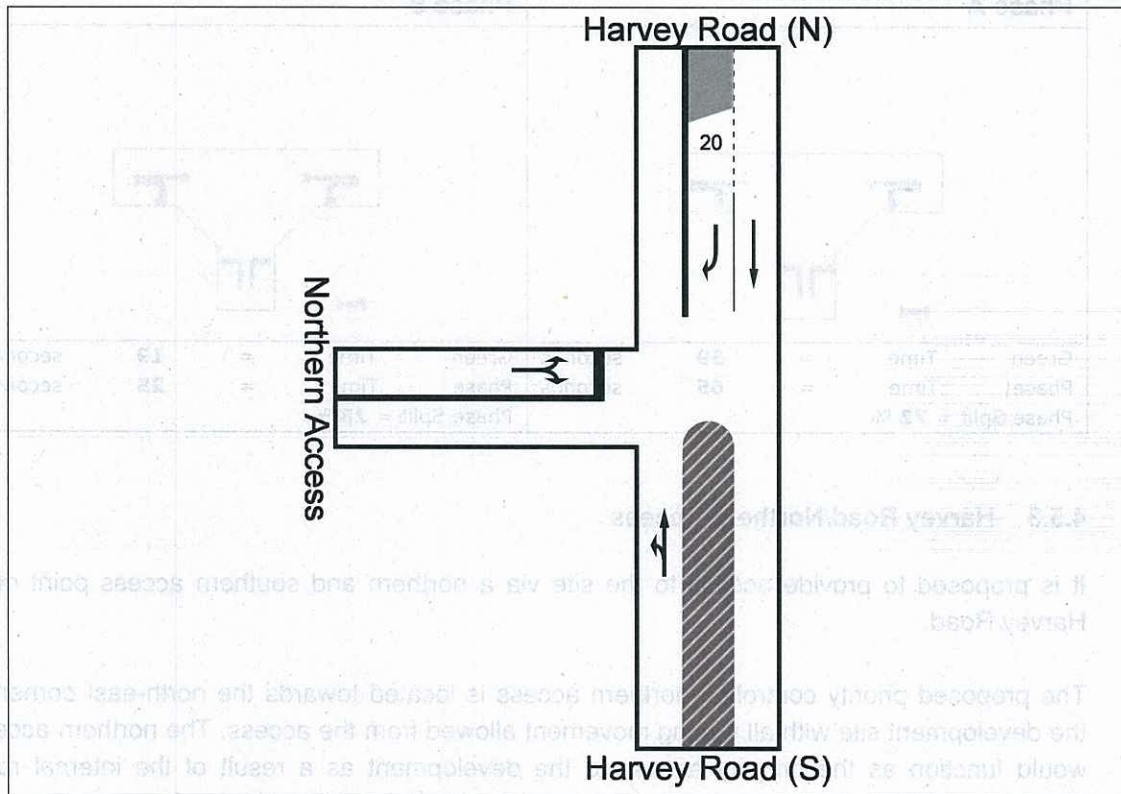
It is proposed to provide access to the site via a northern and southern access point onto Harvey Road.

The proposed priority controlled northern access is located towards the north-east corner of the development site with all turning movement allowed from the access. The northern access would function as the primary access to the development as a result of the internal road network providing a more direct route to a larger number of lots from the northern access.

The proposed northern access form is shown on Figure 4.9.

Figure 4.9

**Proposed Harvey Road/Northern Access -
Priority Controlled Intersection**



Under the forecast intersection movement volumes, the operating characteristics of the adopted intersection geometries are shown below in Table 4.4.

Table 4.4 Northern Access – Intersection Operating Characteristics

Scenarios	Geometry	AM Peak			PM Peak		
		DOS	Avg Delay	95 th %ile Queue	DOS	Avg. Delay	95 th %ile Queue
2011 Background with Development	Priority	0.31	3 sec	12m	0.26	3 sec	5m
2021 Background With Development	Priority	>1.0	209 sec	872m	>1.0	22 sec	143m
2021 Background With Development	Signalised	0.53	10 sec	135m	0.43	6 sec	92m

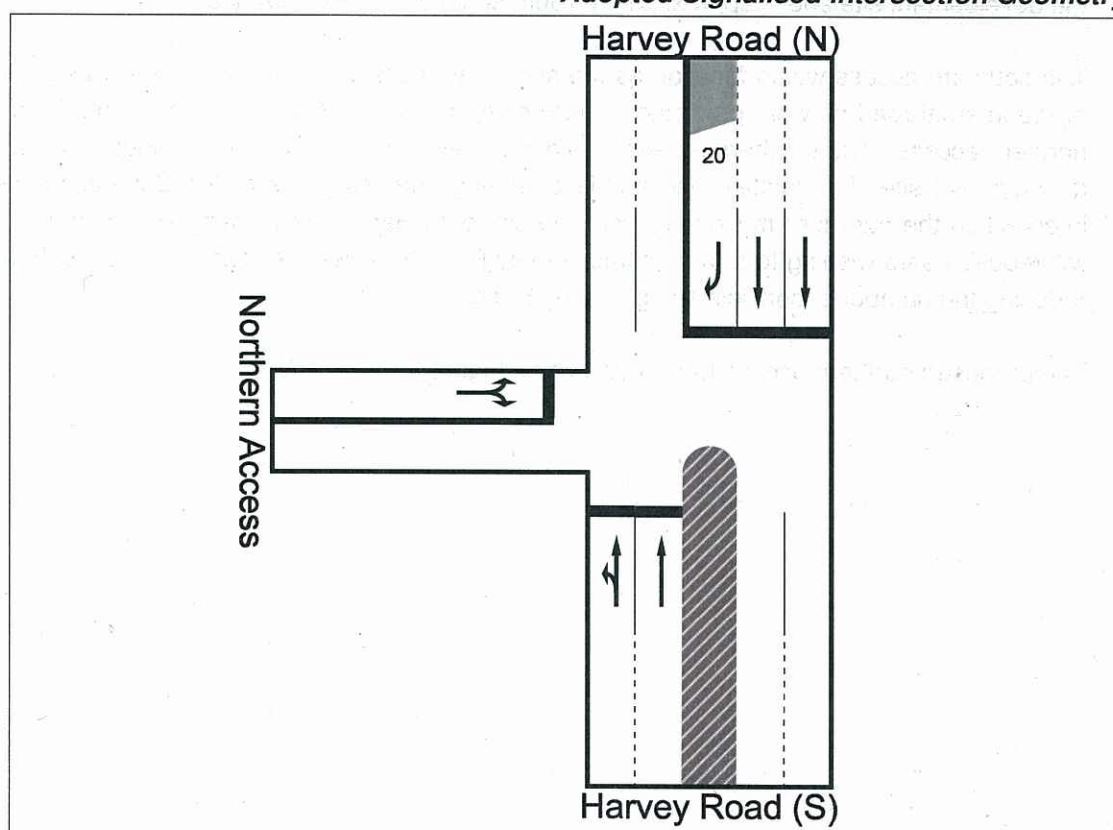
Table 4.4 above shows that the proposed priority controlled access will operate within the desirable DOS for both AM and PM peak 2011 Background With Development volume scenarios. However, the access will exceed practical capacity during both the 2021 AM and PM peak scenarios due to high background traffic volumes along Harvey Road as a result of surrounding developments.

Further analysis undertaken suggests that the access intersection will need to be upgraded once approximately 1,100 dwellings of the surrounding development have been constructed. In addition, 2021 background traffic volumes along Harvey Road imply that Harvey Road be upgraded to a four lane road.

To address capacity constraints an upgrade to a signal control has been tested at the intersection. The geometry adopted is shown on Figure 4.10.

Figure 4.10

**Harvey Road/Northern Access –
Adopted Signalised Intersection Geometry**



The analysis undertaken at the 2021 analysis horizon shows that the adopted upgraded intersection geometry adequately caters for both the projected 2021 AM and PM peak volumes.

The provision of signals will also:

- improve the safe and efficient pedestrian and cycle movement across Harvey Road (particular for school students);
- reduce operating speed in the vicinity of the access and ultimately at the school zone located directly north of the site.

Detailed SIDRA results are attached at Appendix C.

4.5.4 Harvey Road/Southern Access

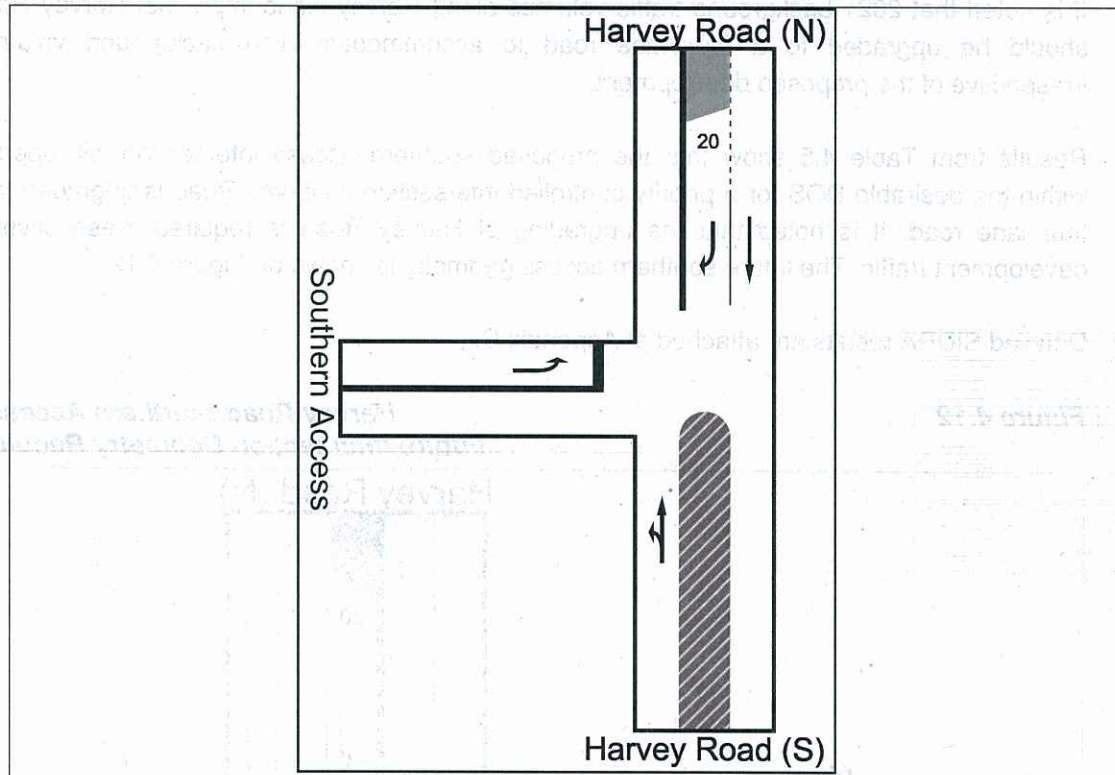
The proposed priority controlled southern access is located towards the south-east corner of the development site and is approximately 160m south of the northern access.

The southern access would function as the secondary access to the development as a result of the internal road network providing a more direct route to a larger number of lots from the northern access. The southern access would primarily service the lots to the south-east of the development site. To maintain acceptable operating characteristics at the Southern Access intersection the right turn movement from the site onto Harvey Road has been banned. This will require users wishing to turn right into Harvey Road to utilise the Northern Access thereby reducing the number of conflicts along Harvey Road.

The proposed northern access form is shown on Figure 4.11.

Figure 4.11

Southern Access – Priority Controlled Intersection



The operating characteristics of the southern access intersection are shown below in Table 4.5

Table 4.5

Southern Access – Intersection Operating Characteristics

Scenarios	Geometry	AM Peak			PM Peak		
		DOS	Avg Delay	95 th %ile Queue	DOS	Delay	95 th %ile Queue
2011 Background With Development	Priority Controlled	0.19	1 sec	1m	0.26	1 sec	1m
2021 Background With Development	Priority Controlled	0.83	4 sec	24m	0.68	1 sec	1m
2021 Background With Development	Harvey Road Upgrade	0.38	1 sec	7m	0.34	1 sec	1m

Results from Table 4.5 show that the intersection is operating within the desirable DOS for a priority controlled intersection for both AM and PM peak 2011 Background With Development scenarios. However, the intersection will marginally exceed the desirable maximum DOS (0.80) during the 2021 AM peak period due to high through movements along Harvey Road.

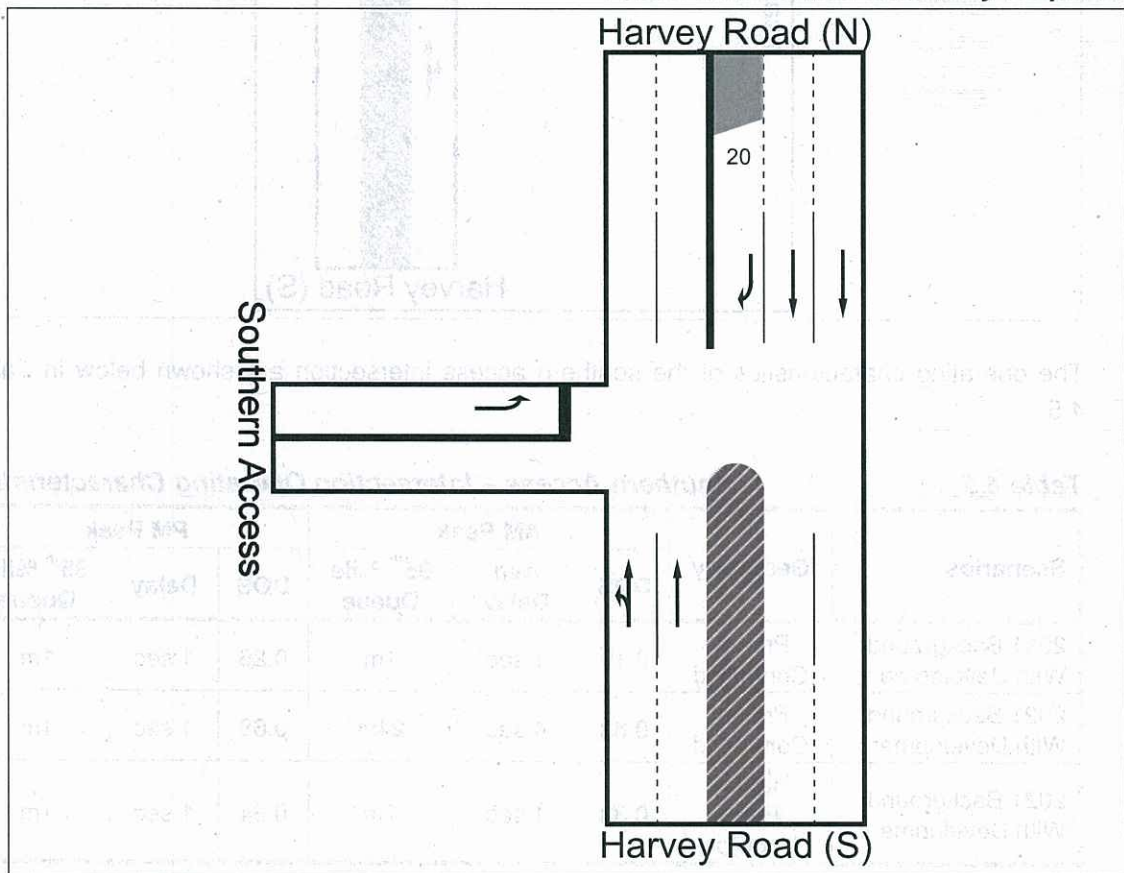
It is noted that 2021 background traffic volumes along Harvey Road imply that Harvey Road should be upgraded to a four lane road to accommodate high background volumes irrespective of the proposed development.

Results from Table 4.5 show that the proposed southern access intersection will operate within the desirable DOS for a priority controlled intersection if Harvey Road is upgraded to a four lane road. It is noted that the upgrading of Harvey Road is required irrespective of development traffic. The future southern access geometry is shown on Figure 4.12.

Detailed SIDRA results are attached at Appendix C.

Figure 4.12

**Harvey Road/Southern Access –
Future Intersection Geometry Required**



5.0 SITE ACCESS

With the extensive residential development occurring along Kirkwood Road to the south of the proposed development, it is likely that the traffic characteristics and role of Harvey Road will change over time. This extensive residential development will result in an increase in vehicle volumes along Harvey Road from 9,300vpd at 2011 to 21,400vpd at 2021 with the greater portion of traffic being through trips rather than trips related by land uses along Harvey Road.

Anticipated vehicle volumes along Harvey Road imply that Harvey Road will fulfil a function and role of a higher order road (such as a Minor Arterial) than its current designation as a Neighbourhood Collector with a Bus Route.

Based on Council's planning scheme no individual lot access or on-street parking is allowed on an arterial road. The proposed development does not incorporate any direct property access or on-street parking along the Harvey Road frontage. Access to the proposed development will be provided via two access points onto Harvey Road.

Therefore the proposed access and parking arrangements are appropriate and are compatible with the likely future function of Harvey Road.

5.1 Sight Distance Review

Inspection of the Harvey Road frontage was undertaken to establish if any obstructions are present which would limit the sight distance available at any accesses located on this frontage.

The sight distances available along the Harvey Road frontage are ample with the road alignment being relatively straight with no significant topographical obstructions present to limit sight distance. Available sight distance along Harvey Road is shown on Figures 5.1 and 5.2.

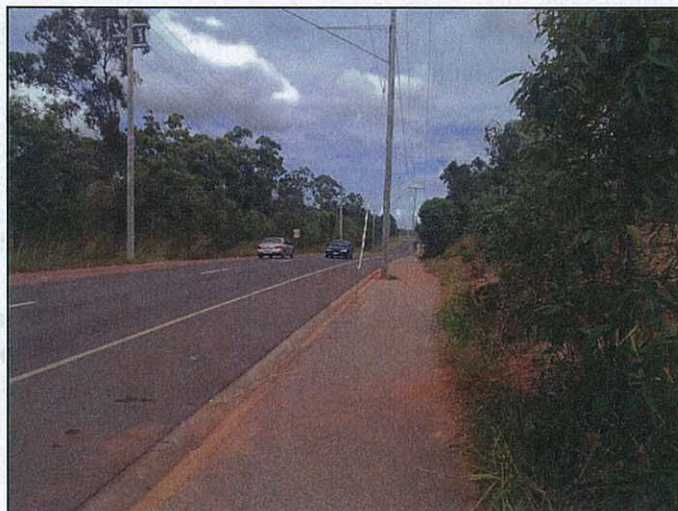
Figure 5.1

Harvey Road – View to North



Figure 5.2

Harvey Road – View to South



6.0 DEVELOPMENT LAYOUT

6.1 Internal Road Network

6.1.1 Road Cross Section

The Gladstone Regional Council Planning Scheme specifies that for an Access Street a minimum carriageway width of 5.5m and road reserve width of 14m is required. For a Neighbourhood Collector street (not accommodating a bus route) a carriageway width of 7.5m and road reserve width of 16m is required.

The proposed development layout shows the provision of a 16m road reserve throughout the majority of the development road network which is consistent with that required under the planning scheme.

Three laneways are proposed within the development and these comprise a 6.5m road reserve each. Whilst these narrow laneways are considered appropriate and acceptable, it is acknowledged that they do not represent a standard cross section with Council's planning scheme.

6.1.2 Speed Control

For a 50km/hr road network Queensland Streets stipulates that the street leg length should not exceed 100m. A number of streets within the development layout exceed a 100m leg length and as such traffic calming devices will need to be incorporated to a future detail.

6.1.3 Refuse Vehicle Swept Path Analysis

Based on Gladstone Regional Council Planning Scheme, residential access streets shall be designed to cater for service vehicles able to use full width of a road to manoeuvre.

A swept path analysis for a 12.5m refuse collection vehicle has been conducted to assess if a refuse vehicle can manoeuvre within the site without mounting kerbs. For design purposes a 12.5m service vehicle with a 12.5m turning radius has been used to assess swept paths.

Swept path analysis shows that a refuse collection vehicle will generally be able to manoeuvre within the site without mounting kerbs. However, swept path analysis showed that refuse vehicles will mount kerbs in some locations and as such the layout will need to be modified. It is noted that alterations to the layout are minor with only minor adjustment required.

Locations where service vehicles are likely to mount kerbs primarily relate to the area in the vicinity of the proposed parking island located to the west of the lots located along Harvey Road as shown on Figure 6.1.