1 September 2025

The Assessment Manager
Toowoomba Regional Council
PO Box 3021
TOOWOOMBA QLD 4350

Attention: Mr Jayden Forbes-Mitchell
By Email: jayden.forbes-mitchell@tr.qld.gov.au

Dear Jayden

RESPONSE TO FURTHER ADVICE & REQUEST TO RECOMMENCE CURRENT PERIOD – SECTION 68, PLANNING ACT 2016 & CHAPTER 1, PART 7, SECTION 35, DEVELOPMENT ASSESSMENT RULES – DEVELOPMENT APPLICATION - PRELIMINARY APPROVAL FOR MATERIAL CHANGE OF USE (DWELLING HOUSES, DUAL OCCUPANCY AND MULTIPLE DWELLINGS) & PRELIMINARY APPROVAL FOR A VARIATION REQUEST - 119 E DREWS ROAD, WESTBROOK - LOT 4 SP254418 (Council Ref: MCUI/2024/7257)(Our Ref: 2024-262)

I act on behalf of the applicant, Fernleigh Properties Pty Ltd, in respect of the above matter.

I refer to Toowoomba Regional Council's (**Council**) Further Advice Request, dated 18 June 2025, in respect of a Development Application for Preliminary Approval for Material Change of Use for Dwelling Houses, Dual Occupancy and Multiple Dwellings including a Preliminary Approval for a Variation Request on land at 119 E Drews Road, Westbrook being that land described as Lot 4 SP254418.

The following advice provides a response to the matters raised in Council's Further Advice correspondence. For ease of comprehension, each item raised in the Information Request has been reproduced in bold print followed by the associated response.

ISSUES AND RESPONSES

1. INFRASTRUCTURE NETWORK ASSESSMENT

1.1. Aspect of Development:

The proposed development is located outside the Priority Infrastructure Area (PIA) meaning that necessary trunk infrastructure has likely not been planned for in Council's LGIP or network planning. There has been no updated assessment of the Subject Site to determine whether infrastructure works might be required before the Subject Site can be developed.

Further Advice:

As previously advised, Engineering Technical Reports were produced by Council when assessing MCUI/2016/3996 and that included the site subject to this application. Provided the Applicant can provide the additional site-specific reports requested in the Information Request, Council will undertake to update the Technical Reports for this application for water, sewer, stormwater and transport networks. Without the site-specific information requested, Council cannot complete the technical reports required to justify development approval.

Response

In response to the above item, we note that in addition to information and assessments provided in response to the information request, the technical assessments requested under this Further Advice request have been prepared by RMA Engineers and provided, namely those related to Traffic Impact Assessment and Water Supply.

We note that the previous information provided with the application including the GenEng Report (December 2024), insofar as it related to the suitability and adequacy of the sewerage and stormwater infrastructure networks has been accepted by Council and further assessment of those networks is not required and has not been sought.

2. TRAFFIC

2.1. Aspect of Development:

The proposed development area is outside of the Priority Infrastructure Area (PIA) and no recent traffic impact assessment has been undertaken for this site. Development traffic is likely to exceed 5% of existing peak hour traffic movement on at least the Drayton Wellcamp Road/Boundary Street South intersection and Council needs to understand the development impacts on this.

The GenEng report references traffic impact assessment undertaken by others in 2017. There is no evidence that the Toowoomba Second Range Crossing has significantly reduced traffic on local government roads servicing Westbrook including Boundary Street South, Drayton Wellcamp Road and Euston Road. Councils tube count data records a significant increase in traffic volumes on all these roads from 2018/2019 to 2024.

Further Advice:

The applicant is requested to provide an updated Traffic Impact Assessment (TIA) consistent with the methodology outlined in the TMR Guide to Traffic Impact Assessment and addressing the road safety and intersection delay impacts of the development. The spatial extent should include intersections where development traffic exceeds 5% of base traffic for any movement in the design peak period in the year of opening.

Response

In response to the above item, RMA Engineers understand that Council's primary concern is the impact of the proposed development on the intersection of Boundary Street South, Drayton Wellcamp Road and Euston Road.

The SARA variation request approval conditions require the assessment of the relevant TMR intersections as part of subsequent development applications. No analysis of those intersections is required at this phase of the approval process.

An assessment of the Boundary Street South, Drayton Wellcamp Road and Euston Road intersection has been undertaken, and the results are discussed in the Traffic Report prepared by RMA Engineers and attached as **Appendix A**.

Based on the outcomes of the Traffic Report, the intersection fails under background traffic and requires an upgrade, regardless of whether the development proceeds or not. The minimum treatment to the intersection to cater for background growth, is also adequate to cater for the impact this development plus background traffic at a 10-year horizon.

Based on the above, there are no traffic related issues that would prevent the development from being approved.

3. WATER SUPPLY

3.1. Aspect of Development:

Council has previously investigated water supply requirements for the Fernleigh Development on land north of Shoesmith Road and outside the PIA, and prepared the Fernleigh Development Westbrook Water Supply Assessment Report February 2017. A supplementary report prepared by Cardno examined the impact of a reduced development (400 lots) and identified the augmentation requirements and timing.

The current development proposal could include in the order of 100 lots but there has been no water network modelling undertaken to determine the development impacts. The limiting factor at present is the ability for the reservoir to service both Westbrook and Glenvale rather than just Westbrook. Currently lots within the PIA in Glenvale have submitted applications or received approvals, earmarking most of the spare capacity. Council needs to be certain of the development impacts and if augmentation work is required to mitigate those impacts.

Further Advice:

Please provide a Water Supply Assessment demonstrating that a compliant water supply system can be achieved to service the anticipated development throughout for all the planning horizons identified in The Greater Western Toowoomba Water Supply Study 2023. The report is to demonstrate, as a minimum, modelling hydraulic results demonstrating pressure and flows and any external augmentations required to service the development. Growth within the PIA area at Westbrook must be as per current assumptions and recognise that recent developments within the PIA such as Gainsborough Lodge (approved) and at 300 Drayton Wellcamp Road (application) are creating significant demand within the network.

The water supply report is to be undertaken in accordance with Councils Water Infrastructure Policy 2.03 and will require up-to-date pressure and flow test results from Council's Water Network Planning team. To request up-to-date network conditions please contact WaterNetPlan@tr.qld.gov.au.

Response

In response to the above item, RMA Engineers note the applicant engaged Toowoomba Regional Council to include the demand load from the proposed development in their water network model to confirm that supply to the lots could achieve the desired standard of service required, and to identify if any detrimental impacts on the network would result from the additional load.

The demand load was based on 310 EP (100 lots at 3.1 EP per lot) and applied to the existing DN150 PVC main in Shoesmith Drive at the frontage of the development.

The results of that work are provided in **Appendix B**. The results are based on the planned upgrades (as per Council's Greater Western Toowoomba Water Supply Study) being in place for each scenario modelled.

The results of the modelling demonstrate that:

- Satisfactory supply to the development can be achieved that will meet Council's required desired standards of service.
- There were no deficiencies identified in the network resulting from the additional demand of the development.
- There were no unplanned augmentations required to the network for the development to proceed.

The water network internal to the development will be designed and modelled as part of subsequent RAL/OW applications for the 100 lots following approval of this Variation Request.

The purpose of those works will be to confirm the internal watermain layout and pipe sizing. Based on the results of Council's modelling, there are no water network related issues that would prevent the development from being approved.

4. OPEN SPACE

4.1. Aspect of Development:

The applicant has not provided any detail relating to the Parks infrastructure network, required to identify necessary Park infrastructure to service the growing community.

Further Advice:

The applicant is requested to provide an Infrastructure Network Assessment report for the Park Network prepared by an appropriately qualified person (with supporting information, maps and metrics) addressing, but not limited to, the following:

1. ***Identification of the most cost-effective method to extend trunk infrastructure networks from the PIA to and through the development site (including estimation of costs of this infrastructure). Please refer to Part 4.2 of the Toowoomba Regional Planning Scheme 2012 for guidance;***
2. ***An assessment of the capacity of existing and future trunk infrastructure identified in the LGIP to determine whether adequate capacity exists to accommodate the development;***
3. ***Identification of any necessary trunk infrastructure identified in the LGIP and that will be made necessary by the development (including an estimation of costs of this infrastructure);***
4. ***Identification of any extra trunk infrastructure which will be made necessary by the development (including an estimation of costs of this infrastructure);***
5. ***Identification of any non-trunk infrastructure which is required to connect the development to trunk infrastructure networks (refer to Planning Scheme Policies for guidance);***
6. ***Commentary regarding the ability to achieve the desired standards of service for each infrastructure network as identified in the LGIP; and***
7. ***The timing and sequencing of the infrastructure (if development is proposed to be staged).***

In the event that the applicant does not provide the above park analysis, Council officers are of the view that, should the application be recommended for approval, it may be reasonable and relevant to require

that any subsequent application for a material change of use or reconfiguring a lot proposing or requiring a Trunk Standard of Local Recreational Park or higher ought to be impact assessable.

Response

In response to the above item, we note that the area to which the current Preliminary Approval (Variation Request) application applies is designated exclusively for residential development. There is no intention or proposal under the current application to designate or use any part of the area to which this application relates for open space purposes.

I note that **there is not, nor has there ever been a proposal to establish a trunk standard local recreation park in this area.** Should it be Council's preference, my client is agreeable to the imposition of a reasonable or relevant condition precluding the establishment of a trunk standard local recreation park within the variation scheme area.

As was previously noted in the response to the information request, my client is also agreeable to the imposition of a reasonable or relevant condition requiring the design of future subdivision within the Variation Scheme Area to be responsive to Council's Desired Standards of Service (DSS) insofar as any future subdivision design provides for frontage and access to open space areas **outside of the variation scheme area**. Whether conditioned or not, we assume the DSS will be applied by Council to the assessment of open space design under future applications for development permits.

5. WATERWAYS (ADVICE ONLY)

The applicant provided a response to the information request item stating that the mapped waterway is predominantly outside the development lot and is Council owned drainage reserve. Notwithstanding, the extent of waterways are not defined by cadastral lot boundaries. Council officers are of the view that, should the application be recommended for approval, it may be reasonable and relevant to require that any subsequent application for a material change of use or reconfiguring a lot demonstrates how the development avoids adverse impacts on the hydraulic regime and water quality values while remaining wholly outside of the waterway.

Response

In response to the above item, we note Council's advice that as part of any subsequent application for Material Change of Use or Reconfiguring a Lot, Council may request information demonstrating that any subsequent reconfiguration or change of use does not:

(a) Impact adversely on the hydraulic regime and water quality values of the waterway; and
(b) Remains wholly outside the waterway.

My client accepts that position and agrees to the imposition of a reasonable or relevant condition indicating that the referenced items are addressed as part of any subsequent development application(s) within the variation scheme area.

SUMMARY

The above responses address each of the items raised in Council's Further Advice correspondence. Having regard to the information provided, we request that Council proceed with the assessment of the application.

WITHDRAWAL OF REQUEST TO STOP CURRENT PERIOD

As part of the response to this Further Advice Request, I note that we advised Council on 3 July 2025, that we would be stopping the current period pursuant to section 68 of the Planning Act 2016 and Chapter 1, Part 7, Section 32.6 of the DA Rules.

In addition to responding to Council's Further Advice Notice, we hereby confirm that this response also withdraws our previous request to stop the current period effective as at 1st September 2025.

Should you require any additional information or clarification please do not hesitate to contact the undersigned on phone 07 4632 2535, mobile 0427 737 526 or by email at andrew@precinctplan.com.au.

Yours sincerely

Andrew Bullen
Precinct Urban Planning

APPENDIX A – TRAFFIC IMPACT ASSESSMENT REPORT

RMA ENGINEERS

RMA Engineers

TRAFFIC IMPACT ASSESSMENT

Fernleigh Development | Westbrook

Client Fernleigh Properties Pty Ltd
Project Number 25E-0272

REPORT CONTROL SHEET

Report Details	
Report Title:	Traffic Impact Assessment Fernleigh Development | Westbrook
Project No.:	25E-0272
Site:	Shoesmith Road, Westbrook
Author:	Christian Tedman

Document Control					
Revision	**Author**	**Reviewer**	**Approved for Issue**		
			Name	**Signature**	**Date**
1	C Tedman	A Gwatking	A Gwatking	NER, CPEng, RPEQ: 15158	25 / 08 / 2025
2	C Tedman	A Gwatking	A Gwatking	NER, CPEng, RPEQ: 15158	27 / 08 / 2025

Disclaimer:

RMA Engineers has undertaken this report based on accepted traffic engineering practices, standards, and information available at the time of writing. It is not intended as a quote, guarantee or warranty and does not cover any latent defects. RMA Engineers do not accept any responsibility for the authentication of accuracy of supplied information or validation of data that is outside the scope of works. RMA Engineers are not accountable for any changes to the standards, physical infrastructure conditions or planning impacts that occur after the completion date of the assessment.

The conclusions in this report should not be read in isolation. We recommend that its contents be reviewed in person with the author so that the assumptions and available information can be discussed in detail to enable the reader to make their own risk assessment in conjunction with information from other sources.

The document is produced by RMA Engineers for the sole benefit and use by the client in accordance with the contracted terms. RMA Engineers does not assume responsibility or liability to any third party arising from any use or reliance on the content of this document.

Contents

1. Introduction

1.1 General

RMA Engineers Pty Ltd has been engaged by Fernleigh Properties Pty Ltd to prepare a traffic impact assessment (TIA) for a proposed low density residential subdivision on Shoesmith Road, Westbrook, formally referred to as Lot 4 on SP254418. The site is located within the Toowoomba Regional Council (TRC) local government area.

This report has been prepared in support of an application which seeks a Preliminary Approval for a Variation Request to vary the effect of the Planning Scheme pursuant to section 50(3) of the Planning Act 2016. The Variation Request will alter the assessment levels, use rights and assessment provisions of the Planning Scheme to allow for residential use to occur on the site, however doesn't specifically authorise development to occur. Therefore, this TIA is prepared as a preliminary assessment only to help identify constraints early on in the planning process, and to help the applicant and Council achieve consistent and agreeable outcomes for the site.

Any detailed planning, design or staging would be undertaken as part of the subsequent material change of use (MCU) or reconfiguration of a lot (RAL) application which seeks a Development Permit for a specific proposal.

The assessment has been undertaken generally in accordance with the road transport related requirements identified in the Department of Transport and Main Roads (DTMR) *Guide to Traffic Impact Assessment* (GTIA) (2018) and the Toowoomba Regional Council (TRC) Planning Scheme (2022).

1.2 Report objectives and scope

This report has been prepared in response to the TRC Further Advice letter dated 18 June 2025, and subsequent conversations held with TRC, which requested an assessment of the Drayton Wellcamp Road / Euston Road / Boundary Street South intersection with the proposed development influence at the year of completion and design horizon (as applicable). No other roads or intersections within the vicinity of the subject site have been investigated as part of this TIA.

Therefore, this report considers:

- The existing transport operation and environment of the surrounding road network.
- Estimated development traffic generation and distribution on the surrounding road network.
- Operational impacts at the key intersection of Drayton Wellcamp Road / Euston Road / Boundary Street South with the proposed development influence at the year of completion and design horizon (as applicable).
- Safety considerations at the key intersection of Drayton Wellcamp Road / Euston Road / Boundary Street South - including turn warrant assessment, available sight distance, and review of historical crash data and commentary on required mitigation measures (if any).
- Active and public transport considerations.

Where required, this report makes recommendations for the mitigation of development impacts.

1.3 Reference material

In preparing this report, reference has been made to the following:

- Austroads Guide to Road Design, Part 4A: Unsignalised and Signalised Intersections – 2023
- Austroads Guide to Traffic Management, Part 12: Traffic Impacts of Developments – 2020
- DTMR Guide to Traffic Impact Assessment (GTIA) – 2018
- DTMR Road Planning and Design Manual (RPDM) – 2024
- DTMR online survey and information database – 2022
- NSW Roads and Maritime Services (formerly Roads and Traffic Authority) Guide to Generating Traffic Developments — 2002
- Toowoomba Regional Council Planning Scheme Version 28 – 2022

2. Proposed development

2.1 Location and descriptions

The proposed development site (referred to as the subject site) is located on Shoesmith Road, Westbrook, within the TRC local government area. The subject site is formally referred to as Lot 4 on SP254418.

The site is currently zoned as 'Rural' as per TRC interactive mapping and is surrounded by low density residential parcels to the south, and rural uses in the north, east, and west.

The subject site and its environs are illustrated on the locality plan in **Figure 2-1** below.

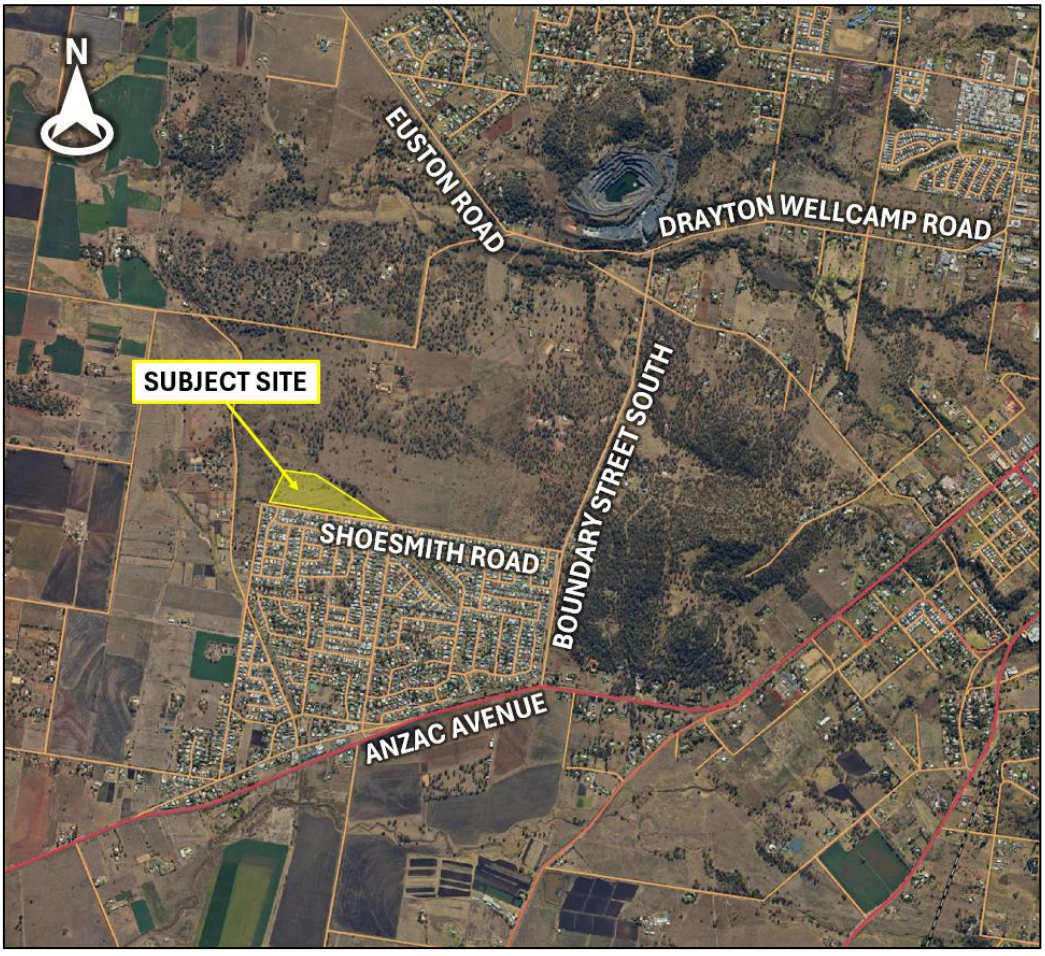


Figure 2-1: Locality plan

2.2 Development intent

The development proposes approximately 100 low density residential lots containing varying lot sizes to accommodate mixed housing types. It should be noted that the proposed yield is considered to be conservative and represent the likely maximum development given the available land area. For this assessment, it is envisaged that the proposed development is to be completed and operational by 2027.

2.3 Development access

The development proposes to gain access to the external road network via Shoesmith Road.

3. Existing transport environment

3.1 Road hierarchy

The TRC road hierarchy classifications for the external road network surrounding the subject site are shown below in **Figure 3-1**.

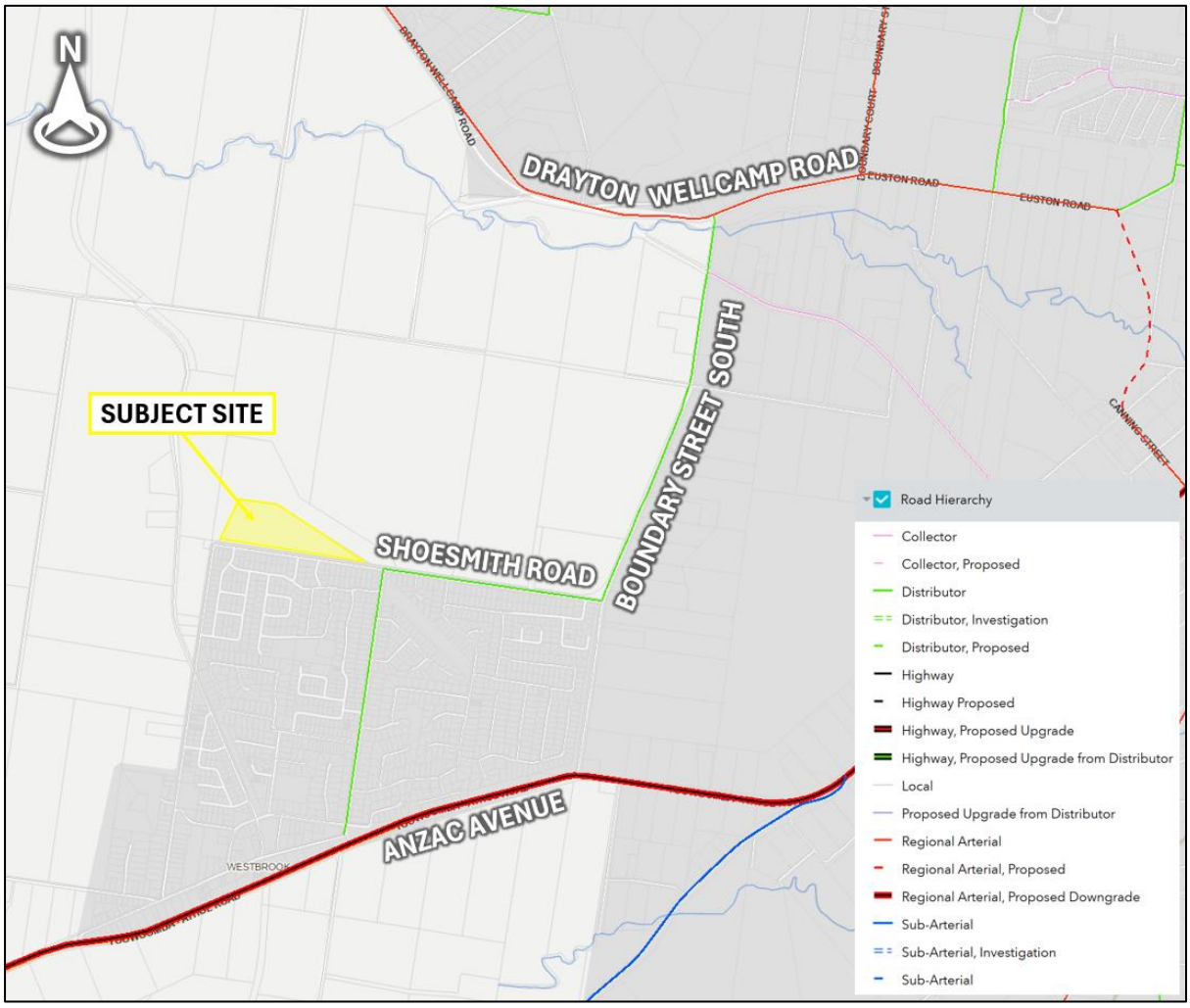


Figure 3-1: Road hierarchy (as per TRC interactive mapping)

As stated in **Section 1.2**, this report has been prepared in response to the TRC Further Advice letter dated 18 June 2025, and subsequent conversations with TRC. Item 2.1 of the Further Advice letter requested an assessment of the Drayton Wellcamp Road / Boundary Street South intersection. This intersection and the key roads of Drayton Wellcamp Road and Boundary Street South are described in the following sections.

3.2 Key roads

3.2.1 Boundary Street South

Boundary Street South is classified as a distributor road under the TRC Planning Scheme. The road is a trunk road under Council jurisdiction and it extends from Drayton Wellcamp Road in the north to Toowoomba Athol Road in the south.

Within the vicinity of the proposed site, Boundary Road South has the following characteristics (refer to **Figure 3-2**):

- Two lane, two way undivided carriageway
- Posted speed limit of:
  - 60km/h in the vicinity of the Boundary Street South/Shoesmith Road intersection
  - 70km/h for the remainder of the road extent
- Lane widths of approximately 3.2m at midblock locations
- Road reserve width of approximately 28m
- Varying paved shoulder widths between 0m and 1.5m
- Centre line marking between Shoesmith Road and Drayton Wellcamp Road
- No active transport provisions

Figure 3-2 Boundary Street South looking north towards Drayton Wellcamp Road

3.2.2 Drayton Wellcamp Road

Drayton Wellcamp Road is located north of the site. The eastern section of the road (from Greenwattle Street to Boundary Street South) is also referred to as Euston Road. Drayton Wellcamp Road is a trunk road and is classified as a regional arterial road under the TRC Planning Scheme. Within the vicinity of the proposed site, Drayton Wellcamp Road has the following characteristics (refer to **Figure 3-3**):

- Two lane, two way undivided carriageway
- Posted speed limit of 80km/h
- Lane widths of approximately 3.8m at midblock locations
- Road reserve width of approximately 20m
- Paved shoulder widths between 0m and 0.5m
- Centre line marking
- No active transport provisions

Figure 3-3 Drayton Wellcamp Road looking west towards Boundary Street South

3.3 Key intersection

3.3.1 Drayton Wellcamp Road / Boundary Street South / Holcim Site Access

Drayton Wellcamp Road / Boundary Street South intersection is located approximately 2.5km northeast of the site and is shown in **Figure 3-4**. It is a channelised four-leg intersection with priority to Drayton Wellcamp Road. The northern leg is a private commercial access to the Holcim quarry site, and it is understood that the quarry is currently not in use. There is no pedestrian infrastructure provisions at this intersection.

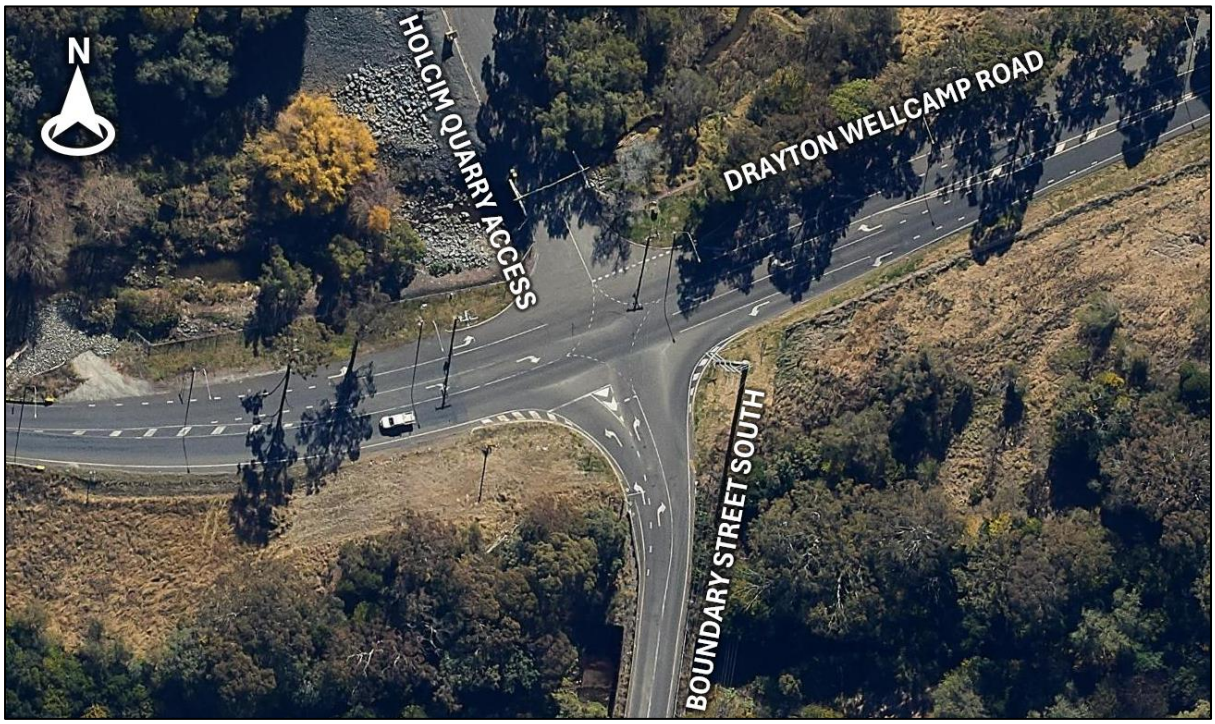


Figure 3-4: Drayton Wellcamp Road / Boundary Street South / Holcim Quarry Access

3.4 Crash data

Queensland Government crash data was examined for the most recent available five-year period, from 1 January 2018 – 1 January 2023. Data was obtained from *Queensland Globe (transportation – road crash locations)* within the vicinity of the key Drayton Wellcamp Road / Boundary Street South intersection.

One crash has been recorded within the most recent five-year period, which was a minor injury angle crash (DCA 104), under clear and dry conditions.

Since one crash has been recorded, no crash patterns have been identified for historical crash data.

3.5 Public and active transport

3.5.1 Public transport

The closest existing bus route in the vicinity of the subject site is TransLink Route 905. The route services southern portions of Toowoomba and runs from Grand Central Shopping Centre to the University of Southern Queensland and then extends to Westbrook as shown in **Figure 3-5**.

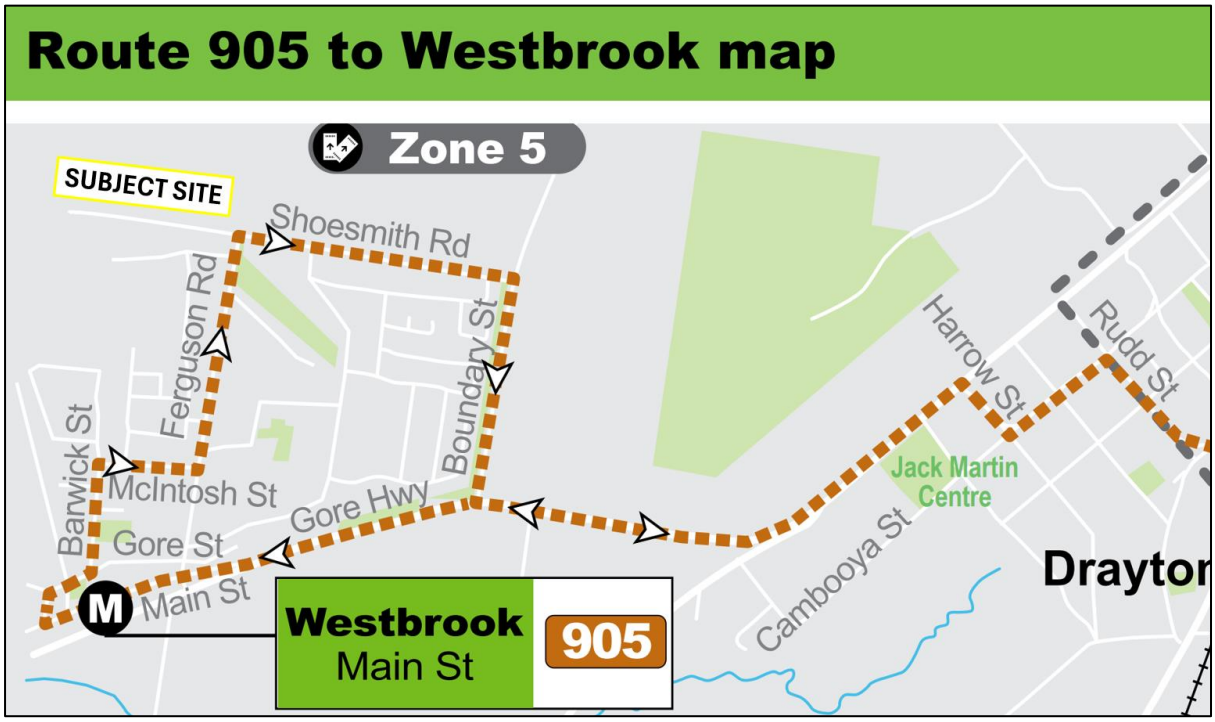


Figure 3-5: Bus Route 905

Route 905 within the vicinity of the subject site is an occasional service. The closest bus stop is located approximately 600m from the site on Ferguson Road.

It is expected that as the northern region of Westbrook develops, revisions to the existing travel route of Route 905 will be undertaken by Translink.

3.5.2 Active transport

There are no existing pedestrian or cycle paths along the subject site's frontage to Shoesmith Road. Pedestrian footpaths were constructed on the southern verge of Shoesmith Road as part of the development to the south.

3.6 Existing traffic volumes

3.6.1 Survey data

Background traffic data was obtained as part of this assessment at the Drayton Wellcamp Road / Boundary Street South intersection. Data was collected on Tuesday 22 July 2025 between from 7:00am – 9:00am, and 2:00pm – 6:00pm. From the data, the following AM and PM peak hours were determined:

- AM peak → 7:30am – 8:30am
- PM peak → 4:30pm – 5:30pm

A summary of the peak hour survey data is shown below in **Figure 3-6**. As indicated below, no traffic travelled in/out of the Holcim quarry site access (northern leg).

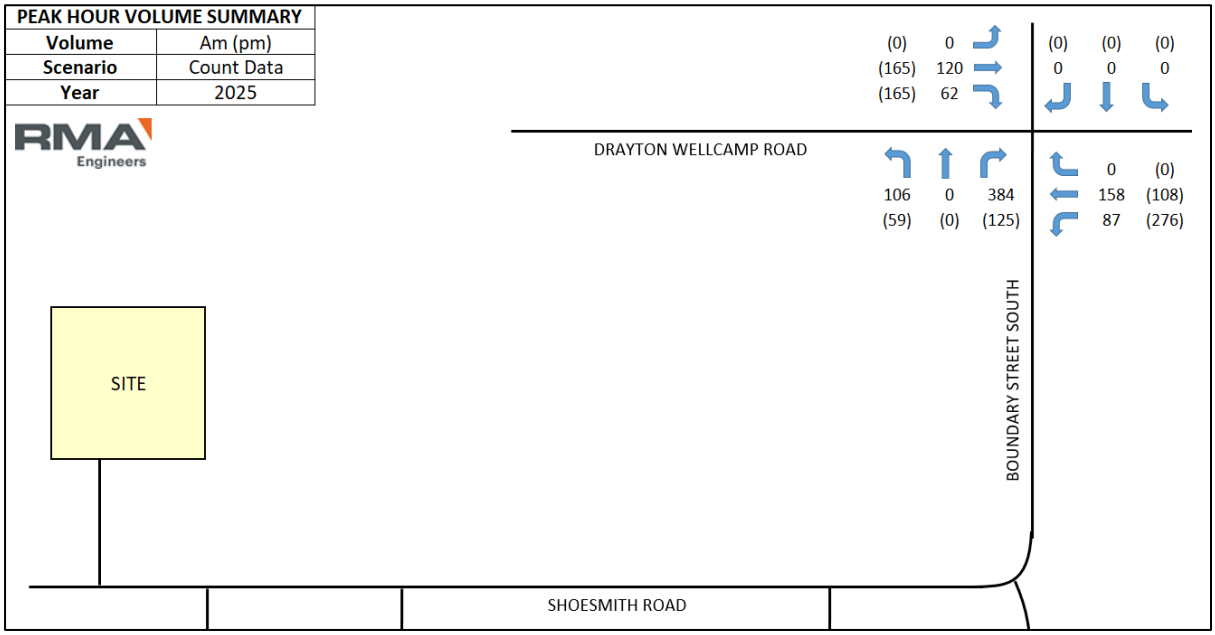


Figure 3-6: 2025 survey traffic

3.6.2 Growth rate

A review of Australian Bureau of Statistics (ABS) data found a compound annual population growth rate of 3% (between 2015 and 2020) for the Toowoomba West Statistical Area 2, and projected population growth (from 2021 to 2041) of 3%. Therefore, a 3% compound annual growth has been adopted for this analysis.

3.6.3 Anticipated future traffic volumes

Background growth

Adopting a 3% (compound) per annum growth rate, the anticipated future traffic volumes (2027 and 2037) are shown in **Figure 3-7** and **Figure 3-8.**

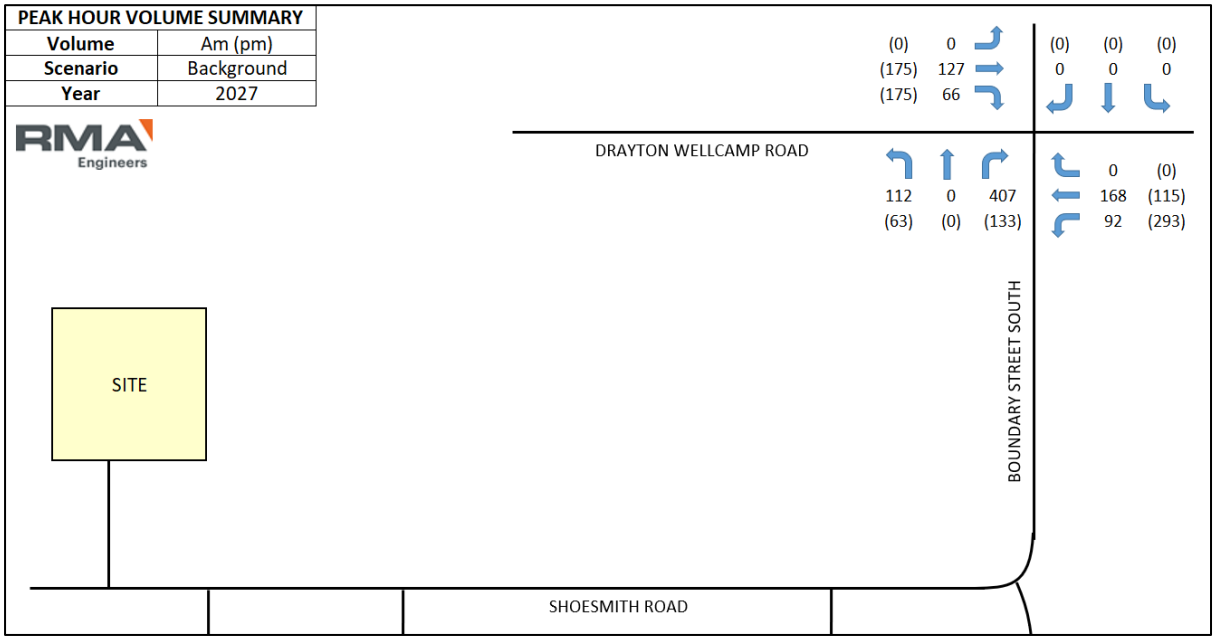


Figure 3-7: 2027 anticipated future background traffic (based on 3% compound growth)

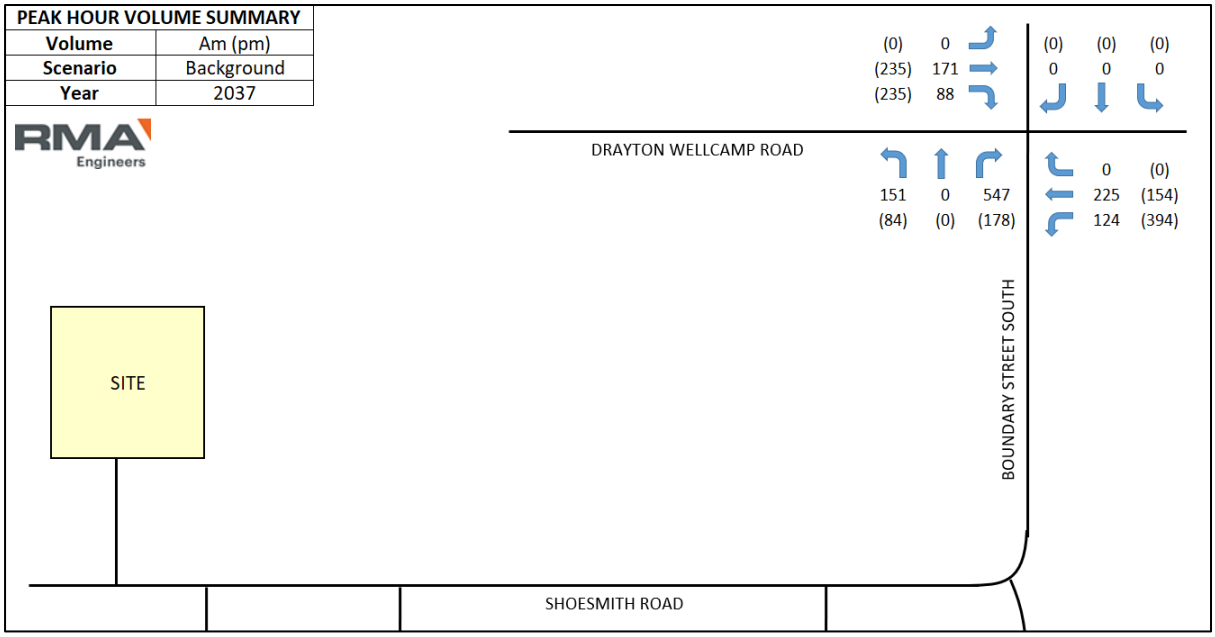


Figure 3-8: 2037 anticipated future background traffic (based on 3% compound growth)

St Francis Catholic College

A Ministerial Infrastructure Designation (MID) application has recently been approved for a proposed Catholic College located on the corner of Shoesmith Road and Boundary Street South, Westbrook. The approved development traffic associated with the College is shown in **Figure 3-9**.

It is noted that only the AM peak hour volumes have been considered relevant to this analysis, as the school PM peak (afternoon pick-up) is outside of the residential commuter peak.

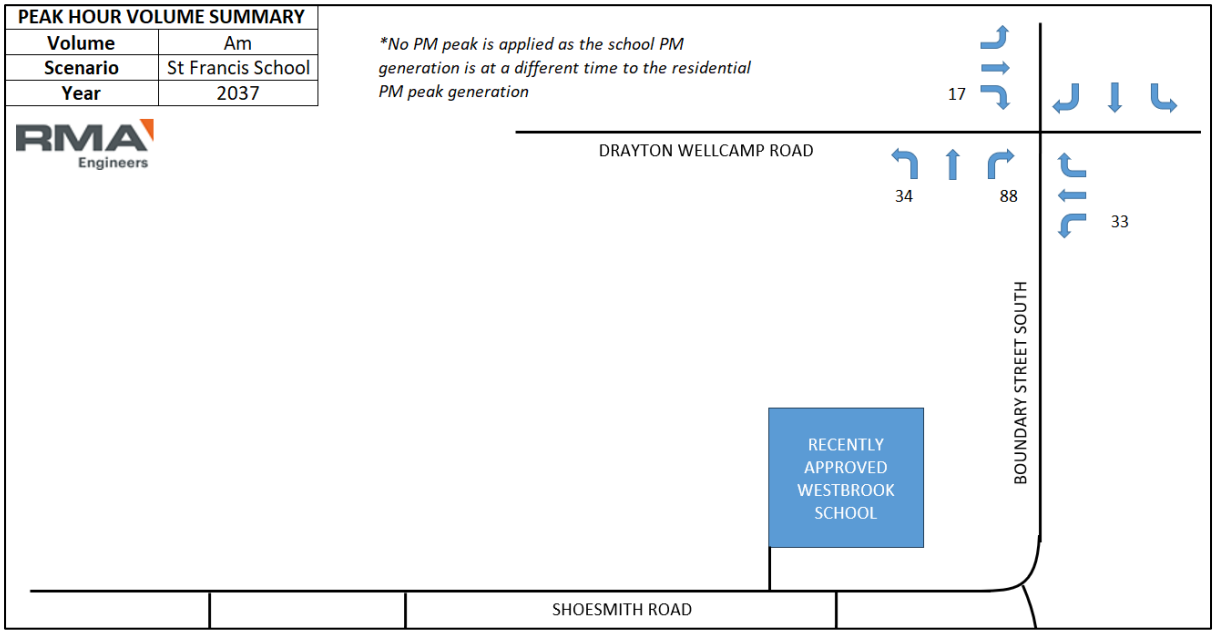


Figure 3-9: Catholic College development traffic

Anticipated future background volumes

Combining the volumes shown in the previous figures results in the anticipated 2027 and 2037 background traffic volumes, as shown in **Figure 3-10** and **Figure 3-11**.

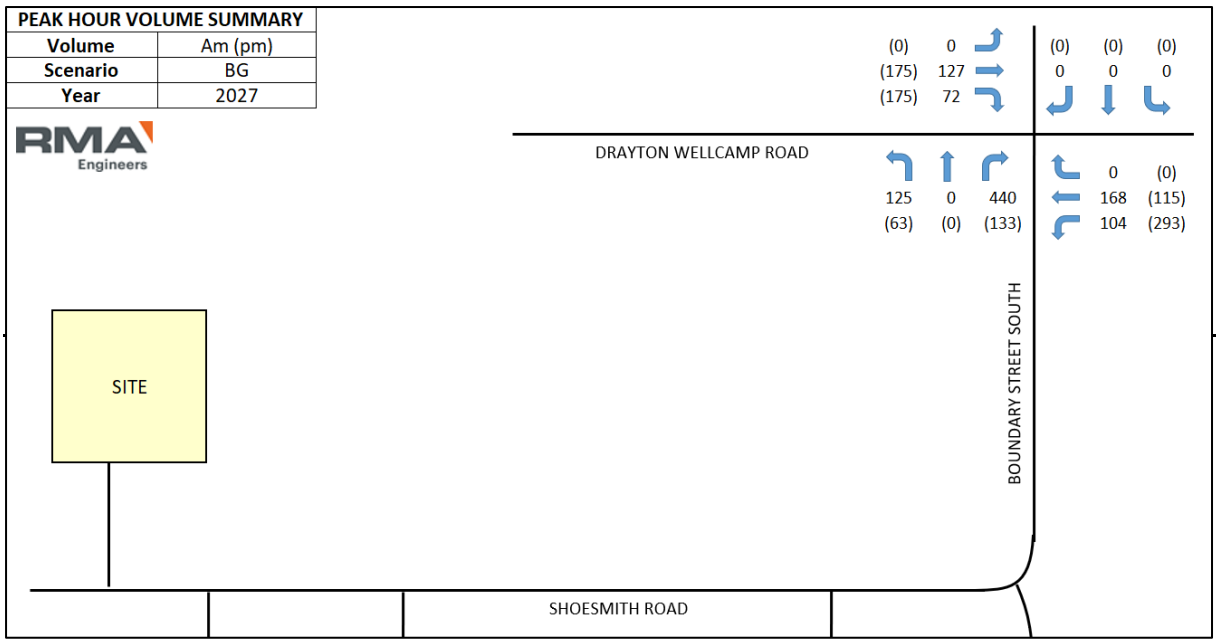


Figure 3-10: 2027 anticipated future background traffic

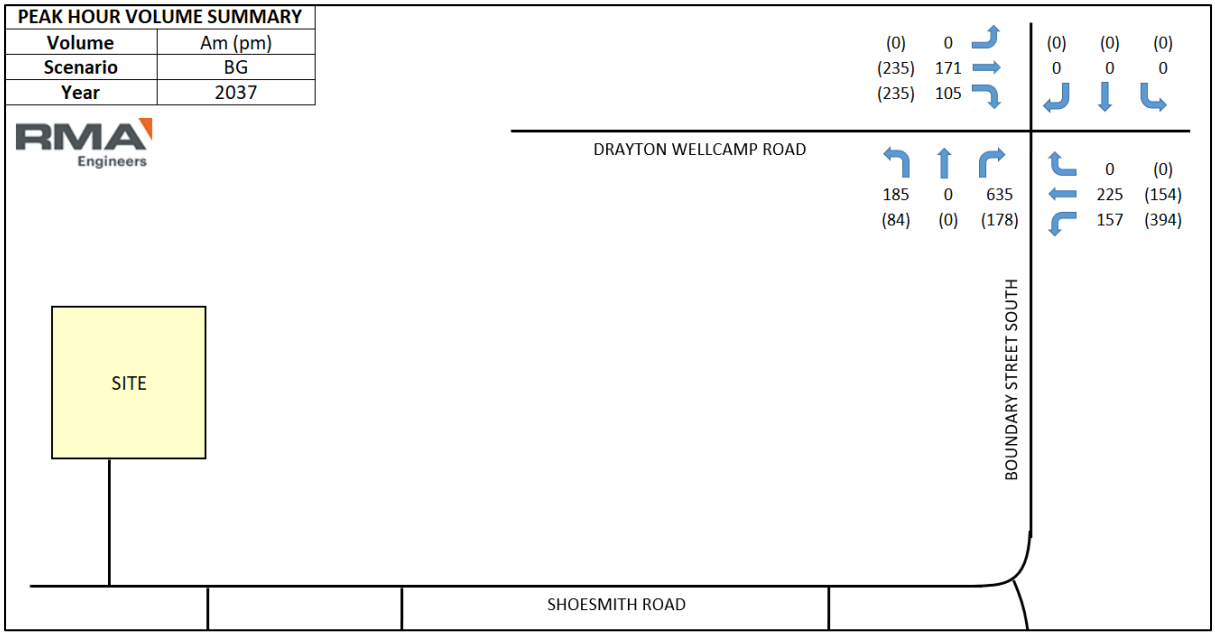


Figure 3-11: 2037 anticipated future background traffic

4. Future road network planning

4.1 Local Government

The TRC Local Government Infrastructure Plan (LGIP) mapping and schedule of works do not include any planned future transport infrastructure upgrades in the vicinity of the subject site.

4.2 State Government

The Queensland Transport and Roads Investment Program (QTRIP) does not include any transport infrastructure upgrade investments in the vicinity of the subject site.

5. Traffic operation

5.1 Development traffic generation

A developmental yield of 100 residential lots has been used for the operational assessment. The trip generation rate and corresponding number of trips is summarised below in **Table 5-1**.

Table 5-1: Trip generation

Precinct	Yield	Peak hour rate		Number of trips		Source
		AM peak hour	PM peak hour	AM peak hour	PM peak hour	
Low density residential	100 dwellings	0.85 trips per dwelling		85 trips		NSW RMS *Guide to Traffic Generating Developments* (2002) report (RTA Guide)

From the above, the development is expected to generate a total of 85 trips in the AM and PM peak hours. This generation is assumed to coincide with the external morning and afternoon commuter peak periods.

5.2 Development traffic distribution

5.2.1 In/out splits

The development traffic in/out split has been based on splits generally identified in the *Trip Generation Manual 10th Edition* (Institute of Transportation Engineers, 2017) and are summarised below in **Table 5-2**.

Table 5-2: In/out distributions

Precinct	Weekday AM peak hour		Weekday PM peak hour		Source
	In	Out	In	Out	
Low density residential	20%	80%	70%	30%	*Trip Generation Manual 10th Edition* (Institute of Transportation Engineers, 2017)

5.2.2 Directional distribution

The estimated traffic distribution for this assessment has been based on the location of key attractors/generators, existing traffic patterns, and the wider road network.

It is assumed that 50% of the traffic generated by the development is expected to travel north via Boundary Street South. The remaining 50% of the traffic is expected to travel south towards Anzac Avenue.

Of the 50% trips associated with the north, 35% of traffic is expected to travel to/from the Toowoomba CBD area via Euston Road/Greenwattle Street, and the remaining 15% is expected travel to/from the north-east via Drayton Wellcamp Road. This east/west split is derived from surrounding attractors and existing splits from the count data.

The estimated traffic distribution with respect to the key intersection has been illustrated below in **Figure 5-1**.

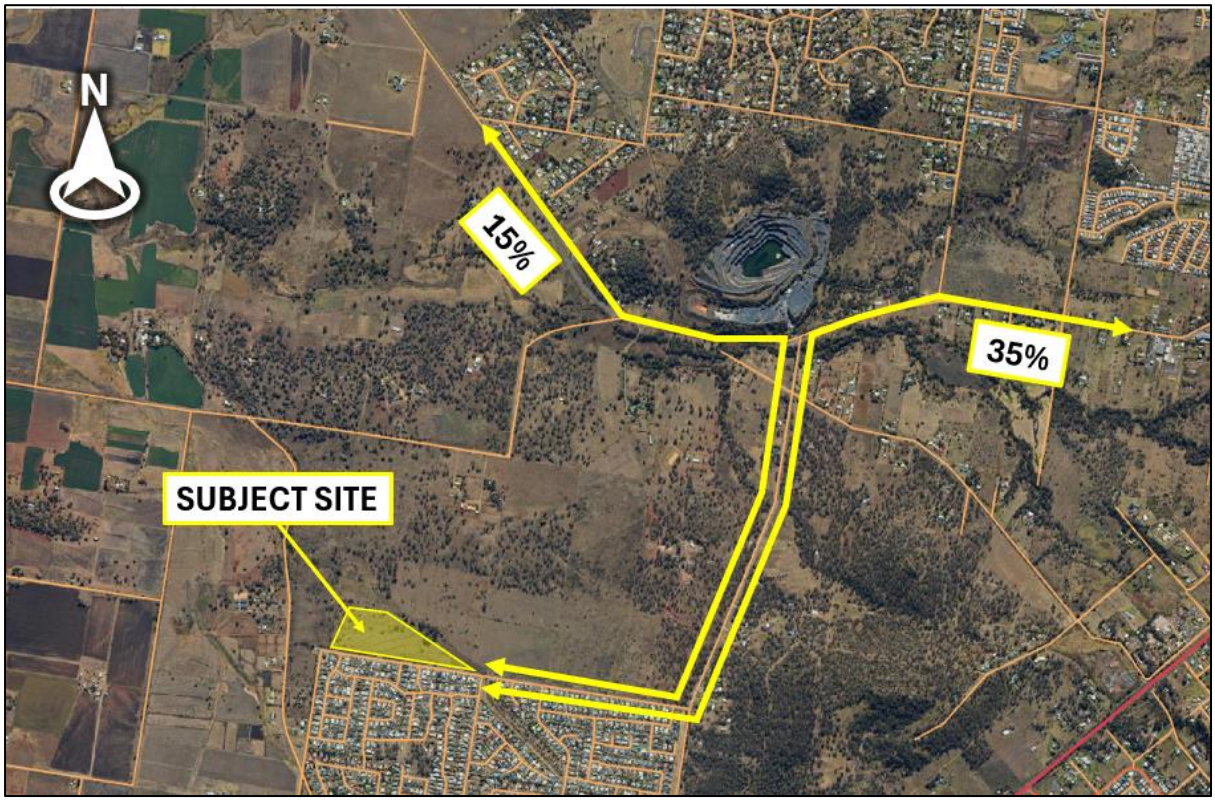


Figure 5-1: Directional distributions

5.3 Development traffic volumes

Application of the above distribution assumptions to the estimated development traffic demand results in the peak hour traffic movements illustrated in **Figure 5-2**. The resulting 'background with development' 2027 and 2037 scenarios are shown in **Figure 5-3** and

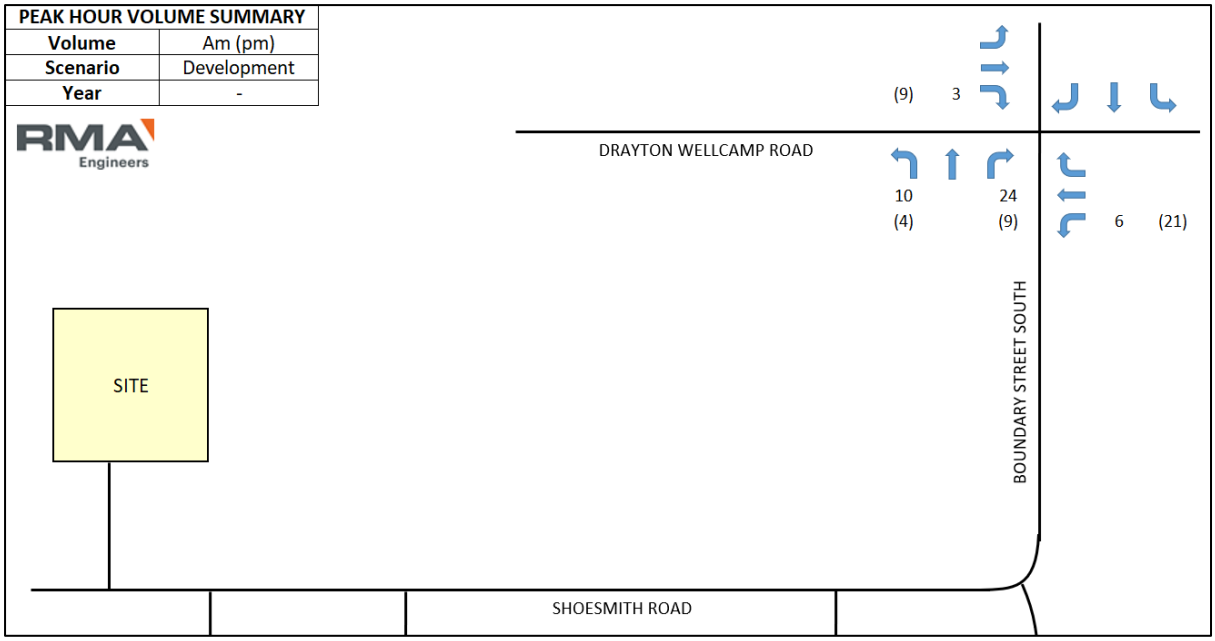


Figure 5-2: Development traffic volumes

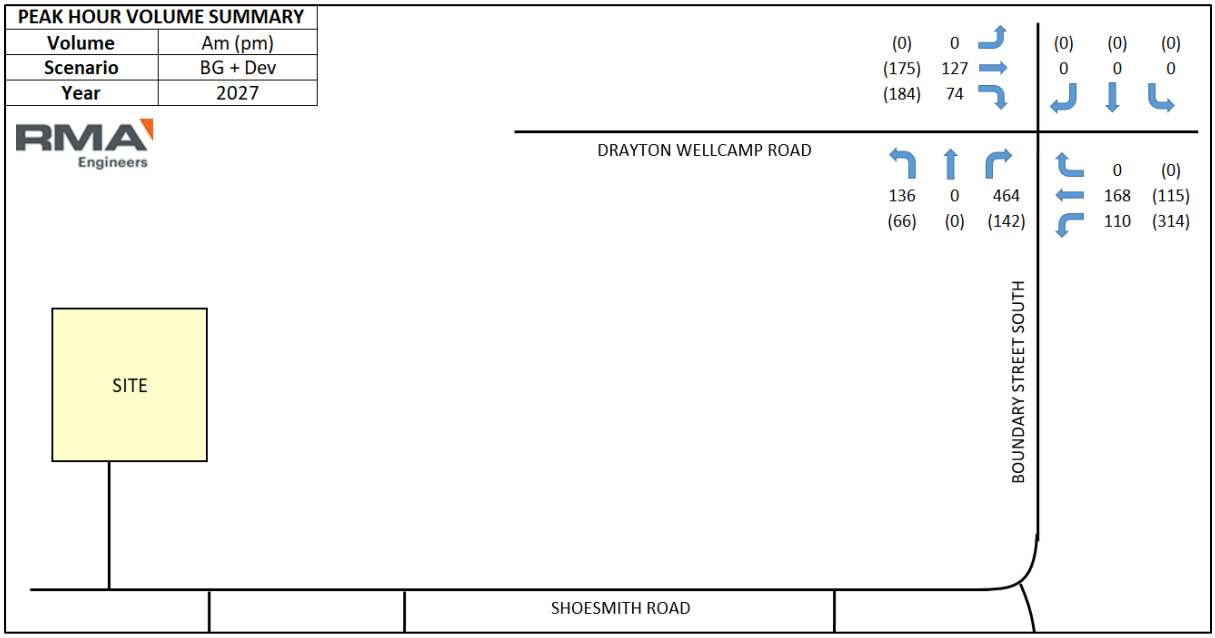


Figure 5-3: 2027 background with development traffic volumes

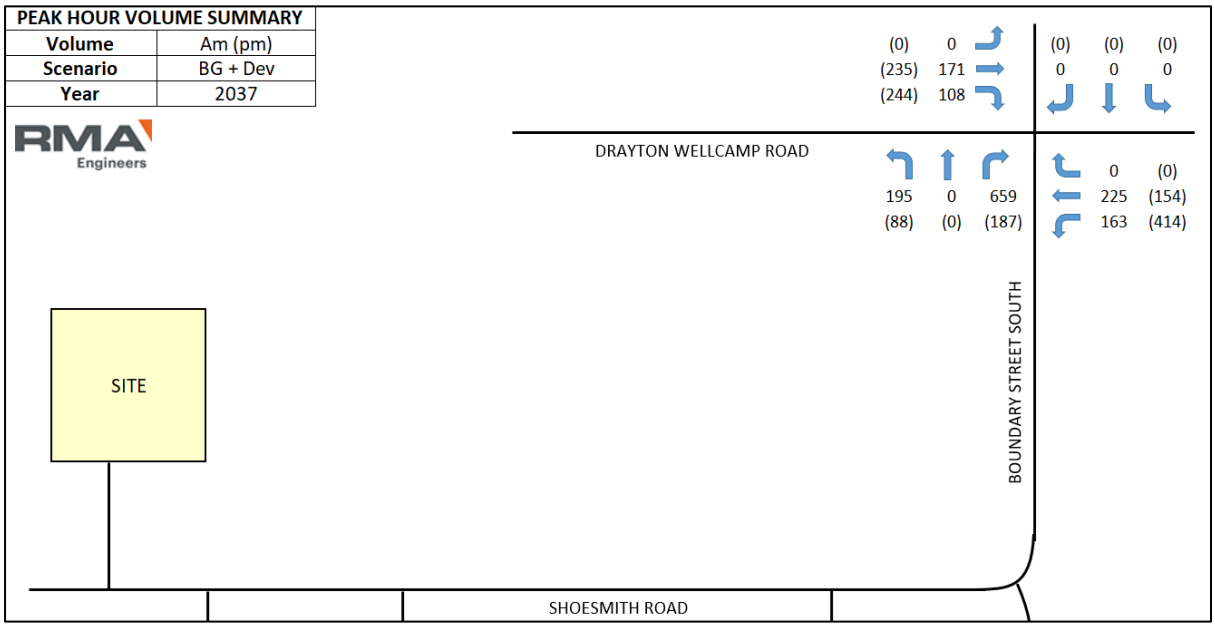


Figure 5-4: 2037 background with development traffic volumes

6. Operational assessment

6.1 Intersection assessment

As per the GTIA, the traffic assessment of existing key intersections will be conducted for the opening year of the development (2027), and any new intersections (i.e. site accesses) for the design horizon (2037), to determine the impact of the development traffic on the surrounding road network.

The intersections have been assessed using SIDRA 10.0 intersection analysis program. This program calculates the operational performance of intersections based on input parameters such as geometry and traffic volumes. Output values that have been recorded include the degree of saturation (DOS), queues and delays. The DOS is a commonly used value, which is principally a volume to capacity ratio.

The typical desired standards of service (DSS) values for DOS and intersection performance are summarised in **Table 6-1**. The SIDRA intersection analysis outputs were compared to the DSS. A DOS exceeding these values indicates that the intersection is exceeding its practical capacity and users of the intersection are likely to experience unsatisfactory queuing and delays.

Table 6-1: Accepted DOS for intersections

Intersection type	Maximum DOS
Signalised intersection	90 - 95% (0.90 – 0.95)
Roundabout	85% (0.85)
Unsignalised intersection	80% (0.80)

These maximum DOS values are also recommended by Austroads *Guide to Traffic Management – Part 12*.

It is noted that the GTIA has DSS values using average movement delay instead of DOS, with any movement increasing more than 5% triggering the need for mitigation. Therefore, for the assessment, both delay and DOS have been considered as DSS.

6.2 SIDRA intersection analysis

6.2.1 Existing configuration

The Drayton Wellcamp Road / Boundary Street South / Holcim Site Access intersection has been modelled in SIDRA as shown in **Figure 6-1**.

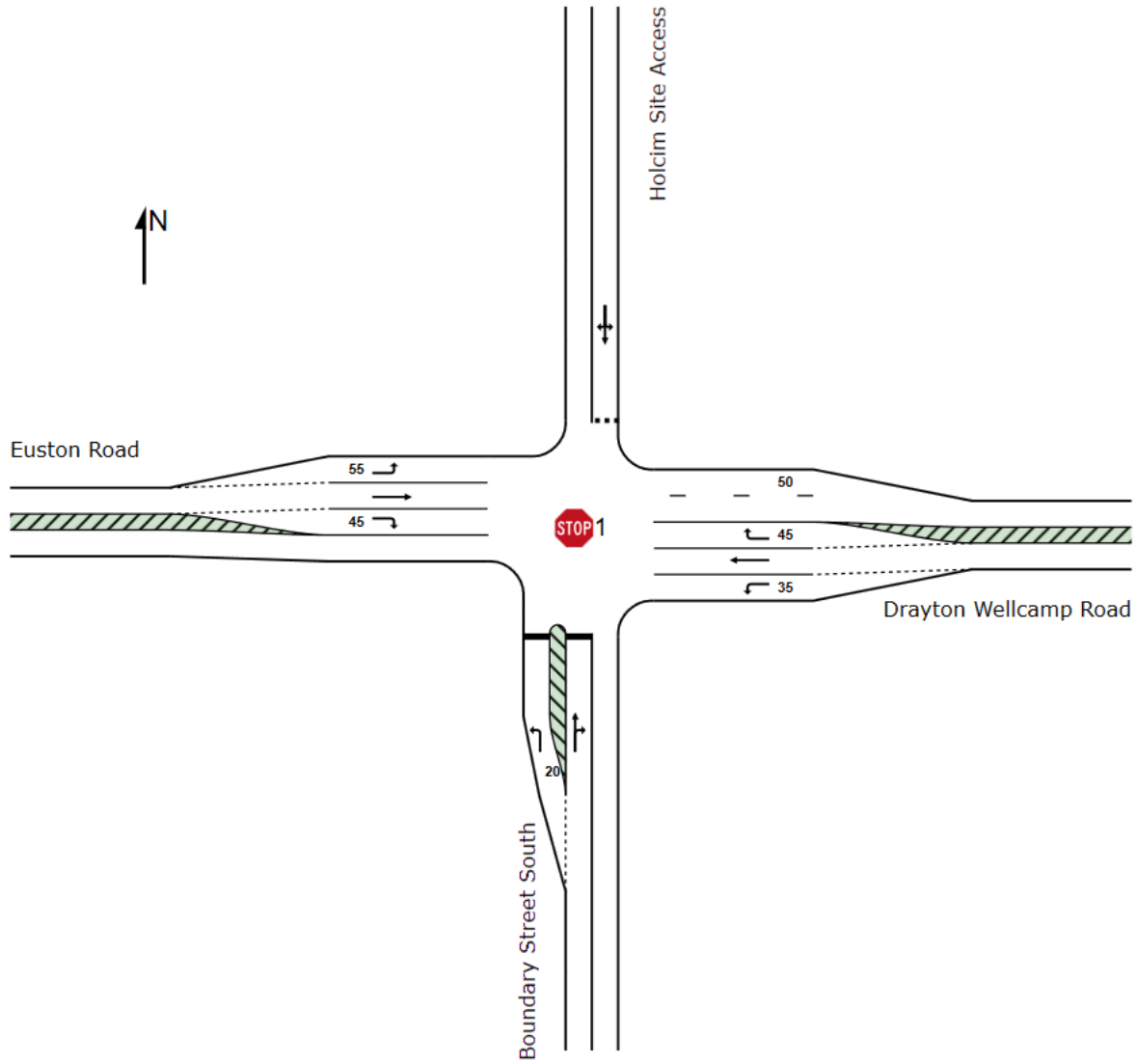


Figure 6-1: Drayton Wellcamp Road / Boundary Street South / Holcim Site Access

Table 6-2 summarises the SIDRA intersection analysis results for the relevant scenarios. Detailed SIDRA outputs are included in **Appendix A**.

Table 6-2: SIDRA intersection analysis summary (existing configuration)

Traffic scenario	Demand (vph)	Degree of saturation	Max avg. delay (s)	Level of service (LOS)	95% ile queue (m)
Drayton Wellcamp Road / Boundary Street South / Holcim Site Access					
2027 AM - Background traffic	1,097	1.515	495.0	LOS F	773.2
2027 PM - Background traffic	1,011	0.706	40.1	-	29.1

As indicated above in **Table 6-2**, the SIDRA analysis indicates the intersection will exceed operating capacity with background traffic, without any influence of the proposed development. This is due to the lack of adequate gaps on the Drayton Wellcamp Road for Boundary Road South right turning traffic.

It is identified that the intersection requires upgrade to a signalised form to adequately cater for the background traffic demands, regardless of the development influence.

6.2.2 Future configuration

Additional analysis of a signalised intersection layout has been undertaken with the results summarised in **Table 6-3**. This upgraded intersection layout is shown in **Figure 6-2** and considers the minimum amount of works required (i.e. retaining the existing lane configurations) to accommodate the background volumes.

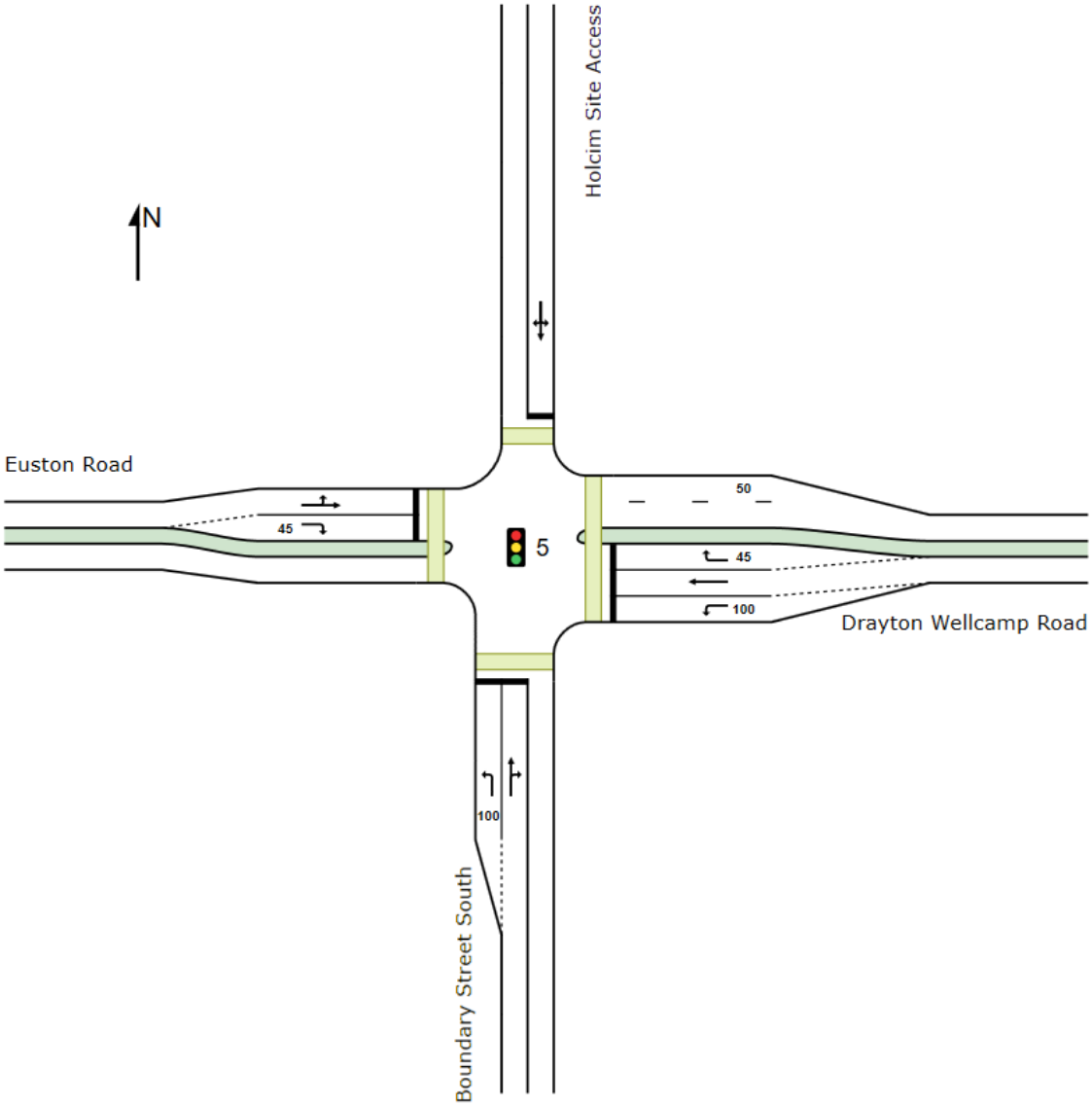


Figure 6-2: Potential future intersection layout

In addition to the above, to adequately accommodate future background traffic volumes, the southern and eastern approach left turn lanes have been extended to 100m. These lane extensions will require widening or duplication of the culvert located on the Boundary Street South leg.

Table 6-3 summarises the SIDRA intersection analysis results for the relevant scenarios based on the above potential intersection layout. Detailed SIDRA outputs are included in **Appendix A**.

Table 6-3: SIDRA intersection analysis summary (signalised configuration)

Traffic scenario	Demand (vph)	Degree of saturation	Max avg. delay (s)	Level of service (LOS)	95% ile queue (m)
Drayton Wellcamp Road / Boundary Street South / Holcim Site Access					
2037 AM - Background traffic	1,562	0.885	38.2	LOS D	279
2037 PM - Background traffic	1,354	0.756	26.4	LOS C	82
2037 AM – Background with development traffic	1,607	0.890	48.8	LOS D	311
2037 PM - Background with development traffic	1,398	0.777	26.9	LOS C	88

As indicated above in **Table 6-3**, the SIDRA assessment indicates that the upgraded intersection layout (minimal required works) can also adequately accommodate the development volumes for the 2037 design horizon. The degrees of saturation are all within DSS for the 'background' and 'background with development' scenarios, and delay and queue length increases are minor as a result of the development.

Based on the analysis, the proposed development is not expected to have an adverse impact on the operational performance of a future signalised intersection.

It is recommended that since this intersection will operate over capacity without the development influence, future consideration of the upgrade and design of this intersection is the responsibility of the relevant road authority (TRC).

7. Safety review

7.1 Crash data

As per **Section 3.4** of this report, no specific safety issues, crash patterns or mitigation measures could be determined from the crash data review at the key intersections or within the vicinity of the site.

7.2 Sight distance

7.2.1 Drayton Wellcamp Road / Boundary Street South

A Safe Intersection Sight Distance (SISD) assessment has been undertaken as per *Austroads Guide to Road Design - Part 4a: Unsignalised and Signalised Intersections* requirements for the key intersection of Drayton Wellcamp Road / Boundary Street South.

Table 7-1 indicates the parameters adopted for the sight distance review.

Table 7-1: Variables adopted for SISD

Variable symbol	Description	Value adopted for assessment		Unit of measure
		Truck	Car	
DT	Decision time (s) = observation time (3 s) + reaction time (s)	5.5	5.5	seconds
V	Operating (85th percentile) speed	90	90	km/hr
d	Coefficient of deceleration for cars / trucks *(Guide to Road Design – Part 3: Geometric Design (Austroads 2016))*	0.29	0.36	
a[1]	Longitudinal grade (approach):	EB = 2.5 WB = - 3.5		%
R_T	perception/reaction time *(Guide to Road Design – Part 3: Geometric Design (Austroads 2016))*	2.5	2.5	seconds
SISD	$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)}$ (Equation 2 *Guide to Road Design - Part 4a*)			

[1]*Longitudinal grade based on Google Earth estimates.*

The outcomes of the assessment are summarised below in **Table 7-2**.

Table 7-2: Outcomes of SISD

Approach road	Intersection	Vehicle type	Direction	Required SISD (m)	Available SISD (m)	Compliance
Drayton Wellcamp Road	Boundary Street South	Car	Eastbound	221m	>250m	Compliant
			Westbound	236m	>250m	Compliant[1]
		Truck	Eastbound	239m	>300m	Compliant
			Westbound	263m	>300m	Compliant[1]

[1]*Sufficient sight lines are provided through adjacent property boundary given the existing wire fence.*

As stated in **Section 6.2.2**, it is expected that the Drayton Wellcamp Road / Boundary Street South / Holcim site access intersection will need to be upgraded to a signalised intersection in the future by the relevant road authority (TRC) to cater for background traffic demands. It is expected that sight lines will be examined throughout the design process.

7.3 Turn warrant assessment

Turn warrants are used to identify the need to provide separate turning provisions from a functionality and safety perspective. The warrants are essentially the relationship between the turning volumes versus the major road traffic volumes.

In accordance with Austroads, turn warrants are based on the construction of new roads (i.e. greenfield sites) and is also used as a reference for intervention levels for updating existing intersection turn treatments. Turn warrant assessment is usually undertaken at these intersections to determine if protected turning lanes (i.e. channelisation) are required from a safety perspective.

As shown in **Figure 7-1**, a channelised right turn (CHR) lane and a short auxiliary left turn (AUL(S)) lane is triggered for the AM and PM peak hour periods for the Drayton Wellcamp Road / Boundary Street South / Holcim site access intersection (for the 2037 scenario). The addition of development traffic does not warrant any further channelisation. Detailed turn warrant graphs are shown in **Appendix B.**

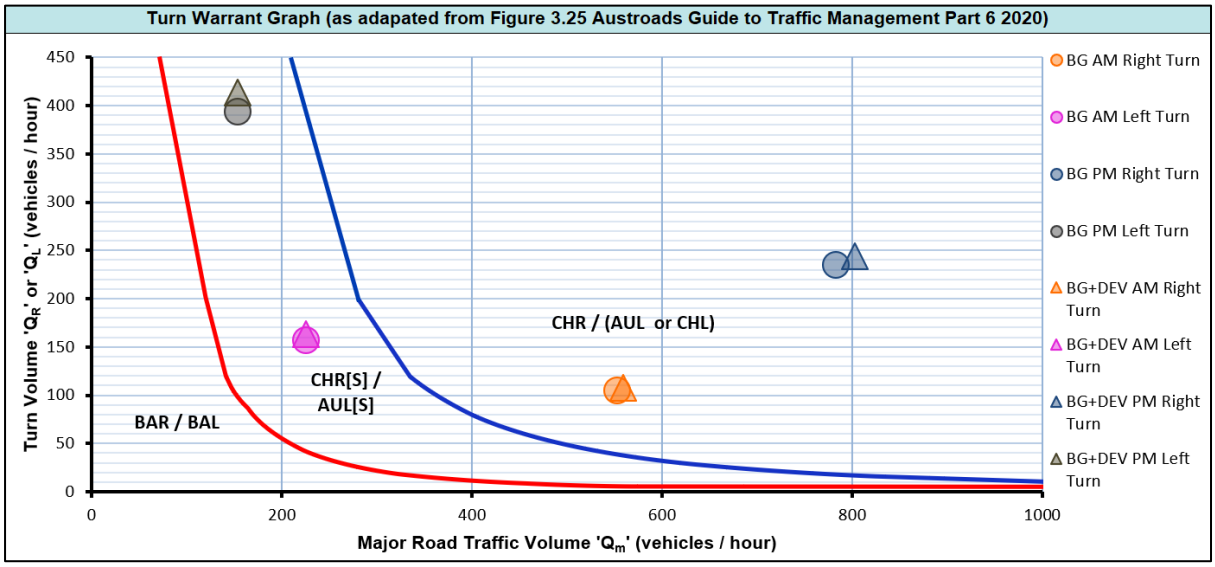


Figure 7-1: Drayton Wellcamp Road / Boundary Street South / Holcim site access (for the 2037 scenario)

The existing configuration of the intersection comprises a CHR(S) and a quasi AUL(S) (as the taper is not to standards). The length of the channelised right turn lane on the western approach leg is constrained by the culvert structure located directly west of the intersection, and therefore, a full length channelised right turn lane is expected to require widening or duplication.

From a review of aerial imagery, the existing left turn lane does not appear to be designed in accordance with relevant Austroads standards. It is recommended that during the design and construction of a signalised intersection, the left turn lane be extended to comply with relevant Austroads standards for an AUL(S), and to cater for traffic demands.

7.4 Risk assessment

Road safety was considered as part of this traffic assessment in accordance with the GTIA. A risk assessment has been considered as per the GTIA process, based on available online imagery. The safety risk score matrix as extracted from the GTIA is shown in **Figure 7-9**.

Potential likelihood	Potential consequence: Property only (1)	Minor injury (2)	Medical treatment (3)	Hospitalisation (4)	Fatality (5)
Almost certain (5)	M	M	H	H	H
Likely (4)	M	M	M	H	H
Moderate (3)	L	M	M	M	H
Unlikely (2)	L	L	M	M	M
Rare (1)	L	L	L	M	M

Figure 7-9: Safety risk score matrix (GTIA)

The existing risk items and deficiencies at the key intersection are summarised in **Table 7-3**.

Table 7-3: Risk assessment

Risk item	Without development			With development and mitigation	Responsibility
	Likelihood	Consequence	Risk score	Mitigation measures	
Head-on vehicle conflict due to narrow lane width on southern departure leg due to existing culvert width. Current departure lane width is less than 3m wide and located on a slight curve.	2	3	M	Widen the departure lane to a minimum of 3.5m wide (plus any required curve widening for larger design vehicles). This will require widening of the culvert structure on the southern leg.	TRC
Vehicle conflict due to two stand up lanes on southern approach, results in restricted sight lines and angled incidents.	2	4	M	Unsignalised intersections with two stand-up lanes on the minor road have higher accident rates than for one-stand up lane (Arndt 2004). Consider removal of the short left turn lane and combine this to a single lane on the minor road approach.	TRC
Vehicle conflict due to different priorities on minor legs ('Stop' and 'Give-Way'), may lead to driver confusion.	2	3	M	Motorists can confuse priorities and think that 'Give-Way' signs have priority over motorists approaching a 'Stop' sign (as they don't need to stop), or that 'Stop' signs hold more significance over 'Give-Way' control. Therefore, it is recommended to change both approaches to the same priority control.	TRC
Current congestion and long delays and queues, particularly on the southern approach, may lead to drivers taking smaller gaps in opposing traffic which could result in angled incidents.	2	4	M	As per **Section 6.2**, signalisation of this intersection is required for the intersection to operate under practical capacity and would improve safety.	TRC
Four-legged priority controlled intersections have high number of potential conflict points (32 conflicts).	2	4	M	Signalisation would improve safety and address the conflicts through protected phasing of movements.	TRC

Risk item	Without development			With development and mitigation	Responsibility
	Likelihood	Consequence	Risk score	Mitigation measures	
Left turning lanes are not to standard AUL(S) design and could lead to side swipe crashes, or vehicles overshooting the intersection (due to inadequate deceleration length).	2	3	M	Construct short left turn lanes to meet applicable design standards and warrants (Austroads: Guide to Road Design - Part 4A).	TRC
Note: Sight lines to/from the southern leg bypass private property.	-	-	NA	This is currently not deemed to be an issue as sight lines are unobstructed through the property. However, this could become a concern if the land owner builds a privacy fence, or if the owner builds infrastructure or vegetation within the sight triangles within the property. Council to consider truncation/resumption of the corner property to allow for sight lines.	TRC

It should be noted that signalisation of the Drayton Wellcamp Road / Boundary Street South / Holcim site access intersection would address the majority of the identified risks illustrated in **Table 7-3**.

As the risk items identified are existing items and since this intersection will operate over capacity without the development influence, mitigation measures are deemed to be the responsibility of the relevant road authority (TRC). None of the above risks would be exacerbated by the development, resulting in a higher risk score.

Therefore, with the implementation of the abovementioned mitigative measures, no high-risk items or adverse safety issues have been identified that would require further consideration by the development.

8. Summary and recommendations

RMA Engineers Pty Ltd has been engaged by Fernleigh Properties Pty Ltd to prepare a traffic impact assessment (TIA) for a proposed low density residential subdivision on Shoesmith Road, Westbrook, formally referred to as Lot 4 on SP254418. The site is located within the Toowoomba Regional Council (TRC) local government area.

This report has been prepared in support of an application which seeks a Preliminary Approval for a Variation Request to vary the effect of the Planning Scheme pursuant to section 50(3) of the Planning Act 2016. The Variation Request will alter the assessment levels, use rights and assessment provisions of the Planning Scheme to allow for residential use to occur on the site, however doesn't specifically authorise development to occur. Therefore, this TIA is prepared as a preliminary assessment only to help identify constraints early on in the planning process, and to help the applicant and Council achieve consistent and agreeable outcomes for the site.

Any detailed planning, design or staging would be undertaken as part of the subsequent material change of use (MCU) or reconfiguration of a lot (RAL) application which seeks a Development Permit for a specific proposal.

This report has been prepared in response to the TRC Further Advice letter dated 18 June 2025, and subsequent conversations held with TRC, which requested an assessment of the Drayton Wellcamp Road / Euston Road / Boundary Street South intersection with the proposed development influence at the year of completion and design horizon (as applicable). No other roads or intersections within the vicinity of the subject site have been investigated as part of this TIA.

This report demonstrates the following:

Traffic operation

- The development is expected to generate a total of 85 trips in the AM and PM peak hours. This generation is assumed to coincide with the external morning and afternoon commuter peak periods.
- The SIDRA analysis indicates the intersection will exceed operating capacity with background traffic, without any influence of the proposed development. This is due to the lack of adequate gaps on the Drayton Wellcamp Road for Boundary Road South right turning traffic.
- It is identified that the intersection requires upgrade to a signalised form to adequately cater for the background traffic demands, regardless of the development influence.
- Based on the analysis, the proposed development is not expected to have an adverse impact on the operational performance of a future signalised intersection.
- It is recommended that since this intersection will operate over capacity without the development influence, future consideration of the upgrade and design of this intersection is the responsibility of the relevant road authority (TRC).

Safety

- No specific safety issues, crash patterns or mitigation measures could be determined from the crash data review.
- From the safety assessment, is recommended that the Drayton Wellcamp Road / Boundary Street South / Holcim site access intersection be upgraded to a signalised intersection. This will address the majority of risk items identified. As the risk items identified are existing items and since this intersection will operate over capacity without the development influence, future consideration of the upgrade and design of this intersection is the responsibility of the relevant road authority (TRC).

- No high-risk items or adverse safety issues have been identified that would require further consideration by the development.

As this traffic assessment has been prepared in support of a Preliminary Approval for a Variation Request, any subsequent development traffic and transport items can be accommodated in future development applications and design phases. It is acknowledged that with the above outcomes that the proposed development can proceed to the next planning phase without any unacceptable or adverse impacts on the external road network.

On the above basis, and as per the findings of this assessment, no traffic and transport engineering matters have been identified that should preclude approval of the proposed development variation request application.

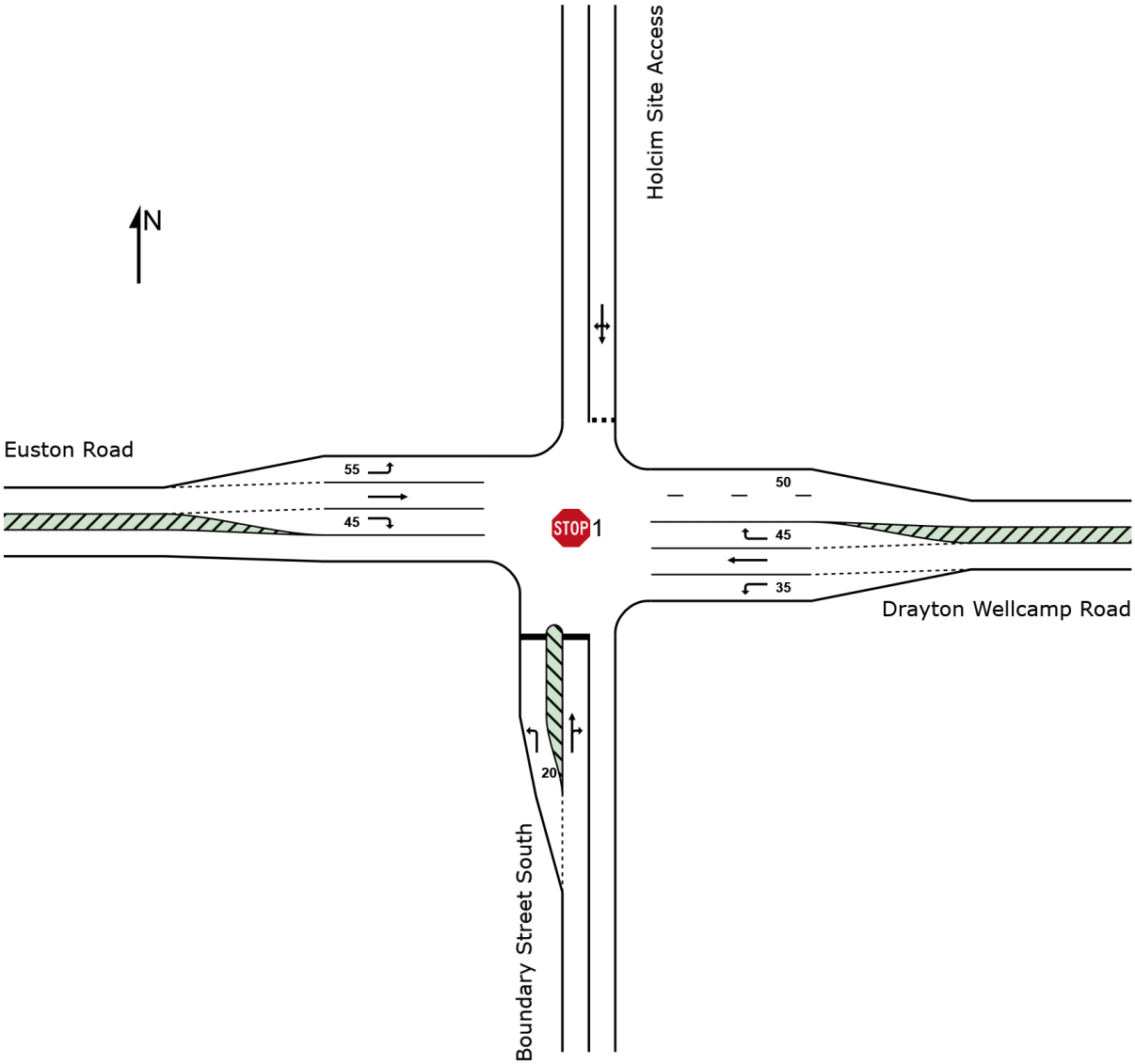
Appendix A SIDRA outputs

SITE LAYOUT

Site: [1] BG 2027 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site Access (General)

New Site
Site Category: (None)
Stop (Two-Way)
Site Scenario: 1 | Local Volumes

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



Organisation: RMA ENGINEERS PTY LTD | Licence: NETWORK / 1PC | Created: Tuesday, 19 August 2025 5:21:26 PM
Project: N:\Synergy\Projects\25E-0272 Fernleigh Development Westbrook\4 Design\Traffic\Sidra\Drayton Wellcamp Road - Euston Rd - Boundary St S.sipx

MOVEMENT SUMMARY

Site: [1] BG 2027 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site Access (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Stop (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	132	5.0	132	5.0	0.137	11.9	LOS B	0.5	3.8	0.31	0.89	0.31	49.0
2	T1	All MCs	1	0.0	1	0.0	1.515	491.7	LOS F	105.9	773.2	1.00	5.38	15.19	45.2
3	R2	All MCs	463	5.0	463	5.0	1.515	495.0	LOS F	105.9	773.2	1.00	5.38	15.19	45.1
Approach			596	5.0	596	5.0	1.515	388.3	LOS F	105.9	773.2	0.85	4.39	11.91	44.5
East: Drayton Wellcamp Road															
4	L2	All MCs	109	5.0	109	5.0	0.061	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	52.7
5	T1	All MCs	177	5.0	177	5.0	0.094	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	All MCs	1	0.0	1	0.0	0.001	6.0	LOS A	0.0	0.0	0.24	0.52	0.24	51.3
Approach			287	5.0	287	5.0	0.094	2.2	NA	0.0	0.0	0.00	0.22	0.00	56.9
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.007	6.1	LOS A	0.0	0.2	0.48	0.57	0.48	46.4
8	T1	All MCs	1	0.0	1	0.0	0.007	11.0	LOS B	0.0	0.2	0.48	0.57	0.48	46.7
9	R2	All MCs	1	0.0	1	0.0	0.007	13.2	LOS B	0.0	0.2	0.48	0.57	0.48	46.4
Approach			3	0.0	3	0.0	0.007	10.1	LOS B	0.0	0.2	0.48	0.57	0.48	46.5
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
11	T1	All MCs	134	5.0	134	5.0	0.071	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	All MCs	76	5.0	76	5.0	0.073	6.9	LOS A	0.3	2.1	0.38	0.61	0.38	50.2
Approach			211	5.0	211	5.0	0.073	2.6	NA	0.3	2.1	0.14	0.22	0.14	56.0
All Vehicles			1097	5.0	1097	5.0	1.515	212.0	NA	105.9	773.2	0.49	2.49	6.49	49.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options 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 (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

MOVEMENT SUMMARY

Site: [2] BG 2027 PM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site Access (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Stop (Two-Way)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	66	5.0	66	5.0	0.065	8.9	LOS A	0.2	1.7	0.24	0.89	0.24	49.4
2	T1	All MCs	1	0.0	1	0.0	0.706	35.2	LOS E	4.0	29.1	0.89	1.24	1.76	39.6
3	R2	All MCs	140	5.0	140	5.0	0.706	40.1	LOS E	4.0	29.1	0.89	1.24	1.76	39.5
Approach			207	5.0	207	5.0	0.706	30.1	LOS D	4.0	29.1	0.68	1.13	1.28	42.2
East: Drayton Wellcamp Road															
4	L2	All MCs	308	5.0	308	5.0	0.172	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	52.6
5	T1	All MCs	121	5.0	121	5.0	0.064	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
6	R2	All MCs	1	0.0	1	0.0	0.001	6.2	LOS A	0.0	0.0	0.28	0.52	0.28	51.1
Approach			431	5.0	431	5.0	0.172	4.1	NA	0.0	0.0	0.00	0.41	0.00	54.5
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.009	6.2	LOS A	0.0	0.2	0.58	0.63	0.58	44.5
8	T1	All MCs	1	0.0	1	0.0	0.009	18.8	LOS C	0.0	0.2	0.58	0.63	0.58	44.8
9	R2	All MCs	1	0.0	1	0.0	0.009	14.1	LOS B	0.0	0.2	0.58	0.63	0.58	44.5
Approach			3	0.0	3	0.0	0.009	13.1	LOS B	0.0	0.2	0.58	0.63	0.58	44.6
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.00	0.58	0.00	52.9
11	T1	All MCs	184	5.0	184	5.0	0.098	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
12	R2	All MCs	184	5.0	184	5.0	0.211	8.1	LOS A	0.9	6.4	0.51	0.71	0.51	49.2
Approach			369	5.0	369	5.0	0.211	4.1	NA	0.9	6.4	0.25	0.36	0.25	54.0
All Vehicles			1011	5.0	1011	5.0	0.706	9.4	NA	4.0	29.1	0.24	0.54	0.36	51.2

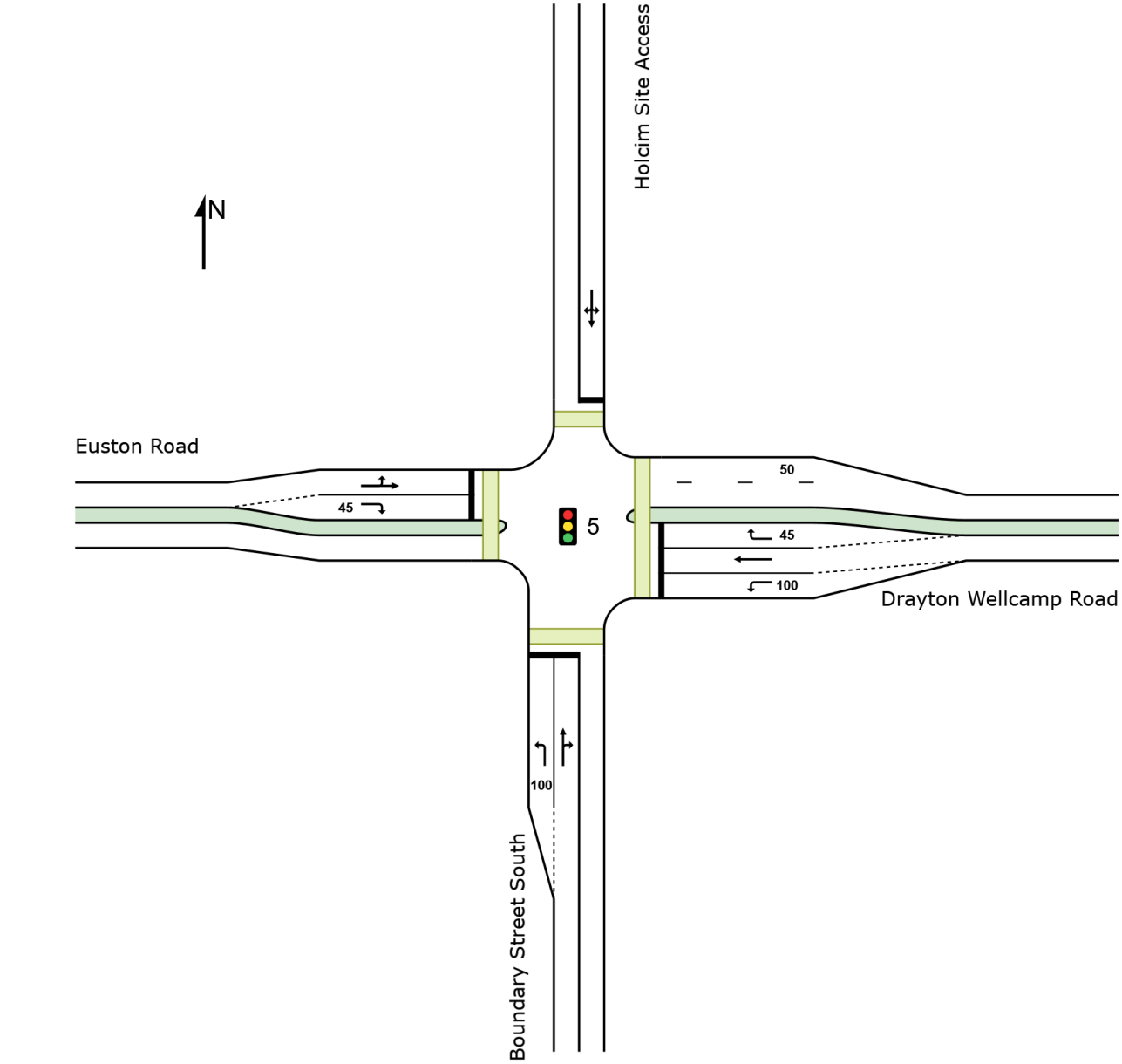
Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).
Two-Way Sign Control Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

SITE LAYOUT

Site: [5] BG 2037 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated
Site Scenario: 1 | Local Volumes

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



MOVEMENT SUMMARY

Site: [5] BG 2037 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 110.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	195	5.0	195	5.0	0.210	20.0	LOS C	2.9	21.1	0.58	1.24	0.58	33.0
2	T1	All MCs	1	0.0	1	0.0	* 0.885	47.4	LOS D	38.2	279.1	0.99	0.96	1.13	37.8
3	R2	All MCs	668	5.0	668	5.0	0.885	53.1	LOS D	38.2	279.1	0.99	0.96	1.13	36.8
Approach			864	5.0	864	5.0	0.885	45.6	LOS D	38.2	279.1	0.90	1.03	1.01	33.6
East: Drayton Wellcamp Road															
4	L2	All MCs	165	5.0	165	5.0	0.143	13.7	LOS B	3.4	24.9	0.42	0.68	0.42	41.2
5	T1	All MCs	237	5.0	237	5.0	* 0.885	67.2	LOS E	14.4	105.3	1.00	1.04	1.31	32.5
6	R2	All MCs	1	0.0	1	0.0	0.008	63.8	LOS E	0.1	0.4	0.95	0.59	0.95	29.4
Approach			403	5.0	403	5.0	0.885	45.3	LOS D	14.4	105.3	0.76	0.89	0.95	34.3
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.013	42.0	LOS D	0.1	1.0	0.89	0.61	0.89	31.2
8	T1	All MCs	1	0.0	1	0.0	0.013	49.0	LOS D	0.1	1.0	0.89	0.61	0.89	31.9
9	R2	All MCs	1	0.0	1	0.0	0.013	54.5	LOS D	0.1	1.0	0.89	0.61	0.89	31.1
Approach			3	0.0	3	0.0	0.013	48.5	LOS D	0.1	1.0	0.89	0.61	0.89	31.4
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	* 0.365	16.0	LOS B	6.0	43.9	0.86	1.00	0.86	32.8
11	T1	All MCs	180	5.0	180	5.0	0.365	22.9	LOS C	6.0	43.9	0.86	1.00	0.86	33.6
12	R2	All MCs	111	5.0	111	5.0	* 0.885	71.8	LOS E	6.8	49.9	1.00	0.99	1.44	28.5
Approach			292	5.0	292	5.0	0.885	41.4	LOS D	6.8	49.9	0.91	1.00	1.08	31.5
All Vehicles			1562	5.0	1562	5.0	0.885	44.8	LOS D	38.2	279.1	0.86	0.99	1.01	33.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed

	ped/h	ped/h	sec		ped	m			sec	m	m/sec
South: Boundary Street South											
P1 Full	25	26	49.2	LOS E	0.1	0.1	0.95	0.95	203.1	200.0	0.98
East: Drayton Wellcamp Road											
P2 Full	25	26	49.2	LOS E	0.1	0.1	0.95	0.95	203.1	200.0	0.98
North: Holcim Site Access											
P3 Full	50	53	49.3	LOS E	0.2	0.2	0.95	0.95	203.1	200.0	0.98
West: Euston Road											
P4 Full	25	26	49.2	LOS E	0.1	0.1	0.95	0.95	203.1	200.0	0.98
All Pedestrians	125	132	49.2	LOS E	0.2	0.2	0.95	0.95	203.1	200.0	0.98

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [6] BG 2037 PM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	88	5.0	88	5.0	0.153	14.8	LOS B	1.1	8.1	0.75	1.14	0.75	33.5
2	T1	All MCs	1	0.0	1	0.0	* 0.756	35.5	LOS D	6.9	50.4	1.00	0.91	1.21	36.7
3	R2	All MCs	187	5.0	187	5.0	0.756	41.2	LOS D	6.9	50.4	1.00	0.91	1.21	35.7
Approach			277	5.0	277	5.0	0.756	32.7	LOS C	6.9	50.4	0.92	0.98	1.06	35.0
East: Drayton Wellcamp Road															
4	L2	All MCs	415	5.0	415	5.0	0.580	23.6	LOS C	11.3	82.1	0.84	0.82	0.84	40.2
5	T1	All MCs	162	5.0	162	5.0	0.493	29.4	LOS C	5.2	38.1	0.95	0.77	0.95	39.8
6	R2	All MCs	1	0.0	1	0.0	0.003	30.7	LOS C	0.0	0.2	0.83	0.59	0.83	36.8
Approach			578	5.0	578	5.0	0.580	25.2	LOS C	11.3	82.1	0.87	0.80	0.87	40.1
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.010	20.1	LOS C	0.1	0.6	0.85	0.60	0.85	37.4
8	T1	All MCs	1	0.0	1	0.0	0.010	31.4	LOS C	0.1	0.6	0.85	0.60	0.85	38.4
9	R2	All MCs	1	0.0	1	0.0	0.010	37.0	LOS D	0.1	0.6	0.85	0.60	0.85	37.4
Approach			3	0.0	3	0.0	0.010	29.5	LOS C	0.1	0.6	0.85	0.60	0.85	37.7
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	* 0.395	8.7	LOS A	3.5	25.6	0.81	1.00	0.81	36.3
11	T1	All MCs	247	5.0	247	5.0	* 0.395	9.8	LOS A	3.5	25.6	0.81	1.00	0.81	37.3
12	R2	All MCs	247	5.0	247	5.0	* 0.756	38.6	LOS D	8.9	64.8	1.00	0.90	1.17	36.5
Approach			496	5.0	496	5.0	0.756	24.2	LOS C	8.9	64.8	0.91	0.95	0.99	36.9
All Vehicles			1354	5.0	1354	5.0	0.756	26.4	LOS C	11.3	82.1	0.89	0.89	0.95	37.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed

	ped/h	ped/h	sec		ped	m			sec	m	m/sec
South: Boundary Street South											
P1 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
East: Drayton Wellcamp Road											
P2 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
North: Holcim Site Access											
P3 Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	183.2	200.0	1.09
West: Euston Road											
P4 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
All Pedestrians	125	132	29.3	LOS C	0.1	0.1	0.92	0.92	183.1	200.0	1.09

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [7] BG+DEV 2037 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	205	5.0	205	5.0	0.211	22.4	LOS C	3.2	23.4	0.55	1.26	0.55	32.9
2	T1	All MCs	1	0.0	1	0.0	* 0.890	51.2	LOS D	42.6	311.1	0.98	0.96	1.12	37.4
3	R2	All MCs	694	5.0	694	5.0	0.890	56.9	LOS E	42.6	311.1	0.98	0.96	1.12	36.3
Approach			900	5.0	900	5.0	0.890	49.0	LOS D	42.6	311.1	0.89	1.03	0.99	32.6
East: Drayton Wellcamp Road															
4	L2	All MCs	172	5.0	172	5.0	0.145	13.6	LOS B	3.7	26.7	0.40	0.68	0.40	40.9
5	T1	All MCs	237	5.0	237	5.0	* 0.890	76.7	LOS E	15.7	114.4	1.00	1.04	1.30	31.2
6	R2	All MCs	1	0.0	1	0.0	0.008	72.4	LOS E	0.1	0.4	0.95	0.59	0.95	28.4
Approach			409	5.0	409	5.0	0.890	50.3	LOS D	15.7	114.4	0.75	0.89	0.92	32.8
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.013	46.2	LOS D	0.2	1.1	0.90	0.61	0.90	29.9
8	T1	All MCs	1	0.0	1	0.0	0.013	54.1	LOS D	0.2	1.1	0.90	0.61	0.90	30.6
9	R2	All MCs	1	0.0	1	0.0	0.013	59.7	LOS E	0.2	1.1	0.90	0.61	0.90	29.9
Approach			3	0.0	3	0.0	0.013	53.3	LOS D	0.2	1.1	0.90	0.61	0.90	30.1
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	* 0.375	17.9	LOS B	6.7	49.1	0.87	1.00	0.87	32.1
11	T1	All MCs	180	5.0	180	5.0	0.375	26.0	LOS C	6.7	49.1	0.87	1.00	0.87	32.8
12	R2	All MCs	114	5.0	114	5.0	* 0.890	77.4	LOS E	7.6	55.7	1.00	0.98	1.42	27.5
Approach			295	5.0	295	5.0	0.890	45.8	LOS D	7.6	55.7	0.92	0.99	1.08	30.5
All Vehicles			1607	5.0	1607	5.0	0.890	48.8	LOS D	42.6	311.1	0.86	0.98	0.99	32.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed

	ped/h	ped/h	sec		ped	m			sec	m	m/sec
South: Boundary Street South											
P1 Full	25	26	54.2	LOS E	0.1	0.1	0.95	0.95	208.1	200.0	0.96
East: Drayton Wellcamp Road											
P2 Full	25	26	54.2	LOS E	0.1	0.1	0.95	0.95	208.1	200.0	0.96
North: Holcim Site Access											
P3 Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
West: Euston Road											
P4 Full	25	26	54.2	LOS E	0.1	0.1	0.95	0.95	208.1	200.0	0.96
All Pedestrians	125	132	54.2	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: [8] BG+DEV 2037 PM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 70.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Site Scenario: 1 | Local Volumes

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Qued	Eff. Stop Rate	Number of Cycles to Depart	Aver. Speed km/h
South: Boundary Street South															
1	L2	All MCs	93	5.0	93	5.0	0.158	14.7	LOS B	1.1	8.4	0.75	1.15	0.75	33.6
2	T1	All MCs	1	0.0	1	0.0	*0.777	36.0	LOS D	7.3	53.6	1.00	0.93	1.23	36.7
3	R2	All MCs	197	5.0	197	5.0	0.777	41.7	LOS D	7.3	53.6	1.00	0.93	1.23	35.8
Approach			291	5.0	291	5.0	0.777	33.0	LOS C	7.3	53.6	0.92	1.00	1.08	35.0
East: Drayton Wellcamp Road															
4	L2	All MCs	436	5.0	436	5.0	0.612	24.0	LOS C	12.0	87.9	0.85	0.83	0.85	40.2
5	T1	All MCs	162	5.0	162	5.0	0.507	29.7	LOS C	5.3	38.4	0.96	0.77	0.96	39.7
6	R2	All MCs	1	0.0	1	0.0	0.003	30.6	LOS C	0.0	0.2	0.83	0.59	0.83	36.8
Approach			599	5.0	599	5.0	0.612	25.6	LOS C	12.0	87.9	0.88	0.81	0.88	40.0
North: Holcim Site Access															
7	L2	All MCs	1	0.0	1	0.0	0.010	20.1	LOS C	0.1	0.6	0.85	0.60	0.85	37.4
8	T1	All MCs	1	0.0	1	0.0	0.010	31.5	LOS C	0.1	0.6	0.85	0.60	0.85	38.4
9	R2	All MCs	1	0.0	1	0.0	0.010	37.0	LOS D	0.1	0.6	0.85	0.60	0.85	37.4
Approach			3	0.0	3	0.0	0.010	29.5	LOS C	0.1	0.6	0.85	0.60	0.85	37.7
West: Euston Road															
10	L2	All MCs	1	0.0	1	0.0	*0.401	8.8	LOS A	3.5	25.8	0.82	1.00	0.82	36.2
11	T1	All MCs	247	5.0	247	5.0	*0.401	10.0	LOS A	3.5	25.8	0.82	1.00	0.82	37.2
12	R2	All MCs	257	5.0	257	5.0	*0.777	39.3	LOS D	9.4	68.3	1.00	0.91	1.20	36.5
Approach			505	5.0	505	5.0	0.777	24.9	LOS C	9.4	68.3	0.91	0.96	1.01	36.8
All Vehicles			1398	5.0	1398	5.0	0.777	26.9	LOS C	12.0	87.9	0.90	0.90	0.97	37.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Qued	Eff. Stop Rate	Travel Time	Travel Dist.	Aver. Speed

	ped/h	ped/h	sec		ped	m			sec	m	m/sec
South: Boundary Street South											
P1 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
East: Drayton Wellcamp Road											
P2 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
North: Holcim Site Access											
P3 Full	50	53	29.3	LOS C	0.1	0.1	0.92	0.92	183.2	200.0	1.09
West: Euston Road											
P4 Full	25	26	29.3	LOS C	0.0	0.0	0.92	0.92	183.1	200.0	1.09
All Pedestrians	125	132	29.3	LOS C	0.1	0.1	0.92	0.92	183.1	200.0	1.09

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: [7] BG+DEV 2037 AM Drayton Wellcamp Road / Euston Road / Boundary Street South / Holcim Site (General)

Output produced by SIDRA INTERSECTION Version: 10.0.3.210

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120.0 seconds (Site Optimum Cycle Time - Minimum Delay)
Site Scenario: 1 | Local Volumes

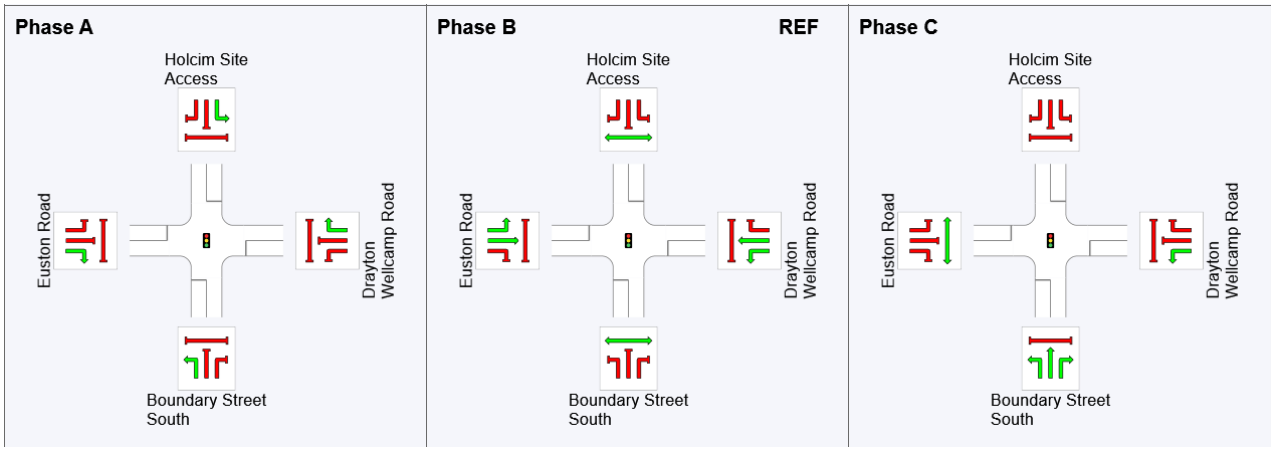
Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Four-Phase Leading Right Turns
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D
Reference Phase: Phase B

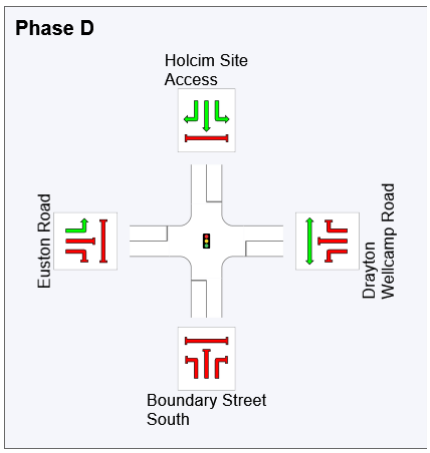
Phase Timing Summary

Phase	A	B	C	D
Phase Change Time (sec)	105.4	0.0	22.9	85.4
Green Time (sec)	8.6	16.9	56.5	14.0
Phase Time (sec)	14.6	22.9	62.5	20.0
Phase Split	12%	19%	52%	17%
Phase Frequency (%)	100.0	100.0	100.0	100.0

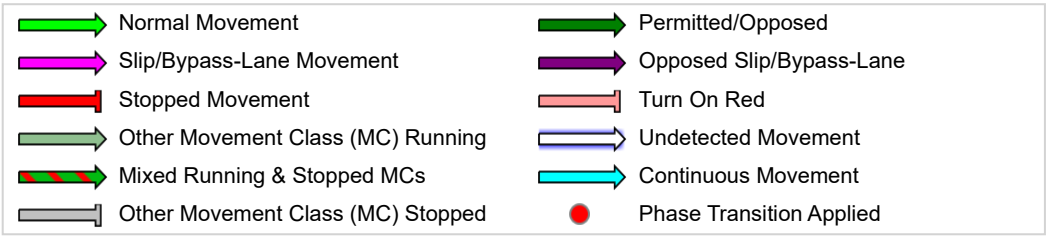
See the Timing Analysis report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Minor Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.

Output Phase Sequence





REF: Reference Phase
VAR: Variable Phase



Appendix B Turn warrant assessment

WARRANTS FOR TURN TREATMENTS
PROJECT: 25E-0272 Fernleigh
TITLE: 2027 PEAK HOUR TRAFFIC VOLUMES

RMA Engineers

INTERSECTION DETAILS

Major Road		Drayton Wellcamp Road
Side Road		Boundary Street South
Splitter Island on Major Road	Yes or No	No
Design Domain	NDD or EDD	NDD
Major Road Design Speed	(km/h)	71-99

TRAFFIC VOLUMES (Vehicles/Hour)		BG		BG+DEV	
		AM	PM	AM	PM
Major Road approaching through traffic flow	Q_{T1}	171	235	171	235
Major Road opposing through traffic flow	Q_{T2}	225	154	225	154
Right turn traffic flow	Q_R	105	235	108	244
Left turn traffic flow	Q_L	157	394	163	414
Major Road traffic volume for right turn	Q_M	553	783	559	803
Major Road traffic volume for left turn	Q_M	225	154	225	154

Turn Warrant Graph (as adapated from Figure 3.25 Austroads Guide to Traffic Management Part 6 2020)

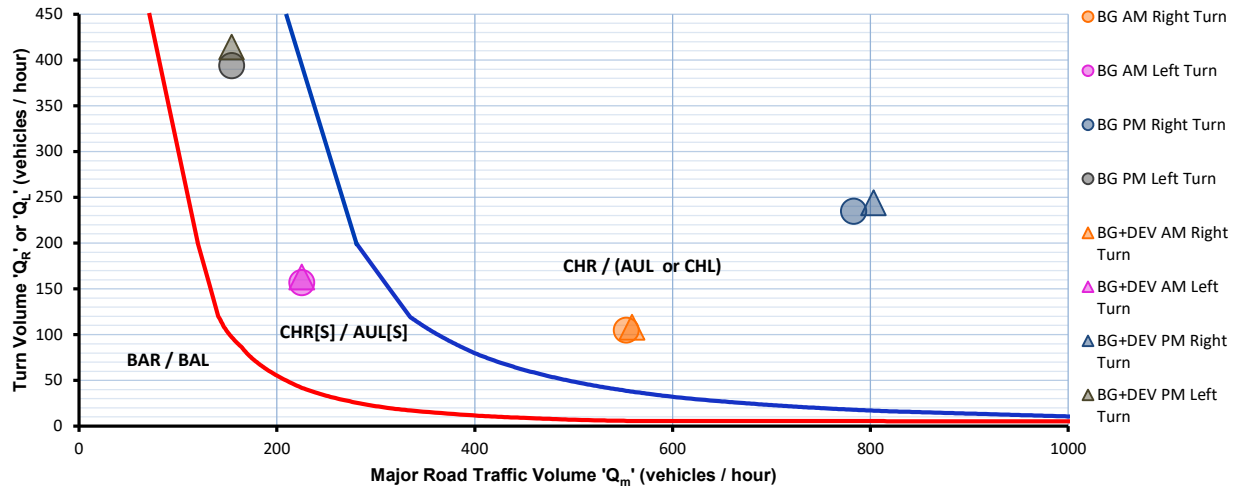
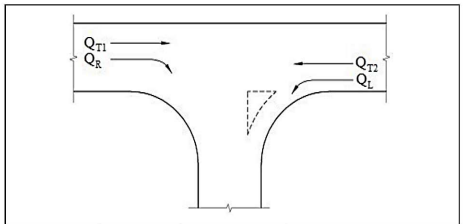


Figure 4A-A 4 - Calculation of the major road traffic volume parameter 'Q_M'



Road Type	Turn Type	Splitter Island	Q_M (veh/h)
2 Lane 2 Way	Right	No	= $Q_{T1} + Q_{T2} + Q_L$
		Yes	= $Q_{T1} + Q_{T2}$
	Left	Yes/No	= Q_{T2}

RESULTS:

BG

	Right turn treatment	Left turn treatment
AM	CHR	AUL[S]
PM	CHR	AUL[S]

BG+DEV

	Right turn treatment	Left turn treatment
AM	CHR	AUL[S]
PM	CHR	AUL[S]

NOTES:

APPENDIX B – HYDRAULIC MODEL PRESSURE & FLOW RESULTS

Toowoomba Regional Council – Network Planning – Water Project Services

HYDRAULIC MODEL PRESSURE & FLOW RESULTS

DA:	MCUI/2024/7257
Location:	119 East Drews Road, Westbrook
Lot/Plan:	Lot 4 SP254418
Development Type:	Residential Subdivision
Zoning:	Rural
Connection Point:	Node H-2765: Shoesmith Road
Water Supply Zone:	Keding
Node Elevation:	Node H-2765: 541.12 mAHD

The application is for a 100 lot subdivision at East Drews Road, Westbrook. The proposed development is requested to be connected to the Keding pressure zone, which forms part of the Greater Western Toowoomba study area. The Keding zone is a pressure reduced zone within Westbrook serviced from the Glenvale Reservoir on Skyline Drive which is supplied from the Mt Kynoch Water Treatment Plant.

The assessment has been completed using the *Greater Western Toowoomba Water Supply Study* model completed in 2023, with the 2026 planning horizon taken as existing conditions.

The demands used in the assessment are summarised in the table below based on information provided by RMA Engineers. Since only the number of the lots were provided the Residential EP has been calculated based on the ratio of 3.1 EP/ET.

Scenario	Lots	Residential EP
2026	100	310

Results:

The following pressure and flow results have been provided for the requested connection points off the existing DN150 PVC main on Shoesmith Road.

	2026 Pre-Development		2026 Post-Development		2061	
	PD	Fireflow	PD	Fireflow	PD	Fireflow
Node H-2765: 541.12 mAHD						
Node EP:	0		310		310	
Max Development Flow	0 L/s	15 L/s	3.0 L/s	17 L/s	3 L/s	17 L/s
Min Pressure	57.3 m	56.5 m	57.2 m	56.3 m	57.1 m	56.2 m
Max Pressure	57.3 m	-	57.3 m	-	57.3 m	-

The 2026 results assume that all 2021 & 2026 Planning Horizon augmentations identified in the *Greater Western Toowoomba Water Supply Study* that impact the development area have been completed. The 2061 results assume all augmentations proposed in the report have also been completed. The table below outline all the augmentations identified in the report which impacts the development area.

Aug ID	Description
GLW_21_6	New Trunk Main supplying Glenvale Reservoir
GLW_21_7	Glenvale Reservoir change fill rates
WBW_21_1	Change in PRV settings
GLW_26_1	Glenvale Reservoir change operating levels
GLW_26_2	Replacement Watermain Riethmuller Rd
GLW_31_1	Glenvale Reservoir change fill rates
WBW_36_1	New Mt Peel Reservoir, Trunk Mains and PRVs
WBW_36_2	Water main replacement Toowoomba Athol Rd
WBW_61_1	Change Fill rate of Mt Peel Reservoir
WBW_61_2	Trunk water main augmentations (Boundary St South, Shoesmith Road)

Development of the site has been previously allowed for in the model in the 2041 planning horizon, once full development of the Priority Infrastructure Area (PIA) is assumed to be reached in Westbrook. The proposed development is located outside of the PIA and therefore inclusion of these lots onto the water supply network will reduce Council's ability to supply growth within the PIA. Consultation with Development Assessment will be required to determine if the provision for additional trunk infrastructure capacity is required.

Existing Water Network:

Comments:

- Results based on design rate of 200 L/EP/d
- Peak Hour (PH) = 07:00
- Fireflow modelled at 2/3 PH (19:30 on 3rd consecutive Peak Day).
- Fireflow results are the residual pressure and flow taken at the maximum flow needed to meet fireflow requirements and background demand.
- Results are taken from a Peak Day (PD) scenario as maximum flow and minimum pressure occur during PH.
- Maximum pressure results provided are representative of static pressure with a minimum baseline flow.
- Full demand for the development is 310 EP as per advice provided by RMA Engineers.
- 2026 has been used as the existing planning horizon from the *Greater Western Toowoomba Water Supply Study* (2023).

The information provided is based on the best available information at the time of publication and is subject to variation over time.

Network models are verified with limited data and conditions in the field may vary from modelling assumptions.

Field investigations and inspections should be undertaken to satisfy the user that the data is suitable for its intended purpose. Users relying on hydraulic modelling information do so at their own risk.

Assessed By:	P Tamang
Reviewed By:	T Millikan
Date:	8 August 2025