



**PROPOSED FREELING CODE AMENDMENT  
105 HANSON RD & LOT 523 BORROW ST,  
FREELING**

**TRAFFIC INVESTIGATIONS REPORT**



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## DOCUMENT CONTROL

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Traffic Investigations Report

Project number: 22381

Client: Humby Consulting

Client contact: Andrew Humby

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### CIRQA Pty Ltd

ABN 12 681 029 983

PO Box 144, Glenside SA 5065

150 Halifax Street, Adelaide SA 5000

(08) 7078 1801

[www.cirqa.com.au](http://www.cirqa.com.au)

## **1. INTRODUCTION**

CIRQA has been engaged to provide assessment advice for a potential Code Amendment affecting Sections 523, 524, 530, 531 and Lot 523 Borrow Street, and 105 Hanson Road, Freeling. Specifically, CIRQA has been engaged to provide advice in respect to traffic aspects of the proposal.

This report provides a review of the subject site, the potential Code Amendment development yield, access arrangements and associated traffic impact on the adjacent road network. The traffic investigations have been based upon concept plans prepared by Geoff Bone (dated 07 February 2022 and 11 February 2022, refer Appendix A).

## **2. BACKGROUND**

### **2.1 SUBJECT SITE**

The subject site comprises a number of land parcels, namely:

- Parcel 523 of Lot 523 Borrow Street, Freeling (CT 6123/745);
- Parcel 524 of Lot 523 Borrow Street, Freeling (CT 6123/745);
- Parcel 530 of Lot 523 Borrow Street, Freeling (CT 6123/745);
- Parcel 531 of Lot 523 Borrow Street, Freeling (CT 6123/745);
- Parcel 537 of Lot 523 Borrow Street, Freeling (CT 6123/745);
- Parcel 94 of 105 Hanson Street, Freeling (CT 6063/540); and
- Parcel 95 of 105 Hanson Street, Freeling (CT 6063/540).

The site is dissected by Borrow Street, with Parcels 94 and 95 located on the southern side, and the balance on the northern side. Furthermore, Parcels 94 and 95 are separated by the location of the Freeling Cemetery.

The portion of the site north of Borrow Street is bound by primary production lane to the northeast, Borrow Street to the southeast and residential development to the west. The portion of the site located south of Borrow Street is bound by Borrow Street to the north, Thiele Highway to the southeast, residential development to the west and the Freeling Cemetery to the northwest.

The Planning and Design Code identifies that the site is located within a Rural Zone, with the following overlays applicable:

- Hazards (Bushfire - General Risk);

- Heritage Adjacency (Lot 105 Hanson Street only);
- Hazards (Flooding - General);
- Major Urban Transport Routes;
- Native Vegetation; and
- Traffic Generating Development.

The portion of the subject site north of Borrow Street is currently used as primary production land and is undeveloped. Vehicle access to this portion of the subject site is provided via adjoining allotments to the northeast of the site, with no direct access currently provided via the surrounding road network.

The portion of the site south of Borrow Street is also used as primary production land, albeit a detached dwelling is located in the north-western corner of Parcel 95. Vehicle access to Parcel 94 is provided via an access on Borrow Street (located approximately central along its frontage) as well as via Parcel 95. Direct vehicle access to Parcel 95 is provided via an extension of the Freeling Cemetery's access road (which is located within a public road reserve), and a crossover from the Hanson Street cul-de-sac.

Figure 1 illustrates the location of the subject site with respect to the adjacent road network.



*Figure 1 – Location of the subject site with respect to the adjacent road network*

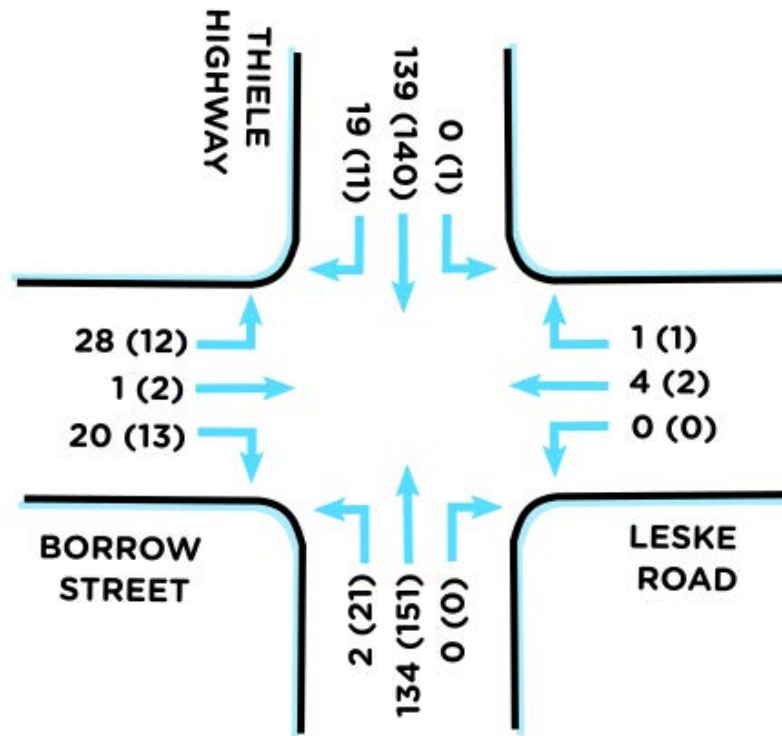
## 2.2 ADJACENT ROAD NETWORK

Borrow Street is a collector road under the care and control of the Light Regional Council. Adjacent the site, Borrow Street comprises a 9.2 m wide sealed carriageway (approximate) with 3.8 m wide traffic lanes and adjacent 0.8 m sealed shoulders in each direction (additional unsealed shoulders of varying width are also provided). Traffic data recorded by Austraffic (from Tuesday 30 August 2022 to Monday 5 September 2022 inclusive) indicates that Borrow Street has an average daily traffic volume of 658 vehicles per day (vpd), of which approximately 16.5% are commercial vehicle. It should be noted that Austraffic's vehicle counter was positioned approximately 200 m east of the Freeling Cemetery access, beyond which point (further east) no significant vehicle access is provided via Borrow Street. An 80 km/h speed limit applies on Borrow Street adjacent the site.

Thiele Highway is an arterial road under the care and control of the Department for Infrastructure and Transport (DIT). Adjacent the site, the Thiele Highway comprises an 8.6 m wide sealed carriageway (approx.) with a 3.5 m wide traffic lane and 0.8 m shoulders in each direction. Additional unsealed shoulders are provided on both sides of the Thiele Highway. Traffic data obtained from DIT indicates that this section of the Thiele Highway has an Annual Average Daily Traffic (AADT) volume in the order of 2,900 vpd, of which approximately 11% are commercial vehicles. Adjacent the site, a 100 km/h speed limit applies on the Thiele Highway.

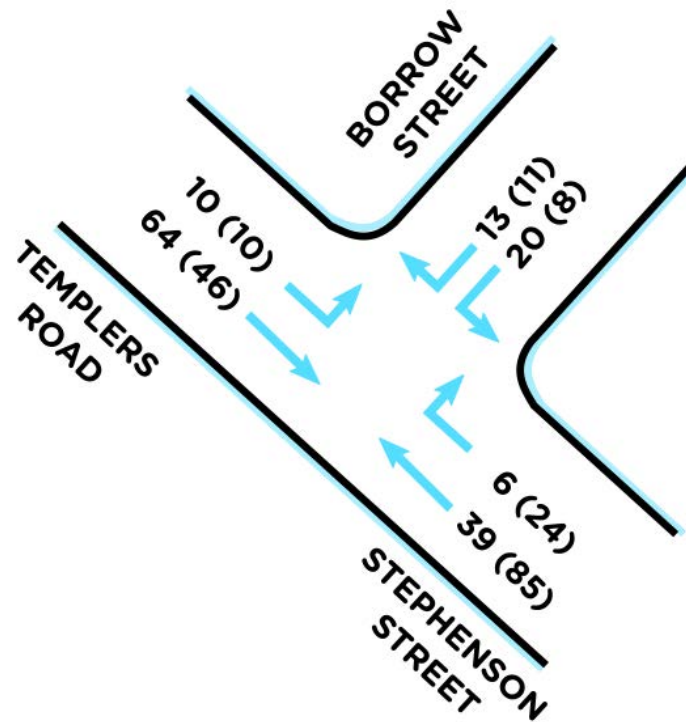
Stollberg Road is a local road under the care and control of the Light Regional Council. Stollberg Road comprises a 7.2 m wide carriageway (approximate) supporting traffic in both directions. On-street parking is accommodated on both sides of Stollberg Road. Traffic data was unable to be provided for Stollberg Street, however based upon the number of residential allotments to which it provides access (directly and indirectly), it is envisaged that daily traffic volumes would be less than 500 vpd. The default urban speed limit of 50 km/h applies on Stollberg Road.

At its eastern end, Borrow Street intersects with the Thiele Highway, creating a four-way priority controlled (Give Way) intersection with its continuation road, Leske Road. Borrow Street is realigned near the intersection (via chevron linemarking) to ensure vehicles approach the intersection perpendicular to the Thiele Highway. This intersection was surveyed by Austraffic on the Tuesday 30 August 2022, which identified that the am and pm peak hours occurred between 7:30 am and 8:30 am, and between 3:45 pm and 4:45 pm. The recorded peak hour traffic volumes are illustrated in Figure 2.



*Figure 2 - Volumes experienced at the Borrow Street, Thiele Highway and Leske Road intersection during the am (pm) peak hours*

At its western end, Borrow Street intersects with Templers Road and Stephenson Street at a priority controlled (Give Way) T-intersection (in close proximity to the Borrow Street/Euston Terrace T-intersection). Both Templers Road and Stephenson Street form the priority approaches with associated linemarking and signage installed at the intersection. This intersection was surveyed by Austraffic on the Tuesday 30 August 2022, which identified that the am and pm peak hours occurred between 7:45 am and 8:45 am, and between 3:15 pm and 4:15 pm. The volumes experienced at the intersection during these peak hours are shown in Figure 3.



*Figure 3 -Volumes experienced at the Borrow Street, Templers Road and Stephenson Street intersection during the am (pm) peak hours*

### 2.3 WALKING AND CYCLING

Limited pedestrian facilities are provided within the vicinity of the site, noting that typically road verges do not provide a sealed footpath. However pedestrian ramps are typically provided at intersections.

No bicycle lanes are provided within the vicinity of the site, as such cyclists are to ride on the footpath (where available) or use the road under a standard shared arrangement.

### 2.4 PUBLIC TRANSPORT

No Adelaide Metro bus services operate within the township of Freeling. However, LinkSA offer several charter bus services which operate through Freeling:

- Route 1140 – Nuriootpa to Hewett via Tanunda, Marananga, Freeling & Willaston;
- Route 1141 – Freeling to Evanston via Wasleys; and
- Route 1146 - Kapunda to Evanston via Freeling & Roseworthy;

Bes services generally operate daily from Monday to Friday.



### 3. PROPOSED DEVELOPMENT

The proposal comprises the potential rezoning of the subject site to create 192 residential allotments, as well as ancillary open space and public road reserves. New residential areas would connect to the existing road network via the following access points:

- two access points on the northern side of Borrow Street. Each access point would create a new T-intersection with Borrow Street at which all turning movements would be permitted;
- one access point on the southern side of Borrow Street. This access point would create a new T-intersection with Borrow Street at which all turning movements would be permitted; and
- one access point on Stollberg Road via the continuation of the existing road carriageway.

The new access points on Borrow Street would be located in accordance with Austroads' *"Guide to Traffic Management – Part 6 Intersections and Crossings Management"* (AGTM6) in which greater than 15 m separation would be achieved between the newly created T-intersections.

Detailed design the new (internal) roadways and intersections would be undertaken as part of later development application(s) in accordance with relevant Standards and Guidelines, and to the satisfaction of Council.

### 4. PARKING ASSESSMENT

The Planning and Design Code identifies an on-street parking requirement of 0.33 spaces per residential allotment created. Based upon 192 residential allotments being created, the land division would require 64 on-street parking spaces to be provided throughout.

While still in the early conceptual stages, should the subject site be developed as envisaged, it is expected that ample on-street parking would be provided through the land division to satisfy the requirements of the Planning and Design Code. This is particularly due to the wide allotment widths proposed throughout, enabling on-street parking in front of virtually all allotments. Further detail regarding the specific provision of on-street parking can be determined as part of future land division stages.



## **5. TRAFFIC ASSESSMENT**

### **5.1 TRAFFIC GENERATION**

Daily traffic generation rates in the order of 7.5 to 8.0 trips per dwelling are commonly applied and accepted for detached dwellings throughout South Australia (with 10% occurring during each of the am and pm peak hours). For conservatism, the higher of the above range (8.0 trips per dwelling) has been adopted for the following assessment.

On the basis of the above rates, it is forecast that future development of the proposed allotments could generate in the order of 1,536 daily vehicle trips (or approximately 154 peak hour trips based upon 10% occurring during the peak hours).

### **5.2 TRAFFIC DISTRIBUTION**

The majority of the traffic generated by the development of the subject site would be distributed onto Borrow Street via the newly created access points, while the traffic generated by the south-eastern portion of the subject site (Parcel 95) would distribute via Stollberg Street.

Specifically, vehicle movements are forecast to be distributed to/from the subject site as follows:

- 30% of the site's am peak hour generation will be ingress movements and 70% egress movements (and vice versa during the pm peak hour);
- 70% of vehicle movements will be distributed to/from the east via Borrow Street; and
- 30% of vehicle movements will be distributed to/from the west via Borrow Street.

Traffic has been further distributed at the intersections of Borrow Street, Thiele Highway and Leske Road, as well as the intersection of Borrow Street, Templers Road and Stephenson Street. The additional vehicle movements through these intersections have been distributed proportionally to the existing vehicle movements captured by Austraffic during the am and pm peak hours.

Based upon the above, the following vehicle movements are forecast at each of the proposed access points:

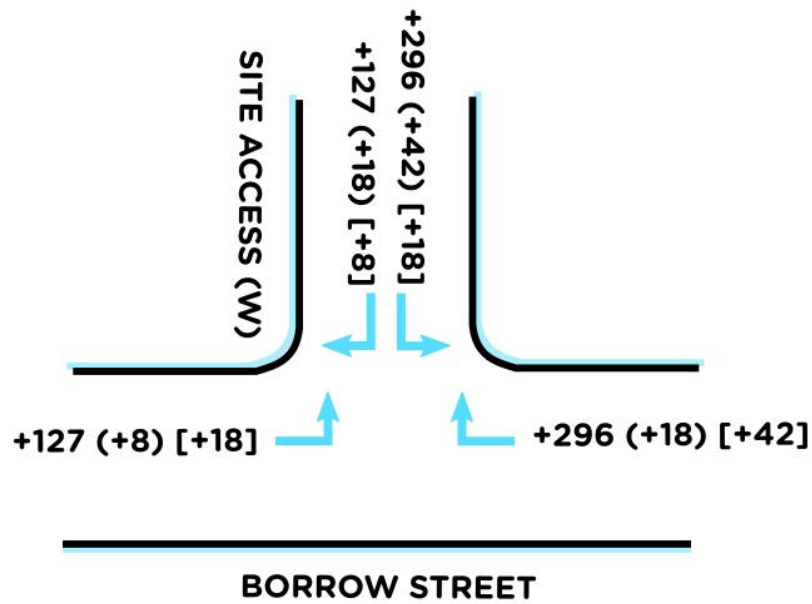


Figure 4 - Development-related daily, (am) and [pm] peak hour traffic volumes at the western Lot 523 Borrow Street intersection

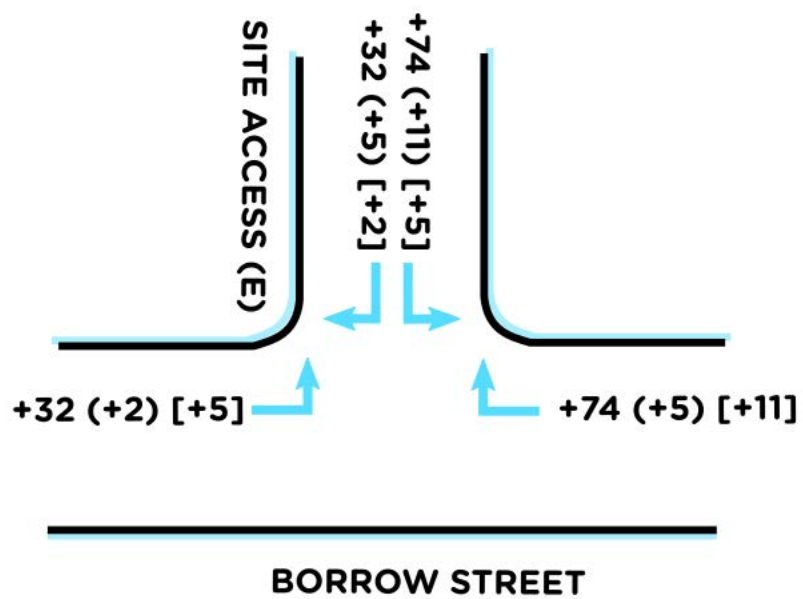
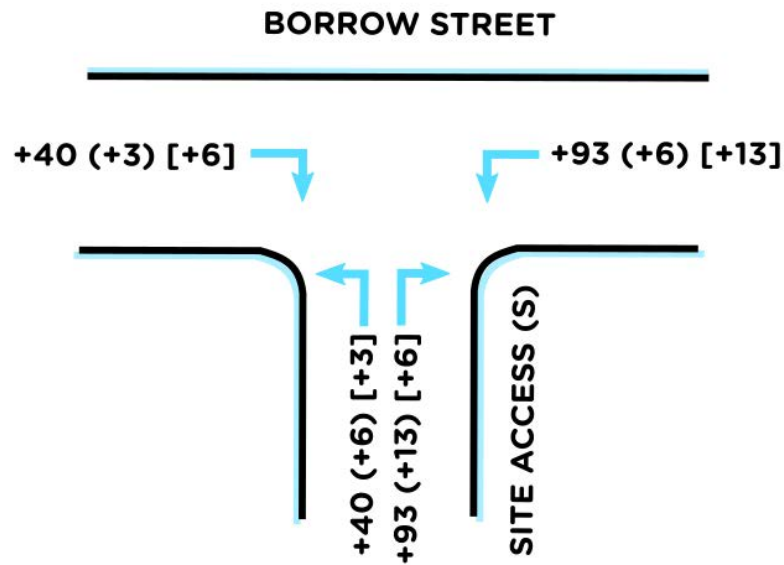


Figure 5 - Development-related daily, (am) and [pm] peak hour traffic volumes at the eastern Lot 523 Borrow Street intersection



*Figure 6 - Development-related daily, (am) and [pm] peak hour traffic volumes at the northern Lot 105 Hanson Street intersection*

It should be noted that in the order of 216 daily vehicle movements (associated Parcel 95 of 105 Hanson Street) will be distributed via the existing residential area immediately west of the subject site (Stollberg Road). Specifically, in the order of 22 peak hour vehicle movements are forecast to be distributed via Stollberg Road, and either View Street or McCallum Road to access the broader (external) road network.

### **5.3 INTERSECTION UPGRADE TREATMENTS**

An assessment has been undertaken for each of the site's access points to determine if an intersection treatment is warranted. The assessment has been undertaken in accordance with AGTM6, using the forecast traffic volumes identified in Figure 4, Figure 5 and Figure 6, as well as existing traffic volumes on Borrow Street.

Taking into account the forecast traffic volumes, the following intersection treatments are warranted at the site's access points:

- **Western Lot 523 Borrow Street access** - Basic Left-turn (BAL) and Basic Right-turn (BAR) treatments;
- **Eastern Lot 523 Borrow Street access** - BAL and BAR treatments; and
- **Parcel 94 Hanson Road access** – BAL and BAR treatments.

Based upon the above, the intersections have been identified to warrant only BAL and BAR treatments (the lowest order treatments for an intersection). As such,

the intersections are not considered to warrant separated turning lane treatments.

Further to the above, an assessment of the existing Thiele Highway, Borrow Street and Leske Street intersection has also been undertaken. Based upon the existing traffic volumes identified in Figure 2 (with additional forecast volumes included in addition), the intersection has been identified to warrant a Short Auxiliary Left-turn (AUL(S)) treatment. No other upgrade treatments at the intersection (beyond that of what is currently required) have been identified.

No upgrades to the Borrow Street, Stephenson Street and Templers Road intersection are considered to be warranted as a result of the potential Code Amendment.

#### **5.4 TRAFFIC IMPACT ANALYSES**

In the event that the full (envisaged) development yield was realised, rezoning and redevelopment of the site is forecast to generate in the order of 398 additional daily vehicle movements to the west of the site on Borrow Street, and in the order of 926 additional daily vehicle movements to the east of the site on Borrow Street.

As noted in section 2.2, Borrow Street has an existing daily traffic volume in the order of 658 vpd. Considering the additional vehicle movements generated by the proposal, the following daily vehicle movements are forecast on Borrow Street:

- east of the site's access points – 1,584 vpd (658 existing plus 926 forecast); and
- west of the site's access points – 1,056 vpd (658 existing plus 398 forecast).

The total daily traffic volumes identified above are well within the capacity of a 'collector road' (as is Borrow Street) and would also be within that of a typical 'local road'. As such, should the proposed rezoning be realised, the existing nature and function of Borrow Street would be maintained.

The remaining 212 additional daily vehicle movements (totalling the 1,536 daily vehicle movements) generated by the potential rezoning would be distributed to Stollberg Street. Conservatively assuming a daily traffic volume of 500 vpd on Stollberg Road, the proposal would similarly not impact upon the nature or function of Stollberg Road as a 'local road'.

With regard to the site's access points, Borrow Street adjacent the site comprises a relatively straight and flat alignment. It is therefore expected that access could be readily achieved on Borrow Street, achieving appropriate

sightlines as per the requirements of Austroads' *"Guide to Road Design: Part 4A – Signalised and Unsignalised Intersections"* (AGRD4A).

Furthermore, the associated access intersection warrants identified in Section 5.3 will readily accommodate the forecast traffic volumes associated with the site's rezoning and development.

Beyond the site and Borrow Street, vehicle movements will be further distributed via the Thiele Highway/Leske Road and Stephenson Street/Templers Road intersections. As such, in order to determine any potential traffic impacts with the site's rezoning, traffic impact analyses have been undertaken using SIDRA Intersection modelling software. Specifically, traffic modelling of both intersections has been undertaken during the am and pm peak hour periods identified in Section 2.2, using both existing and total (existing plus development related) traffic volumes.

It should be noted however that the pm peak hour traffic generated by the potential residential would not likely coincide with that of the network's exiting pm peak hour identified by the survey. Notwithstanding, in order to provide a conservative assessment, the modelling analyses have been undertaken assuming that such pm peak hours coincide directly.

#### **5.4.1 BORROW STREET / THIELE HIGHWAY / LESKE ROAD INTERSECTION**

A summary of the SIDRA modelling output for the Borrow Street, Thiele Highway and Leske Road intersection, for both existing and total traffic scenarios, is illustrated in Table 1, while detailed results of the SIDRA modelling are attached in Appendix B.

*Table 1 – SIDRA results for the intersection of Borrow Street, Thiele Highway and Leske Road am (pm)*

Approach	Movement	Existing Scenario		Future Scenario	
		Degree of Saturation	Ave. Delay (sec)	Degree of Saturation	Ave. Delay (sec)
Thiele Highway (N)	L	0.092 (0.088)	8.4 (8.5)	0.108 (0.104)	8.4 (8.6)
	T	0.092 (0.088)	0.1 (0.1)	0.108 (0.104)	0.2 (0.2)
	R	0.092 (0.088)	8.3 (8.3)	0.108 (0.104)	8.1 (8.3)
Leske Road (E)	L	0.003 (0.004)	7.3 (7.4)	0.006 (0.009)	7.4 (7.4)
	T	0.003 (0.004)	7.0 (7.1)	0.006 (0.009)	7.1 (7.4)
	R	0.003 (0.004)	8.3 (8.3)	0.006 (0.009)	8.8 (8.5)
Thiele Highway (S)	L	0.084 (0.098)	8.0 (7.9)	0.085 (0.121)	7.9 (7.8)
	T	0.084 (0.098)	0.0 (0.0)	0.085 (0.121)	0.0 (0)
	R	0.084 (0.098)	7.9 (7.9)	0.085 (0.121)	7.9 (7.9)
Borrow Street (W)	L	0.050 (0.030)	7.8 (7.8)	0.117 (0.064)	7.6 (7.6)
	T	0.050 (0.030)	7.1 (7.1)	0.117 (0.064)	7.3 (7.4)
	R	0.050 (0.030)	8.3 (8.7)	0.117 (0.064)	8.7 (8.9)

As illustrated in Table 1, the intersection of Borrow Street, Thiele Highway and Leske Road currently operates satisfactorily with negligible queues and delays during both the am and pm peak hours. Taking into account the additional vehicle movements generated by the potential rezoning, the intersection will continue to operate satisfactorily with negligible increases in queues and delays.

#### **5.4.2 BORROW STREET / TEMPLERS ROAD / STEPHENSON STREET**

A summary of the SIDRA modelling output for the Borrow Street, Stephenson Street and Templers Road intersection, for both existing and total traffic scenarios, is illustrated in Table 2, while detailed results of the SIDRA modelling are attached in Appendix C.

*Table 2 – SIDRA results for the intersection of Borrow Street, Templers Road and Stephenson Street am (pm)*

Approach	Movement	Existing Scenario		Future Scenario	
		Degree of Saturation	Ave. Delay (sec)	Degree of Saturation	Ave. Delay (sec)
Borrow Street (NE)	L	0.026 (0.017)	4.7 (4.8)	0.048 (0.028)	4.8 (4.8)
	R	0.026 (0.017)	5.1 (5.4)	0.048 (0.028)	5.1 (5.4)
Stephenson Street (SE)	T	0.027 (0.062)	0.0 (0.1)	0.030 (0.074)	0.1 (0.1)
	R	0.027 (0.062)	5.0 (4.7)	0.030 (0.074)	4.9 (4.8)
Templers Road (SW)	T	0.042 (0.032)	4.8 (4.7)	0.046 (0.037)	4.7 (4.6)
	R	0.042 (0.032)	0.0 (0.0)	0.046 (0.037)	0.0 (0.0)

The performance of the Borrow Street, Templers Road and Stephenson Street currently operates at an acceptable level with negligible queues and delays. The SIDRA modelling indicates that the additional vehicle movements generated by the proposed rezoning will not (noticeably) impact upon the operation of the intersection, with delays on any movement forecast to increase by no more than 0.1 seconds. The intersection’s operation is therefore forecast to largely operate akin to that of the existing intersection’s operation.

## 6. SUMMARY

This report investigates the potential traffic impacts associated with the potential rezoning of vacant lands north and south of Borrow Street, Freeling. Specifically, it is envisaged that the lands could be rezoned to create 192 residential allotments, with associated public open space and road reserve allowances.

Noting the size of the residential allotments proposed, it is anticipated that adequate on-street parking (in excess of the requirements of the Planning and Design Code) could be provided throughout the site. Further development of on-street parking plans would be required as part of future land division application(s).

Vehicle access to the site would be provided via Borrow Street (for all land north of Borrow Street and Parcel 94 Borrow Street immediately south), as well as via Stollberg Road (Parcel 95 Borrow Street only). Taking into consideration existing traffic volumes, each access (via Borrow Street) would warrant only BAL/BAR treatments and would not warrant channelised (separated) turning treatments (as per the requirements of AGTM6). It is not anticipated that any treatment would be required to accommodate additional vehicle movements distributed via Stollberg Road.



Beyond the site, it anticipated that development of the lands would require the installation of an AUL(S) treatment at the intersection of Borrow Street, Thiele Highway and Leske Road (for left turn movements from the southern Thiele Highway approach into Borrow Street). No other upgrades are warranted as a result of the proposal (beyond that of what is currently required by the intersection).

Should the full development yield be realised, in the order of 1,536 additional daily vehicle movements would likely be generated by the proposed rezoning. Additional traffic volumes would be readily accommodated on Borrow Street and Stollberg Road without impact upon their existing nature and/or function (as collector and local roads respectively).

The additional vehicle movements would also be readily accommodated at the Borrow Street, Thiele Highway and Leske Road, and the Borrow Street, Templers Road and Stephenson Street intersections with negligible impact upon their operation.

# **APPENDIX A**

## **PLANS PREPARED BY GEOFF BONE**



# CONCEPT PLAN

## Towards Land Division, Section 530, Borrow Street, FREELING SA

by Burke Urban for Windy Acres Pty Ltd

**REGENERATIVE LANDSCAPE.** Establish a buffer in a regenerative design utilising native species to be visually attractive and low maintenance while restoring the natural function of the landscape for environmental improvement.

**AGRICULTURAL INTERFACE** addressed with a variable regenerative landscape buffer of 20-80 metres, comprising WSUD stormwater infrastructure, cycle and pedestrian shared paths combining to shield future Residential Area sensitive receivers to mitigating any adverse impacts of hazards, noise, dust, odour, light spill or other emissions from existing agricultural land uses.

Stormwater Detention Basin to be determined.

**Sec 530**  
22.58 hectares  
132 Lots  
@ 1,000m<sup>2</sup>

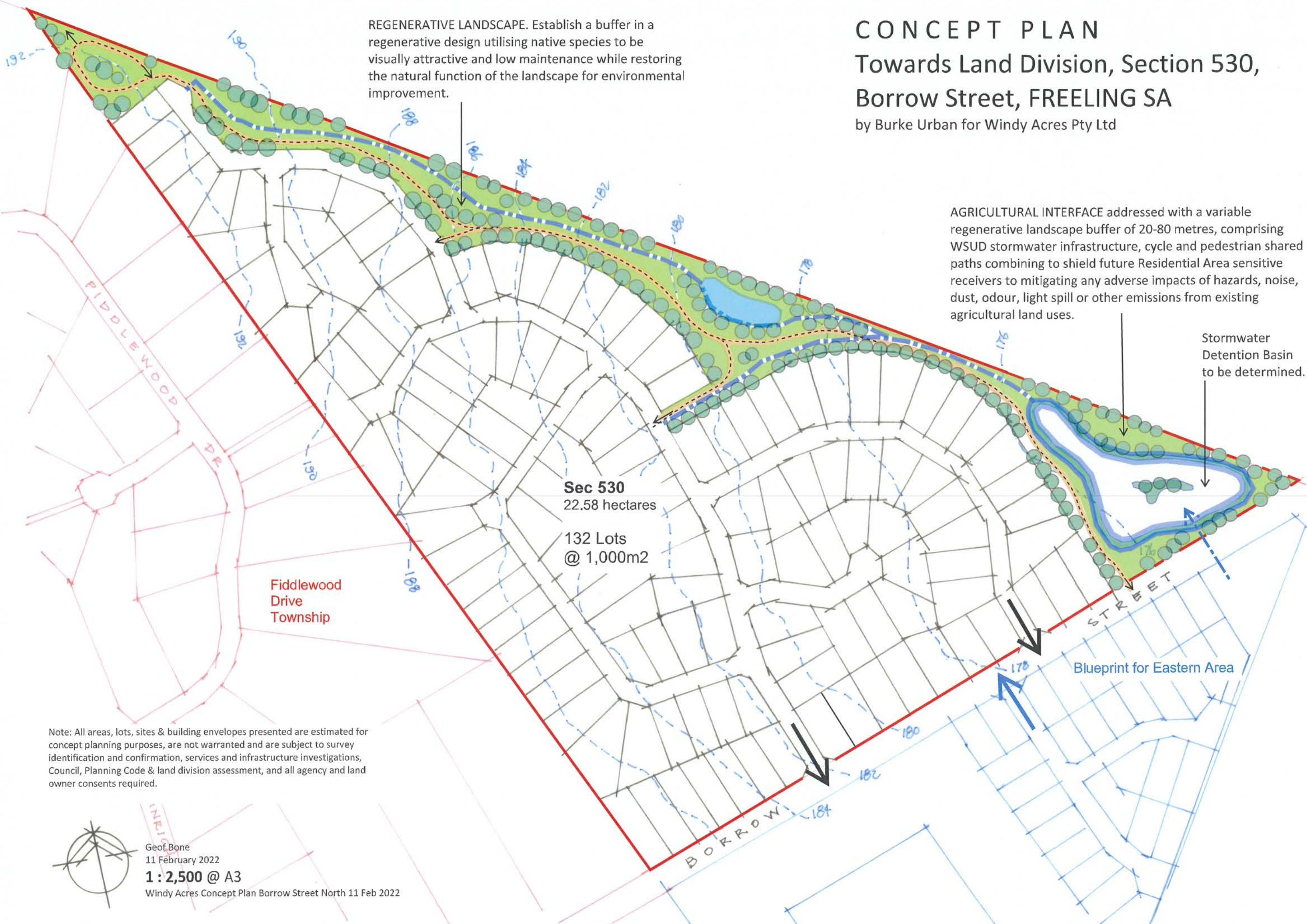
Fiddlewood Drive Township

Blueprint for Eastern Area

Note: All areas, lots, sites & building envelopes presented are estimated for concept planning purposes, are not warranted and are subject to survey identification and confirmation, services and infrastructure investigations, Council, Planning Code & land division assessment, and all agency and land owner consents required.



Geof Bone  
11 February 2022  
**1 : 2,500 @ A3**  
Windy Acres Concept Plan Borrow Street North 11 Feb 2022





CONCEPT PLANS - C, D, F & G  
 Towards Land Division, Pieces 94 & 95  
**FREELING SA**  
 for Windy Acres Pty Ltd



Stollberg Road precise alignment to be determined by survey

Resolution of Easements and Hanson Street (3 Lots)

Remove Dwelling

Suitability of Easements in back of lots and with Hanson Street? (8 Lots affected)

Detention Requirements to be determined. (this area 2,100m2)



CONCEPT PLANS - A, B & E  
 Towards Land Division, Pieces 94 & 95  
 FREELING SA  
 for Windy Acres Pty Ltd



Detention Requirements to be determined. (this area 3,550m<sup>2</sup>)

Note: All areas, lots, sites & building envelopes presented are estimated for concept planning purposes, are not warranted and are subject to survey identification and confirmation, services and infrastructure investigations, Council, Planning Code & land division assessment, and all agency and land owner consents required.

# **APPENDIX B**

## **SIDRA RESULTS - BORROW STREET/THIELE HIGHWAY/LESKE ROAD**

# MOVEMENT SUMMARY

Site: 101 [EXAM - BORROW STREET/THIELE HIGHWAY (Site Folder: EXISTING)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: THIELE HIGHWAY (S)														
1	L2	2	0	2	0.0	0.084	8.0	LOS A	0.0	0.1	0.01	0.01	0.01	82.0
2	T1	134	27	141	20.1	0.084	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	99.3
3	R2	1	0	1	0.0	0.084	7.9	LOS A	0.0	0.1	0.01	0.01	0.01	81.2
Approach		137	27	144	19.7	0.084	0.2	NA	0.0	0.1	0.01	0.01	0.01	98.9
East: LESKE ROAD (E)														
4	L2	1	0	1	0.0	0.003	7.3	LOS A	0.0	0.1	0.30	0.59	0.30	69.0
5	T1	1	0	1	0.0	0.003	7.0	LOS A	0.0	0.1	0.30	0.59	0.30	64.7
6	R2	1	0	1	0.0	0.003	8.3	LOS A	0.0	0.1	0.30	0.59	0.30	68.6
Approach		3	0	3	0.0	0.003	7.5	LOS A	0.0	0.1	0.30	0.59	0.30	67.4
North: THIELE HIGHWAY (N)														
7	L2	1	0	1	0.0	0.092	8.4	LOS A	0.2	1.1	0.08	0.08	0.08	80.1
8	T1	139	6	146	4.3	0.092	0.1	LOS A	0.2	1.1	0.08	0.08	0.08	96.6
9	R2	19	2	20	10.5	0.092	8.3	LOS A	0.2	1.1	0.08	0.08	0.08	74.1
Approach		159	8	167	5.0	0.092	1.1	NA	0.2	1.1	0.08	0.08	0.08	93.1
West: BORROW STREET (W)														
10	L2	28	5	29	17.9	0.050	7.8	LOS A	0.2	1.4	0.29	0.63	0.29	62.8
11	T1	1	0	1	0.0	0.050	7.1	LOS A	0.2	1.4	0.29	0.63	0.29	64.4
12	R2	20	0	21	0.0	0.050	8.3	LOS A	0.2	1.4	0.29	0.63	0.29	67.7
Approach		49	5	52	10.2	0.050	8.0	LOS A	0.2	1.4	0.29	0.63	0.29	64.7
All Vehicles		348	40	366	11.5	0.092	1.8	NA	0.2	1.4	0.08	0.14	0.08	89.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



# MOVEMENT SUMMARY

Site: 101 [EXPM - BORROW STREET/THIELE HIGHWAY (Site Folder: EXISTING)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: THIELE HIGHWAY (S)														
1	L2	21	0	22	0.0	0.098	7.9	LOS A	0.0	0.1	0.01	0.09	0.01	80.4
2	T1	151	11	159	7.3	0.098	0.0	LOS A	0.0	0.1	0.01	0.09	0.01	97.1
3	R2	1	0	1	0.0	0.098	7.9	LOS A	0.0	0.1	0.01	0.09	0.01	79.7
Approach		173	11	182	6.4	0.098	1.0	NA	0.0	0.1	0.01	0.09	0.01	94.6
East: LESKE ROAD (E)														
4	L2	1	0	1	0.0	0.004	7.4	LOS A	0.0	0.1	0.32	0.59	0.32	69.2
5	T1	2	0	2	0.0	0.004	7.1	LOS A	0.0	0.1	0.32	0.59	0.32	64.8
6	R2	1	0	1	0.0	0.004	8.3	LOS A	0.0	0.1	0.32	0.59	0.32	68.8
Approach		4	0	4	0.0	0.004	7.4	LOS A	0.0	0.1	0.32	0.59	0.32	66.8
North: THIELE HIGHWAY (N)														
7	L2	1	0	1	0.0	0.088	8.5	LOS A	0.1	0.7	0.06	0.05	0.06	80.8
8	T1	140	10	147	7.1	0.088	0.1	LOS A	0.1	0.7	0.06	0.05	0.06	97.7
9	R2	11	1	12	9.1	0.088	8.3	LOS A	0.1	0.7	0.06	0.05	0.06	75.4
Approach		152	11	160	7.2	0.088	0.7	NA	0.1	0.7	0.06	0.05	0.06	95.5
West: BORROW STREET (W)														
10	L2	12	2	13	16.7	0.030	7.8	LOS A	0.1	0.8	0.31	0.63	0.31	63.0
11	T1	2	0	2	0.0	0.030	7.1	LOS A	0.1	0.8	0.31	0.63	0.31	64.3
12	R2	13	1	14	7.7	0.030	8.7	LOS A	0.1	0.8	0.31	0.63	0.31	65.1
Approach		27	3	28	11.1	0.030	8.2	LOS A	0.1	0.8	0.31	0.63	0.31	64.1
All Vehicles		356	25	375	7.0	0.098	1.5	NA	0.1	0.8	0.05	0.12	0.05	91.2

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

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

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

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

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

Queue Model: SIDRA Standard.

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

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

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Project: C:\Users\Aaron Hesse\Cirqa Pty Ltd\Cirqa Pty Ltd Team Site - Public\2022\22381 Code Amendment Freeling\SIDRA\22381 Code Amendment Freeling V1.1.sip9

# MOVEMENT SUMMARY

Site: 101 [FUAM - BORROW STREET/THIELE HIGHWAY (Site Folder: FUTURE DEVELOPMENT)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: THIELE HIGHWAY (S)														
1	L2	5	0	5	0.0	0.085	7.9	LOS A	0.0	0.1	0.01	0.03	0.01	81.6
2	T1	134	27	141	20.1	0.085	0.0	LOS A	0.0	0.1	0.01	0.03	0.01	98.8
3	R2	1	0	1	0.0	0.085	7.9	LOS A	0.0	0.1	0.01	0.03	0.01	80.8
Approach		140	27	147	19.3	0.085	0.3	NA	0.0	0.1	0.01	0.03	0.01	97.9
East: LESKE ROAD (E)														
4	L2	1	0	1	0.0	0.006	7.4	LOS A	0.0	0.1	0.33	0.60	0.33	69.1
5	T1	3	0	3	0.0	0.006	7.1	LOS A	0.0	0.1	0.33	0.60	0.33	64.8
6	R2	1	0	1	0.0	0.006	8.8	LOS A	0.0	0.1	0.33	0.60	0.33	68.7
Approach		5	0	5	0.0	0.006	7.5	LOS A	0.0	0.1	0.33	0.60	0.33	66.4
North: THIELE HIGHWAY (N)														
7	L2	1	0	1	0.0	0.108	8.4	LOS A	0.3	2.2	0.15	0.16	0.15	78.0
8	T1	139	6	146	4.3	0.108	0.2	LOS A	0.3	2.2	0.15	0.16	0.15	93.6
9	R2	43	2	45	4.7	0.108	8.1	LOS A	0.3	2.2	0.15	0.16	0.15	75.0
Approach		183	8	193	4.4	0.108	2.1	NA	0.3	2.2	0.15	0.16	0.15	88.3
West: BORROW STREET (W)														
10	L2	65	5	68	7.7	0.117	7.6	LOS A	0.4	3.2	0.30	0.64	0.30	65.5
11	T1	3	0	3	0.0	0.117	7.3	LOS A	0.4	3.2	0.30	0.64	0.30	64.3
12	R2	47	0	49	0.0	0.117	8.7	LOS A	0.4	3.2	0.30	0.64	0.30	67.6
Approach		115	5	121	4.3	0.117	8.1	LOS A	0.4	3.2	0.30	0.64	0.30	66.3
All Vehicles		443	40	466	9.0	0.117	3.1	NA	0.4	3.2	0.14	0.25	0.14	83.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

Site: 101 [FUPM - BORROW STREET/THIELE HIGHWAY (Site Folder: FUTURE DEVELOPMENT)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
South: THIELE HIGHWAY (S)														
1	L2	61	0	64	0.0	0.121	7.8	LOS A	0.0	0.1	0.00	0.20	0.00	78.1
2	T1	151	11	159	7.3	0.121	0.0	LOS A	0.0	0.1	0.00	0.20	0.00	93.8
3	R2	1	0	1	0.0	0.121	7.9	LOS A	0.0	0.1	0.00	0.20	0.00	77.5
Approach		213	11	224	5.2	0.121	2.3	NA	0.0	0.1	0.00	0.20	0.00	88.6
East: LESKE ROAD (E)														
4	L2	1	0	1	0.0	0.009	7.4	LOS A	0.0	0.2	0.37	0.61	0.37	69.0
5	T1	6	0	6	0.0	0.009	7.4	LOS A	0.0	0.2	0.37	0.61	0.37	64.7
6	R2	1	0	1	0.0	0.009	8.5	LOS A	0.0	0.2	0.37	0.61	0.37	68.6
Approach		8	0	8	0.0	0.009	7.6	LOS A	0.0	0.2	0.37	0.61	0.37	65.7
North: THIELE HIGHWAY (N)														
7	L2	1	0	1	0.0	0.104	8.6	LOS A	0.2	1.8	0.15	0.13	0.15	78.5
8	T1	140	10	147	7.1	0.104	0.2	LOS A	0.2	1.8	0.15	0.13	0.15	94.3
9	R2	32	1	34	3.1	0.104	8.3	LOS A	0.2	1.8	0.15	0.13	0.15	76.2
Approach		173	11	182	6.4	0.104	1.8	NA	0.2	1.8	0.15	0.13	0.15	90.3
West: BORROW STREET (W)														
10	L2	25	2	26	8.0	0.064	7.6	LOS A	0.2	1.7	0.32	0.65	0.32	65.2
11	T1	5	0	5	0.0	0.064	7.4	LOS A	0.2	1.7	0.32	0.65	0.32	64.1
12	R2	27	1	28	3.7	0.064	8.9	LOS A	0.2	1.7	0.32	0.65	0.32	66.2
Approach		57	3	60	5.3	0.064	8.2	LOS A	0.2	1.7	0.32	0.65	0.32	65.6
All Vehicles		451	25	475	5.5	0.121	2.9	NA	0.2	1.8	0.11	0.24	0.11	84.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# **APPENDIX C**

## **SIDRA RESULTS - BORROW STREET/STEPHENSON STREET/TEMPLERS ROAD**

# MOVEMENT SUMMARY

Site: 101 [EXAM - BORROW STREET/TEMPLERS ROAD (Site Folder: EXISTING)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: STEPHENSON ST (SE)														
5	T1	39	5	41	12.8	0.027	0.0	LOS A	0.0	0.3	0.06	0.07	0.06	49.4
6	R2	6	1	6	16.7	0.027	5.0	LOS A	0.0	0.3	0.06	0.07	0.06	48.2
Approach		45	6	47	13.3	0.027	0.7	NA	0.0	0.3	0.06	0.07	0.06	49.3
NorthEast: BORROW STREET (NE)														
7	L2	20	0	21	0.0	0.026	4.7	LOS A	0.1	0.7	0.16	0.51	0.16	46.3
9	R2	13	1	14	7.7	0.026	5.1	LOS A	0.1	0.7	0.16	0.51	0.16	45.7
Approach		33	1	35	3.0	0.026	4.9	LOS A	0.1	0.7	0.16	0.51	0.16	46.0
NorthWest: TEMPLERS ROAD (NW)														
10	L2	10	3	11	30.0	0.042	4.8	LOS A	0.0	0.0	0.00	0.07	0.00	48.7
11	T1	64	1	67	1.6	0.042	0.0	LOS A	0.0	0.0	0.00	0.07	0.00	49.7
Approach		74	4	78	5.4	0.042	0.7	NA	0.0	0.0	0.00	0.07	0.00	49.5
All Vehicles		152	11	160	7.2	0.042	1.6	NA	0.1	0.7	0.05	0.17	0.05	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

Site: 101 [EXPM - BORROW STREET/TEMPLERS ROAD (Site Folder: EXISTING)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: STEPHENSON ST (SE)														
5	T1	85	2	89	2.4	0.062	0.1	LOS A	0.1	1.0	0.07	0.12	0.07	49.1
6	R2	24	0	25	0.0	0.062	4.7	LOS A	0.1	1.0	0.07	0.12	0.07	48.2
Approach		109	2	115	1.8	0.062	1.1	NA	0.1	1.0	0.07	0.12	0.07	48.9
NorthEast: BORROW STREET (NE)														
7	L2	8	1	8	12.5	0.017	4.8	LOS A	0.1	0.5	0.15	0.52	0.15	46.1
9	R2	11	2	12	18.2	0.017	5.4	LOS A	0.1	0.5	0.15	0.52	0.15	45.6
Approach		19	3	20	15.8	0.017	5.2	LOS A	0.1	0.5	0.15	0.52	0.15	45.8
NorthWest: TEMPLERS ROAD (NW)														
10	L2	10	1	11	10.0	0.032	4.7	LOS A	0.0	0.0	0.00	0.10	0.00	48.8
11	T1	46	4	48	8.7	0.032	0.0	LOS A	0.0	0.0	0.00	0.10	0.00	49.4
Approach		56	5	59	8.9	0.032	0.8	NA	0.0	0.0	0.00	0.10	0.00	49.3
All Vehicles		184	10	194	5.4	0.062	1.4	NA	0.1	1.0	0.06	0.16	0.06	48.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

# MOVEMENT SUMMARY

Site: 101 [FUAM - BORROW STREET/TEMPLERS ROAD (Site Folder: FUTURE DEVELOPMENT)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: STEPHENSON ST (SE)														
5	T1	39	5	41	12.8	0.030	0.1	LOS A	0.1	0.5	0.09	0.12	0.09	49.1
6	R2	11	1	12	9.1	0.030	4.9	LOS A	0.1	0.5	0.09	0.12	0.09	48.0
Approach		50	6	53	12.0	0.030	1.1	NA	0.1	0.5	0.09	0.12	0.09	48.8
NorthEast: BORROW STREET (NE)														
7	L2	38	0	40	0.0	0.048	4.8	LOS A	0.2	1.3	0.16	0.52	0.16	46.3
9	R2	24	1	25	4.2	0.048	5.1	LOS A	0.2	1.3	0.16	0.52	0.16	45.8
Approach		62	1	65	1.6	0.048	4.9	LOS A	0.2	1.3	0.16	0.52	0.16	46.1
NorthWest: TEMPLERS ROAD (NW)														
10	L2	18	3	19	16.7	0.046	4.7	LOS A	0.0	0.0	0.00	0.12	0.00	48.6
11	T1	64	1	67	1.6	0.046	0.0	LOS A	0.0	0.0	0.00	0.12	0.00	49.4
Approach		82	4	86	4.9	0.046	1.0	NA	0.0	0.0	0.00	0.12	0.00	49.2
All Vehicles		194	11	204	5.7	0.048	2.3	NA	0.2	1.3	0.07	0.25	0.07	48.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.



# MOVEMENT SUMMARY

Site: 101 [FUPM - BORROW STREET/TEMPLERS ROAD (Site Folder: FUTURE DEVELOPMENT)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[ Total veh/h	HV ] veh/h	[ Total veh/h	HV ] %				[ Veh. veh	Dist ] m				
SouthEast: STEPHENSON ST (SE)														
5	T1	85	2	89	2.4	0.074	0.1	LOS A	0.3	1.8	0.11	0.19	0.11	48.6
6	R2	44	0	46	0.0	0.074	4.8	LOS A	0.3	1.8	0.11	0.19	0.11	47.7
Approach		129	2	136	1.6	0.074	1.7	NA	0.3	1.8	0.11	0.19	0.11	48.3
NorthEast: BORROW STREET (NE)														
7	L2	13	1	14	7.7	0.028	4.8	LOS A	0.1	0.7	0.15	0.53	0.15	46.2
9	R2	18	2	19	11.1	0.028	5.4	LOS A	0.1	0.7	0.15	0.53	0.15	45.7
Approach		31	3	33	9.7	0.028	5.2	LOS A	0.1	0.7	0.15	0.53	0.15	45.9
NorthWest: TEMPLERS ROAD (NW)														
10	L2	19	1	20	5.3	0.037	4.6	LOS A	0.0	0.0	0.00	0.16	0.00	48.5
11	T1	46	4	48	8.7	0.037	0.0	LOS A	0.0	0.0	0.00	0.16	0.00	49.1
Approach		65	5	68	7.7	0.037	1.4	NA	0.0	0.0	0.00	0.16	0.00	48.9
All Vehicles		225	10	237	4.4	0.074	2.1	NA	0.3	1.8	0.09	0.23	0.09	48.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).  
 Vehicle movement LOS values are based on average delay per movement.  
 Minor Road Approach LOS values are based on average delay for all vehicle movements.  
 NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.  
 Delay Model: SIDRA Standard (Geometric Delay is included).  
 Queue Model: SIDRA Standard.  
 Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).  
 HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.