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Memo

To	Fraser McNutt / Sam Le Heron (Barker & Associates)
From	Siva Balachandran
Date	16 June 2025
Job No.	148900
Job name	SL1 Rogerson Block
Subject	**Transportation Assessment – Referral Application**

1. Introduction

Bloxam Burnett & Olliver ("BBO") has been commissioned by G A Rogerson ("the Applicant") to prepare a preliminary transport assessment to support a referral application in accordance with the Fast-track Approvals Act 2024. Rogerson Block development is a combined residential and industrial development within the wider Southern Links 1 ("SL1") area.

The Applicant is part of a well-established group of developers involved in a consortium that has been established for some time that represent the bulk of the SL1 growth cell, recognised by Future Proof and the development community in the Waikato. Strong synergies with the listed (SL1 Stage 1 Industrial and Stage 1 Residential) Fast-Track project exist.

This memorandum provides a high-level assessment of an indicative transport network and access arrangement identified through a master planning process to service the proposed development of the Rogerson Block in the SL1 growth area ("subject site"). The subject site is located at the southwest end of Hamilton, bordered by Tuhikaramea Road to the west and Higgins Road to the east. The extent and locality of the subject site is shown in Figure 1.

Figure 1: Subject Site Locality

The memo firstly describes the strategic transport network considerations influencing connectivity for the SL1 Rogerson Block, followed by a high-level assessment of the anticipated transport effects on the adjoining road network, and finally an overview of the infrastructure upgrades and triggers considered necessary to sustainably integrate the development with the present and future transport network surrounding the site.

The strategic high-level considerations that influence the ultimate form of the SL1 Rogerson Block transport network are:

- The existing transport network; capacity and connectivity constraints and opportunities.
- Providing appropriate separation of residential land use and access from industrial land use and transport access.
- Maximising the potential development yield of the site.
- Access to public transport ("PT") and walking and cycling network integration with existing infrastructure.

2. Proposal

The Applicant seeks to develop approximately 43 ha (gross) of land yielding approximately 7 hectares ("ha") of net developable land for residential purposes and 20 ha net developable land for industrial activities.

For this preliminary assessment, it is assumed that the residential component will yield approximately 205 new residential units, primarily medium density (300 m^2 allotments), of varying typologies such as terraced, duplex and detached dwellings.

SL1 is essentially two distinct areas from a transportation access point of view due to severance by the North Island Main Trunk Rail line ("NIMTR") and the Hamilton Southern Links Arterial ("HSL") designation. The two areas are referred herein as the SL1 Northern and Southern Blocks. The Rogerson Block is located within the Northern Block as illustrated in Figure 2.

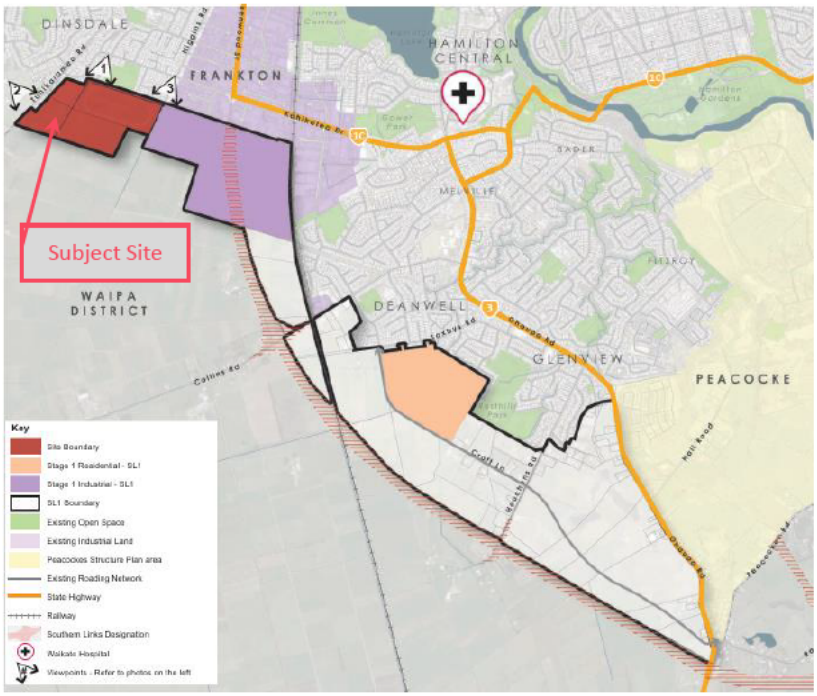


Figure 2: SL1 Indicative Concept Plan

Figure 3 presents the high-level Masterplan for the subject site, developed by Barker and Associates with input by Maven (3 waters) and BBO (Transport). It shows just one possible development outcome for the subject site and as for all masterplans, will continue to evolve to respond to opportunities and constraints as they are identified through the planning process.

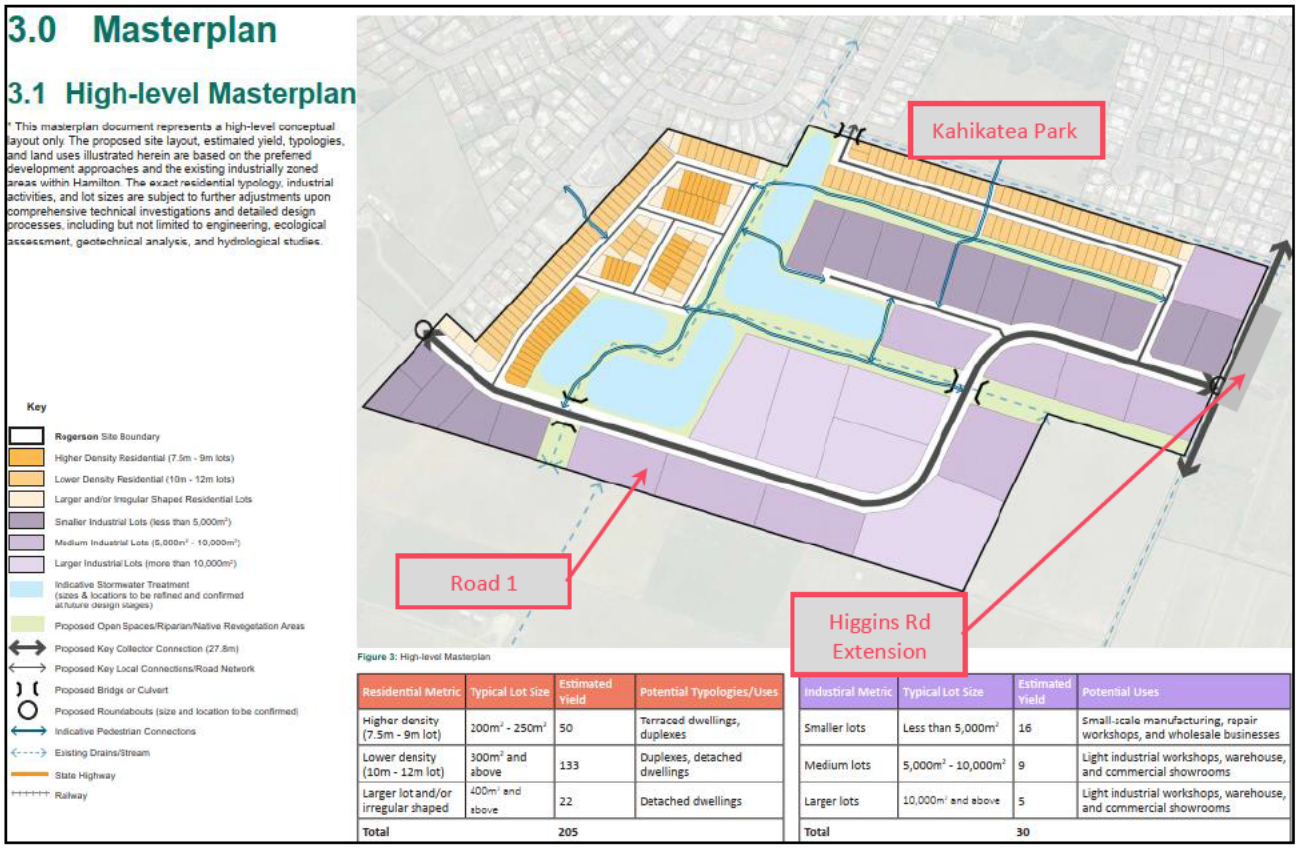


Figure 3: SL1 Rogerson Block High-level Masterplan

2.1 Proposed Staging

The proposed staging for the subject site is presented in Figure 4. Residential Stages 1 and 2 will have a net developable land area of approximately 2.6 ha and 4.3 ha respectively, while industrial Stages 1 and 2 will have a net developable land area of approximately 7.8 ha and 12.1 ha respectively.

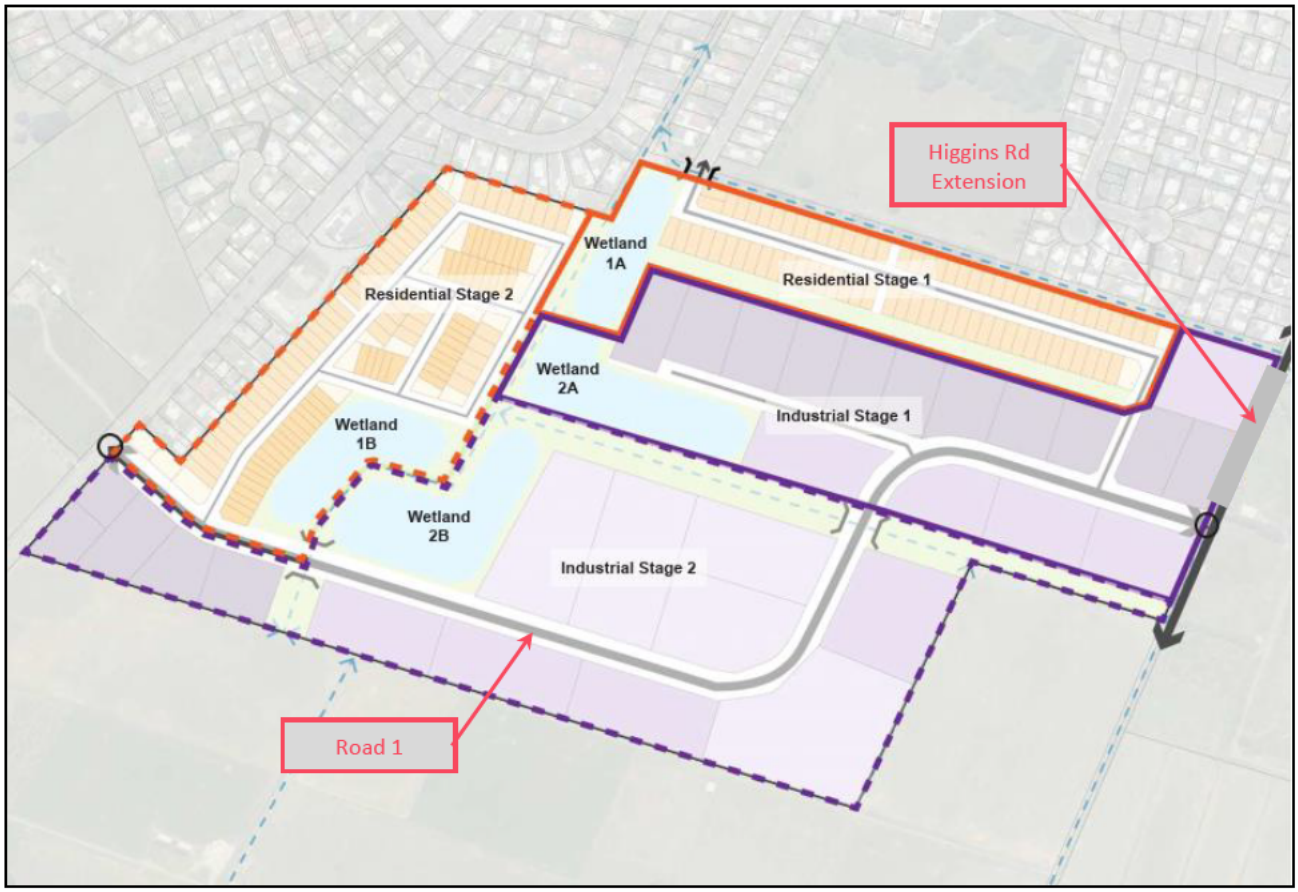


Figure 4: Rogerson Block Proposed Staging

2.2 Access and Connectivity Strategy

The high-level Masterplan adopts three primary access points to facilitate the separation of residential and industrial traffic as much as practicable within the constraints of the subject site. Key components of the network are described below:

- Provision of an east / west orientated Collector Road through the industrial zone ("Road 1").
- Connection of Road 1 at the west end to Tuhikaramea Road via a new access intersection, and at the east end to an extended Higgins Road while future proofing a connection to the SL1 North Industrial land area to the east.
- Connection of the Stage 1 residential area to Karen Crescent, and to the eastern end of Road 1.
- Connection of the Stage 2 residential area to the western end of Road 1.
- Provision of a safe and efficient road network within the subject site that supports the types of vehicles and movements associated with industrial and residential activities.
- Provision of a safe and convenient walking and cycling network throughout the subject site connecting to existing active mode infrastructure on the wider road network.

Table No: 1 provides a summary of the configuration of the three proposed access points.

Table No: 1

Preliminary Access Configurations			
Proposed Access	**Access Type**	**Anticipated Configuration**	**Design Guide Reference**
Tuhikaramea Road	Intersection	3-arm roundabout with single circulating lane, entry and exit lanes	In accordance with Austroads Guide to Road Design Part 4B: Roundabouts
Higgins Road	Intersection	Extension of Higgins Road south to connect with Road 1.	Traffic Control Devices Manual Part 4 Figure 4-14. Regional Infrastructure Technical Specification ("RITS")
Karen Cresent	Access Rd	Extension of Karen Cresent into the subject site	RITS

2.2.1 Tuhikaramea Road Access

Initial intersection modelling conducted for this assessment, based on preliminary trip generation and distribution calculations in Sections 4 and 5, indicates that a roundabout is likely to be necessary to achieve safe and efficient access from Tuhikaramea Road to the site.

A give-way controlled T-intersection with a right turn bay on Tuhikaramea Road has been tested as an alternative option but performs poorly (insufficient capacity) due to the high volume of through traffic on Tuhikaramea Road, including future trips from the approved Temple View residential development. Modelling shows the right turn out movement from the site would experience extensive delays during both the AM and PM peak periods, increasing the safety risk for all road users as drivers will feel the pressure to accept unsuitable gaps in the opposing traffic flow.

The land on the opposite side of Tuhikaramea Road from the Rogerson Block is currently farm paddocks but zoned Future Urban in the Hamilton City Council ("HCC") Operative District Plan. Therefore, the road environment along the section of Tuhikaramea Road fronting the subject site is anticipated to change from rural to an urban environment at some point in future.

An 80 / 50 km/h speed limit change presently exists on Tuhikaramea Road about where the new road access to the site is indicated on the Masterplan. Our opinion is that an 80 km/h speed limit through the new roundabout and this section of Tuhikaramea Road when urbanised would not be appropriate. Therefore, the speed limit change would ideally be relocated approximately 170 m southwest on Tuhikaramea Road to the southern boundary of the subject site.

The new roundabout should be designed in accordance with the best practice guidance in the *Austroads Guide to Road Design Part 4B: Roundabout* ("AGRD Part 4B"). Table 4.1 of AGRD Part 4B identifies the desirable central island radius for a roundabout with a 60 km/h design speed environment is 12 m (ie 24 m diameter). This size is consistent with two existing three-arm roundabouts on Tuhikaramea Road at the north and south ends of Temple View near the 80 km/h to 50 km/h speed limit thresholds.

Figure 5 illustrates an example of a similar scale three-arm single lane roundabout located on Tuhikaramea Road in Temple View, approximately 2.6 km to the south.

Figure 5: Existing 3-Arm Roundabout, Tuhikaramea Road, Temple View

2.2.2 Proposed Higgins Road Access

The eastern connection of Road 1 to an extended Higgins Road is recommended to distribute the industrial traffic movements more effectively throughout the wider network. It also provides an alternative emergency vehicle access point to the industrial and residential areas of the site. Higgins Road is already a joint industrial / residential access road. It would be extended approximately 215 m south from the existing cul-de-sac to Road 1.

2.3 Future Connectivity

Road 1 connection to Higgin Road extension will be future proofed so that a connection to the SL1 North Industrial area could be provided, as shown in Figure 6. Road 1 would then intersect with Wickham Street extension before continuing east to a potential connection with HSL (NZTA designation).

HCC advised during our initial discussions on SL1 Northern Block that a direct connection from the Stage 1 industrial area to Kahikatea Drive (SH1C) would not be supported (as a long-term solution) given the access challenges that exist because of the high traffic volumes. For this reason, HCC also advised that they have had initial discussions with NZ Transport Agency Waka Kotahi ("NZTA") about allowing a road connection from the future HSL corridor to the identified SL1 Stage 1 industrial area to avoid it becoming land-locked by the HSL designation. The location of a new connection is approximately 600 m south of the future HSL / Kahikatea Drive / Greenwood Street signalised intersection.

However, since there is presently no certainty that Stage 1 of SL1 North will be consented, this preliminary assessment for Rogerson Block is undertaken in isolation from the land use and road network proposed in the SL1 North Stage 1 Fast Track consent application.

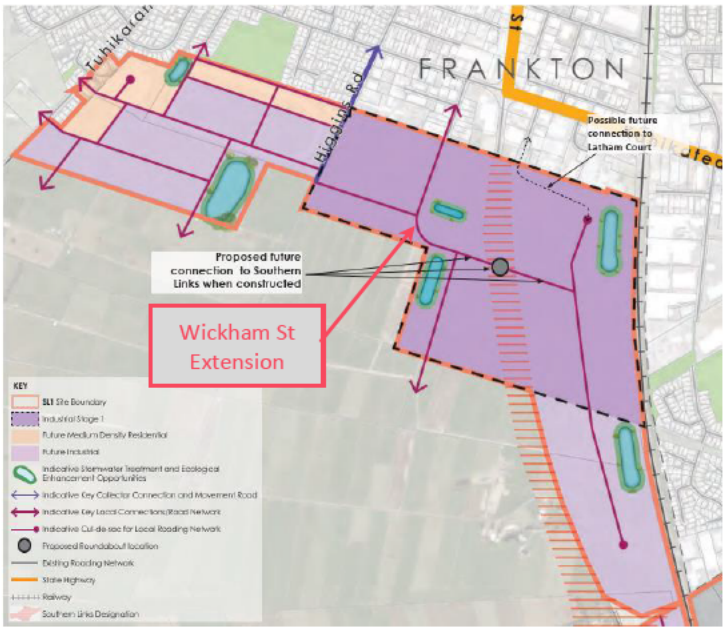


Figure 6: Potential Future Connectivity to SL1 North Stage 1 Industrial Area

3. Existing Transport Network – Constraints and Opportunities

The transport network adjacent to SL1 Rogerson Block includes the local roads of Karen Cresent (residential land use) and Higgins Road (residential/industrial land use) and the primary roads of Tuhikaramea Road (minor arterial), Kahikatea Drive (collector road) and SH1C / Greenwood Street (major arterial).

The Average Daily Traffic ("ADT") and posted speed limits for each of these roads are summarised in Table No: 2 below.

Table No: 2

ADT Volumes and Posted Speed Limits				
Road	ADT[1] (vpd)	HCV[2] (%)	Posted Speed Limit[3]	Mean Operating Speed[4]
Karen Cres (between Kahikatea Dr and site)	261	6.8%	40 km/h	22 km/h
Higgins Rd (between Kahikatea Dr and site)	611	14%	50 km/h	40 km/h
Kahikatea Dr	5,378	7.5%	50 km/h	46 km/h
Tuhikaramea Rd (site frontage)	8,467	4.5%	80 km/h	71 km/h
SH1C (Greenwood St)	24,136	6.2%	60 km/h	57 km/h
SH1C (Kahikatea Dr)	27,515	6.2%	60 km/h	55 km/h

[1] Mobile Road website; 2024 estimates
[2] Mobile Road website; 2024 estimates
[3] MegaMaps
[4] MegaMaps

3.1 Network Constraints

The primary road network constraint for SL1 Rogerson Block accessibility is Kahikatea Drive / SH1C (Greenwood Street) intersection. This intersection is currently a give way-controlled T-intersection but is to be replaced in future with a large urban signalised intersection as part of the HSL project.

Preliminary transport modelling for SL1 Rogerson Block indicates that a signalised intersection, or an initial form of it, is likely needed in place of the T-intersection to support development of the subject site if it is completed before the construction of the HSL. The HSL project is currently listed under the government's Roads of National Significance (RoNS), increasing the probability of funding for construction within 10 years.

This memo outlines the desktop assessment undertaken to date to identify the key transport infrastructure required to support the Rogerson Block development. Further detailed modelling and evaluation, most likely with inputs from the Waikato Regional Transport Model ("WRTM") and/or Hamilton Transport Model (if completed), will be undertaken for the substantive Consent application transport assessment.

4. Trip Generation

4.1 Trip Generation Rates

4.1.1 Residential

Typical trip generation rates for medium density residential flats and dwelling houses have been obtained from the RTA Guide to Traffic Generating Developments. As the number of residential detached dwellings, apartments and townhouses is unknown at this stage, an average trip generation rate between the medium density residential flat and dwelling house trip rates is considered reasonable for this high-level assessment. Thus, a daily trip generation rate of 7.75 per dwelling unit and a peak hour trip generation rate of 0.75 per dwelling were adopted.

4.1.2 Industrial

A peak hour trip generation rate of 20.9 trips per hour per developable hectare has been adopted for the industrial land use component. This trip generation rate has been derived and used by BBO in numerous transport assessments for new industrial zones including the following recent plan changes:

- Private Plan Change 20 – Airport Northern Precinct Extension ("PPC20"), 2023
- Waikato District Plan review – Comfort Group Industrial Park Ohinewai Rezoning, 2022

4.2 Predicted Trip Generation

4.2.1 Residential

Table No: 3 outlines the potential residential development yield of the subject site, along with peak hour trip generation calculations which is based on the trip generation rate identified in Section 4.1.1. Travel mode splits are estimated based on the 2023 Census data on how people who live in Kahikatea travel to work.

Table No: 3

Predicted Trip Generation - Residential								
Dev Land Area (ha)	Density (m^2 / dwelling)	No. of dwellings	Peak Hour Trip Generation Rate (trips / hr / dwelling)	Total no. of trips generated during peak hour	Travel Modes[5]			
					PT (trips / hr)	Active Modes (trips / hr)	Private Veh Passenger (trips / hr)	Private Veh Driver (trips / hr)
6.97	200 - 400	232	0.75	154	5	8	7	119

Based on Table No: 3, the residential component of SL1 Rogerson Block is predicted to add around 120 new vehicle trips to the adjoining road network during the commuter peak periods.

4.2.2 Industrial

Table No: 4 outlines peak hour trip generation calculation which is based on the trip generation rate identified in Section 4.1.2. Travel mode splits are based on the 2023 Census data on how people who work in Frankton Junction travel to work.

Table No: 4

Predicted Trip Generation – Industrial						
Dev Land Area (ha)	Peak Hour Trip Generation Rate (trips / hr / dev ha)	Total no. of trips generated during peak hour	Travel Modes[6]			
			PT (trips / hr)	Active Modes (trips / hr)	Private Veh Passenger (trips / hr)	Private Veh Driver (trips / hr)
19.9	20.9	417	5	14	13	376

Table No: 4 illustrates that the industrial component of SL1 Rogerson Block is expected to add approximately 380 new vehicle trips to the adjoining road network during the commuter peak periods.

5. Trip Distribution

The WRTM run that was created to aid the assessment off effects of PPC20 was used to understand the inbound and outbound directional split for industrial activities, while tube counts undertaken in 2024 at the Temple View residential development were used to understand the inbound and outbound directional split for residential activities during commuter peak periods. Table No: 5 provides a summary of the inbound and outbound trips for the residential and industrial components of SL1 Rogerson Block.

[5] https://tools.summaries.stats.govt.nz/places/SA2/kahikatea#main-means-of-travel-to-work
[6] https://tools.summaries.stats.govt.nz/places/SA2/frankton-junction#main-means-of-travel-to-work

Table No: 5

Inbound and Outbound Trips					
Peak Period	Land Use	Incoming	Outgoing	Incoming New Vehicle Trips	Outgoing New Vehicle Trips
AM	Residential	26%	74%	31	88
PM	Residential	74%	26%	88	31
AM	Industrial	80%	20%	301	75
PM	Industrial	27%	73%	102	275

Origin – destination data from TomTom was obtained from HCC to understand the current traffic patterns of the existing residential and industrial traffic in Kahikatea / Frankton Junction (i.e. accessed via Kahikatea Drive and Higgins Road) to inform the likely traffic distribution of the SL1 Rogerson Block development traffic around the wider network. Figure 7 to Figure 10 illustrate the likely trip distribution patterns in percentages during peak periods.

Figure 7: Weekday AM Peak Hour Trip Distribution – Residential

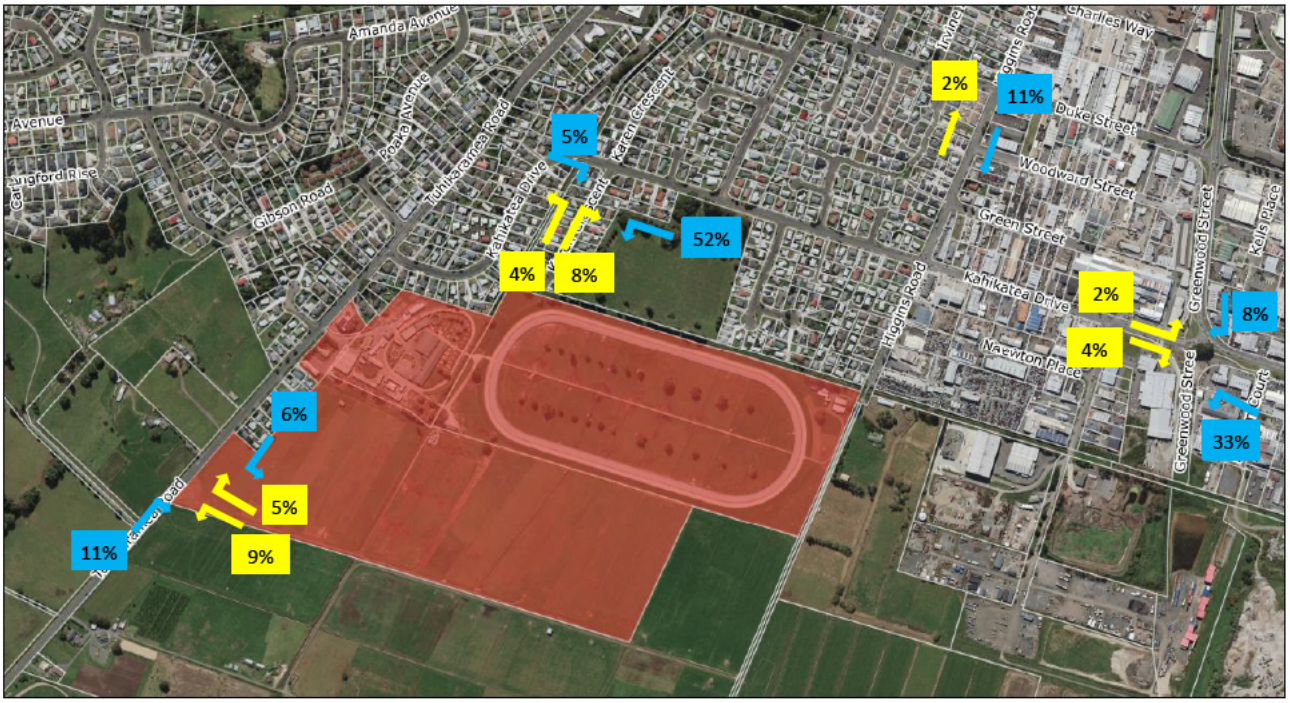


Figure 8: Weekday PM Peak Hour Trip Distribution – Residential

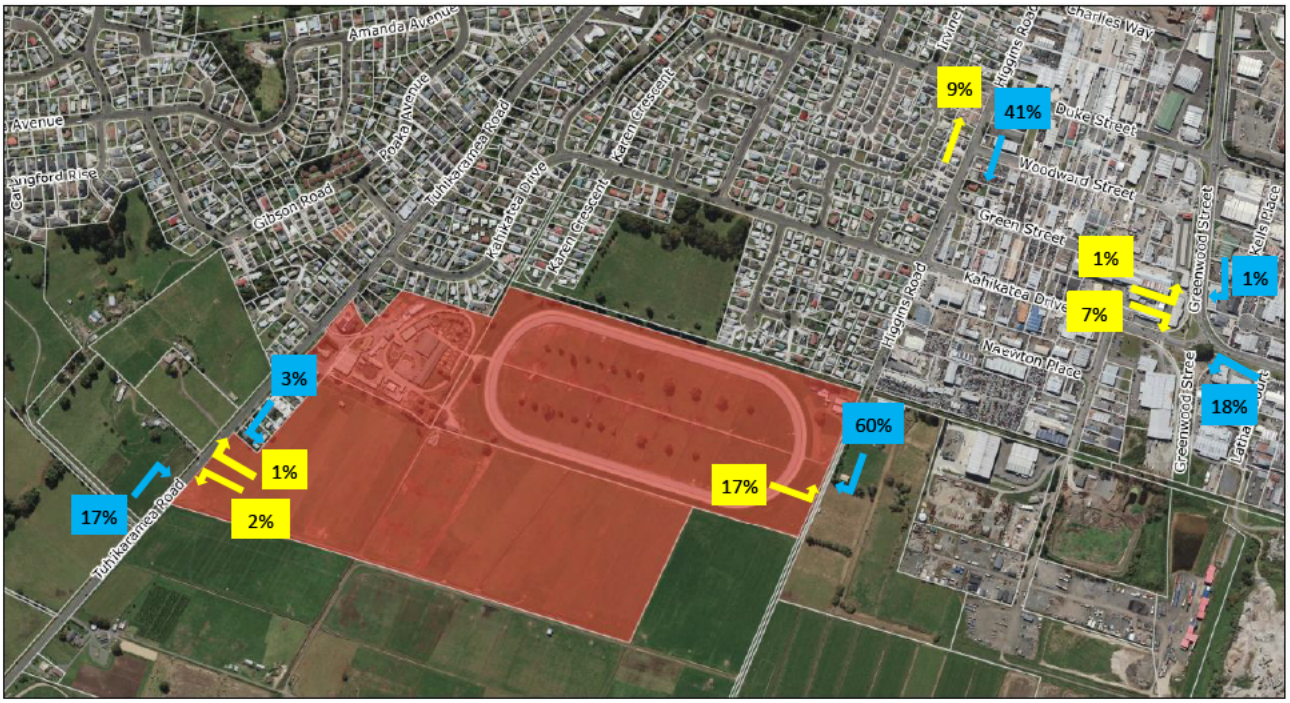


Figure 9: Weekday AM Peak Hour Trip Distribution – Industrial

Figure 10: Weekday PM Peak Hour Trip Distribution – Industrial

6. Preliminary Assessment of Transportation Effects

6.1 Internal Transport Network

The subject site internal road network will consist of two industrial road typologies and one residential road typology.

6.1.1 Industrial Collector Road - East-West Spine Road

The main internal road, also referred to as the spine road, will run from the new Tuhikaramea Road roundabout access to the new Higgins Road access intersection. The following indicative typical cross-section illustrates how a 27.8 m wide spine road through the subject site can appropriately cater for high volume of heavy vehicles and provide connectivity for active modes.

This industrial collector road typology provides a carriageway width of 11.5 m inclusive of a 2.5 m wide flush median. A 3.5 m wide shared walking and cycling paths is proposed on the northern side of the road such that it provides a direct connection to the residential roads. Recessed parallel parking can be provided both sides of the carriageway, replacing the 2.5 m wide planted berm as shown in Figure 11.

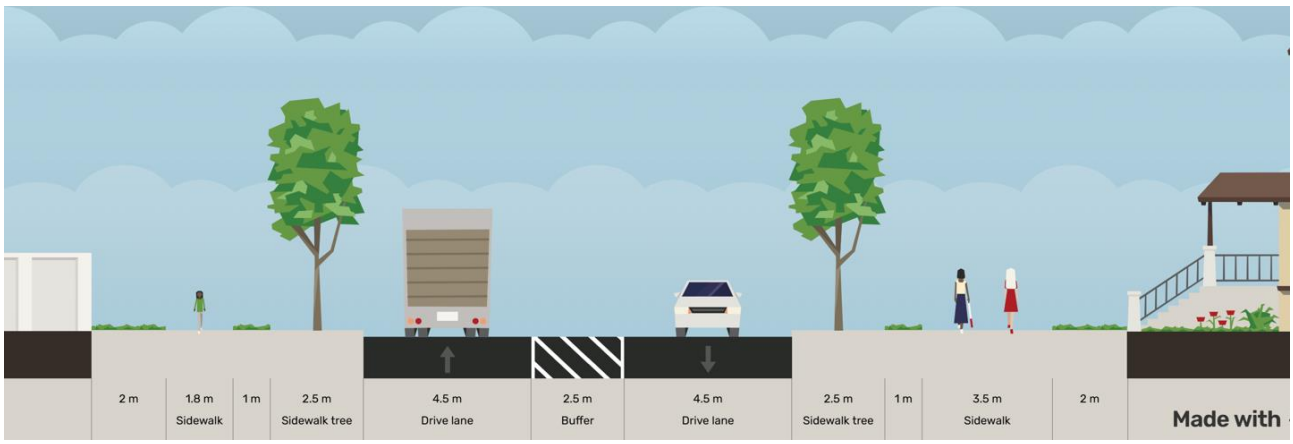


Figure 11: Indicative Typical Cross-Section – Spine Road (27.6 m wide)

6.1.2 Residential and Industrial Local Roads

The typical cross-section of the local roads will be in accordance with HCC Operative District Plan as presented in Figure 12 and Figure 13.

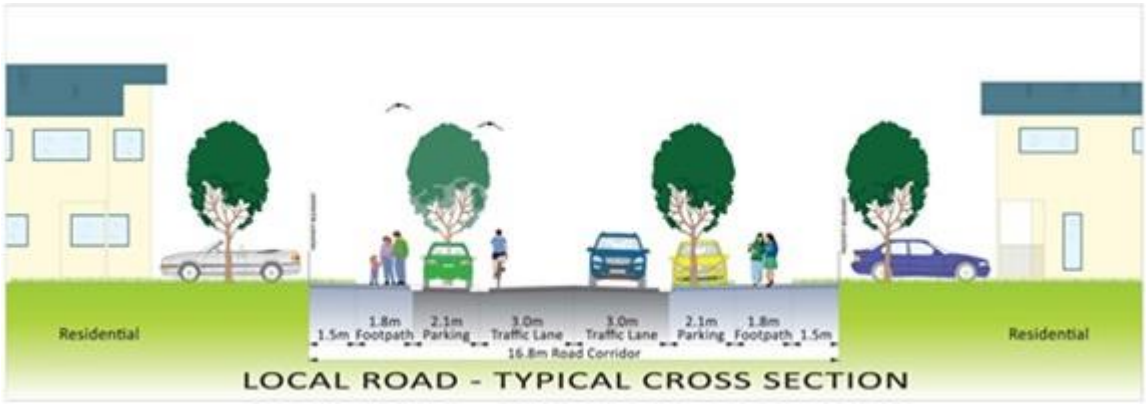


Figure 12: Typical Cross-Section – Residential Local Road

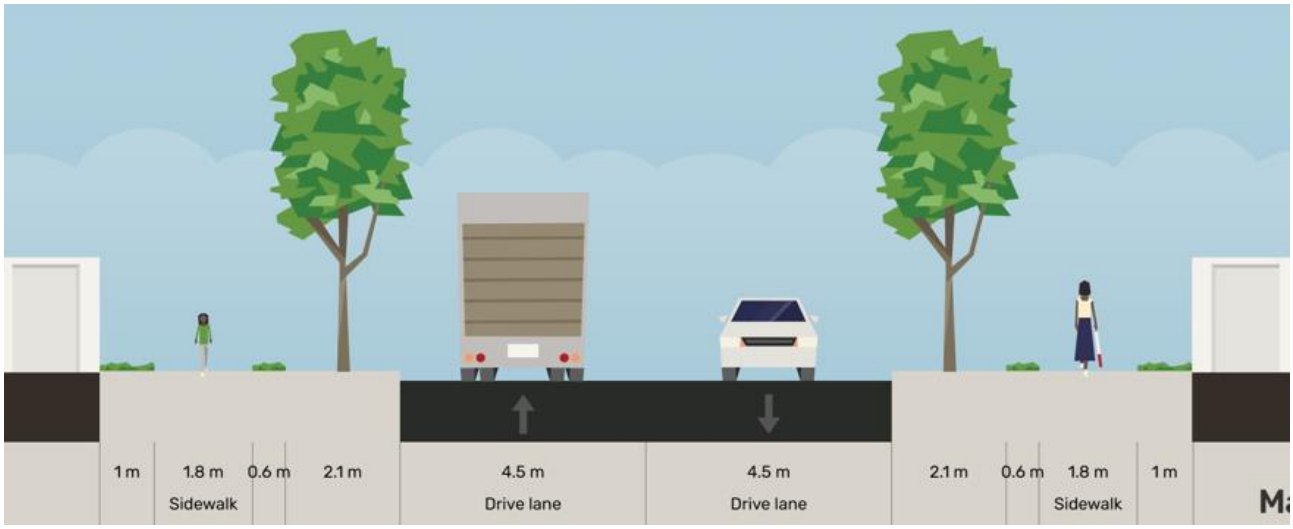


Figure 13: Typical Cross-Section – Industrial Local Road

6.2 Integration with Existing Public Transport

The locality is well served by public transport with bus stops located on Tuhikaramea Rd, Kahikatea Drive and Higgins Road as shown in Figure 14. The *Waikato Regional Public Transport Plan 2022 – 2032 Policy P13* recommends that over 95 percent of all properties within Hamilton should have access to public transport within a 600 m or less walking distance. The approximate walking distances from the proposed access points on Tuhikaramea Road, Karen Crescent and Higgins Road are presented in Figure 15 and they are all within the maximum requirement.

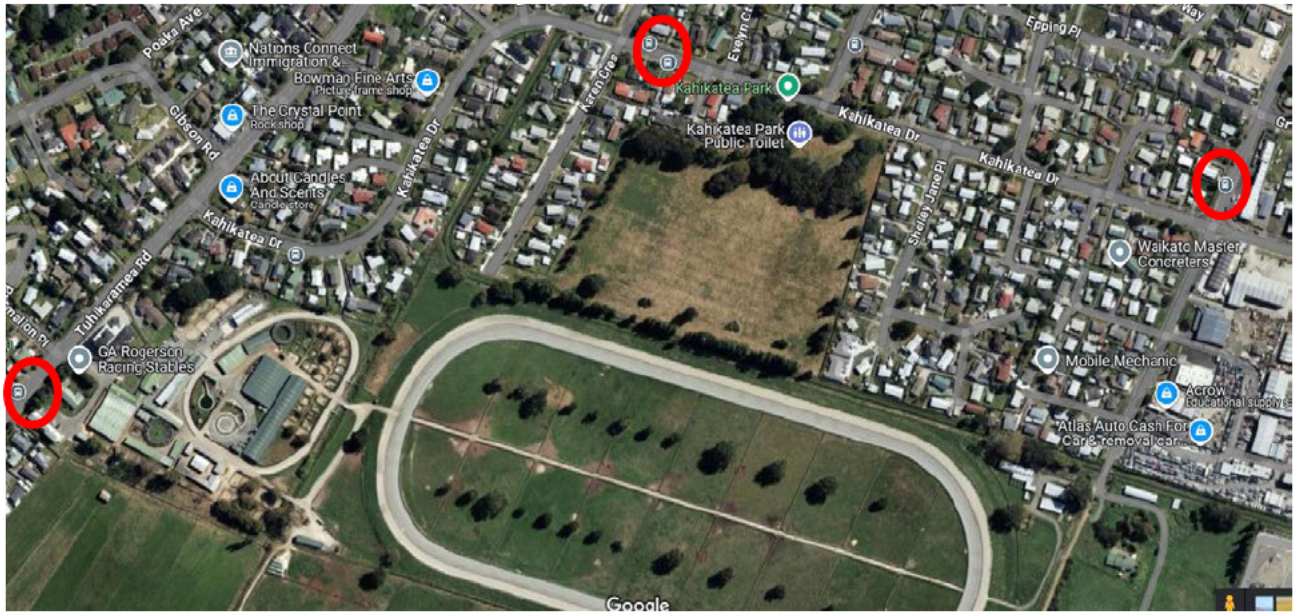


Figure 14: Existing Bus Stops Near the Subject Site

Figure 15: Approximate Walking Distances to Nearest Bus Stops

6.3 Walking and Cycling Network and Connectivity

Road 1 (east-west spine road) through the subject site provides an opportunity for a shared walking and cycling path to be included along the full length of the road, connecting the proposed roundabout intersection on Tuhikaramea Road to Higgins Road extension and then northwards on Higgins Road to the intersection with Kahikatea Drive.

The design of the proposed roundabout should include off-ramps for cyclists before the entry land pinch points, and typical kerb letdown crossing points through the roundabout splitter islands. The existing footpaths on both sides of Tuhikaramea Road should also be extended to the new roundabout and connected to the walking and cycling shared path proposed along Road 1.

The residential roads are expected to be constructed to facilitate slow vehicle speeds and promote walking and cycling for short trips.

6.4 Road Safety

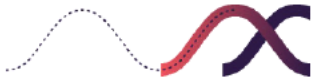
Crash records for a five-year period 2020 – 2024 were sourced from the NZTA Crash Analysis System ("CAS"). Additionally, we have also included all available data for 2025. The study area includes all crashes within a 50 m radius of key intersections identified in 6.5 as well as sections of various roads in the vicinity of the subject site.

Table No: 6 summarises the crash and injury history together with relevant commentary.

Table No: 6

Crash History 2020 - 20205						
Location	Total # Crashes	Crash Severity				Comments
		Death	Serious Injury	Minor Injury	Non-injury	
Intersections						
Tuhikaramea Rd / Kahikatea Dr / Gibson Rd Staggered Intersections	3	0	0	0	3	One crash involved a vehicle travelling southbound on Tuhikaramea Rd after completing a right turn from Gibson Rd. As the vehicle passed the intersection with Kahikatea Dr, it collided with another vehicle that was attempting to turn right out Kahikatea Dr but had failed to notice the vehicle from Gibson Rd.
Kahikatea Dr / Karen Cres Intersection	1	0	0	0	1	-
Kahikatea Dr / Higgins Rd Intersection	6	0	1	1	4	Serious injury crash involved a vehicle travelling eastbound on Kahikatea Dr not giving way to northbound vehicle on Higgins Rd. Minor injury crash involved a vehicle travelling eastbound on Kahikatea Dr not giving way to southbound vehicle on Higgins Rd. Three of the non-injury crashes were right angle crashes

Kahikatea Dr / Wickham St Intersection	2	0	0	1	1	Minor injury crash involved a truck and trailer turning right from Kahikatea Dr to Wickham St failing to give way to a vehicle travelling westbound on Kahikatea Dr. The non-injury crash was similar in nature.
SH1C (Greenwood St) / Kahikatea Dr Intersection	25	0	4	5	16	One serious injury and three minor injury crashes involved a vehicle turning right from Kahikatea Dr failing to give way to a northbound vehicle on SH1C. One serious injury crash involved a southbound vehicle speeding on Greenwood St, losing control, side swiping a truck on the opposite direction and colliding head-on into a vehicle which was following the truck. Another serious injury crash involved a driver fainting or having a seizure while driving and crashed into a fence. One serious injury crash involved a police chase with two motorcycles colliding with each other. One minor injury crash involved a vehicle turning left from Kahikatea Dr failing to give way to a northbound vehicle on SH1C. One minor injury crash involved a rear-end collision between two northbound vehicles on SH1C where the front vehicle was forced to a stop due to a right turning vehicle from Kahikatea Dr. 6 x crossing (right turn right side) non-injury crashes – 2 x drivers' view masked by left turning vehicles. 2 x cornering (missed intersection or end of road)
Road Sections						
Tuhikaramea Rd – between Kahikatea Dr and southern boundary of subject site	3	0	1	1	1	Serious injury involved a driver falling asleep while driving to work and crashing into property wooden fences. Minor injury crash involved a vehicle overtaking and side swiping another vehicle that was waiting to turn right into property driveway.
Kahikatea Dr – between Tuhikaramea Rd and Karen Cres	4	0	1	1	2	Serious injury crash involved a bus that was travelling east on Kahikatea Dr crashed into a motorcycle that was sliding on the ground. The rider was off the motorcycle, however, had sustained injuries in the fall. Motorcycle was stolen. Minor injury crash involved a vehicle that was travelling westbound on Kahikatea Dr colliding into a parked vehicle and crashing into property fence. Driver was



						under the influence of impairment substance.
Kahikatea Dr – between Karen Cres and Higgins Rd	0	0	0	0	0	-
Kahikatea Dr – between Higgins Rd and Wickham St	0	0	0	0	0	-
Kahikatea Dr – between Wickham St and Greenwood St	2	0	0	0	2	No crash pattern.
Higgins Rd – between Kahikatea Dr and northern boundary of subject site	1	0	0	0	1	-

The above tabulated data reveals that there are no fatal crashes within the study area over the last five plus years period. However, seven serious injury crashes have been recorded. The serious injury crashes recorded along Tuhikaramea Road and Kahikatea Drive appear to be isolated incidents and are not attributable to road safety concerns.

However, serious injury crashes recorded at Kahikatea Drive / Higgins Road and SH1C (Greenwood Streer) / Kahikatea Drive intersections contribute to the crash patterns that are observed at these intersections.

The crash data indicates that there is a pattern of crossing (right turn – right side) crashes at the SH1C (Greenwood Streer) / Kahikatea Drive intersection. This intersection is currently a give way-controlled T-intersection but is proposed to be replaced with a large urban signalised crossroads intersection as part of the HSL project. This proposed upgrade is expected to reduce the likelihood and severity of crossing crashes by:

- Eliminating the existing horizontal curve for continuous through movement on SH1C (Greenwood Street).
- Signalising turning movements with exclusive turn phases.
- Reducing excessive approach speed.

The crash data indicates there is a pattern of crossing (right angle) crashes at Kahikatea Drive / Higgins Road intersection. A high-level assessment of the weighted crash rate at the intersection of the baseline 2034 scenario against the scenario with the completed SL1 Rogerson Block was undertaken based on the NZTA Crash Estimation Compendium, Method C – Weighted Crash Procedure. Considering the negligible increase in weighted crash rate at the intersection, as presented in Table No: 7, it is fair to conclude that the adverse safety effects of adding SL1 Rogerson Block traffic is likely to be negligible at this intersection.

However, it is considered that upgrading the Kahikatea Drive / Higgins Road intersection to a compact urban roundabout be assessed in detail during the consenting phase because the existing crossroads form of the intersection is known to contribute to poor safety outcomes in New Zealand and is no longer accepted as good-practice design solution. The likelihood remains high that a DSI crash will occur in future at this intersection regardless of the recent good safety record (i.e. one DSI crash every 2.4 years based on baseline 2034 weighted crash rate). For clarity, this safety upgrade to Kahikatea Drive / Higgins Road intersection is recommended to address the safety risk regardless of the SL1 Rogerson Block, not because of the proposal.

Our assessment shows that the existing intersection form has sufficient capacity to accommodate the additional trips generated by development of Rogerson Block (refer to section 6.5), and the additional trips do not cause a material increase to the predicted injury crash rate for the intersection.

Table No: 7

Crash Rate Summary					
Intersection	Site-specific crash rate	Typical Crash Rate (Baseline 2034)	Typical Crash Rate (Baseline 2034 + SL1 Rogerson Block)	Weighted Crash Rate (Baseline 2034)	Weighted Crash Rate (Baseline 2034 + SL1 Rogerson Block)
Kahikatea Dr / Higgins Rd	0.4	0.43	0.65	0.41	0.47

6.5 Intersection Capacity and Performance

For this preliminary assessment, the following intersections have been modelled with indicative flows using the industry-recognised SIDRA Intersection 9.1 software ("SIDRA") to assess the effects of additional traffic associated with SL1 Rogerson Block:

- SH1C (Greenwood Street) / Kahikatea Drive intersection
- Kahikatea Drive / Higgins Road intersection
- Tuhikaramea Road / Kahikatea Drive / Gibson Road staggered intersections
- Proposed Tuhikaramea Road roundabout access

The capacity assessment results are summarised in the following sub-sections in terms of Level of Service ("LoS"), average delays and 95th percentile queue lengths. The performance of each of the above-mentioned intersection has been modelled for both the AM and PM peak periods under the "2034 Baseline" and "2034 Baseline + SL1 Rogerson Block" scenarios.

The 2034 baseline peak hour traffic flows consist of classified traffic volume tube counts that were undertaken in May 2024 and trips generated by the full consented Temple View residential development. The volumes also consider a background traffic growth rate of 1% on all roads. Additional traffic generated by the SL1 Rogerson Block development was added to the 2034 baseline peak hour traffic flows to understand the effects on the intersections for a future year scenario.

6.5.1 SH1C (Greenwood Street) / Kahikatea Drive Intersection

The existing give-way controlled intersection modelled in SIDRA is illustrated in Figure 16.

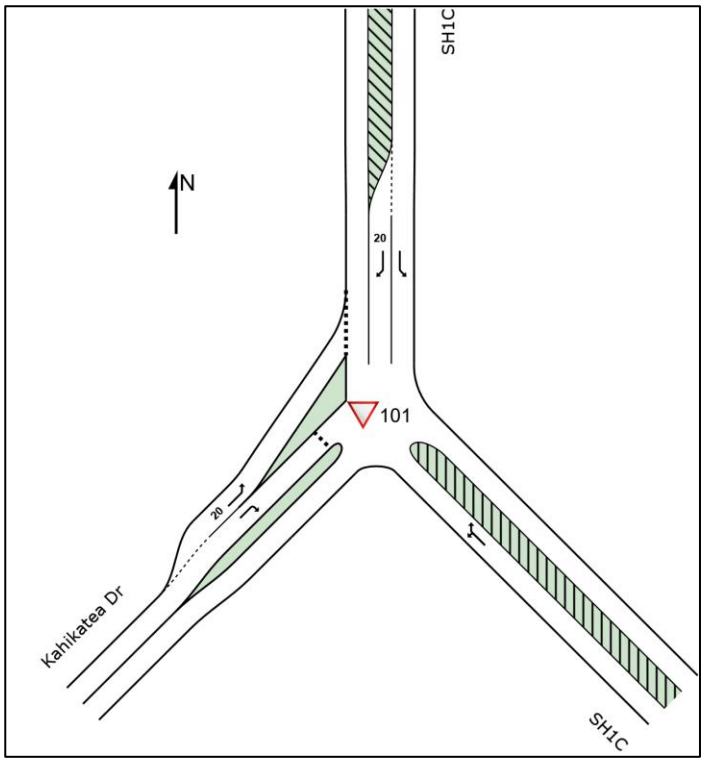


Figure 16: Existing SH1C / Kahikatea Dr Intersection Layout

The existing intersection is known to operate very poorly for the right turn out of Kahikatea Drive west. Long delays are already observed daily for this movement in the AM and PM peak periods. Adding more traffic to the intersection only raises the safety risk for all road users as drivers feel pressure to accept small and unsuitable gaps to cross or merge into the main opposing traffic flow on SH1C. Drivers on the main road alignment also feel they should let side-road traffic in, which causes flow breakdown on SH1C and increases the risk of nose-tail crashes.

This demonstrates that the SH1C (Greenwood St) / Kahikatea Drive intersection requires a capacity and safety upgrade before any further traffic can be safely added to it. The HSL project involves upgrading this intersection to a signalised crossroads intersection in future, to connect the new arterial to Greenwood Street and Kahikatea Drive.

Ideally, the form of intersection upgrade to support SL1 Rogerson block development should be consistent with the ultimate HSL intersection form, to avoid significant sacrificial infrastructure costs in future. A similar form of intersection for the interim period may also facilitate a potential cost-share arrangement with NZTA for the intersection before the HSL arterial is constructed. Therefore, we recommend the intersection is upgraded to a signalised T-intersection that the HSL project can upgrade as needed for connecting the HSL arterial as the fourth arm. Figure 17 illustrates the recommended signalised intersection layout to support SL1 Rogerson Block development.

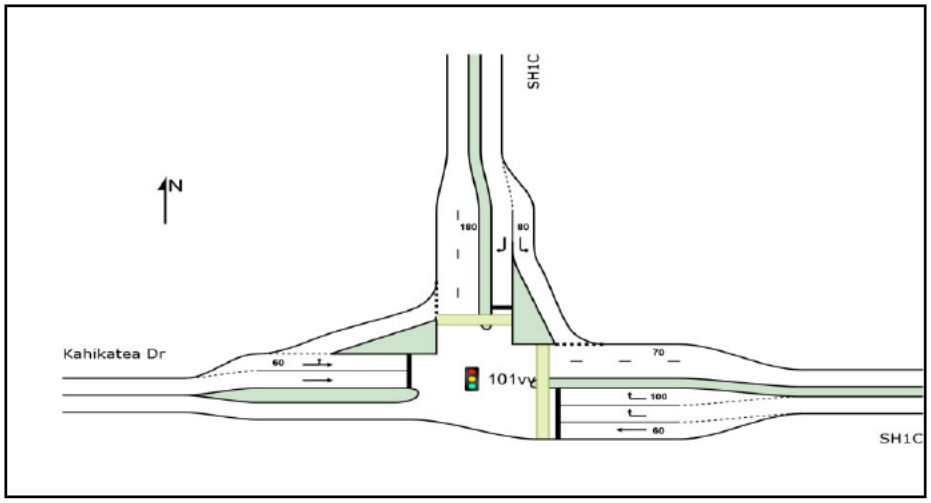


Figure 17: SH1C / Kahikatea Dr Signalised Intersection Upgrade

The performance of the signalised T-intersection proposal in the future year scenario during peak periods is presented in Table No: 8.

Table No: 8

SH1C / Kahikatea Dr Signalised Intersection Upgrade									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
2034 Baseline (Figure 17)	AM	0.88	24.8	307 SH1C (N)	C	RT from Kahikatea Dr (W)	56.6	72.9	E
	PM	0.77	16.5	144.1 SH1C (N)	B	RT from Kahikatea Dr (W)	51.8	35.7	D
2034 Baseline + SL1 Rogerson Block (Figure 17)	AM	0.92	32.7	435.5 SH1C (N)	C	Through from Kahikatea Dr (W)	55.8	96.0	E
	PM	0.78	18.5	204.0 SH1C (N)	B	RT from SH1C (N) and through from Kahikatea Dr (W)	54.4	65	D

Although average delay of some of the movements perform at LoS E, all approaches to the intersection achieve an average delay per vehicle of less than or equal to 55 seconds during both commuter peak periods which is in accordance with the 'efficiency' guidance provided in HCC Operative District Plan Appendix 15 Table 15-2b.

Given the present uncertainty about funding and construction timing for the HSL project, BBO recommends that signalising SH1C (Greenwood Street) / Duke Street intersection be explored and investigated with HCC and NZTA as a means to enabling development of Rogerson Block to proceed in the interim period. Upgrading the existing priority cross-roads junction to a signal control intersection will help to improve road user safety and the efficiency for side-road traffic to enter the high traffic flow on Greenwood Street. It will also provide

much needed pedestrian crossings over Greenwood Street for significantly improved accessibility and safety of walking and cycling connection between two existing industrial areas.

A further point to note is that the upgrade of the cross-roads intersection is likely to be required in any case, as part of the HSL connection to Greenwood Street to safely and efficiently accommodate the increased traffic volume that HSL will channel into Frankton area. A safer intersection at Duke Street in the interim before HSL project is complete is also likely to attract traffic away from using the existing problematic SH1C (Greenwood Street) / Kahikatea Drive intersection.

6.5.2 Kahikatea Drive / Higgins Road Intersection

Figure 18 presents the existing intersection layout and Table No: 9 presents the modelled performance results.

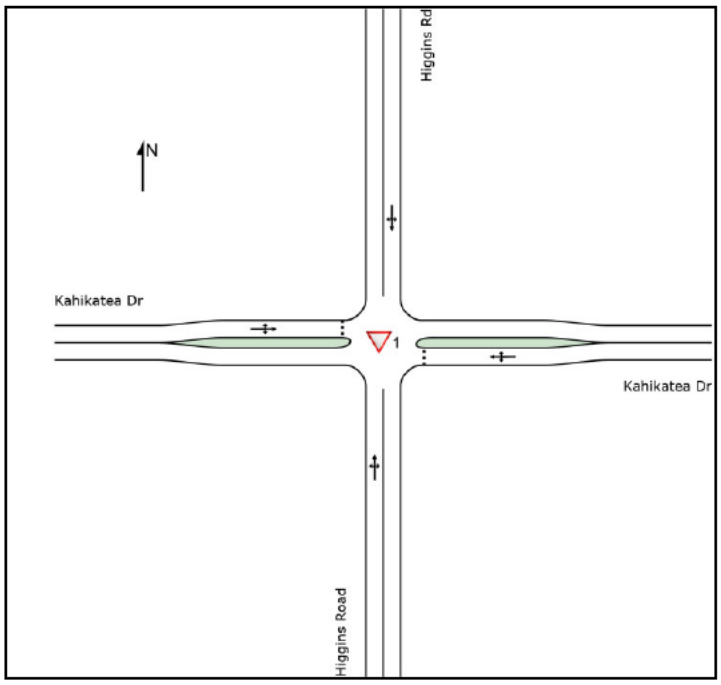


Figure 18: Existing Kahikatea Dr / Higgins Rd Intersection Layout

Table No: 9

Kahikatea Dr / Higgins Rd Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
2034 Baseline	AM	0.25	4.5	8.0 Kahikatea Dr (W)	N/A	RT from Kahikatea Dr (E)	8.0	4.5	A
	PM	0.45	4.6	18.3 Kahikatea Dr (E)	N/A	RT from Kahikatea Dr (W)	11.7	6.2	B
2034 Baseline + SL1 Rogerson Block	AM	0.39	4.8	13.9 Kahikatea Dr (W)	NA	RT from Kahikatea Dr (E)	12.7	8.8	B

Kahikatea Dr / Higgins Rd Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
	PM	0.70	7.3	59.6 Kahikatea Dr (E)	NA	RT from Kahikatea Dr (W)	20.7	9.1	C

Although the modelling results indicate that the performance of the right turn movements from Kahikatea Drive deteriorates from LoS A to LoS B during the AM peak period and LoS B to LoS C during the PM peak period, the increase in average delays and 95th percentile queue distances are not significant with the intersection operating satisfactorily.

6.5.3 Tuhikaramea Road / Kahikatea Drive / Gibson Road Intersections

The intersections of Gibson Road and Kahikatea Drive with Tuhikaramea Road are two closely spaced staggered 'T' intersections with give-way control on Gibson Road and Kahikatea Drive. These intersections were modelled as a network in SIDRA as illustrated in Figure 19.

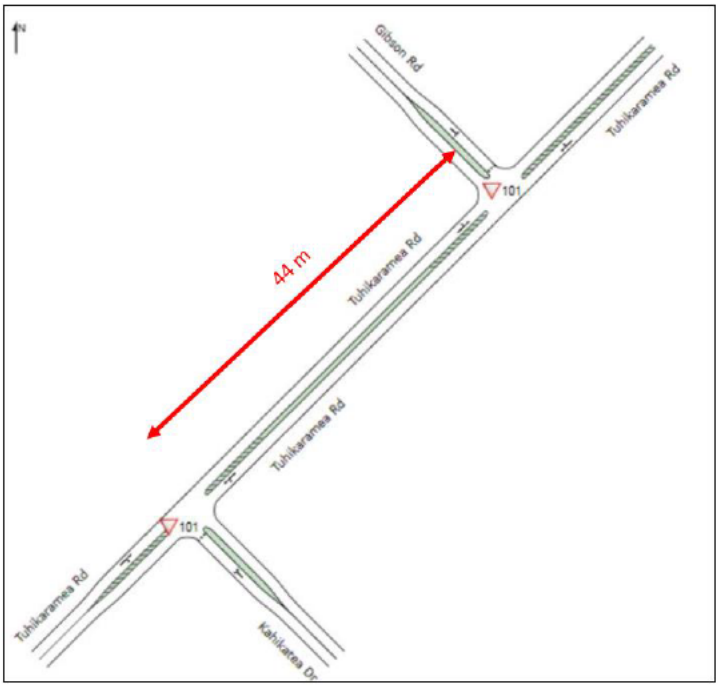


Figure 19: Existing Tuhikaramea Rd / Kahikarea Dr / Gibson Rd Staggered Intersections

The staggered intersections' performance results during peak periods are presented in Table No: 10 and Table No: 11.

Table No: 10

Tuhikaramea Rd / Gibson Rd Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
2034 Baseline	AM	0.48	2.6	5.6 Gibson Rd	N/A	RT from Gibson Rd	16.6	5.6	C
	PM	0.41	1.9	4.2 Gibson Rd	N/A	RT from Gibson Rd	19.3	4.2	C
2034 Baseline + Stage 1 Residential	AM	0.49	2.6	5.7 Gibson Rd	N/A	RT from Gibson Rd	16.9	5.7	C
	PM	0.41	2.0	4.3 Gibson Rd	N/A	RT from Gibson Rd	19.7	4.3	C
2034 Baseline + SL1 Rogerson Block	AM	0.52	2.7	6.2 Gibson Rd	N/A	RT from Gibson Rd	18.1	6.2	C
	PM	0.45	2.1	4.8 Gibson Rd	N/A	RT from Gibson Rd	21.5	4.8	C

Table No: 11

Tuhikaramea Rd / Kahikatea Dr Intersection									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
2034 Baseline	AM	0.50	3.2	8.0 Tuhikaramea Rd (SW)	N/A	RT from Kahikatea Dr	22.8	4.9	C
	PM	0.88	7.5	22.0 Kahikatea Dr	N/A	RT from Kahikatea Dr	39.1	22.0	E
2034 Baseline + Stage 1 Residential	AM	0.51	3.5	8.5 Tuhikaramea Rd (SW)	N/A	RT from Kahikatea Dr	23.9	5.7	C
	PM	0.92	9.0	27.2 Kahikatea Dr	N/A	RT from Kahikatea Dr	45.4	27.2	E
2034 Baseline + SL1 Rogerson Block	AM	0.51	3.5	8.5 Tuhikaramea Rd (SW)	N/A	RT from Kahikatea Dr	24.9	5.8	C
	PM	0.97	11.5	35.8 Kahikatea Dr	N/A	RT from Kahikatea Dr	59.5	35.8	F

The modelling results indicate that Stage 1 residential area in Rogerson Block could be developed without requiring the new roundabout access on Tuhikaramea Road since the Tuhikaramea Road / Kahikatea Drive / Gibson Road intersection will be performing satisfactorily with the Stage 1 residential trips added. Although the right turn movement from Kahikatea Drive performs at LoS E during the PM peak hour, the average delay per vehicle is less than 55 seconds which is aligned with the acceptable limit in the 'efficiency' guidance provided in HCC Operative District Plan Appendix 15 Table 15-2b.

However, there appears to be a need for planned improvements to these intersections to accommodate the completed Rogerson Block development.
The Tuhikaramea Road / Kahikatea Drive / Gibson Road staggered intersections have three potential upgrade solutions: a signalised intersection, two closely spaced mini roundabouts or a signalised mid-block crossing north of Gibson Road to provide gaps for right turning traffic out of Kahikatea Drive and Gibson Road during commuter peak periods.

These options will need to be assessed in greater detail during the consenting phase to identify the preferred mitigation form.

6.5.4 Access Roundabout on Tuhikaramea Road

The SIDRA model layout for the proposed roundabout access on Tuhikaramea Road is illustrated in Figure 20. The modelled performance results for the future development scenario during peak periods are presented in Table No: 12.

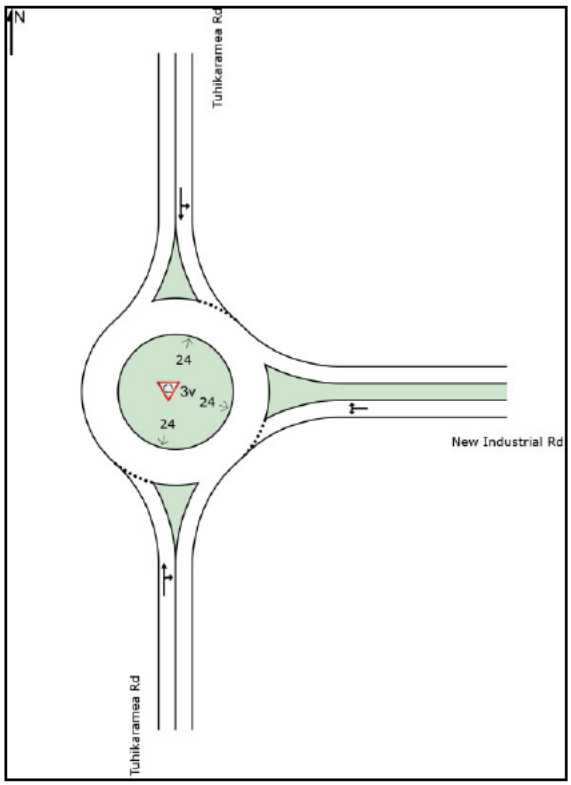


Figure 20: Tuhikaramea Rd Access Roundabout Layout

Table No: 12

Tuhikaramea Rd Access Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
2034 Baseline + SL1 Rogerson Block	AM	0.54	3.2	47.5 Tuhikaramea Rd (S)	A	RT from Industrial Rd (E)	10.6	2.3	B

Tuhikaramea Rd Access Roundabout									
Infrastructure Scenarios	Peak	Intersection Average				Worst Movements (in terms of delay)			
		V/C	Av. Delay (s)	95th % Queue (m)	LOS	Movement	Av. Delay (s)	95th % Queue (m)	LOS
	PM	0.65	3.7	57.6 Tuhikaramea Rd (N)	A	RT from Industrial Rd (E)	18.2	13.0	B

The modelling assessment indicates that the new access roundabout will operate satisfactorily within practical spare capacity and with minor delay during both peak periods in the future year scenario.

7. SL1 Rogerson Block Potential Transportation Infrastructure Improvements

This preliminary assessment indicatively shows that the following transport network improvements are likely to be needed to support the development of SL1 Rogerson Block residential and industrial components according to the high-level master plan.

As part of the substantive Consent application, definite staging triggers will be developed for each transport infrastructure improvement.

Table No: 13

Potential Transportation Infrastructure Improvements	
No.	Infrastructure Requirement
1	Extension of the Karen Crescent into the subject site.
2	A new roundabout access intersection on Tuhikaramea Road including: • Relocation of existing gated speed limit signs on Tuhikaramea Road to the southern boundary of the subject site • Extension of existing footpaths on both sides of Tuhikaramea Road to the roundabout.
3	Extension of Higgins Road to connect to Road 1 including: • A new walking and cycling shared path from the subject site on Higgins Road to the intersection with Kahikatea Drive.
4	Upgrading of Tuhikaramea Road / Kahikatea Drive / Gibson Road staggered intersections providing sufficient capacity to accommodate SL1 Rogerson Block traffic. (upgrade options to be investigated in consenting phase)
5	Upgrading of SH1C (Greenwood Street) / Kahikatea Drive intersection to a signalised T-intersection including provision for safe walking and cycling connectivity.[7]

[7] BBO recommends that the opportunity of signalising SH1C (Greenwood Street) / Duke Street intersection be explored and investigated to improve safety and capacity for side-road traffic to enter the traffic flow on Greenwood Street instead of upgrading the SH1C (Greenwood Street) / Kahikatea Drive intersection (refer to Section 6.5.1).

8. Conclusions

The following provides our key conclusions from this preliminary transport assessment for Rogerson Block:

- The indicative development of SL1 Rogerson Block consists of approximately 7 ha net developable residential land and 20 ha net developable industrial land. The potential residential development yield of the SL1 Rogerson Block is around 205 new houses.
- Under this scenario, the residential component of SL1 Rogerson Block is predicted to add around 120 new vehicle trips to the surrounding network while the industrial component is predicted to add approximately 380 new vehicle trips during the commuter peak periods.
- The proposed access points to the subject site include a new 3-arm roundabout connection on Tuhikaramea Road, extension of Higgins Road to connect to Road 1, and an extension of Karen Crescent into the site (for residential traffic use only).
- The crash history indicates there is a pattern of crossing (right angle) crashes at Kahikatea Drive / Higgins Road intersection. A high-level assessment of the weighted crash rate at the intersection shows that the existing intersection form can accommodate the additional trips generated by the completed SL1 Rogerson Block. The additional trips added to the intersection do not cause a material increase to the predicted injury crash rate for the intersection.
- However, BBO recommends that upgrading the Kahikatea Drive / Higgins Road intersection to a compact urban roundabout be assessed in detail during the consenting phase because the existing crossroads form of the intersection is known to contribute to poor safety outcomes in New Zealand and is no longer accepted as good-practice design solution. For clarity, this safety upgrade to Kahikatea Drive / Higgins Road intersection is recommended to address the safety risk regardless of the SL1 Rogerson Block, not because of the proposal.
- Transportation infrastructure improvements identified in Table No: 13 will potentially be required to support the development of SL1 Rogerson Block residential and industrial components. This will be progressed as part of a further detailed assessment for a substantive Consent application.
- Given the present uncertainty about funding and construction timing for the HSL project, BBO recommends that signalising SH1C (Greenwood Street) / Duke Street intersection be explored and investigated with HCC and NZTA as a means to enabling development of Rogerson Block to proceed in the interim period. Upgrading the existing priority cross-roads junction to a signal control intersection will help to improve road user safety and the efficiency for side-road traffic to enter the high traffic flow on Greenwood Street. It will also provide much needed pedestrian crossings over Greenwood Street for significantly improved accessibility and safety of walking and cycling connection between two existing industrial areas.

Yours sincerely
Bloxam Burnett & Olliver

Siva Balachandran
Senior Transportation Engineer
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