

A blurred city skyline at night, with lights from buildings and streetlights, set against a dark blue background. The image is partially obscured by a large, light blue diagonal shape that cuts across the page from the top left to the bottom right.

**1023 and 1039 Linwood
Road, Plan Change**

Integrated Transport
Assessment

September 2021

flow



TRANSPORTATION SPECIALISTS



TRANSPORTATION SPECIALISTS

Project: 1023 and 1039 Linwood Road, Plan Change
Title: Integrated Transport Assessment
Document Reference: P:\ACXX\421 Kingseat Plan Change and Transport Review\Report\R1B210908 - Kingseat Plan Change ITA.docx
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Reviewed by: Mat Collins/Terry Church

Revisions:

Date	Status	Reference	Approved by	Initials
5 August 2021	A	R1A210805	T Church	
8 September	B	R1B210908	M Collins	

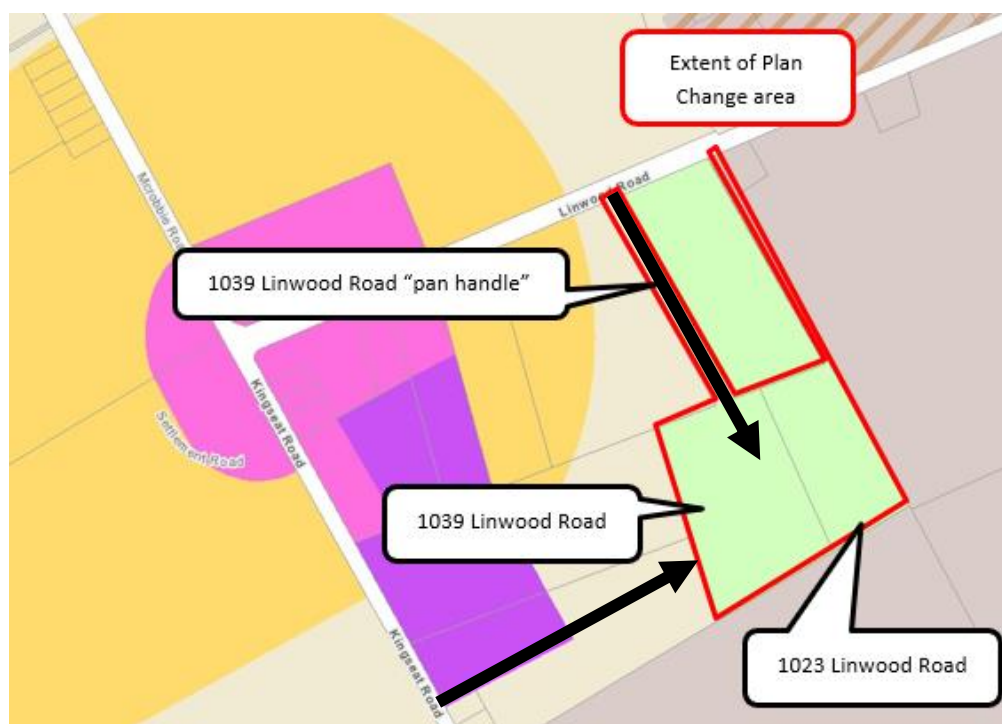
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SUMMARY OF OUR ASSESSMENT

Auckland Council (Council) has engaged Flow Transportation Specialists Ltd (Flow) to assess the transport planning and traffic engineering matters relating to a proposed Plan Change (PC) for 1023 and 1039 Linwood Road, Kingseat, Auckland (sites).

We have investigated the potential safety and efficiency effects of the Plan Change on Linwood Road and Kingseat Road. We have assumed that access to the Plan Change sites will be via two new intersections, one on Kingseat Road and one on Linwood Road, as shown in Figure ES1. This is consistent with the Kingseat Precinct, Precinct Plan 2.

Figure ES1: Operative zoning for the sites and land subject to this Plan Change



We have assessed the potential safety and efficiency effects of the Plan Change on the surrounding transport network. We note that

- ♦ the new intersections with Linwood Road and Kingseat Road are expected to operate with acceptable delays, with the right turn movement predicting a delay of 50 seconds or LOS F during the morning and afternoon peak periods. These results reflect a future scenario where Kingseat is fully developed. We note that our modelling assumption presents a somewhat conservative approach, with alternative access points likely to bring the delay down. The Plan Change shows a negligible effect, therefore we consider that the Plan Change does not, by itself, generate effects that warrant specific mitigation beyond that identified within the Precinct provisions
- ♦ there is a trend for head on and loss of control crashes on Linwood Road and Kingseat Road, which is not atypical of a heavily trafficked rural road. As the Kingseat Precinct continues to urbanise, we expect that Linwood Road and Kingseat Road will be urbanised and the speed limit reduced from the existing 70 km/hr posted speed limit to a 50 km/hr posted speed limit. This will likely

reduce the severity of any crashes and combined with the very low increase in daily traffic movements attributable to the Plan Change, we consider that there will be a negligible safety effect as a result of the Plan Change.

We have assessed the Plan Change against the objectives and policies of the Regional Policy Statement B2.4 Residential Growth and the Kingseat Precinct that are relevant to transport matters. In summary we consider that the Plan Change is consistent with relevant Objectives and Policies of RPS B2 Tāhuhu whakaruruhau ā-taone - Urban growth and form and I418 Kingseat Precinct.

Having reviewed the Kingseat Precinct provisions, we consider that any transport upgrades for Kingseat Road and/or Linwood required to support the Kingseat Precinct (including the Plan Change sites) are captured by Table I418.4.1 Activity table 1 (A13) to (A15) and (A63) and (A64). In our view amendments to the Kingseat Precinct to support the Plan Change are not required.

Overall, we consider that the Plan Change can be accommodated by the local transport network and that the existing Kingseat Precinct provisions are adequate to ensure that any development within the Plan Change area will provide appropriate improvements to the local transport network to support development.

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APPENDICES

- APPENDIX A SIDRA MODELLING RESULTS
- APPENDIX B SUMMARY OF SAFETY RECORD

1 WHAT THIS REPORT INCLUDES

Auckland Council (Council) has engaged Flow Transportation Specialists Ltd (Flow) to assess the transport planning and traffic engineering matters relating to a proposed Plan Change (PC) for 1023 and 1039 Linwood Road, Kingseat, Auckland (sites).

This Integrated Transport Assessment provides the following

- ◆ A description of the PC, focussing on the transport matters
- ◆ A description of the surrounding transport environment
- ◆ An assessment of the potential traffic effects using
 - Auckland Forecast Centre's Southern Growth Area SATURN traffic model outputs for 2028, and
 - SIDRA modelling of a potential new intersection on Kingseat Road and a potential new intersection on Linwood Road
- ◆ An assessment of the Proposal against the relevant Regional Policy Statement objectives and policies contained in the Auckland Unitary Plan (Unitary Plan)
- ◆ A review of existing Kingseat Precinct provisions as they relate to the PC, and commentary on whether these provide sufficient scope and surety that any required mitigation measures (if any) will be delivered in an integrated manner with development
- ◆ A summary of our findings and conclusions, and recommendations to Council.

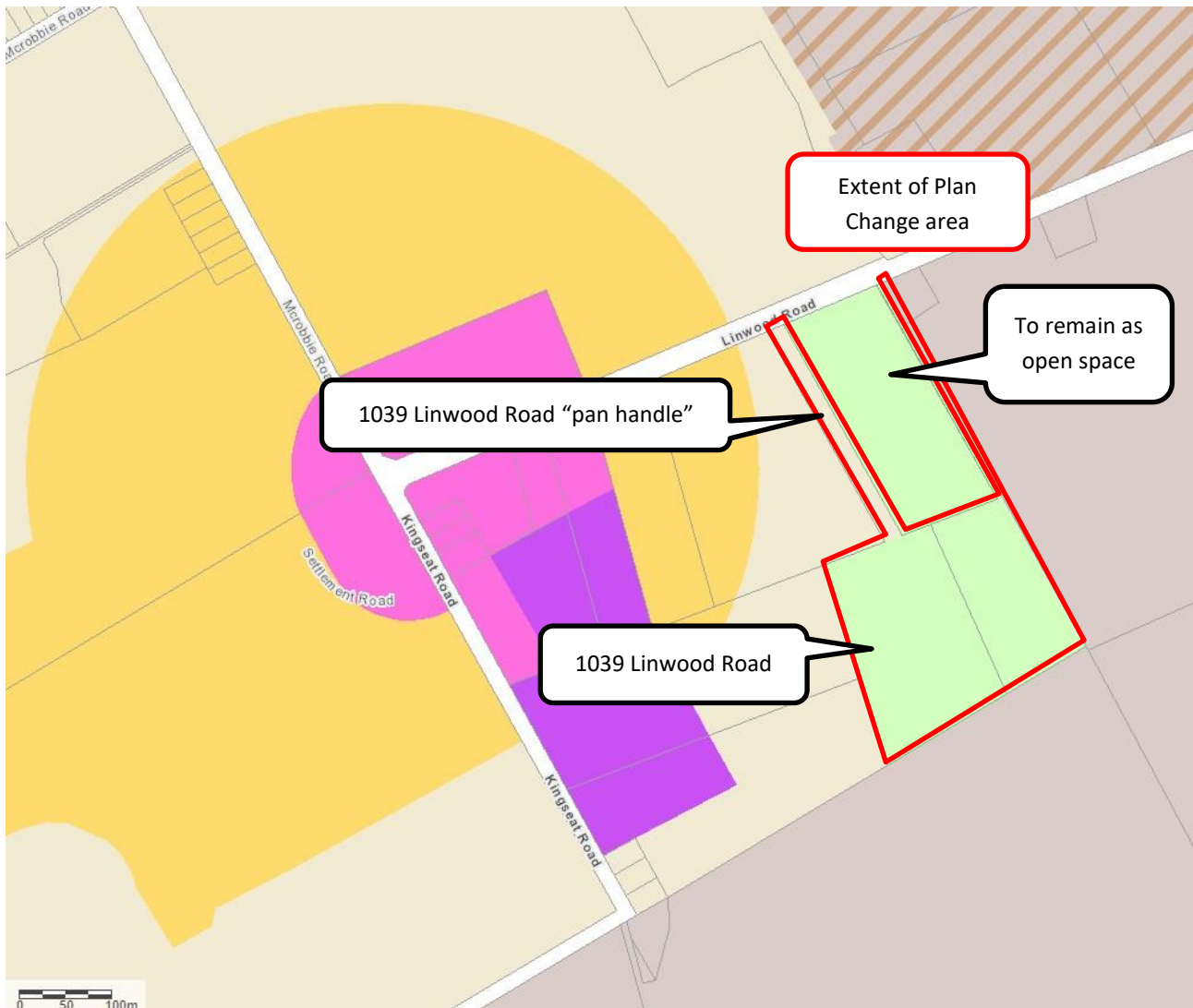
2 A DESCRIPTION OF THE PLAN CHANGE

The Kingseat area was the subject of a structure plan in 2010 and the structure plan’s indicative zonings and provisions were incorporated into the Unitary Plan via the zoning maps and the Kingseat Precinct.

The sites were shown as open space in the Kingseat Structure Plan and were therefore zoned as Open Space – Sport and Active Recreation when incorporated into the Unitary Plan (as shown in Figure 1). The sites are privately owned by Kingseat Village Limited and Council has determined that they are not required as Open Space. Therefore, Council is undertaking a Plan Change to change the zoning to Residential – Single House Zone, consistent with the adjacent land use within the Kingseat Precinct.

1023 Linwood Road has an area of 2.0 ha. 1039 Linwood Road has an area approximately 3.5ha, of which 3ha is zoned open space, the remaining “pan handle” is zoned Single House and Mixed Housing Suburban.

Figure 1: Operative zoning for the sites and land subject to this Plan Change



3 A DESCRIPTION OF THE EXISTING ENVIRONMENT

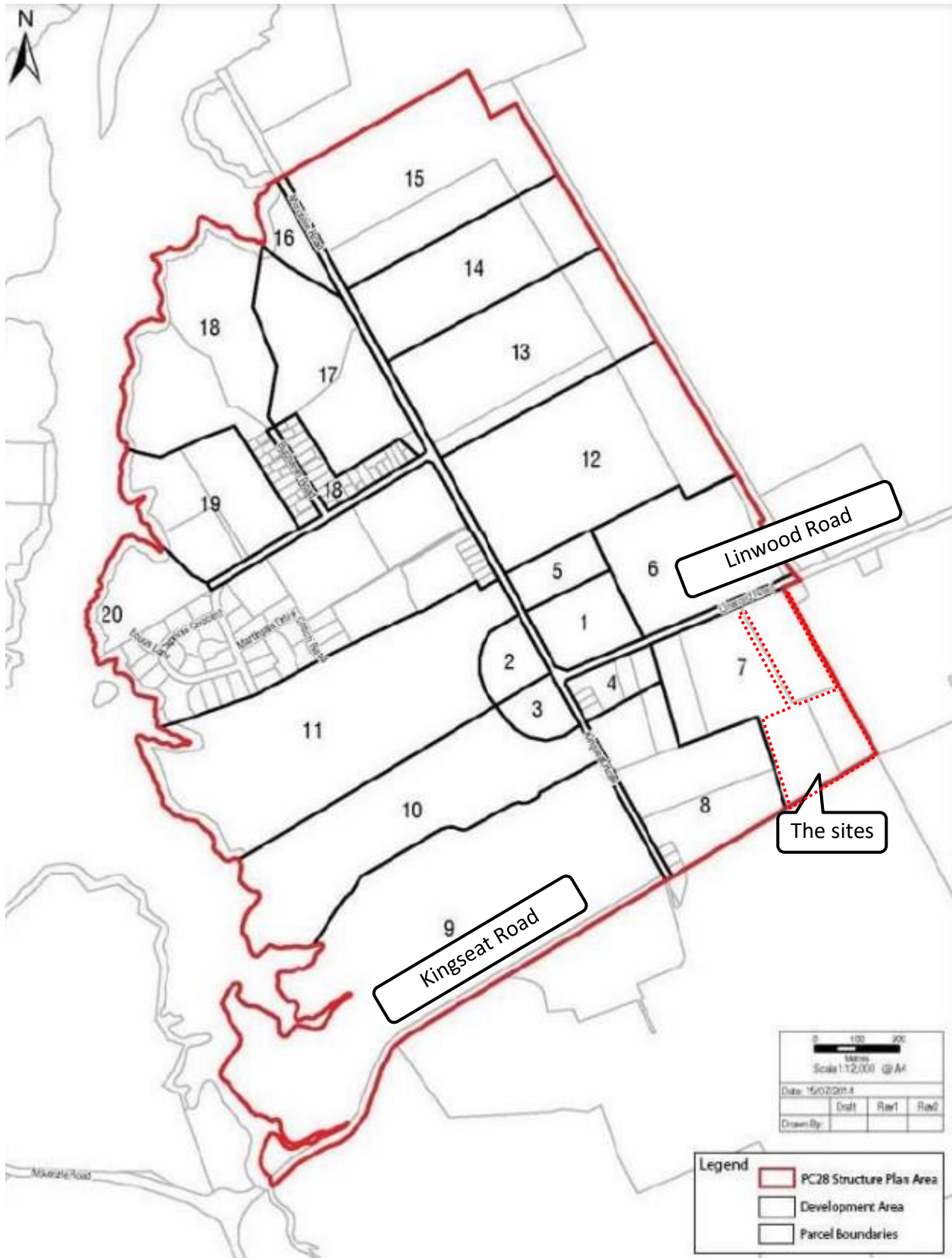
3.1 The sites

The sites are shown in Figure 2. Both sites are currently rural and have vehicle access to Linwood Road. We note that 1039 Linwood Road has recently been created by the subdivision of 1043 Linwood Road. 1043 Linwood Road is subject to a notice of requirement from the Ministry of Education (refer to Section 3.2). The sites are within Development area 7, defined in Precinct I418.10.10. Kingseat: Precinct Plan 10 and shown in Figure 3.

Figure 2: The sites



Figure 3: I418.10.10. Kingseat: Precinct plan 10 showing the location of the sites



3.2 The surrounding environment

The sites are located approximately 600 m east of Kingseat Village, as shown in Figure 4. The land uses surrounding the site are predominately rural, however this is set to change as residential development enabled by the Operative zoning occurs. Linwood Road and Kingseat Road are classified as arterial roads in the Unitary Plan. Both roads are predominately rural, although we expect that these roads will be urbanised as adjoining land urbanises.

Council has advised us that the following nearby sites are being development as part of consent applications and notices of requirement, which have been included within our traffic modelling

- ♦ 9 McRobbie Road, 41 Mc Robbie Road, and 833 Kingseat Road. Comprising approximately 870 residential lots, and 18 superlots. Shown in yellow in Figure 4
- ♦ 1039 Linwood Road (northern portion). The Ministry of Education has lodged a notice of requirement for a primary school and early childhood education centre. Expected to cater for around 370 students, with a master roll plan up to 900 students and 45 staff plus an additional 50 early childhood education pupils and 13 staff. This site is shown in orange in Figure 4.

Figure 4: The site locality and nearby developments



3.3 Existing traffic conditions

The latest traffic volume data about the immediate roading network has been obtained from Auckland Transport¹. The average two-way daily traffic volume measured in vehicles per day (vpd) and peak hour volumes in vehicles per hour (vph) are summarised in Table 1.

Table 1: Traffic volume data (two-way)

Road	Location	Count Date	Average Daily Traffic (vpd)	Peak Hour Volume (vph)
Linwood Road	Speed restriction east of Kingseat village	6/02/2019	6083	700
Kingseat Road	Speed restriction west of Kingseat village	7/02/2018	5571	670

3.4 The existing road safety record

We have assessed the crash records from 2016 to 2021 for the surrounding roads obtained from the Waka Kotahi NZTA Crash Analysis System (CAS). The search area includes Linwood Road, the Linwood/McRobbie/Kingseat road intersection, and Kingseat Road.

The locations of each recorded crash, injury severity level (non-injury, minor, serious and fatal) and other factors such as crash year, weather conditions and road conditions were considered. Crashes are summarised below with further detail provided in Appendix B.

- ◆ A total of 20 incidents were recorded: 8 non-injury, 3 minor injury, and 3 serious injury incidents
- ◆ 9 events occurred at the intersection of Linwood Road/Kingseat Road
- ◆ 5 occurred on the midblock east of the Linwood Road/Kingseat Road intersection
- ◆ 5 are related to the nearby horizontal curve south of the Linwood Road/Kingseat Road intersection
- ◆ 1 isolated incident is reported on the midblock north of the Linwood Road/Kingseat Road intersection

The crash history indicates an existing road safety issue within the study area, with head on and loss of control crashes being a moderate proportion of crashes.

¹ Auckland Transport Open GIS Data, available online <https://data-atgis.opendata.arcgis.com/datasets/average-daily-traffic-counts?geometry=174.779%2C-37.132%2C174.825%2C-37.120>

3.5 The site's transport accessibility

3.5.1 Public transport accessibility

Kingseat currently has limited public transport accessibility. The 395 service between Waiuku and Papakura Station operates during weekday peak periods only². Two services operate during the morning peak, travelling from Waiuku through to Papakura (via Kingseat), with two services operating during the evening peak, travelling from Papakura to Waiuku (via Kingseat).

3.5.2 Walking and cycling accessibility

There are limited existing footpaths in the area, and no cycle facilities. As the Kingseat Precinct urbanises, walking and cycling accessibility within the Precinct and to the Kingseat commercial centre will improve, as required by Policy 8 of the Precinct.

3.5.3 Private vehicle accessibility

The sites are well located with respect to providing for vehicle accessibility to the arterial road and State Highway network. Access to State Highway 1 (SH1) is via Papakura Interchange, located approximately 12 km to the east. We note that Papakura Interchange is congested during peak periods, with further discussion on this provided at Section 4.5.3 of this report.

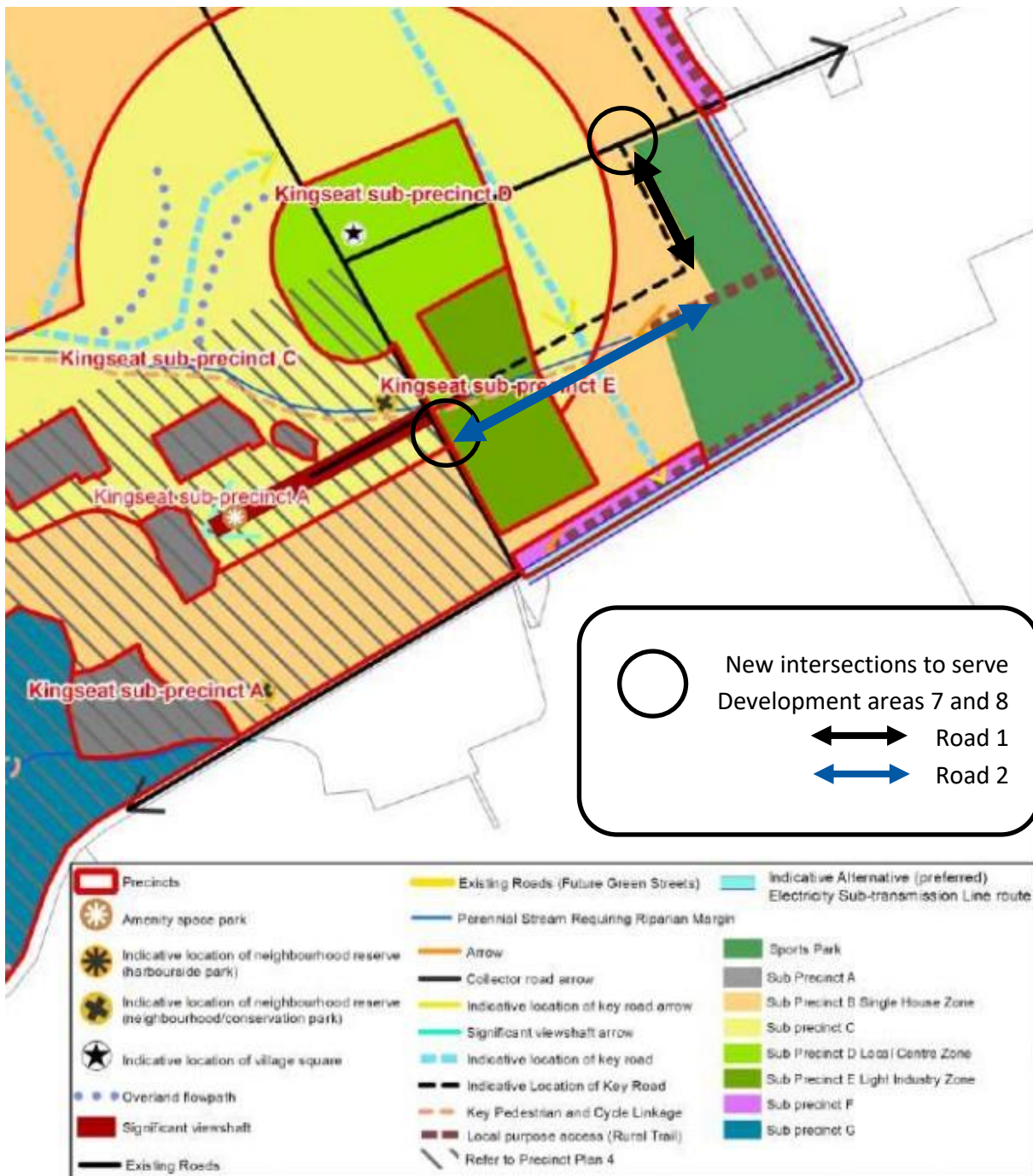
² Auckland Transport 395 route summary, available online <https://at.govt.nz/media/1908555/route-395-waiuku-to-papakura-station-july-2016.pdf>

4 ACCESS, YIELD AND TRAFFIC GENERATION OF THE PLAN CHANGE

4.1 Access assessment of the Plan Change

As discussed with Auckland Transport, we have assumed that access to Development Area 7 and Development Area 8 (including the sites) will be via two new intersections, one on Kingseat Road and one on Linwood Road. This is consistent with Precinct Plan 2. The assumed road location are shown in Figure 5. We note that through resource consents and notices of requirement, further accesses onto Linwood Road and Kingseat Road may be provided, however our assumption creates conservatism in our traffic modelling assessment.

Figure 5: Excerpt from I418.10.2. Kingseat: Precinct plan 2 – Development plan, showing new intersections



4.2 Traffic generation

Within Development Area 7, the Plan Change will see the total Open Space zone reduced from 8ha to 3ha, and the total Single House zone increased from 7.3ha to 12.3ha. We have termed the existing zoning as the “Reference Case” and the Plan Change zoning as the “Plan Change Case”.

We note that our assessment includes Development Area 8, although the Plan Change is entirely within Development Area 7. We have assessed the traffic effects of Development Area 7 and 8 as a conservative approach, assuming that all traffic from these two development areas will route through 1 intersection on Kingseat Road, and 1 intersection onto Linwood Road.

Based on advice from Auckland Council, we have assumed that

- ◆ the 8 ha of Open Space zoned land for the Reference Case would provide up to 4 soccer fields and 2 tennis courts, with the remainder being park and recreational trails
- ◆ the 3 ha of Open Space zoned land for the Plan Change Case would provide for 2 soccer fields and 1 tennis court.

Based on advice from Auckland Transport, we have assumed that

- ◆ the additional 5ha of Single House zoned land for the Plan Change Case will yield up to 90 dwellings.

Auckland Transport’s assumption of dwelling yield of 90 houses can be derived from the Precinct enabled parcel size for the Single House Zone (SHZ), of 450 m². The 5 ha gross area resulting from recreation zone being converted to SHZ was reduced by 20% to account for roading, water management etc. The net yield area of 4ha approximates to 90 lots of 450 m². We note that our assessment of the wider Kingseat Precinct indicates a yield of around 60 dwellings for the Plan Change sites. By adopting Auckland Transport’s assumed yield, our assessment is conservative.

Using trip rates referenced from industry sources (the ITE³ Trip Generation Manual) we have estimated the morning and evening peak hour trip generation under the Reference Case and the Plan Change Case for Development Area 7 and Development Area 8, which is presented in Table 2.

The reduction to the vehicle peak hour trip rates of 20% is to take into account local area effects. Trip rates reflect the peak trip rates of an activity, with the activity rate generally being based on developments in urban areas. Given the location of Kingseat and the level of congestion on the Southern Motorway for example, we consider that it is appropriate to amend these values to apply to an area that is a sparsely populated rural area of South Auckland. This considers the distance to travel to employment zones is significantly further than urban areas, hence avoiding peak hour is a high consideration of this demographic. This means that we account for trips with an earlier commute time due to wider area congestion.

³ Institute of Transportation Engineers - ITE

Figure 6 below was retrieved from NZTA Telemetry Site No: 48 in 2020 (Site Ref ID: 01N00463), located in Drury. We expect a similar demographic to the Kingseat population to be captured by this site. The figure shows that the morning commuter peak starts as early as 6am, being outside of the typical 7am-9am morning peak period. This supports our view above, where commuters living about the fringe of the Auckland region commute earlier and therefore outside of the typical peak hours, which therefore supports a reduction in the peak hour trip rates.

Figure 6: Drury hourly traffic flows



In summary

- ◆ The Reference Case is predicted to generate some 400 veh/hr and 465 veh/hr in the AM and PM peak respectively
- ◆ The Plan Change Case is predicted to generate some 450 veh/hr and 490 veh/hr in the AM and PM peak respectively
- ◆ The Plan Change is predicted to generate an additional 50 veh/hr and 25 veh/hr in the AM and PM peak respectively.

Table 2: Land use and vehicle trip generation for Development Area 7 and Development Area 8

	Land use	Area (ha)	Yield	Trip rate ⁴		Veh/hr (peak)
				AM	PM	AM/PM
Development Area 7 and 8 – Consistent Development Areas between Reference and Plan Change scenarios						
Development Area 7 and 8 (excluding the sites and MoE NoR)	Housing - Single House Zone	7.3	84 dwellings	0.59	0.68	50/57
	Housing - Suburban	3	48 dwellings	0.59	0.68	28/33
	Centre Activities (Commercial)	3.5	22400 ha	0.32	0.34	72/75
	Industrial	7.5	36000 ha	0.7	0.63	252/227
	Subtotal (DA 7 and DA 8 excl. Sites)					402/392
Reference Case activities for the sites						
Sites (Reference case)	Fields	8	4 fields	0.99	16.43	4/66
	Courts		2 courts	0	4.21	0/8
	Park		8 ha	0.02	0.11	0/1
	Subtotal (Sites: Reference case)					4/75
Plan Change activities for the sites						
Sites (Plan Change case)	Fields	3	2 fields	0.99	16.43	2/33
	Courts		1 court	0	4.21	0/4
	Park		8 ha	0.02	0.11	0/0
	Housing - Single House Zone	5	90 dwellings	0.59	0.68	53/61
	Subtotal (Site: Plan Change case)					55/98
TOTAL: Reference case						400/465
TOTAL: Plan Change case						450/490

4.3 Traffic distribution

We have assumed that these trips will be distributed based on the 2038 SATURN Southern Growth model as summarised in Table 3. Figure 7 and Figure 8 show the resulting traffic movements at the two new intersections in the morning and evening peaks respectively. We have shown the Reference Case in black and the additional traffic as a result of the Plan Change Case in red.

⁴ Adapted from Institute of Transport Engineers (2020). *Trip Generation Manual*, 10th Edition Volume 2.

Table 3: Traffic volume distribution

		East	West
AM	Inbound	61%	39%
	Outbound	73%	27%
PM	Inbound	70%	30%
	Outbound	61%	39%

Figure 7: Predicted traffic distribution changes in the morning peak hour

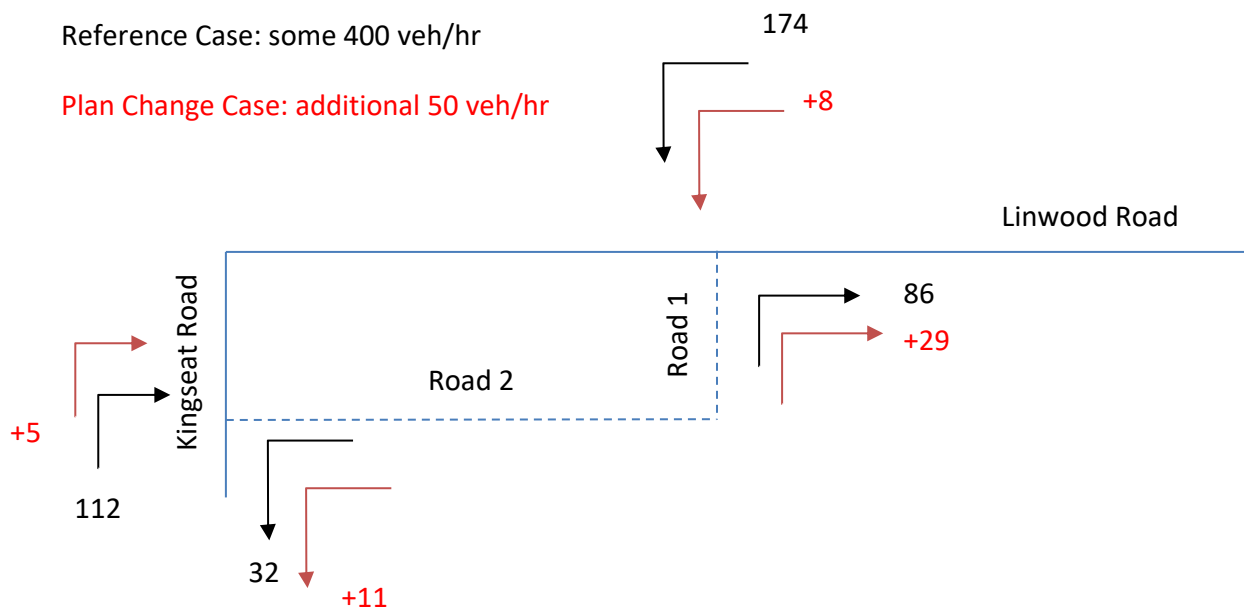
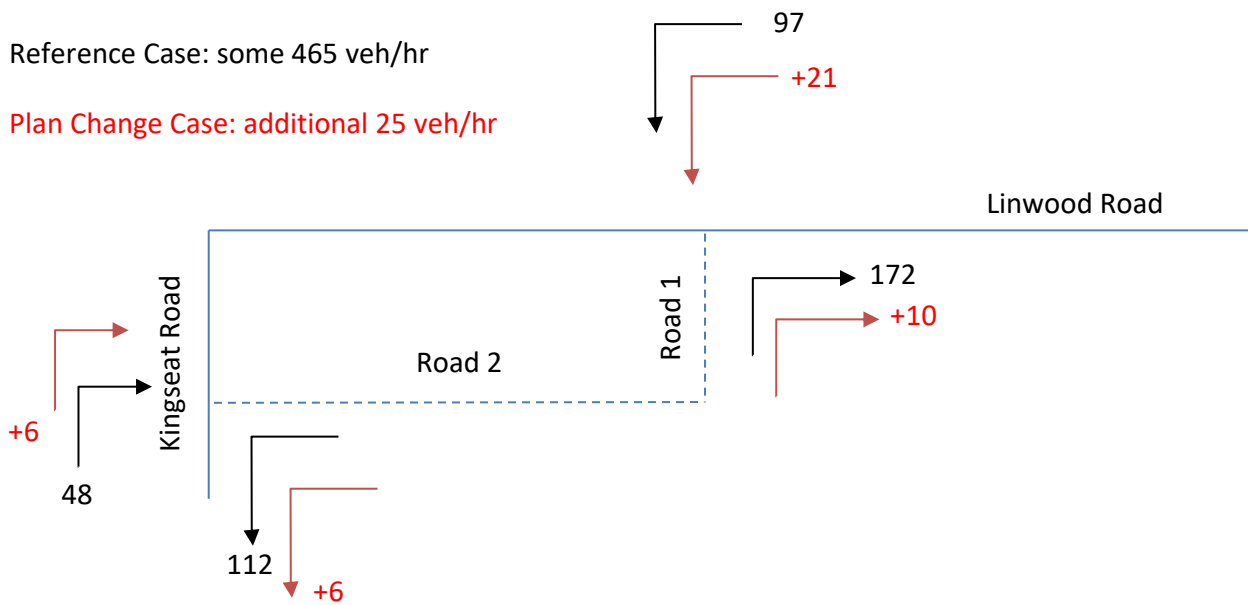


Figure 8: Predicted traffic distribution changes in the evening peak hour



4.4 Traffic growth on the wider transport network

To estimate the future peak hour traffic movements on Kingseat Road and Linwood Road we have relied on Auckland Forecast Centre’s Southern Growth Area SATURN traffic model for 2028.

As the SATURN model uses the superseded I11.5 land use scenario, we have briefly investigated the land use differences with the current I11.6 land use scenario. As set out in Table 4, most changes are fairly minor other than employment changes. This means that vehicle trips may increase as people are required to commute outside of the Kingseat area to work.

Table 4: Comparison of MSM I11.6 vs MSM I11.5

	Zone	HH	Pop	Emp
South Kingseat	586	5%	5%	-23%
Kingseat	587	-5%	-5%	-10%
Waiau Pa	588	-3%	-3%	-1%
Te Hihi	585	1%	1%	16%

4.5 Traffic modelling results

We have assessed the changes in traffic volumes using SIDRA, an isolated intersection traffic modelling tool, with full outputs contained in Appendix A. The results from the modelling are summarised below. In summary, we consider that the Plan Change will have a negligible effect at the new intersections onto Kingseat Road and Linwood Road, when compared with development already enabled by the Kingseat Precinct.

4.5.1 Effects on the Kingseat Road/New Road 2 intersection

As the change in volumes are minor, there is little change in the operation of the Kingseat Road/Road 2 intersection predicted in the morning and evening peaks.

We note that

- ◆ Both scenarios are forecast to operate within capacity in the morning and evening peaks
- ◆ Change in the degree of saturation (DOS) for each approach is negligible for most approaches
- ◆ The right turn out of New Road 2 experiences a LOS D in the morning peak and LOS F in the evening peak for both scenarios. While a LOS F is predicted, we note that our modelling approach is somewhat conservative and that motorists have alternative routes from which to exit the area.
- ◆ Movements out of New Road 2 in the evening peaks experience moderate delays in both scenarios.

4.5.2 Effects on the Linwood Road/New Road 1 intersection

As the change in volumes are minor, there is little change in the operation of the Linwood Road/Road 1 intersection predicted in the morning and evening peaks.

We note that

- ◆ The morning peaks have negligible changes between scenarios
- ◆ The Reference Case and Plan Change Case in the evening peak shows each approach operates within capacity
- ◆ While the distribution of traffic is predicted to change, the traffic volume remains similar. The intersection operates similar overall, with minor differences in performance predicted on the intersection approaches
- ◆ The south approach is expected to experience moderate delays in both scenarios.

4.5.3 Effects on the Papakura Interchange

As part of our engagement with Auckland Transport, we discussed whether the effects on the Papakura interchange should be considered. Given the minor increase in traffic movements during peak periods, we consider that modelling of the Papakura interchange is not warranted, as it would show a negligible effect on intersection performance and will likely sit within the realms of current daily fluctuations.

5 ASSESSMENT OF TRANSPORT EFFECTS

5.1 Traffic efficiency effects assessment

As discussed in Section 4.5, the Road 1 and Road 2 intersections with Linwood Road and Kingseat Road are expected to experience delays of about 50 seconds during the morning and afternoon peak periods. The Plan Change Case shows a negligible effect, therefore we consider that the Plan Change does not, by itself, generate effects that warrant mitigation.

5.2 Traffic safety effects assessment

As discussed in Section 3.4, there is a trend for head on and loss of control crashes on Linwood Road and Kingseat Road, which is not atypical of a heavily trafficked rural road.

As the Kingseat Precinct continues to urbanise, we expect that Linwood Road and Kingseat Road will be urbanised and the speed limit reduced from the existing 70 km/hr posted speed limit to a 50 km/hr posted speed limit. This will likely reduce the severity of any crashes and, combined with the very low increase in daily traffic movements as a result of the Plan Change, we consider that there will be a negligible safety effect as a result of the Plan Change.

6 RELEVANT RPS AND KINGSEAT PRECINCT OBJECTIVES AND POLICIES

We have assessed the Plan Change against the objectives and policies of the Regional Policy Statement B2.4 Residential Growth that are relevant to transport matters. Our commentary is provided in Table 5. In summary we consider that the Plan Change is consistent with relevant Objectives and Policies of RPS B2 Tāhuhu whakaruruhau ā-taone - Urban growth and form and the I418 Kingseat Precinct.

Table 5: Objectives and policies relevant transport matters

Relevant policy / guidance	Flow comment
B2.4.1.(3) Land within and adjacent to centres and corridors or in close proximity to public transport and social facilities (including open space) or employment opportunities is the primary focus for residential intensification	<p>As discussed in Section 3, the Plan Change is within the Kingseat Precinct and within moderate walking distance of the Kingseat Centre. However, public transport services are limited.</p> <p>We consider that the sites are suitable for lower residential intensity zoning, and that the proposed Residential: Single House zone is appropriate.</p>
B2.4.2.(2) Enable higher residential intensities in areas closest to centres, the public transport network, large social facilities, education facilities, tertiary education facilities, healthcare facilities and existing or proposed open space	
B2.4.2.(3) Provide for medium residential intensities in area that are within moderate walking distance to centres, public transport, social facilities and open space	
B2.4.2.(4) Provide for lower residential intensity in areas that are not close to centres and public transport	
B2.4.2.(6) Ensure development is adequately serviced by existing infrastructure or is provided with infrastructure prior to or at the same time as residential intensification	Refer to our comments on Kingseat Precinct objectives and policies below
I418.2(6) A range of residential densities that support the development of an integrated multimodal transport system (private vehicles, public transport, horse riding, walking, cycling) is provided	The Plan Change is within the existing Precinct area, and can be developed in a manner consistent with the transport network indicated in the I418.10.2. Kingseat: Precinct plan 2 – Development plan
I418.3(1) Undertake subdivision and development to achieve a compact and contained urban form that is consistent with the Kingseat Precinct plans and the controls that apply to the sub-precincts	The Plan Change is within the existing Precinct area, and can be developed in a manner consistent with the Kingseat Precinct plans and the controls that apply to Development Area 7.
I418.3(8) Ensure that subdivision and land use activities establish a transport network that provides for the safe and efficient movement of motor vehicles, pedestrians, horse riders (coastal and rural trails), and cyclists	The Plan Change is within Development Area 7. Several key roads within Development Area 7 are shown on I418.10.2. Kingseat: Precinct plan 2 –

<p>I418.3(9) Provide for the co-ordinated upgrade of public roading infrastructure within the precinct so that such upgrades occur either before or concurrent with development.</p>	<p>Development plan, which are not precluded by the Plan Change.</p> <p>Any new dwelling within the Plan Change will be subject to Table I418.4.1 Activity table 1 (A13) to (A15) and (A63) and (A64), which give strong direction to the requirement to urbanise Linwood Road. Should a road connection between Development Area 7 and Kingseat Road be provided, this would likewise be subjected to the requirement to urbanised Kingseat Road, as this would have to include subdivision within Development Area 8</p>
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We have assessed the Plan Change against the provisions of the Kingseat Precinct. Any development within the Sites would trigger Table I418.4.1 Activity Table 1 (A13) to (A15) and/or (A63) and/or (A64). These activities relate to improvements identified in Precinct Plan 9.

- ◆ (A13) states than any development that includes road works associated with the adjoining road frontage of the respective development area, is an RD activity
- ◆ (A14)/(A63) state that any development that does not include the relevant roading plan is a NC activity.
- ◆ (A15)/(A64) states that any development that does not include road works associated with the adjoining road frontage is a NC activity.

Required road works means the works that must be undertaken to the centreline of the adjoining public road, and which must be along the full road frontage of the development area (which would include tie-in works) in which the subdivision or development is occurring. All such works must be undertaken in accordance with a roading plan that has been approved as part of a resource consent application

The Plan Change sits within Development Area 7 and Precinct Plan 9 identifies that Linwood Road (Road B) requires a Roothing Plan. The Plan Change sites have a small extent of frontage with Linwood Road.

At the time of future resource consent for the Plan Change sites, any subdivision/land use consent application would need to include

- ◆ a Roothing Plan for Road B (if one had not already been prepared by another resource consent application within Development Area 7)
- ◆ upgrade of Linwood Road to the centreline of the carriageway (including tie-in works as agreed through the resource consent), along the sites frontage with Linwood Road
- ◆ in addition to the above, the application would need to include internal roading and a new intersection with Linwood Road (if not already provided via an adjoining development). This is not specified in the Kingseat Precinct, but is standard practice for any greenfield development.

In summary, we consider that the existing Kingseat Precinct provisions are adequate to ensure that improvements to the local transport network are coordinated with any development within the Plan Change site.

7 OUR SUMMARY AND RECOMMENDATIONS

We have investigated the potential safety and efficiency effects of the Plan Change on Linwood Road and Kingseat Road. We have assumed that access to the Plan Change sites will be via two new intersections, one on Kingseat Road and one on Linwood Road, as shown in Figure ES1. This is consistent with the Kingseat Precinct, Precinct Plan 2.

We have assessed the potential safety and efficiency effects of the Plan Change on the surrounding transport network. We note that

- ♦ the new intersections with Linwood Road and Kingseat Road are expected to operate with acceptable delays, with the right turn movement predicting a delay of 50 seconds or LOS F during the morning and afternoon peak periods. These results reflect a future scenario where Kingseat is fully developed. We note that our modelling assumption presents a somewhat conservative approach, with alternative access points likely to bring the delay down. The Plan Change shows a negligible effect, therefore we consider that the Plan Change does not, by itself, generate effects that warrant specific mitigation beyond that identified within the Precinct provisions
- ♦ there is a trend for head on and loss of control crashes on Linwood Road and Kingseat Road, which is not atypical of a heavily trafficked rural road. As the Kingseat Precinct continues to urbanise, we expect that Linwood Road and Kingseat Road will be urbanised and the speed limit reduced from the existing 70 km/hr posted speed limit to a 50 km/hr posted speed limit. This will likely reduce the severity of any crashes and combined with the very low increase in daily traffic movements attributable to the Plan Change, we consider that there will be a negligible safety effect as a result of the Plan Change.

We have assessed the Plan Change against the objectives and policies of the Regional Policy Statement B2.4 Residential Growth and the Kingseat Precinct that are relevant to transport matters. In summary we consider that the Plan Change is consistent with relevant Objectives and Policies of RPS B2 Tāhuhu whakaruruhau ā-taone - Urban growth and form and I418 Kingseat Precinct.

Having reviewed the Kingseat Precinct provisions, we consider that any transport upgrades for Kingseat Road and/or Linwood required to support the Kingseat Precinct (including the Plan Change sites) are captured by Table I418.4.1 Activity table 1 (A13) to (A15) and (A63) and (A64). In our view amendments to the Kingseat Precinct to support the Plan Change are not required.

Overall, we consider that the Plan Change can be accommodated by the local transport network and that the existing Kingseat Precinct provisions are adequate to ensure that any development within the Plan Change area will provide appropriate improvements to the local transport network to support development.

APPENDIX A

SIDRA MODELLING RESULTS

Figure A 1: Network layout of reference case and plan change scenario 2028

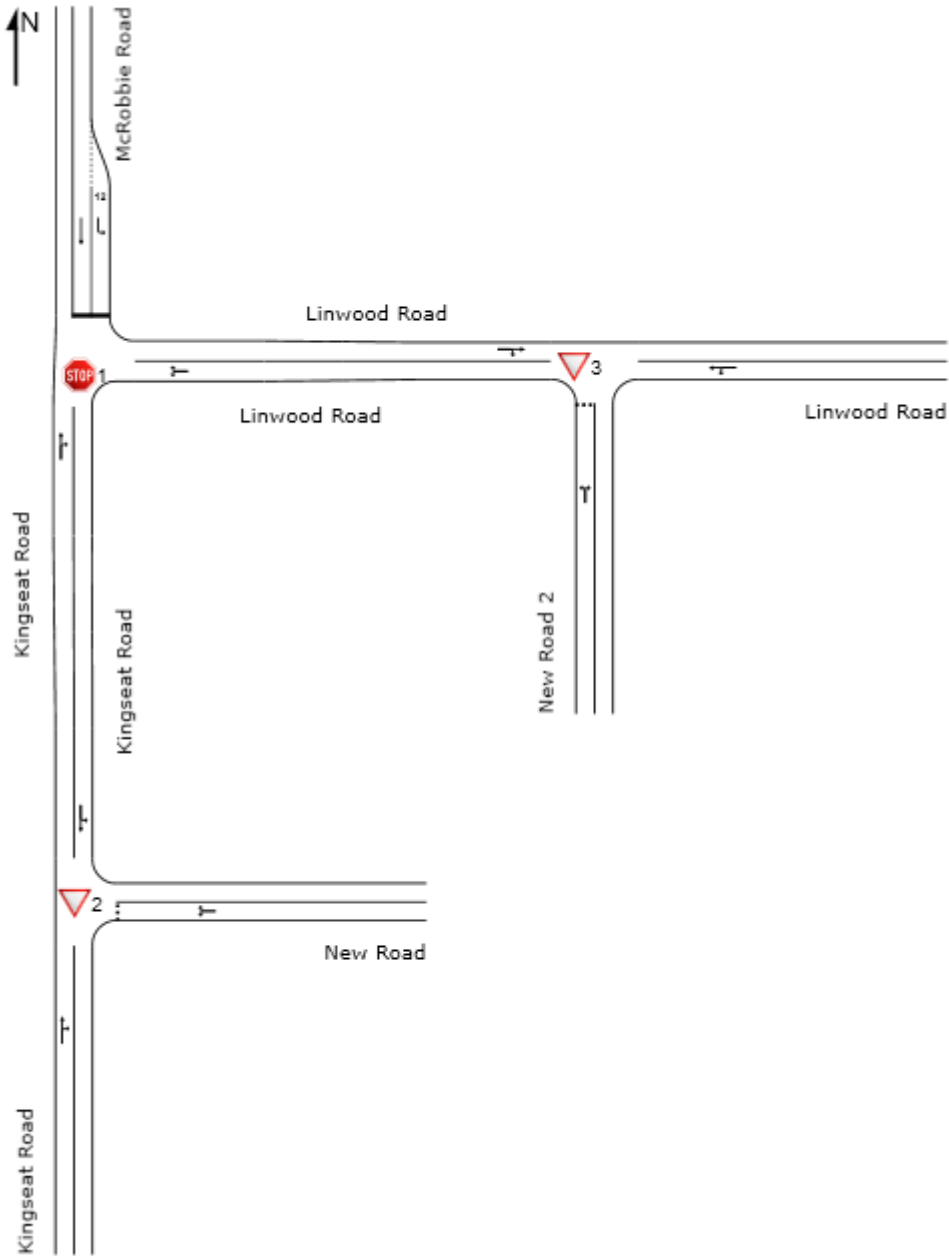


Table A 1: Reference Case - Kingseat Road/New Road 2 intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	782	0.0	782	0.0	0.498	1.2	LOS A	1.0	6.8	0.29	0.10	0.43	47.1
3	R2	118	0.0	118	0.0	0.498	9.0	LOS A	1.0	6.8	0.29	0.10	0.43	46.8
Approach		900	0.0	900	0.0	0.498	2.2	NA	1.0	6.8	0.29	0.10	0.43	47.1
East: New Road														
4	L2	34	0.0	34	0.0	0.142	7.5	LOS A	0.2	1.2	0.72	0.85	0.72	39.8
6	R2	16	0.0	16	0.0	0.142	26.1	LOS D	0.2	1.2	0.72	0.85	0.72	29.3
Approach		49	0.0	49	0.0	0.142	13.5	LOS B	0.2	1.2	0.72	0.85	0.72	37.9
North: Kingseat Road														
7	L2	1	0.0	1	0.0	0.337	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	48.9
8	T1	657	0.0	657	0.0	0.337	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.8
Approach		658	0.0	658	0.0	0.337	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.8
All Vehicles		1607	0.0	1607	0.0	0.498	1.7	NA	1.0	6.8	0.19	0.08	0.26	48.0

Table A 2: Reference Case - Kingseat Road/New Road 2 intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	457	0.0	457	0.0	0.340	3.4	LOS A	2.0	14.3	0.38	0.08	0.50	44.3
3	R2	51	0.0	51	0.0	0.340	16.0	LOS C	2.0	14.3	0.38	0.08	0.50	45.0
Approach		507	0.0	507	0.0	0.340	4.7	NA	2.0	14.3	0.38	0.08	0.50	44.4
East: New Road														
4	L2	118	0.0	118	0.0	0.601	26.2	LOS D	2.4	16.5	0.93	1.11	1.43	32.3
6	R2	16	0.0	16	0.0	0.601	53.6	LOS F	2.4	16.5	0.93	1.11	1.43	19.7
Approach		134	0.0	134	0.0	0.601	29.5	LOS D	2.4	16.5	0.93	1.11	1.43	31.4
North: Kingseat Road														
7	L2	1	0.0	1	0.0	0.613	4.7	LOS A	0.0	0.0	0.00	0.00	0.00	48.6
8	T1	1194	0.0	1194	0.0	0.613	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.5
Approach		1195	0.0	1195	0.0	0.613	0.2	NA	0.0	0.0	0.00	0.00	0.00	49.5
All Vehicles		1836	0.0	1836	0.0	0.613	3.6	NA	2.4	16.5	0.17	0.10	0.24	46.4

Table A 3: Plan Change - Kingseat Road/New Road 2 intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	782	0.0	782	0.0	0.502	1.3	LOS A	2.5	17.8	0.30	0.10	0.45	47.0
3	R2	123	0.0	123	0.0	0.502	9.0	LOS A	2.5	17.8	0.30	0.10	0.45	46.8
Approach		905	0.0	905	0.0	0.502	2.3	NA	2.5	17.8	0.30	0.10	0.45	47.0
East: New Road														
4	L2	45	0.0	45	0.0	0.157	7.6	LOS A	0.5	3.4	0.70	0.85	0.70	40.3
6	R2	16	0.0	16	0.0	0.157	26.7	LOS D	0.5	3.4	0.70	0.85	0.70	30.2
Approach		61	0.0	61	0.0	0.157	12.5	LOS B	0.5	3.4	0.70	0.85	0.70	38.9
North: Kingseat Road														
7	L2	1	0.0	1	0.0	0.337	4.6	LOS A	0.0	0.0	0.00	0.00	0.00	48.9
8	T1	657	0.0	657	0.0	0.337	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	49.8
Approach		658	0.0	658	0.0	0.337	0.1	NA	0.0	0.0	0.00	0.00	0.00	49.8
All Vehicles		1624	0.0	1624	0.0	0.502	1.8	NA	2.5	17.8	0.20	0.09	0.28	47.9

Table A 4: Plan Change - Kingseat Road/New Road 2 intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	457	0.0	457	0.0	0.333	3.2	LOS A	1.9	13.4	0.36	0.07	0.47	44.6
3	R2	47	0.0	47	0.0	0.333	16.0	LOS C	1.9	13.4	0.36	0.07	0.47	45.2
Approach		504	0.0	504	0.0	0.333	4.4	NA	1.9	13.4	0.36	0.07	0.47	44.7
East: New Road														
4	L2	124	0.0	124	0.0	0.623	26.9	LOS D	2.5	17.4	0.94	1.12	1.47	32.1
6	R2	16	0.0	16	0.0	0.623	54.2	LOS F	2.5	17.4	0.94	1.12	1.47	19.4
Approach		140	0.0	140	0.0	0.623	30.0	LOS D	2.5	17.4	0.94	1.12	1.47	31.2
North: Kingseat Road														
7	L2	1	0.0	1	0.0	0.613	4.7	LOS A	0.0	0.0	0.00	0.00	0.00	48.6
8	T1	1194	0.0	1194	0.0	0.613	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	49.5
Approach		1195	0.0	1195	0.0	0.613	0.2	NA	0.0	0.0	0.00	0.00	0.00	49.5
All Vehicles		1839	0.0	1839	0.0	0.623	3.6	NA	2.5	17.4	0.17	0.11	0.24	46.3

Table A 5: Reference Case - Linwood Road/New Road 1 intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: New Road 2														
1	L2	1	0.0	1	0.0	0.235	7.9	LOS A	0.2	1.7	0.84	0.95	0.92	30.0
3	R2	91	0.0	91	0.0	0.235	12.6	LOS B	0.2	1.7	0.84	0.95	0.92	39.8
Approach		92	0.0	92	0.0	0.235	12.5	LOS B	0.2	1.7	0.84	0.95	0.92	39.8
East: Linwood Road														
4	L2	183	0.0	183	0.0	0.425	4.7	LOS A	0.0	0.0	0.00	0.12	0.00	48.3
5	T1	637	0.0	637	0.0	0.425	0.2	LOS A	0.0	0.0	0.00	0.12	0.00	48.4
Approach		820	0.0	820	0.0	0.425	1.2	NA	0.0	0.0	0.00	0.12	0.00	48.4
West: Linwood Road														
11	T1	1323	0.0	1323	0.0	0.680	0.0	LOS A	0.0	0.1	0.00	0.00	0.01	50.0
12	R2	1	0.0	1	0.0	0.680	15.2	LOS C	0.0	0.1	0.00	0.00	0.01	48.0
Approach		1324	0.0	1324	0.0	0.680	0.0	NA	0.0	0.1	0.00	0.00	0.01	50.0
All Vehicles		2236	0.0	2236	0.0	0.680	1.0	NA	0.2	1.7	0.04	0.08	0.04	48.9

Table A 6: Reference Case - Linwood Road/New Road 1 intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: New Road 2														
1	L2	14	0.0	14	0.0	0.759	46.4	LOS E	2.8	19.3	0.97	1.19	1.75	20.0
3	R2	181	0.0	181	0.0	0.759	26.7	LOS D	2.8	19.3	0.97	1.19	1.75	32.5
Approach		195	0.0	195	0.0	0.759	28.1	LOS D	2.8	19.3	0.97	1.19	1.75	32.0
East: Linwood Road														
4	L2	102	0.0	102	0.0	0.788	5.3	LOS A	0.0	0.0	0.00	0.04	0.00	48.1
5	T1	1429	0.0	1429	0.0	0.788	0.9	LOS A	0.0	0.0	0.00	0.04	0.00	48.4
Approach		1532	0.0	1532	0.0	0.788	1.2	NA	0.0	0.0	0.00	0.04	0.00	48.4
West: Linwood Road														
11	T1	733	0.0	733	0.0	0.536	10.0	LOS A	15.7	110.0	1.00	0.04	1.21	41.3
12	R2	25	0.0	25	0.0	0.536	48.7	LOS E	15.7	110.0	1.00	0.04	1.21	36.9
Approach		758	0.0	758	0.0	0.536	11.3	NA	15.7	110.0	1.00	0.04	1.21	41.2
All Vehicles		2484	0.0	2484	0.0	0.788	6.4	NA	15.7	110.0	0.38	0.13	0.51	43.5

Table A 7: Plan Change - Linwood Road/New Road 1 intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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 %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: New Road 2														
1	L2	1	0.0	1	0.0	0.315	8.3	LOS A	0.9	6.0	0.86	0.97	1.00	29.4
3	R2	121	0.0	121	0.0	0.315	13.2	LOS B	0.9	6.0	0.86	0.97	1.00	39.5
Approach		122	0.0	122	0.0	0.315	13.1	LOS B	0.9	6.0	0.86	0.97	1.00	39.4
East: Linwood Road														
4	L2	192	0.0	192	0.0	0.430	4.7	LOS A	0.0	0.0	0.00	0.13	0.00	48.2
5	T1	637	0.0	637	0.0	0.430	0.2	LOS A	0.0	0.0	0.00	0.13	0.00	48.4
Approach		828	0.0	828	0.0	0.430	1.2	NA	0.0	0.0	0.00	0.13	0.00	48.3
West: Linwood Road														
11	T1	1323	0.0	1323	0.0	0.680	0.0	LOS A	0.1	0.4	0.00	0.00	0.01	50.0
12	R2	1	0.0	1	0.0	0.680	15.4	LOS C	0.1	0.4	0.00	0.00	0.01	48.0
Approach		1324	0.0	1324	0.0	0.680	0.0	NA	0.1	0.4	0.00	0.00	0.01	50.0
All Vehicles		2275	0.0	2275	0.0	0.680	1.2	NA	0.9	6.0	0.05	0.10	0.06	48.7

Table A 8: Plan Change - Linwood Road/New Road 1 intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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 %	[Total veh/h	HV %				[Veh. veh	Dist] m				
South: New Road 2														
1	L2	6	0.0	6	0.0	0.750	44.4	LOS E	2.6	18.2	0.97	1.17	1.72	21.0
3	R2	192	0.0	192	0.0	0.750	25.4	LOS D	2.6	18.2	0.97	1.17	1.72	33.3
Approach		198	0.0	198	0.0	0.750	26.0	LOS D	2.6	18.2	0.97	1.17	1.72	33.1
East: Linwood Road														
4	L2	124	0.0	124	0.0	0.797	5.4	LOS A	0.0	0.0	0.00	0.04	0.00	47.9
5	T1	1423	0.0	1423	0.0	0.797	0.9	LOS A	0.0	0.0	0.00	0.04	0.00	48.3
Approach		1547	0.0	1547	0.0	0.797	1.3	NA	0.0	0.0	0.00	0.04	0.00	48.3
West: Linwood Road														
11	T1	733	0.0	733	0.0	0.462	5.8	LOS A	15.7	109.6	1.00	0.02	1.09	44.6
12	R2	13	0.0	13	0.0	0.462	50.7	LOS F	15.7	109.6	1.00	0.02	1.09	40.8
Approach		745	0.0	745	0.0	0.462	6.5	NA	15.7	109.6	1.00	0.02	1.09	44.5
All Vehicles		2491	0.0	2491	0.0	0.797	4.8	NA	15.7	109.6	0.38	0.13	0.46	44.9

Table A 9: Reference Case - Kingseat Road/Linwood Road intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	96	0.0	96	0.0	0.526	0.1	LOS A	0.0	0.0	0.00	0.50	0.00	46.2
3	R2	901	0.0	901	0.0	0.526	4.7	LOS A	0.0	0.0	0.00	0.50	0.00	40.8
Approach		997	0.0	997	0.0	0.526	4.2	NA	0.0	0.0	0.00	0.50	0.00	42.0
East: Linwood Road														
4	L2	496	0.0	496	0.0	0.432	8.3	LOS A	1.3	9.1	0.55	0.37	0.81	33.2
6	R2	125	0.0	125	0.0	0.432	12.5	LOS B	1.3	9.1	0.55	0.37	0.81	42.1
Approach		621	0.0	621	0.0	0.432	9.1	NA	1.3	9.1	0.55	0.37	0.81	36.5
North: McRobbie Road														
7	L2	406	0.0	406	0.0	0.685	26.4	LOS D	2.8	19.9	0.91	1.39	1.97	30.1
8	T1	149	0.0	149	0.0	0.205	11.5	LOS B	0.3	1.9	0.74	1.03	0.78	39.4
Approach		556	0.0	556	0.0	0.685	22.4	LOS C	2.8	19.9	0.86	1.30	1.65	32.1
All Vehicles		2174	0.0	2174	0.0	0.685	10.3	NA	2.8	19.9	0.38	0.67	0.65	36.6

Table A 10: Reference Case - Kingseat Road/Linwood Road intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL 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] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	168	0.0	168	0.0	0.365	0.1	LOS A	0.0	0.0	0.00	0.42	0.00	46.9
3	R2	527	0.0	527	0.0	0.365	4.6	LOS A	0.0	0.0	0.00	0.42	0.00	42.1
Approach		696	0.0	696	0.0	0.365	3.5	NA	0.0	0.0	0.00	0.42	0.00	44.3
East: Linwood Road														
4	L2	1060	0.0	1060	0.0	0.872	11.9	LOS B	18.9	132.4	1.00	0.41	2.36	28.9
6	R2	369	0.0	369	0.0	0.872	16.8	LOS C	18.9	132.4	1.00	0.41	2.36	39.6
Approach		1429	0.0	1429	0.0	0.872	13.1	NA	18.9	132.4	1.00	0.41	2.36	33.5
North: McRobbie Road														
7	L2	232	0.0	232	0.0	0.190	10.5	LOS B	1.2	8.6	0.70	0.86	0.70	40.2
8	T1	132	0.0	132	0.0	0.419	20.7	LOS C	1.3	9.4	0.92	1.07	1.15	33.2
Approach		363	0.0	363	0.0	0.419	14.2	LOS B	1.3	9.4	0.78	0.93	0.86	37.4
All Vehicles		2488	0.0	2488	0.0	0.872	10.6	NA	18.9	132.4	0.69	0.49	1.48	36.6

Table A 11: Plan Change - Kingseat Road/Linwood Road intersection morning peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	96	0.0	96	0.0	0.526	0.1	LOS A	0.0	0.0	0.00	0.50	0.00	46.2
3	R2	901	0.0	901	0.0	0.526	4.7	LOS A	0.0	0.0	0.00	0.50	0.00	40.8
Approach		997	0.0	997	0.0	0.526	4.2	NA	0.0	0.0	0.00	0.50	0.00	42.0
East: Linwood Road														
4	L2	496	0.0	496	0.0	0.432	8.3	LOS A	1.3	9.1	0.55	0.37	0.81	33.2
6	R2	125	0.0	125	0.0	0.432	12.5	LOS B	1.3	9.1	0.55	0.37	0.81	42.1
Approach		621	0.0	621	0.0	0.432	9.1	NA	1.3	9.1	0.55	0.37	0.81	36.5
North: McRobbie Road														
7	L2	406	0.0	406	0.0	0.685	26.4	LOS D	2.8	19.9	0.91	1.39	1.97	30.1
8	T1	149	0.0	149	0.0	0.205	11.5	LOS B	0.3	1.9	0.74	1.03	0.78	39.4
Approach		556	0.0	556	0.0	0.685	22.4	LOS C	2.8	19.9	0.86	1.30	1.65	32.1
All Vehicles		2174	0.0	2174	0.0	0.685	10.3	NA	2.8	19.9	0.38	0.67	0.65	36.6

Table A 12: Plan Change - Kingseat Road/Linwood Road intersection evening peak hour movement summary

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS		ARRIVAL FLOWS		Deg. Satn	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] %	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Kingseat Road														
2	T1	168	0.0	168	0.0	0.365	0.1	LOS A	0.0	0.0	0.00	0.42	0.00	46.9
3	R2	527	0.0	527	0.0	0.365	4.6	LOS A	0.0	0.0	0.00	0.42	0.00	42.1
Approach		696	0.0	696	0.0	0.365	3.5	NA	0.0	0.0	0.00	0.42	0.00	44.3
East: Linwood Road														
4	L2	1060	0.0	1060	0.0	0.867	11.6	LOS B	7.4	51.8	1.00	0.40	2.30	29.2
6	R2	363	0.0	363	0.0	0.867	16.5	LOS C	7.4	51.8	1.00	0.40	2.30	39.8
Approach		1423	0.0	1423	0.0	0.867	12.9	NA	7.4	51.8	1.00	0.40	2.30	33.7
North: McRobbie Road														
7	L2	218	0.0	218	0.0	0.179	10.5	LOS B	0.5	3.3	0.70	0.85	0.70	40.2
8	T1	132	0.0	132	0.0	0.413	20.4	LOS C	0.5	3.7	0.92	1.07	1.14	33.4
Approach		349	0.0	349	0.0	0.413	14.2	LOS B	0.5	3.7	0.78	0.93	0.86	37.4
All Vehicles		2468	0.0	2468	0.0	0.867	10.4	NA	7.4	51.8	0.69	0.48	1.45	36.7

APPENDIX B

summary of safety record

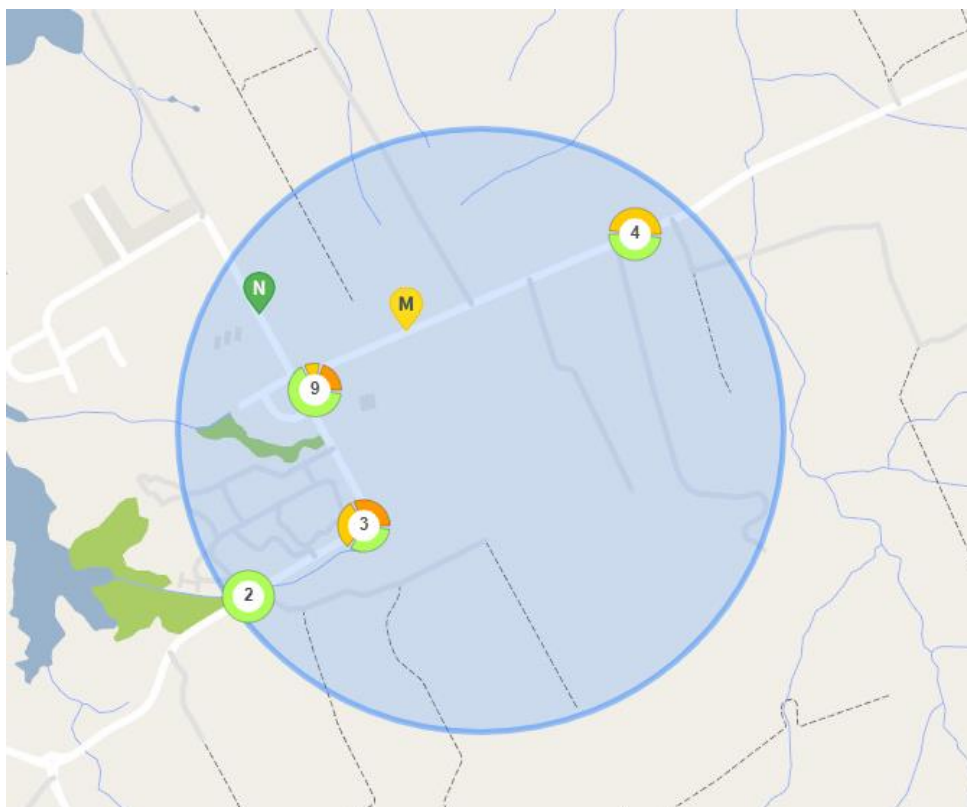
We have assessed the crash records from 2016 to 2021 for the surrounding roads obtained from the Waka Kotahi NZTA Crash Analysis System (CAS). The search area includes Linwood Road, the Linwood/McRobbie/Kingseat road intersection, and Kingseat Road, as shown in

The locations of each recorded crash, injury severity level (non-injury, minor, serious and fatal) and other factors such as crash year, weather conditions and road conditions were considered. Crashes are summarised below.

- ◆ A total of 20 incidents were recorded: 8 non-injury, 3 minor injury, and 3 serious injury incidents
- ◆ 9 events occurred at the intersection of Linwood/Kingseat
- ◆ 5 occurred on the midblock east of the Linwood/Kingseat intersection
- ◆ 5 are related to the nearby horizontal curve south of the Linwood/Kingseat intersection
- ◆ 1 isolated incident is reported on the midblock north of the Linwood/Kingseat intersection

The crash history indicates an existing road safety issue within the study area, with head on and loss of control crashes being a moderate proportion of crashes.

Figure B 1: Crash study area (1 km radii from site)



The crash data is summarised in Table B 1 below showing the crash pattern of the intersection and midblock in addition to the severity of the crash. This table is intended to be read in conjunction with Figure B 2.

Table B 1: Number of injuries related to the movement and severity of crash










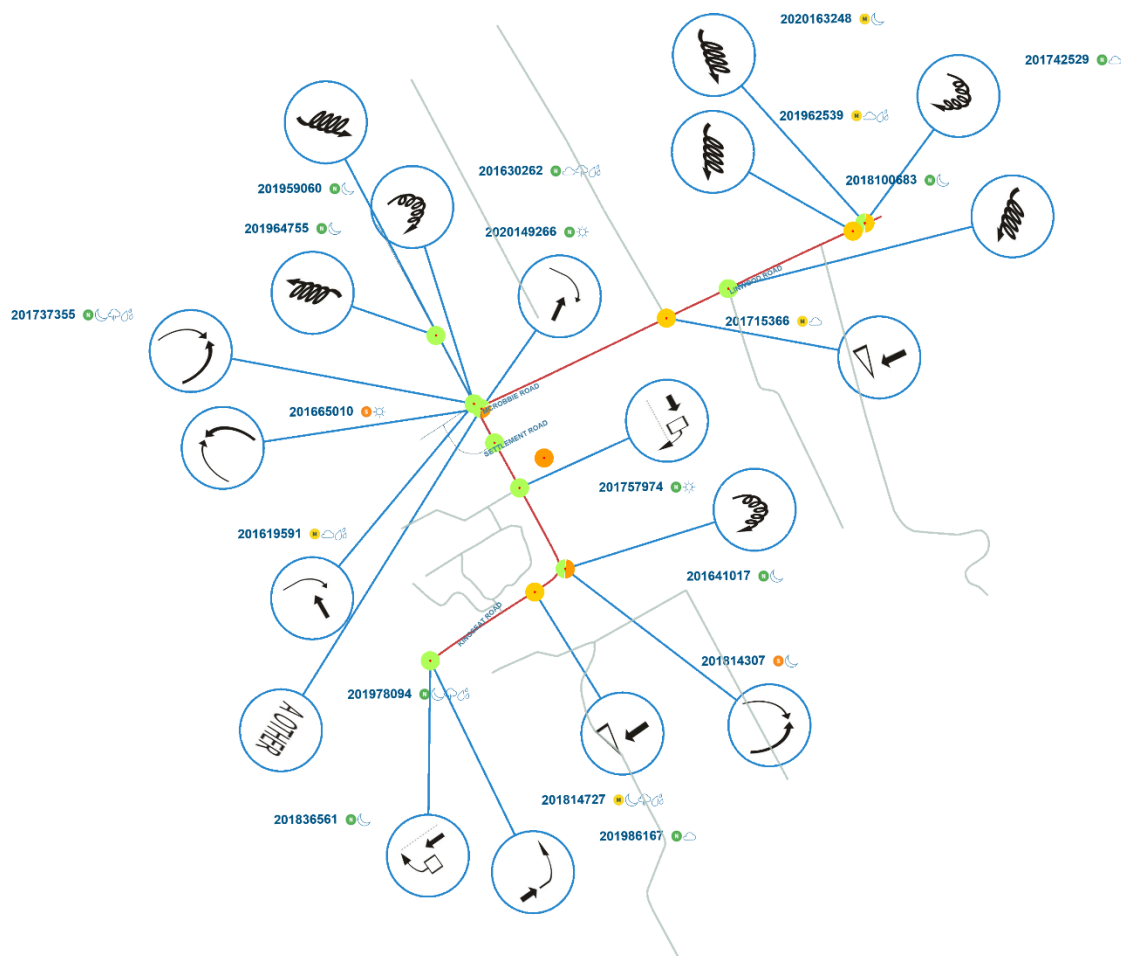
Category	Movement code	Fatal injury	Serious injury	Minor injury	Non-injury	Total
Head on	 Swinging wide		2		1	3
Lost control bend	 DH (old)				3	3
Lost control straight	 Off roadway to left			2	3	5
Obstruction	 Non vehicular obstructions (including animals)			2		2
Other ped	 Walking on footpath		1			1
Overtaking	A OTHER				1	
Same turning direction	 Rear of left turning vehicle				1	
	 Stopped or turning from left side				1	
	 Near centre line				1	
Crossing vehicle turning	 Right turn right side				1	
Total		0	3	5	12	20

Figure B 2: Collision diagram



For the Linwood/Kingsseat T intersection, we note that

- ◆ A total of 6 incidents relating to the intersection have been reported including 3 non-injury incidents, 1 minor injury incident, and one serious injury incident
- ◆ The serious injury was likely caused by a driver attempting negotiate the corner at a speed significantly higher than the recommended 35 kph posted speed resulting in an overcorrection into the oncoming lane. A similar event has been recorded resulting in non-injury due to the evasive manoeuvre carried out to avoid collision with the oncoming vehicle crossing the centreline, however this resulted in the driver running off the road
- ◆ 2 crossing movements have resulted in 1 instance of minor injury and 1 non-injury event with both caused by the driver on the north approach failing to give way to the priority eastbound traffic
- ◆ A non-injury crash occurred during wet weather involving a driver likely exceeding the recommended posted speed losing control around the bend
- ◆ A non-injury crash with occupants fleeing scene – likely intoxicated

For the midblock south of the Kingseat/Linwood intersection, we note that,

- ◆ Most incidents are the result of driver behaviour
- ◆ A collision with a pedestrian is reported resulting in serious injury
- ◆ A minor injury and a non-injury incident are reported as westbound drivers have likely exceeded the advisory speed limit resulting in ---- the minor injury occurred following a weather event
- ◆ One serious injury is reported on the corner of Kingseat Road, resulting from a similar event as discussed above with the eastbound driver likely exceeding the advisory speed limit around the curve, attempting to correct by crossing the centre line subsequently involved in a head on collision
- ◆ 3 non-injury incidents relating to drive-way access have been reported (driver was tailgating + other driver gave >3 s indication, driver failed to give way, other no further details)

For the midblock east of site, we note that,

- ◆ A likely isolated collision has occurred between a vehicle and animal resulting in minor injury
- ◆ Isolated incidents attributed to driver behaviour including distraction, impairment, inexperience and police evasion have resulted in 3 non-injury and 2 minor injury incidents

For the midblock north of Linwood/Kingseat, we note that,

- ◆ A vehicle has driven off the roadway to the left and has no reported injuries. Likely an isolated incident