Regional Freight Hub Section 92 Response- Transport

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Revision Schedule

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1.0 INTRODUCTION

This report is in response to a request for information ("RFI") from the Palmerston North City Council ("PNCC"), dated 23 November 2020. The transportation matters of the RFI to which this report responds are shown in Table 1-1 below.

Table 1-1: Transportation RFI

INFORMATION REQUEST		
Schedule 1		
114)	*Please provide an assessment of the proposed Regional Freight Hub roading network in relation to strategic plans for the Regional Freight Ring Road ('Ring Road'), including assessment of the extent to which the proposed Regional Freight Hub roading network:*	
	(i)	*includes optimal connections between the Regional Freight Hub and future Ring Road route;*
	(ii)	*allows for optimal connections between the Regional Freight Hub and future Ring Road to be developed in future;*
	(iii)	*impacts on the ability for the Ring Road to be developed in a manner consistent with existing strategic plans, including plans for a southern bypass of Bunnythorpe.*
115)	*Please provide a description of:*	
	(i)	*what KiwiRail's optimal Regional Freight Hub roading network would look like assuming there was certainty that the Regional Freight Ring Road would be in place by the time the Regional Freight Hub became operational;*
	(ii)	*the feasibility and approximate cost implications of changing the Regional Freight Hub roading network from the network outlined in the NoR to the network envisaged in paragraph (i), including a demonstration of how the northern Perimeter Road route could transition to a southern bypass of Bunnythorpe.*
Potential effects on the North East Industrial Zone		
116)	*Please provide an assessment of traffic effects on activities in the NEIZ, including:*	
	(i)	*Identify and assess the access to the Regional Freight Hub intended to be used by NEIZ customers;*
	(ii)	*Assess the safety impacts on each of the existing Foodstuffs driveways, given the proximity to Railway Road and the additional vehicle flows that will be along the frontage with Railway Road diverted.*
117)	*Please also provide, from a traffic and economic perspective, an assessment of the effects that KiwiRail's proposed roading changes may have on the ability of current and future occupants of the NEIZ to move freely to and from their sites (e.g. closure of Railway Road*	

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	and resulting diversion of traffic onto Roberts Line, closure of Roberts Line level crossing) and details of mitigation measures that could be taken to alleviate any identified impact).
118)	*Please explain what an efficient connectivity solution for moving freight between the NEIZ and Regional Freight Hub could look like, including but not limited to a dedicated freight corridor.*
119)	*Please confirm whether there is sufficient space within the NoR for the southern access to the Regional Freight Hub to be grade separated if required, including allowance for the movement of containers between the NEIZ and the Regional Freight Hub via a private access?*
120)	*Please explain how the road layout proposals provide for alternative access for existing businesses in the NEIZ to the freight road network, with regard to District Plan Rule 12A.8.4?*
Impacts on the Road Network	
13.1	**Positive Effects**
141)	*From a network wide perspective, what is the approximate overall reduction of road freight in terms of truck movements, caused by the provision of the additional rail freight capacity?*
142)	*Please provide an assessment of the predicted character and magnitude of the effect of any overall reduction of road freight in terms of truck movements.*
13.2	**Analysis**
143)	*To better reflect the intended use of the road network, please include the following in the Do Minimum and future road networks in the traffic model:*
	(i) *Flygers Line to each side of SH3 as access only;*
	(ii) *The western end of Richardson Line being accessible to light but not heavy vehicles; and*
	(iii) *A roundabout at the Roberts Line/ KB Road intersection.*
144)	*To assist with understanding the particular traffic effects of the Regional Freight Hub, rather than the effects resulting from an implied permitted baseline, please develop and report on the following traffic model scenarios:*
	(i) *An ultimate year Do Minimum which includes the 2041 PNATM demands with the NEIZ developed but not into the Regional Freight Hub area; and*
	(ii) *An ultimate year with Regional Freight Hub which includes at least an indicative vehicle bypass to the south and west of Bunnythorpe.*

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145)	*Assuming the strategic road network is in place (as per Figure 12.3), including a ring road around Bunnythorpe and no through traffic on Flygers Line; are there still any performance challenges within the road network, e.g. on Tremaine Ave?*	
146)	*Please provide further detailed traffic effects assessment within Bunnythorpe, addressing the following:*	
	(i)	*traffic effects at local intersections (e.g. detailed analysis of KB Rd/ Campbell Rd, Stoney Creek Rd/ Ashhurst Rd, Maple St/ Railway Rd);*
	(ii)	*traffic effects including safety at the intersections. Include consideration of changes to available sight lines at the intersection of Maple Street and Railway Road and the adequacy of existing sight lines at the intersections of Kairanga-Bunnythorpe Road and Railway Road, and Stoney Creek Road with Ashhurst Road;*
	(iii)	*pedestrian and cyclist delay/ safety;*
	(iv)	*access to services for local residents and businesses; and*
	(v)	*access to the relocated bus stop.*
147)	*Please provide an explanation* as to how the traffic model is fit for the purpose of determining localised traffic effects in this northeastern part of the network, noting that the model was validated in 2013 for strategic rather than local use. In particular:*	
	(i)	*Level of calibration of traffic volumes for local roading network (including Tremaine Ave, Railway Road, Richardsons Line, Roberts Line and through Bunnythorpe) including light/heavy split;*
	(ii)	*Calibration of distribution for the existing rail hub;*
	(iii)	*Calibration of intersection performance and delays (Table 8.6). The effects included in Figures 9.4 and 9.6 can only be relied on if the model is proven to be fit for purpose with regard to modelling intersection delay at this local level;*
	(iv)	*Travel time calibration for key local routes (Palmerston North to/from Bunnythorpe and Feilding, and between the existing KiwiRail yard and the NoR site);*
	(v)	*Calibration of NEIZ trip generations from counts with current activity.*
	**Note that a peer review of the model confirming that it is fit for purpose would be acceptable as a means of providing this information.*	
13.3	**Mitigation**	
148)	*Identify, describe, and assess the appropriateness of any mitigations at the Bunnythorpe 'node' and associated traffic effects. For example, grade separation of the level crossing, achieving safe sight lines at the Railway Road / Kairanga-Bunnythorpe Road intersection*	

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	and satisfactory performance of the Campbell Road / Kairanga-Bunnythorpe Road intersection.
149)	*Figure 9.2 of Technical Report C - Integrated Transport Assessment shows two intersection upgrades in Bunnythorpe as part of the Regional Freight Hub network. Are these upgrades to be provided by KiwiRail, and what is the nature of the upgrades? Are there any local property or access effects as a result of the upgrades?*
13.4	**Other**
150)	*Is it intended that the Network Integration Plan be geographically limited to areas within the NoR?*

The existing Te Araroa Trail is primarily a walkway with sections (the unformed section of Sangsters Road) that are not suitable for cyclist use. Palmerston North City Council has been planning a shared path within the existing Railway Road corridor which would be suitable for use by commuter cyclists travelling between Feilding and Bunnythorpe and Palmerston North. The Te Araroa Trail is not an option for these cyclists due to the unformed sections combined with vertical alignment in parts (goes through a paddock with steep slopes). The existing Railway Road corridor provides an option for a reasonably steady vertical and horizontal alignment with a limited number of side roads to cross, each with low traffic volumes. A shared path along the alignment of the perimeter road will be longer and will require negotiating a number of busy intersections.

151)	*Please Provide an assessment of the effect of the change of alignment of Railway Road, and identify any available means of mitigating those effects, including by reference to Palmerston North City Council's plans for a shared path for active modes?*	
13.5	**Roading Design**	
152)	*What will be the treatment at the ends of the roads that will be closed (Te Ngaio Road, Clevely Line and Roberts Line)? Consider, for example,*	
	(i)	*Will turning heads be included?*
	(ii)	*Will there be any changes in the formation at the connections of each of Tutaki Road and Parrs Road with Sangster Road?*
	(iii)	*Will there be any change at the Clevely Line connection with Sangsters Road other than the closure of the level crossing?*
153)	*For the north and west accesses to the Regional Freight Hub from the perimeter road and the Roberts Line intersection with the perimeter road, can the Austroads requirements for intersection sight lines be met?*	
154)	*Is there any risk of traffic blocking back through the Perimeter Road intersections from the internal Regional Freight Hub level crossings which are shown just into the site from the southern and northern site entry points?*	

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155)	*Is there sufficient space within the NoR to accommodate roundabouts, if required, for the north and west accesses and the Roberts Line intersection? If not, how much additional space would be required?*	
13.6	**Analysis**	
156)	*Explain whether the perimeter road has a function of accommodating internal trips for the Regional Freight Hub? If so, what proportion of trips on the perimeter road will be effectively internal Regional Freight Hub trips?*	
157)	*Explain the basis of the assumptions regarding:*	
	(i)	*Capacities of each road type in the V/C Level of Service calculations (Tables 8.2 and 8.5). How do these compare with One Network Road Classification (ONRC) expectations?*
	(ii)	*25% / 75% external / local traffic attraction and whether this split would remain the same as the Regional Freight Hub develops?*
	(iii)	*Figures 9.4 and 9.6 show little if any heavy vehicle movements between Regional Freight Hub and central Palmerston North (within inner ring road) and south of the river and also little if any to/from SH3 to the east. Why are these distributions of external trips different to those included in Figure 6.4?*
158)	*Explain how trucks are modelled in the model. Are they included as multiple car equivalents? Is there any allowance for slower acceleration from intersections and larger minimum gap requirements?*	
159)	*Explain the use of average month rail volume data rather than 85th percentile to factor traffic counts. What would be the 85th percentile daily traffic generation for the Regional Freight Hub?*	
160)	*Are any trips included in the model between the NEIZ and the Regional Freight Hub, if so how many and what is the heavy/light split?*	
161)	*Provide an assessment of any effects on the safety of the following intersections and accesses as a result of at least the initial stage of the Regional Freight Hub compared with existing safety performance:*	
	(i)	*Tremaine Avenue intersections between North Street and Railway Road inclusive;*
	(ii)	*Railway Road / Airport Drive;*
	(iii)	*Existing Railway Road intersections and accesses including with Setters Line, The Cutting Way, El Prado Drive and DKSH New Zealand;*
	(iv)	*Future accesses from NEIZ lots to Railway Road where the only practical access is to Railway Road;*

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	(v)	*Each of the Foodstuffs driveways onto Roberts Line;*
	(vi)	*Railway Road / Maple St and also the property accesses on Railway Road between Maple Street and KB Road;*
	(vii)	*Railway Road/ KB Road;*
	(viii)	*Kairanga-Bunnythorpe Road / Campbell Road;*
	(ix)	*The property accesses onto Campbell Road within central Bunnythorpe between Dixons Line and Stoney Creek Road;*
	(x)	*Richardsons Line / Milson Line;*
	(xi)	*SH54 / Waughs Road; and*
	(xii)	*The intersections and accesses along Stoney Creek Road between Ashhurst Road and Kelvin Grove Road inclusive.*
For the intersections included in the above point, plus the new intersections around the Perimeter Road, provide Sidra analysis of the intersection performance for the existing/base scenario and at least the initial stage with and without the Regional Freight Hub.		
162)	*Explain the impact on school bus routes, including (if any) Ministry of Education funded rural school bus services.*	
13.7	**Reporting**	
163)	*When reporting outputs from Sidra analysis of intersections include traffic volumes and performance on each approach to the intersection.*	
164)	*At tables 10.6 and 10.7, include Flygers Line to each side of SH3.*	
165)	*Provide versions of Figures 9.4 and 9.6 for light vehicles.*	
166)	*Compare the following traffic flows for central Bunnythorpe:*	
	(i)	*Existing/base traffic flows;*
	(ii)	*Initial stage without Regional Freight Hub; and*
	(iii)	*Initial stage with Regional Freight Hub.*
167)	*Provide a select link analysis for the main central Feilding and central Bunnythorpe zones to see the change in routes between the existing/base and the initial stages both without and with the Regional Freight Hub.*	

2.0 RESPONSES

2.1 Request 114

114)	*Please provide an assessment of the proposed Regional Freight Hub roading network in relation to strategic plans for the Regional Freight Ring Road ('Ring Road'), including assessment of the extent to which the proposed Regional Freight Hub roading network:*	
	(i)	*includes optimal connections between the Regional Freight Hub and future Ring Road route;*
	(ii)	*allows for optimal connections between the Regional Freight Hub and future Ring Road to be developed in future;*
	(iii)	*impacts on the ability for the Ring Road to be developed in a manner consistent with existing strategic plans, including plans for a southern bypass of Bunnythorpe.*

2.1.1 Overall Response

As included in Section 7 of the Integrated Transportation Assessment (ITA), the Regional Land Transport Plan (RLTP) [1] presents the publicly available information on the Ring Road. It has limited details related to timing, route alignments and tie in positions. The published Ring Road is in the process of being reviewed by Waka Kotahi and the Councils, with release of an updated strategic roading network plan expected in 2021.

Portions of the Ring Road included in the RLTP that have more visibility such as the SH/Kairanga Bunnythorpe roundabouts have been allowed for in the transportation modelling undertaken, since they have funding as part of the Waka Kotahi National Land Transport Program. It is not KiwiRail's responsibility to assume route alignments and connections for the Ring Road. In the absence of the available detail, preparation of a Road Network Integration Plan is volunteered as per the updated NoR Conditions, to be developed in conjunction with the road controlling authorities, that has a purpose of developing an integrated roading plan, incorporating KiwiRail's proposals.

2.1.2 (i) includes optimal connections between the Regional Freight Hub and future Ring Road route;

Section 7.1.2 of the ITA shows the RLTP proposal for the Ring Road, which includes western and southern bypasses of Bunnythorpe. The Regional Freight Hub (RFH) roading network has been designed in such a way as to enable future connections to these bypasses. This could occur, for example, with the northern section of the perimeter road being converted to, or connecting into, a southern bypass while the western section of the perimeter road could be aligned within the designation to link to a western bypass.

2.1.3 (ii) allows for optimal connections between the Regional Freight Hub and future Ring Road to be developed in future;

The updated NoR Conditions detail the volunteered requirements for KiwiRail to develop a Road Network Integration Plan. The details require the Plan to be developed 12 months prior to construction of the RFH and provide a mechanism to enable the roading network for the RFH to be appropriately integrated with plans for the wider transport network. The Plan would, for example, provide the opportunity for the northern section of the perimeter road to be designed and constructed to a southern bypass standard or in a manner that would not foreclose the ability of the southern bypass to be constructed subsequently.

The details of the Road Network Integration Plan require KiwiRail to consult with the Palmerston North City Council, Horizons Regional Council and Waka Kotahi NZ Transport Agency in preparing the Plan and to include in the Plan any feedback provided by those parties, including any feedback regarding the location and timing of the Ring Road and / or any bypasses.

2.1.4 (iii) impacts on the ability for the Ring Road to be developed in a manner consistent with existing strategic plans, including plans for a southern bypass of Bunnythorpe.

KiwiRail's RFH designation does not foreclose the ability for new strategic infrastructure to be developed in the future and delivered by others. As set out above, the proposed Road Network Integration Plan provides a mechanism to enable the RFH to be designed and integrated with the wider transport network, as further detail on the timing and alignment of those upgrades are released.

Based on the publicly available information contained within the RLTP, it is possible, for example, that the northern portion of the RFH's designation could be designated for the southern bypass. It is not uncommon for land to be subject to multiple designations and the RMA provides a mechanism for this. In the event that this land was designated for a southern bypass, KiwiRail would work with other parties to ensure that access to the northern portion of the RFH site is provided while also integrating that access with any bypass. It is expected that this level of detail will be defined at a later date as more details on the Ring Road are revealed and KiwiRail's detailed design for the site is finalised.

2.2 Request 115

115)	*Please provide a description of:*	
	(i)	*what KiwiRail's optimal Regional Freight Hub roading network would look like assuming there was certainty that the Regional Freight Ring Road would be in place by the time the Regional Freight Hub became operational;*
	(ii)	*the feasibility and approximate cost implications of changing the Regional Freight Hub roading network from the network outlined in the NoR to the network envisaged in paragraph (i), including a demonstration of how the northern Perimeter Road route could transition to a southern bypass of Bunnythorpe.*

2.2.1 (i) what KiwiRail's optimal Regional Freight Hub roading network would look like assuming there was certainty that the Regional Freight Ring Road would be in place by the time the Regional Freight Hub became operational;

Refer to the response to Request 114 (i).

2.2.2 (ii) the feasibility and approximate cost implications of changing the Regional Freight Hub roading network from the network outlined in the NoR to the network envisaged in paragraph (i), including a demonstration of how the northern Perimeter Road route could transition to a southern bypass of Bunnythorpe.

As explained in the overall response to Request 114, publicly available information on the Ring Road (in the RLTP) has limited details related to timing, route alignments and tie in positions. KiwiRail cannot assume route alignments and connections for the Ring Road and, in the absence of more detail, KiwiRail cannot provide assessment of the future strategic roading network.

In the response to Request 114 (ii) it is discussed that the northern section of the perimeter road has the potential to be developed to a standard required for the southern bypass. If this is achieved, it would mitigate future cost associated with changing infrastructure. Regardless, costs associated with converting the northern portion of the perimeter road to the southern bypass cannot be reliably determined at this stage since details surrounding the bypass formation and tie in locations have not been defined in the RLTP.

2.3 Request 116

116)	*Please provide an assessment of traffic effects on activities in the NEIZ, including:*

(i)	*Identify and assess the access to the Regional Freight Hub intended to be used by NEIZ customers;*
(ii)	*Assess the safety impacts on each of the existing Foodstuffs driveways, given the proximity to Railway Road and the additional vehicle flows that will be along the frontage with Railway Road diverted.*

2.3.1 (i) Identify and assess the access to the Regional Freight Hub intended to be used by NEIZ customers;

Sections 7.2.1 and 12 of the ITA show that Richardsons Line and Roberts Line will provide the primary link between the NEIZ and the RFH via the proposed roundabout at the Roberts Line/Richardsons Line intersection. Palmerston North City Council is progressing plans to upgrade Richardsons Line to service the NEIZ with a recent contract (Richardsons Line – Detailed design and tender for road upgrades and new water services) seeking proposals from the market.

The traffic models and results reported in the ITA have been updated in response to Request 143, with the updated 2051 analysis showing that the expected volumes at this intersection will be adequately accommodated with a dual-lane roundabout, performing at a LOS A in the 2051 'with RFH' scenario. The updated model demonstrates there is no need to provide for a grade separated intersection. The NoR is sufficiently sized to accommodate this roundabout, providing access to the RFH including for NEIZ customers.

The proposed location of the additional NEIZ access points, shown by District Plan Map 7.2 which is repeated in Appendix A, will remain on Richardsons Line. The RFH does not give rise to a change in these future access points.

2.3.2 (ii) Assess the safety impacts on each of the existing Foodstuffs driveways, given the proximity to Railway Road and the additional vehicle flows that will be along the frontage with Railway Road diverted.

The updated 2051 modelling shows daily traffic volumes of approximately 6,500vpd and 14,100vpd on Roberts Line in 2051 for the 'with RFH' and 'without RFH' scenarios, respectively. The increased traffic coupled with the lowered speed limit, proposed from 100km/h to 80km/h, will moderate the speed environment and reduce the risk to turning vehicles.

With these changing traffic volumes, KiwiRail acknowledges the need to ensure the safety and efficiency for movements to and from the Foodstuffs' site. The updated NoR Conditions provide for KiwiRail to engage with Foodstuffs and Palmerston North City Council regarding property access solutions to resolve any safety and efficiency issues arising from future increases in traffic volumes on Roberts Line.

2.4 Request 117

117)	*Please also provide, from a traffic and economic perspective, an assessment of the effects that KiwiRail's proposed roading changes may have on the ability of current and future occupants of the NEIZ to move freely to and from their sites (e.g. closure of Railway Road and resulting diversion of traffic onto Roberts Line, closure of Roberts Line level crossing) and details of mitigation measures that could be taken to alleviate any identified impact).*

2.4.1 Response

The proposed locations for the additional NEIZ access points, shown in Appendix A will remain on Richardsons Line and will provide additional route choice between the NEIZ and the surrounding road network, in addition to El Prado Drive and the direct access connections some properties have to (Foodstuffs for example) Roberts Line. The RFH will be serviced by the perimeter road and the Roberts Line/Richardsons Line roundabout which, as demonstrated in response to Request 116, will have sufficient capacity to accommodate the traffic movements safely and efficiently, including for current and future occupants of the NEIZ.

Section 10.2 of the ITA detailed the analysis of the travel time impacts to and from key destinations. A copy of Table 10-11 showing the travel time differences for the 2051 'with RFH' and 'without RFH' scenarios is repeated below. It is clear from the table below that the Kelvin Grove/NEIZ Extension origin-destination (O-D) pair will be the most impacted by the infrastructure changes (arising from the Roberts Line level crossing closure), with an increase of 2 to 3 minutes based on the model predictions. Elsewhere, most of the other travel time changes are shown to be modest, at less than 1 minute which would typically be unnoticed by motorists.

There is no identified need to mitigate these travel time changes, noting also that the model changes (as per Request 143) showed only localised effects on intersection LOS as discussed in the response to Request 164, that do not materially change these travel-time results.

Table 2-1: Full build-out 'with RFH' and 'without RFH' Route Travel Time Difference in minutes (Table 10-11 in the ITA)

Full build-out (minutes)	Feilding	CBD	Bunnythorpe	Kelvin Grove	Ashhurst	NEIZ Existing	NEIZ Extension
Feilding		0.4	0.1	1.8	0.1	0.9	0.6
CBD	0.3		0.3	0.0	0.0	0.1	0.1
Bunnythorpe	0.0	0.1		1.1	0.0	0.7	0.5
Kelvin Grove	0.9	0.2	0.9		0.0	0.3	2.9
Ashhurst	0.0	0.0	0.0	0.0		0.5	0.7
NEIZ Existing	0.2	-0.1	1.1	0.6	2.1		0.0
NEIZ Extension	1.1	-0.1	1.1	1.8	1.3	-0.1	

2.5 Request 118

118)	*Please explain what an efficient connectivity solution for moving freight between the NEIZ and Regional Freight Hub could look like, including but not limited to a dedicated freight corridor.*

2.5.1 Response

As discussed in the response to Request 116, the optimal connections will utilise the existing roading infrastructure, with a dual-lane roundabout at the Richardsons Line/Roberts Line intersection.

The prior and updated traffic modelling demonstrates that an at grade solution (roundabout) and the existing surrounding roading network will efficiently accommodate the NEIZ traffic travelling to and from the RFH and the wider areas. The 2051 scenario models show that there is no need for a grade separated solution.

Palmerston North City Council is progressing plans to upgrade Richardsons Line to service the NEIZ, with a recent contract (Richardsons Line – Detailed design and tender for road upgrades and new water services) seeking proposals from the market.

2.6 Request 119

119)	*Please confirm whether there is sufficient space within the NoR for the southern access to the Regional Freight Hub to be grade separated if required, including allowance for the movement of containers between the NEIZ and the Regional Freight Hub via a private access?*

2.6.1 Response

As referred to the response to Request 116 and Request 118 above, the designation is of sufficient size to accommodate a dual-lane roundabout at the Roberts Line/Richardsons Line intersection, within an 80km/h speed environment. The model has demonstrated that a grade separated solution is not required.

2.7 Request 120

120)	*Please explain how the road layout proposals provide for alternative access for existing businesses in the NEIZ to the freight road network, with regard to District Plan Rule 12A.8.4?*

2.7.1 Response

The District Plan Rule 12A.8.4 sets out guidelines around restricting access to Railway Road from the NEIZ. The explanation for this rule states:

The Council's approach to managing the road network in this area of the City is to promote Roberts Line, Kairanga Bunnythorpe Road and Railway Road as a strategic route for freight movement. For this reason, it is preferable to minimise the opportunities for additional side-friction and avoid access to Railway Road as it is a Major Arterial Road. (Noting that Rule R7.8.4.2 makes any subdivision in the North East Industrial Zone Extension Area seeking access to Railway Road a non-complying activity)

As demonstrated at the time of informing the District Plans rules relating to the NEIZ extension, the updated traffic modelling shows that the traffic demands forecast to be generated by the NEIZ and NEIZ extension can be accommodated by the additional proposed accesses via Richardsons Line, shown in Map 7.2 of the District Plan (and included in Appendix A). There is no identified need for the access arrangements defined by the District Plan to be modified in response to the RFH.

2.8 Request 141

141)	*From a network wide perspective, what is the approximate overall reduction of road freight in terms of truck movements, caused by the provision of the additional rail freight capacity?*

2.8.1 Response

A worst-case scenario with no reduction in truck movements was assessed and reported within the ITA to ensure a conservative approach to road demand was taken to informing the impact of the RFH on the surrounding road network.

The RFH will have an increase in rail capacity as highlighted in Section 2 of the Master Planning report[1]. According to the economic specialist, the reconstruction of the RFH (increasing in rail capacity) would primarily affect logs moved by road and general manufactured goods transported by rail.

The construction of the RFH will likely redistribute a considerable portion of the log traffic from the central Palmerston North to alternative routes to the RFH, reducing the heavy vehicle flows along Tremaine Avenue and the surrounding road network.

The volume of manufactured goods transported into the RFH by rail would potentially increase. The Ministry of Transport model for rail traffic for manufactured and retail goods for 2052/53 shows SH3 (north) and SH54 are the key long-distance road links that are likely to see a reduction of long-distance manufactured and retail goods. However, the RFH may result in an increase in shorter distance manufacturing trips from the RFH to customers in the Palmerston North area, resulting in the net effect on local demands remaining unchanged.

Overall, the RFH will result in a decrease in primarily long-haul trips on road network as a result of manufacturing modal shifts, with potentially no changes to local traffic demands as a result of the combined impacts of logs and manufacturing.

2.9 Request 142

142)	*Please provide an assessment of the predicted character and magnitude of the effect of any overall reduction of road freight in terms of truck movements.*

[1] Intermodal Freight Hub Master Plan - Palmerston North, Stantec, March 2020

2.9.1 Response

Refer to the response to Request 141.

2.10 REQUEST 143

143)	*To better reflect the intended use of the road network, please include the following in the Do Minimum and future road networks in the traffic model:*	
	(i)	*Flygers Line to each side of SH3 as access only;*
	(ii)	*The western end of Richardson Line being accessible to light but not heavy vehicles; and*
	(iii)	*A roundabout at the Roberts Line/ KB Road intersection.*

2.10.1 Overall Response

The PNATM has been updated to reflect changes (i) and (ii). As agreed with Palmerston North City Council, Request (iii) was not implemented in the model, as this intersection change is not documented in the RLTP.

These changes have been implemented for all 5 scenarios previously tested, being:

1. Existing Conditions
2. RFH Base Year development ('with RFH' and 'without RFH')
3. RFH Ultimate development ('with RFH' and 'without RFH')

The results are presented in Appendix B, in the form of LOS plots.

2.10.2 (i) Flygers Line to each side of SH3 as access only;

The traffic models were updated to reflect Flygers Line as providing 'access only' by restricting through traffic from the State Highways and only loading the surrounding land-uses onto Flygers Line.

There is little difference in the LOS link and intersection performance for the surrounding road network when compared to the results presented in the ITA at other reported intersections in all scenarios.

2.10.3 (ii) The western end of Richardson Line being accessible to light but not heavy vehicles

The traffic models were updated to reflect the portion of Richardsons Line between the NEIZ and Milson Line as being used by light vehicles only. Richardsons Line (between Setters Line and Milson Line) is shown to have an improved LOS D to C in 2051 for the 'with RFH' scenario compared to the results reported in the ITA.

2.10.4 (iii) A roundabout at the Roberts Line/ KB Road intersection.

As agreed with Palmerston North City Council, this change was not implemented in the updated model, since this intersection change is not documented in the RLTP.

2.11 Request 144

144)	*To assist with understanding the particular traffic effects of the Regional Freight Hub, rather than the effects resulting from an implied permitted baseline, please develop and report on the following traffic model scenarios:*	
	(i)	*An ultimate year Do Minimum which includes the 2041 PNATM demands with the NEIZ developed but not into the Regional Freight Hub area; and*
	(ii)	*An ultimate year with Regional Freight Hub which includes at least an indicative vehicle bypass to the south and west of Bunnythorpe.*

2.11.1 *(i) An ultimate year Do Minimum which includes the 2041 PNATM demands with the NEIZ developed but not into the Regional Freight Hub area; and*

Section 7.2 of the ITA shows the proposed extent of the NEIZ (as per the District Plan), the proposed RFH site and the extent to which the RFH overlaps with the NEIZ. According to the District Plan, the overlapped area is zoned Industrial and will be developed with traffic activity typical of an industrial area, regardless of the RFH or the NEIZ. Therefore, it is expected that this portion of land will generate more traffic than existing rural conditions. Modelling this land based on the current rural state would misrepresent the performance of the network in the future.

Notwithstanding, the RFH and the NEIZ are anticipated to provide for very similar types of activities, such as freight forwarders. For the overlapped area it is reasonably assumed that the RFH will generate traffic demands and distributions at about the same level as anticipated if the land remained part of the NEIZ.

To ensure the roading changes and improvements required to provide a safe and efficient transport solution for the RFH are appropriate, the updated NoR Conditions include a review mechanism for reassessing traffic generation levels.

2.11.2 *(ii) An ultimate year with Regional Freight Hub which includes at least an indicative vehicle bypass to the south and west of Bunnythorpe*

Refer to the response to Request 114 (i)

2.12 Request 145

145)	*Assuming the strategic road network is in place (as per Figure 12.3), including a ring road around Bunnythorpe and no through traffic on Flygers Line; are there still any performance challenges within the road network, e.g. on Tremaine Ave?*

2.12.1 *Response*

Refer to the response to Request 114 (i)

The updated modelling for 2051 shows that the conversion of Flygers Line to an access only road results in a decrease in traffic demand of the scale shown in Table 2-2.

The modelling shows the reduction in traffic along Flygers Line redistributing to multiple alternative routes including Tremaine Avenue, Kairanga Bunnythorpe Road, John F Kennedy Drive and Featherston Street forming the primary alternative routes. No single route will become congested as a result of the conversion, as demonstrated by the updated LOS plots in Appendix B which indicates that at worst the route will operate at a LOS D in the 2051.

Table 2-2: Traffic Volume Changes with Flygers Line Converted to Access Only

Year	Scenario	Volumes (vpd)
2051 - ITA	Without Hub	7,600
2051 – Request 143	Without Hub	1,800
2051 - ITA	With Hub	7,300
2051 – Request 143	With Hub	2,000

2.13 Request 146

146)	*Please provide further detailed traffic effects assessment within Bunnythorpe, addressing the following:*	
	(i)	*traffic effects at local intersections (e.g. detailed analysis of KB Rd/ Campbell Rd, Stoney Creek Rd/ Ashhurst Rd, Maple St/ Railway Rd);*
	(ii)	*traffic effects including safety at the intersections. Include consideration of changes to available sight lines at the intersection of Maple Street and Railway Road and the adequacy of existing sight lines at the intersections of Kairanga-Bunnythorpe Road and Railway Road, and Stoney Creek Road with Ashhurst Road;*
	(iii)	*pedestrian and cyclist delay/ safety;*
	(iv)	*access to services for local residents and businesses; and*
	(v)	*access to the relocated bus stop.*

2.13.1 *(i) traffic effects at local intersections (e.g. detailed analysis of KB Rd/ Campbell Rd, Stoney Creek Rd/ Ashhurst Rd, Maple St/ Railway Rd);*

The LOS for these intersections is presented in Table 2-3. These results are based on the updated model as per Request 143, with LOS plots shown in Appendix B.

Table 2-3: Traffic Effects based on Updated Model

NAME	EXISTING	WITHOUT		WITH	
	2021	2031	2041	Initial Stage	Full build-out
Campbell Road/Kairanga Bunnythorpe Road	A	A	A	A	A
Stoney Creek Road / Ashhurst Road	A	A	A	A	A
Maple Street / Railway Road*	B	B	B	C	B

2.13.2 *(ii) traffic effects including safety at the intersections. Include consideration of changes to available sight lines at the intersection of Maple Street and Railway Road and the adequacy of existing sight lines at the intersections of Kairanga-Bunnythorpe Road and Railway Road, and Stoney Creek Road with Ashhurst Road;*

The perimeter road will be designed with an improved vertical alignment, improving the current crest curve south of the Maple Street/ Railway Road intersection, and sight lines as a result. The proposed reduction in the speed environment from 100km/h to 80km/h on this portion of the road (south of Maple Street) will reduce the sight line requirements and improve safety at this intersection.

As set out in Section 10.1 of the ITA, the Kairanga-Bunnythorpe Road/Railway Road intersection is proposed to be upgraded jointly between all relevant stakeholders as part of the RFH network with the design developed and coordinated in response to the Road Network Integration Plan. The result will be improved safety and performance conditions at this intersection.

Safety effects on the Stoney Creek Road/Ashhurst Road intersection are reported on in response to Request 161*(xii)*.

2.13.3 *(iii) pedestrian and cyclist delay/ safety;*

As set out in the ITA, Sections 4.6 and 10.6, the current pedestrian and cyclist route location will not be impacted by the RFH. As discussed in the ITA the Te Araroa New Zealand Trail will continue to run between Feilding and Palmerston North following Campbell Road, switching to Waughs Road at the level crossing, accessing Stoney

Creek Road via Bunnythorpe, then traverses Sangsters Road before joining the shared path along Railway Road south of the Roberts Line intersection.

The Kairanga Bunnythorpe/Campbell Road intersection has been proposed to be upgraded (jointly between all relevant stakeholders), to reduce the risk to vulnerable road users through these intersections. Since cyclists and pedestrians utilise these shared paths, the increase in traffic along these routes are will not impact user safety. The updated NoR Condition provides for pedestrians and cyclists to be addressed as a component part of the Road Network Integration Plan.

2.13.4 (iv) access to services for local residents and businesses; and

As seen in response to Request 117, the Bunnythorpe O-D impacted most by the proposed RFH infrastructure changes is Bunnythorpe to Kelvin Grove, with a delay of 1.1 minutes. This O-D uses the Roberts Line level crossing and, with a change of just over 1 minute is considered within acceptable limits that would largely go unnoticed to motorists travelling the approximately 5km of this route.

As discussed in response to Request 117, it is understood that Palmerston North City Council is currently in discussions with KiwiRail to assess the impacts of the level crossing closure at Roberts Line. This investigation is being undertaken independently from the RFH studies. If this level crossing closure is implemented the impact of the RFH on travel times will be minimal between Bunnythorpe and Kelvin Grove, when compared to this 'new' status quo.

2.13.5 (v) access to the relocated bus stop.

With the roading changes proposed, the existing bus stop in Bunnythorpe will need to be located away from the current location in Campbell Road. Determining the new location for this bus stop is provided for in the updated NoR Condition and will be undertaken in consultation with all relevant stakeholders to ensure that all stakeholder requirements are incorporated.

2.14 Request 147

147)	*Please provide an explanation* as to how the traffic model is fit for the purpose of determining localised traffic effects in this northeastern part of the network, noting that the model was validated in 2013 for strategic rather than local use. In particular:*	
	(i)	*Level of calibration of traffic volumes for local roading network (including Tremaine Ave, Railway Road, Richardsons Line, Roberts Line and through Bunnythorpe) including light/heavy split;*
	(ii)	*Calibration of distribution for the existing rail hub;*
	(iii)	*Calibration of intersection performance and delays (Table 8.6). The effects included in Figures 9.4 and 9.6 can only be relied on if the model is proven to be fit for purpose with regard to modelling intersection delay at this local level;*
	(iv)	*Travel time calibration for key local routes (Palmerston North to/from Bunnythorpe and Feilding, and between the existing KiwiRail yard and the NoR site);*
	(v)	*Calibration of NEIZ trip generations from counts with current activity.*

2.14.1 Overall Response

The model development is documented in the "Palmerston North Area Traffic Model - Model Development and Validation Report", prepared by Beca Ltd dated 15 August 2014. The model was validated by Beca and peer reviewed[2] by a third party. The peer review concluded that '*Overall, the base-year model is well specified and can be regarded as being fit for purpose for subsequent application to forecasting and specific assessments*'.

[2] Palmerston North Area traffic Model, Peer Review Report (including Beca responses to issues raised), Tim Kelly transportation planning Ltd, 2015.

2.15 Request 148

148)	*Identify, describe, and assess the appropriateness of any mitigations at the Bunnythorpe 'node' and associated traffic effects. For example, grade separation of the level crossing, achieving safe sight lines at the Railway Road / Kairanga-Bunnythorpe Road intersection and satisfactory performance of the Campbell Road / Kairanga-Bunnythorpe Road intersection.*

2.15.1 Response

Section 10.1.1 of the ITA highlights a potential solution for this intersection, one of which is the conversion of this priority control intersection to a signalised intersection. This will allow for increased intersection control and safety for all road users at this node, including pedestrians and cyclists.

Based on the RLTP, shown in Section 7.1.1 of the ITA, it is likely that if the southern and western bypasses of Bunnythorpe materialise, these bypasses will redirect through traffic away from this node. As such, the need for change may vary, and it is proper that a solution be informed by the relevant future information, as an outcome of the Road Network Integration Plan provided for by updated NoR Conditions..

2.16 Request 149

149)	*Figure 9.2 of Technical Report C - Integrated Transport Assessment shows two intersection upgrades in Bunnythorpe as part of the Regional Freight Hub network. Are these upgrades to be provided by KiwiRail, and what is the nature of the upgrades? Are there any local property or access effects as a result of the upgrades?*

2.16.1 Response

As per Section 11.3 in the ITA, these upgrades are not the sole responsibility of KiwiRail, as this node currently performs inadequately, with safety concerns, as demonstrated by the LOS plots in Appendix B and the Sidra Movement Summaries included in Appendix C. As set out in response to Request 148 above, the relevant solution for this node needs to be developed, agreed and implemented jointly between the relevant stakeholders, as provided for inthe updated NoR Conditions.

Property access implications have been included in the updated NoR Conditions and will be considered during detailed design, once there is more clarity on the RFH details as well as the Ring Road.

2.17 Request 150

150)	*Is it intended that the Network Integration Plan be geographically limited to areas within the NoR?*

2.17.1 Response

The Road Network Integration Plan is not intended to be limited to the designation extent. As noted in the NoR Condition that sets out the expectation of the Road Network Integration Plan, this Plan is intended as a multi-party response to developing a future roading network that meets the needs of all parties and users.

2.18 Request 151

151)	*Please Provide an assessment of the effect of the change of alignment of Railway Road, and identify any available means of mitigating those effects, including by reference to Palmerston North City Council's plans for a shared path for active modes?*

2.18.1 Response

As identified in Sections 5.5 and 10.6 of the ITA, the shared path and active mode routes will not be realigned as a result of the RFH. The provisional design for the perimeter road shows footpaths along the perimeter road, as well as potential recreational areas that could be utilised for cyclists, shown in Appendix F.

Figure 5.6 in the ITA shows the existing and planned shared paths stop along Railway Road at Roberts Line, with no shared paths (existing or planned) indicated beyond this point, as shown in the District Plan. However, it is important to note that there are cyclists currently use Railway Road as an unmapped cycling route between Feilding and Palmerston North, there are no cyclist provisions on Railway Road between Roberts Line and Kairanga Bunnythorpe. Similarly, no cyclist provisions have been made on the current plans for the perimeter road as it is expected that cyclists will utlilise the perimeter road in a similar manner to Railway Road.

2.19 Request 152

152)	*What will be the treatment at the ends of the roads that will be closed (Te Ngaio Road, Clevely Line and Roberts Line)? Consider, for example,*	
	(i)	*Will turning heads be included?*
	(ii)	*Will there be any changes in the formation at the connections of each of Tutaki Road and Parrs Road with Sangster Road?*
	(iii)	*Will there be any change at the Clevely Line connection with Sangsters Road other than the closure of the level crossing?*

2.19.1 (i) Will turning heads be included?

The location and need for turning heads at Clevely Line and Te Ngaio Road will be assessed during the detailed design phase of the project, as included in the updated NoR Conditions to ensure that these roads operate safely and efficiently.

2.19.2 (ii) Will there be any changes in the formation at the connections of each of Tutaki Road and Parrs Road with Sangster Road?

There will be no changes to the formation of Tutaki Road and Parrs Road or the Tutaki Road/ Sangsters Road and Parrs Road/ Sangsters Road intersections.

2.19.3 (iii) Will there be any change at the Clevely Line connection with Sangsters Road other than the closure of the level crossing?

The only change to Clevely Line will be the closure of the level crossing.

2.20 Request 153

153)	*For the north and west accesses to the Regional Freight Hub from the perimeter road and the Roberts Line intersection with the perimeter road, can the Austroads requirements for intersection sight lines be met?*

2.20.1 Response

Yes. The designs of these accesses will be based on the speed environment of each road section and have been checked provisionally (for an 80km/h speed). The perimeter road and the access roads will be constructed at approximately the same road level as Roberts Line, so that there would not be any vertical geometry issues that could impact sightlines.

2.21 Request 154

154)	*Is there any risk of traffic blocking back through the Perimeter Road intersections from the internal Regional Freight Hub level crossings which are shown just into the site from the southern and northern site entry points?*

2.21.1 Response

Queue spill backs may happen occasionally. Noting this prospect, all RFH accesses will be designed to have dedicated turning lanes to accommodate any traffic that may need to queue off-site when trains stage/shunt, separate from the through movement lanes.

2.22 Request 155

155)	*Is there sufficient space within the NoR to accommodate roundabouts, if required, for the north and west accesses and the Roberts Line intersection? If not, how much additional space would be required?*

2.22.1 Response

Yes, the designation is sufficiently sized to accommodate roundabouts at the northern and western RFH accesses. However, based on the peak hour volumes at 2051, it is assessed that the access intersections for the northern and western parts of the site will not require to be formed as roundabouts.

2.23 Request 156

156)	*Explain whether the perimeter road has a function of accommodating internal trips for the Regional Freight Hub? If so, what proportion of trips on the perimeter road will be effectively internal Regional Freight Hub trips?*

2.23.1 Response

No. A key function of the perimeter road is to provide access to and from the RFH. Unlike the Tremaine Avenue sites, the RFH will have internal connectivity for all operations, and vehicles will not need to exit one access of the RFH to enter through another.

2.24 Request 157

157)	*Explain the basis of the assumptions regarding:*	
	(i)	*Capacities of each road type in the V/C Level of Service calculations (Tables 8.2 and 8.5). How do these compare with One Network Road Classification (ONRC) expectations?*
	(ii)	*25% / 75% external / local traffic attraction and whether this split would remain the same as the Regional Freight Hub develops?*
	(iii)	*Figures 9.4 and 9.6 show little if any heavy vehicle movements between Regional Freight Hub and central Palmerston North (within inner ring road) and south of the river and also little if any to/from SH3 to the east. Why are these distributions of external trips different to those included in Figure 6.4?*

2.24.1 *(i) Capacities of each road type in the V/C Level of Service calculations (Tables 8.2 and 8.5). How do these compare with One Network Road Classification (ONRC) expectations?*

Each road in the modelled network is coded with a road type. The capacities for each road type used in the model are outlined in Table 3-1 of the Beca report, and no changes have been made to these capacities.

2.24.2 (ii) 25% / 75% external / local traffic attraction and whether this split would remain the same as the Regional Freight Hub develops?

This external/local split for the RFH was adopted to match the existing Tremaine Avenue site (as indicated in the PNATM) and is not expected to change.

2.24.3 (iii) Figures 9.4 and 9.6 show little if any heavy vehicle movements between Regional Freight Hub and central Palmerston North (within inner ring road) and south of the river and also little if any to/from SH3 to the east. Why are these distributions of external trips different to those included in Figure 6.4?

The distribution of heavy vehicles to and from the RFH is influenced by the location of the RFH in the road network and the proximity to complimentary land uses. Figures 9.4 and 9.6 show a higher proportion of heavy vehicle trips to and from Feilding due to the closer proximity of the RFH to origins and destinations in Feilding.

The distribution along SH3 east represents approximately 25% of the traffic to external links, in line with the Figure 6.4.

2.25 Request 158

158)	*Explain how trucks are modelled in the model. Are they included as multiple car equivalents? Is there any allowance for slower acceleration from intersections and larger minimum gap requirements?*

2.25.1 Response

No changes have been made to the model parameters associated with heavy vehicles, as validated by Beca. Heavy vehicles are modelled as vehicles and not passenger car units (multiple car equivalents).

2.26 Request 159

159)	*Explain the use of average month rail volume data rather than 85th percentile to factor traffic counts. What would be the 85th percentile daily traffic generation for the Regional Freight Hub?*

2.26.1 Response

The trip generation rates included in Section 6.2 of the ITA are calculated using a combination of traffic count records and rail volumes.

The one-week available traffic counts reported in the ITA were scaled upwards using 2018 rail volumes, to match average rail commodity volumes. This methodology was considered appropriate as there are not significant variations in commodity volumes through the year. For example, using the same 2018 rail dataset, there is a difference of approximately 12% between the average and 85th percentile rail commodities. This translates to approximately an additional 100vph at the RFH, in 2051. As reported, the updated modelling shows that the road network has existing capacity constraints that require mitigation regardless of the RFH. It is normal practice for these mitigations to be designed with allowance to accommodate traffic variations. To that end, the updated NoR Conditions propose a Traffic Management Plan, which will provide a mechanism for reviewing and validating traffic generation levels and design responses.

2.27 Request 160

160)	*Are any trips included in the model between the NEIZ and the Regional Freight Hub, if so how many and what is the heavy/light split?*

2.27.1 Response

Trips between the NEIZ and the Freight Hub (existing and RFH) have been included in the previous and updated (Request 143) models. From the updated model, the table below illustrates the proportion of trips between the

RFH and the NEIZ (including the extension), relative to the total trips generated by the freight hub (existing or RFH), and the proportion of heavy vehicles, for each scenario.

Table 2-4: Trip between the NEIZ and RFH

Year	Scenario	Location	Proportion of total trips between RFH and NEIZ	Proportion of trips by heavy vehicles
2021	Existing	Existing freight hub on Tremaine Ave	1%	10%
2031	Without RFH	Existing freight hub on Tremaine Ave	3%	20%
2031	With RFH	RFH	10%	40%
2051	Without RFH	Existing freight hub on Tremaine Ave	6%	18%
2051	With RFH	RFH	14%	42%

2.28 Request 161

161)	*Provide an assessment of any effects on the safety of the following intersections and accesses as a result of at least the initial stage of the Regional Freight Hub compared with existing safety performance:*	
	(i)	*Tremaine Avenue intersections between North Street and Railway Road inclusive;*
	(ii)	*Railway Road / Airport Drive;*
	(iii)	*Existing Railway Road intersections and accesses including with Setters Line, The Cutting Way, El Prado Drive and DKSH New Zealand;*
	(iv)	*Future accesses from NEIZ lots to Railway Road where the only practical access is to Railway Road;*
	(v)	*Each of the Foodstuffs driveways onto Roberts Line;*
	(vi)	*Railway Road / Maple St and also the property accesses on Railway Road between Maple Street and KB Road;*
	(vii)	*Railway Road/ KB Road;*
	(viii)	*Kairanga-Bunnythorpe Road / Campbell Road;*
	(ix)	*The property accesses onto Campbell Road within central Bunnythorpe between Dixons Line and Stoney Creek Road;*
	(x)	*Richardsons Line / Milson Line;*
	(xi)	*SH54 / Waughs Road; and*
	(xii)	*The intersections and accesses along Stoney Creek Road between Ashhurst Road and Kelvin Grove Road inclusive.*

2.28.1 *Overall Response*

In addition to the Collective Risk and Infrastructure Risk safety assessments included at Section 5.6 of the ITA, the Waka Kotahi Crash Estimation Compendium was used to develop crash prediction models for the requested intersections within the study area. The appropriate urban/rural crash model was used to predict injury crashes per year based on the traffic volume for the existing, 2031 'with RFH' and 'without RFH' and the 2051 'with RFH' and 'without RFH' scenarios.

The results provided in the tables that follow clearly show that the traffic generated by the RFH will have little to no change in the expected injury crashes per year.

2.28.2 *(i) Tremaine Avenue intersections between North Street and Railway Road inclusive;*

The table below shows the results of the crash prediction models for the primary intersections along Tremaine Avenue. It can be seen that the crash prediction models are conservative when compared to the averaged 5-year (2015 to 2019) crash analysis from Waka Kotahi Crash Analysis System (CAS)

Table 2-5: Tremaine Avenue Crash Statistics - Crashes Per Year

Intersection	Existing (2015-2019 averaged)	2021	2031 without	2031 with	2051 without	2051 with
TREMAINE AVENUE / NORTH ST	0.2	0.71	0.72	0.72	0.74	0.73
TREMAINE AVENUE / RUSSELL ST	0.2	0.31	0.34	0.33	0.34	0.34
TREMAINE AVENUE / HERETAUNGA ST	0.2	0.37	0.39	0.39	0.41	0.41
TREMAINE AVENUE / MILSON LINE	0.8	0.91	0.92	0.93	0.94	0.94
TREMAINE AVENUE / RAILWAY ROAD	0.8	0.86	0.92	0.95	0.95	0.99

2.28.3 *(ii) Railway Road / Airport Drive;*

The table below shows the results of applying the crash prediction model for the Railway Road/Airport Drive intersection. Similar to the above, it can be seen that the crash prediction models are conservative when compared to the averaged 5-year (2015 to 2019) crash analysis from CAS.

Table 2-6: Railway Road/Airport Drive Crash Statistics – Crashes Per Year

Intersection	Existing	2021	2031 without	2031 with	2051 without	2051 with
Railway Road / Airport Drive	0	0.25	0.34	0.37	0.36	0.40

2.28.4 *(iii) Existing Railway Road intersections and accesses including with Setters Line, The Cutting Way, El Prado Drive and DKSH New Zealand;*

The Railway Road/ El Prado Drive intersection has been identified for an upgrade as part of the PNCC 10-year plan (discussed in Section 7.1.1 of the ITA), designed to improve both efficiency and safety. It is not appropriate to compare safety of the existing intersection form to the future changed form.

It has been conservatively assumed that the other accesses of The Cutting Way and DKSH New Zealand will follow the safety risk on Setters Line which is currently the busiest of the access points listed. Again, it is clear that the crash models are more conservative when compared to an average of the actual crash statistic taken from CAS.

Table 2-7: Railway Road/ Setters Line Crash Statistics – Crashes Per Year

Intersection	Existing	2021	2031 without	2031 with	2051 without	2051 with
Railway Road / Setters Line	0	0.24	0.28	0.28	0.28	0.30

2.28.5 *(iv) Future accesses from NEIZ lots to Railway Road where the only practical access is to Railway Road;*

It is assumed that the NEIZ accesses along Railway Road between Airport Drive and Roberts Line will follow a similar traffic profile to Setters Line (700vpd busiest of all access points listed above), and any subsequent access point will follow a similar safety profile. The assumption is considered acceptable since the area designated NEIZ in the District Plan have planned access via Richardsons Line, as shown in Appendix A. None of the larger NEIZ activities are expected to have access via Railway road.

As demonstrated by the crash prediction models, the increase in safety risk will be low.

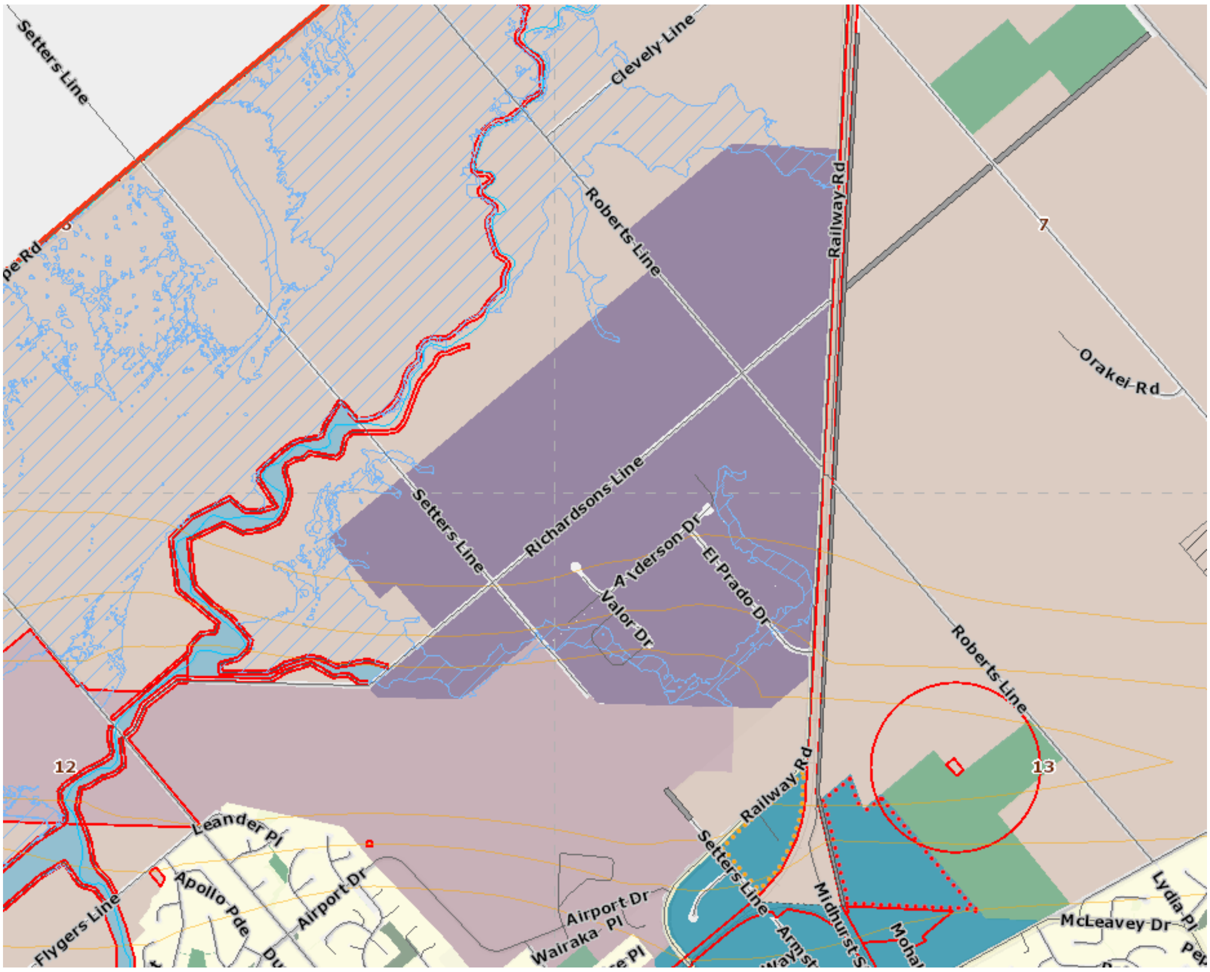


Figure 2-1: Area Zone NEIZ as per PNCC District Plan

2.28.6 *(v) Each of the Foodstuffs driveways onto Roberts Line;*

As per response to Request 116, with these changing traffic volumes, KiwiRail acknowledges the need to ensure the safety and efficiency for movements to and from the Foodstuffs' driveways. The updated NoR Conditions provide a process for KiwiRail to engage with stakeholders such as Foodstuffs and Palmerston North City Council regarding property access solutions to resolve any safety and efficiency issues arising from future increases in traffic volumes on Roberts Line.

2.28.7 *(vi) Railway Road / Maple St and also the property accesses on Railway Road between Maple Street and KB Road;*

The crash prediction models and crash statistics from CAS are shown below.

Table 2-8: Railway Road/ Other Crash Statistics - Crashes Per Year

Intersection	Existing	2021	2031 without	2031 with	2051 without	2051 with
Railway Road / Maple Street	0	0.03	0.03	0.03	0.03	0.03

2.28.8 (vii) Railway Road/ KB Road;

This intersection has been identified for an upgrade, designed to improve both efficiency and safety. It is not appropriate to compare safety of the existing intersection form to the future changed form.

2.28.9 (viii) Kairanga-Bunnythorpe Road / Campbell Road;

This intersection has been identified for an upgrade, designed to improve both efficiency and safety. It is not appropriate to compare safety of the existing intersection form to the future changed form.

2.28.10 (ix) The property accesses onto Campbell Road within central Bunnythorpe between Dixons Line and Stoney Creek Road;

The results of the traffic modelling show that the increase in traffic volumes on Campbell Road between these intersections.. This increase in volumes of roughly 90vph is not expected to have an impact on safety.

2.28.11 (x) Richardsons Line / Milson Line;

Table 2-9 below shows the results of the crash prediction model for the Richardsons Line / Milson Line intersection. Similar to the above, it can be seen that the crash prediction models are conservative when compared to the averaged 5-year (2015 to 2019) crash analysis from CAS.

Table 2-9: Railway Road/ Milson Line Crash Statistics – Crashes Per Year

Intersection	Existing	2021	2031 without	2031 with	2051 without	2051 with
Richardsons Line / Milson Line	0	0.07	0.13	0.17	0.22	0.21

2.28.12 (xi) SH54 / Waughs Road; and

This intersection has been identified for an upgrade, designed to improve both efficiency and safety. It is not appropriate to compare safety of the existing intersection form to the future changed form.

2.28.13 (xii) The intersections and accesses along Stoney Creek Road between Ashhurst Road and Kelvin Grove Road inclusive

Based on the CAS query the only intersections that show an existing crash history are Stoney Creek Road/ Ashhurst Road and Stoney Creek Road/Kelvin Grove Road. The table below shows the results of the crash prediction model for these intersections as well as the averaged 5-year crash statistics for 2015-2019.

Table 2-10: Stoney Creek Road/ Other Crash Statistics – Crashes Per Year

Intersection	Existing	2021	2031 without	2031 with	2051 without	2051 with
Stoney Creek Road/ Ashhurst Road	1	0.11	0.12	0.18	0.13	0.21
Stoney Creek Road/Kelvin Grove Road	0.2	0.25	0.29	0.31	0.32	0.35

2.29 REQUEST 162

162)	*Explain the impact on school bus routes, including (if any) Ministry of Education funded rural school bus services.*

2.29.1 Response

All existing school bus routes are shown in Figure 2-1 below, as obtained from the Ministry of Education.[3] Two routes will be impacted by the level crossing closures at Roberts Line and Clevely Line and the closure of a portion of Railway Road.

Section 10.4 of the ITA indicates an alternative route, possibly along the perimeter road and Kairanga Bunnythorpe Road, for buses affected by the Clevely Line level crossing closure. Buses impacted by the Roberts Line level crossing closure will also have an alternative route along the perimeter road, with corresponding implications on bus travel times. However, the travel time implication on the Roberts Line route as related to the RFH proposal would be zeroed if PNCC proceeds to close Roberts Line materialise.

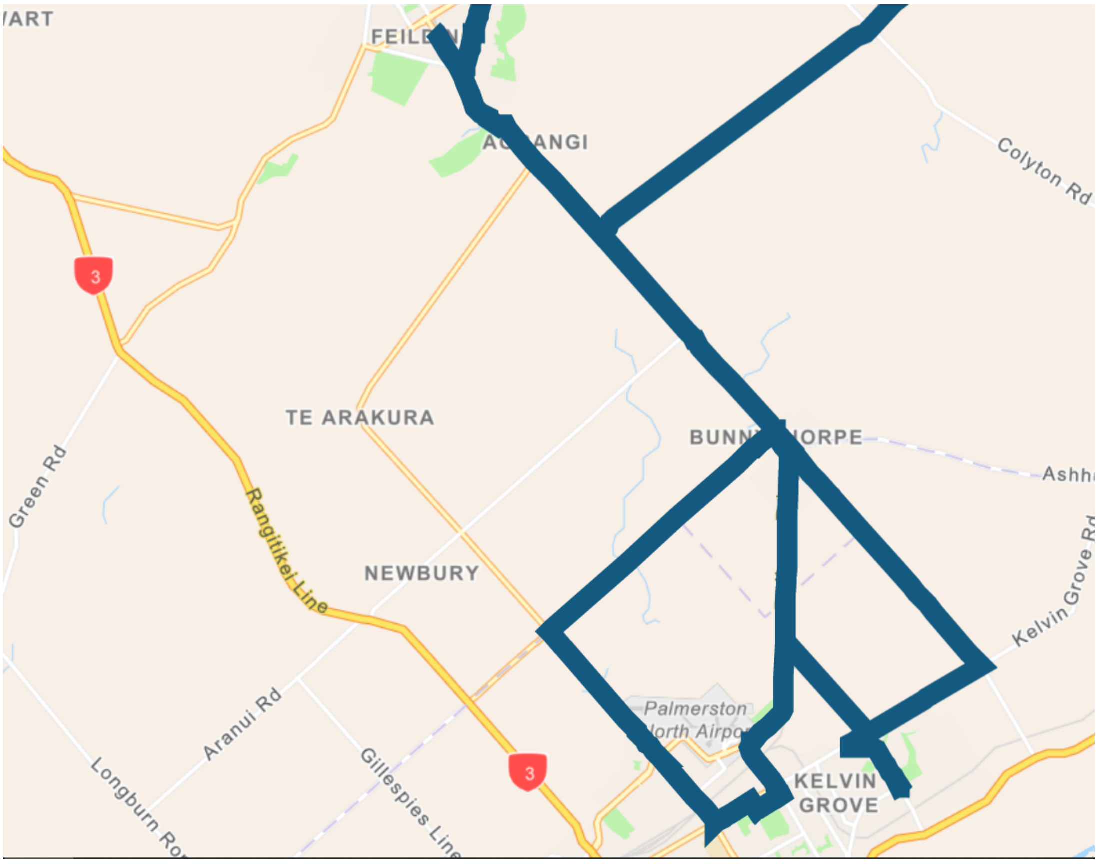


Figure 2-2: School bus Routes in Palmerston North

2.30 REQUEST 163

163)	*When reporting outputs from Sidra analysis of intersections include traffic volumes and performance on each approach to the intersection.*

[3] Palmerston North Maps for Kiwirail (arcgis.com)

2.30.1 Response

Based on the updated model (as per Request 143) the SIDRA analysis shown in Section 10.1 of the ITA has been updated.

Table 10.4 in the ITA shows Sidra results for the Railway Road /Tremaine Avenue and Stoney Creek Road/Kelvin Grove Road intersections, however these intersections have not been remodelled in Sidra, as the updated model shows these intersections will perform at an LOS D or better.

The updated Sidra results for the remaining intersections show that three intersections will perform at an unacceptable LOS F in the 2051 scenarios, shown inTable 2-11. Potential mitigations for the intersections performing at an LOS F were also modelled in Sidra with the results shown in Table 2-12. Mitigation for these underperforming intersections will be the responsibility other authorities as stated in Section 11.2 of the ITA.

The 2051 Sidra movement summaries based on the updated models are provided in Appendix C.

Table 2-11: Full Build out Sidra Results

Site	**Worst Approach**	**'without RFH' LOS (2041)**	**'with RFH' LOS (Full Build Out)**
Railway Road – Kairanga Bunnythorpe Road	Railway Road	B	C
SH54 – Waughs Road	SH54	F	F
Tremaine Avenue-Milson Line[4]	All Approaches	C	C
SH3 – Flygers Line	Flygers Line SB	F	F
Campbell Road- Kairanga Bunnythorpe Road (all approaches give way)	Campbell Road	F	F

Table 2-12: Potential Intersection Mitigations at Full buildout - Sidra Results

Site	'without RFH' LOS (2041)	'With RFH' LOS (Full Buildout)
SH54 – Waughs Road (roundabout)	C	C
SH3 – Flygers Line (roundabout)	C	C
Campbell Road- Kairanga Bunnythorpe Road (signalised)	D	D

2.31 REQUEST 164

164)	*At tables 10.6 and 10.7, include Flygers Line to each side of SH3.*

[4] The Tremaine Avenue/Milson Line intersection was modelled in Sidra using a two-phased signal plan, with the right turns allowed for as a filtered movement only. It is unclear what signal plan is adopted or is planned to be adopted by PNCC.

2.31.1 Response

Table 2-13 and **Table 2-14** shows the volume shift to on Flygers Line for the 'with RFH' and 'without RFH; scenarios to be added to Table 10.6 and Table 10.7 of the ITA. The volume shifts below are based on the updated model as per Request 143.

Table 2-13: Volume Shift for Flygers Line ADT

Road	Section Impacted	Traffic Shift (vpd)
Flygers Line	SH3 – Milson Line	+200

Table 2-14: Volume Shift for Flygers Line Heavy Vehicles

Road	Section Impacted	Traffic Shift (vpd)
Flygers Line	SH3 – Milson Line	+10

2.32 REQUEST 165

165)	*Provide versions of Figures 9.4 and 9.6 for light vehicles.*

2.32.1 Response

The light vehicle select link plots for the RFH are attached in Appendix D.

2.33 REQUEST 166

166)	*Compare the following traffic flows for central Bunnythorpe:*	
	(ii)	*Existing/base traffic flows;*
	(ii)	*Initial stage without Regional Freight Hub; and*
	(iii)	*Initial stage with Regional Freight Hub.*

2.33.1 Overall Response

The updated model (as per Request 143) shows that when comparing the 2031 'with RFH' to the 'without RFH' scenarios, Bunnythorpe is not expected to experience any material traffic growth over the next ten years. As demonstrated in the comparisons below an increase of approximately 50 vehicles per day on Campbell Road equating to roughly 5 additional vehicles during the peak hours, and an increase of approximately 10 heavy vehicles per day along Dixons Line, is shown between the 'without RFH' and 'with RFH' scenarios. These minor increases are not expected to decrease LOS to/from Bunnythorpe, as seen in the LOS plots in Appendix B.

Year	**Scenario**	**ADT**				**Heavy Vehicles (vpd)**			
		Total	**Dixons Line**	**Ashhurst Road**	**Campbell Road (Dixons Line and Stoney Creek Road)**	**Total**	**Dixons Line**	**Ashhurst Road**	**Campbell Road (Dixons Line and Stoney Creek Road)**

2021	Without Hub	1270	890	280	100	135	90	40	5
2031	Without Hub	1290	920	270	100	135	90	40	5
2031	With Hub	1320	920	250	150	145	100	40	5

2.34 REQUEST 167

167)	*Provide a select link analysis for the main central Feilding and central Bunnythorpe zones to see the change in routes between the existing/base and the initial stages both without and with the Regional Freight Hub.*

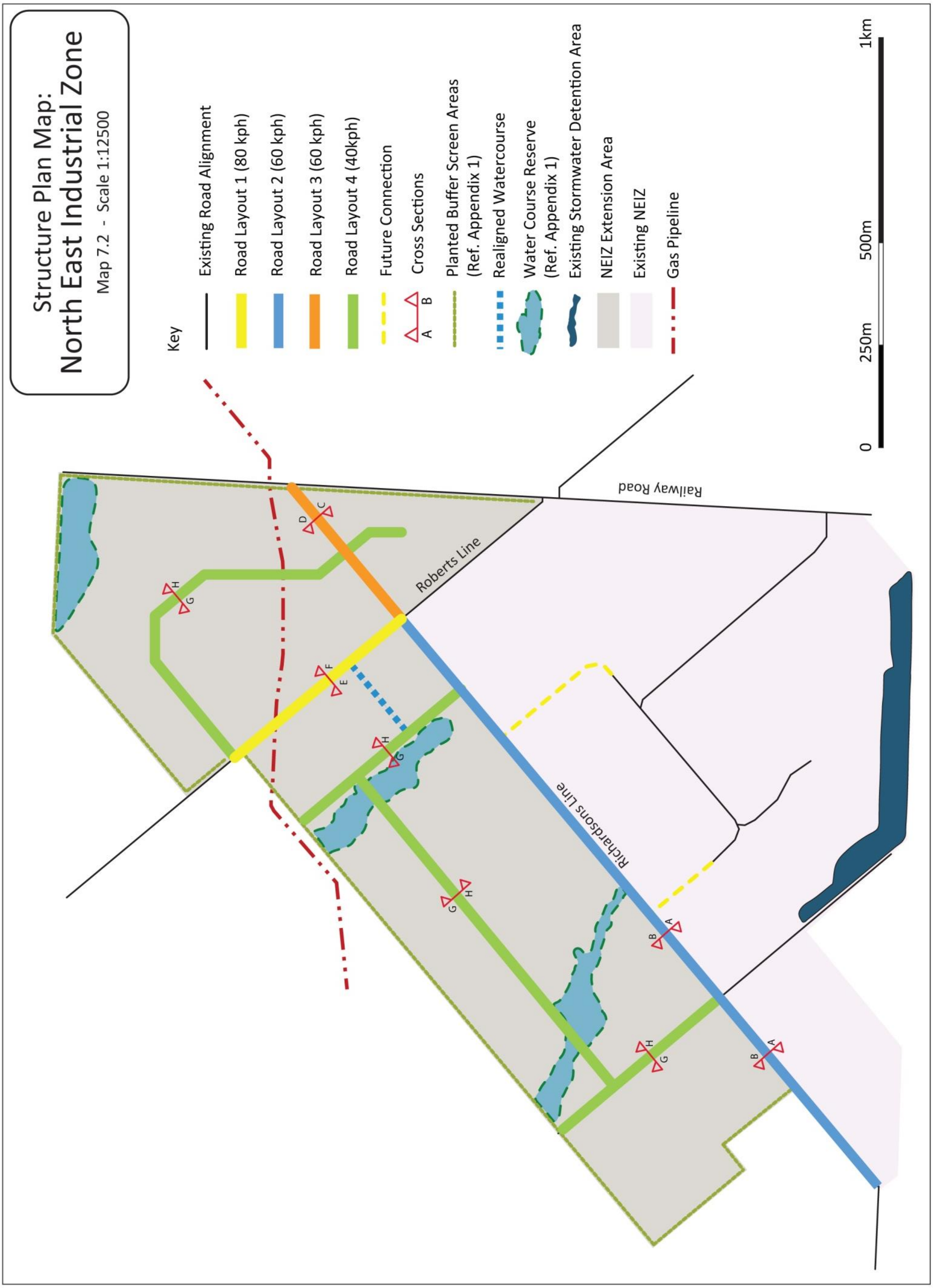
2.34.1 Response

The select link plots for the Feilding and Bunnythorpe zones are attached in Appendix E.

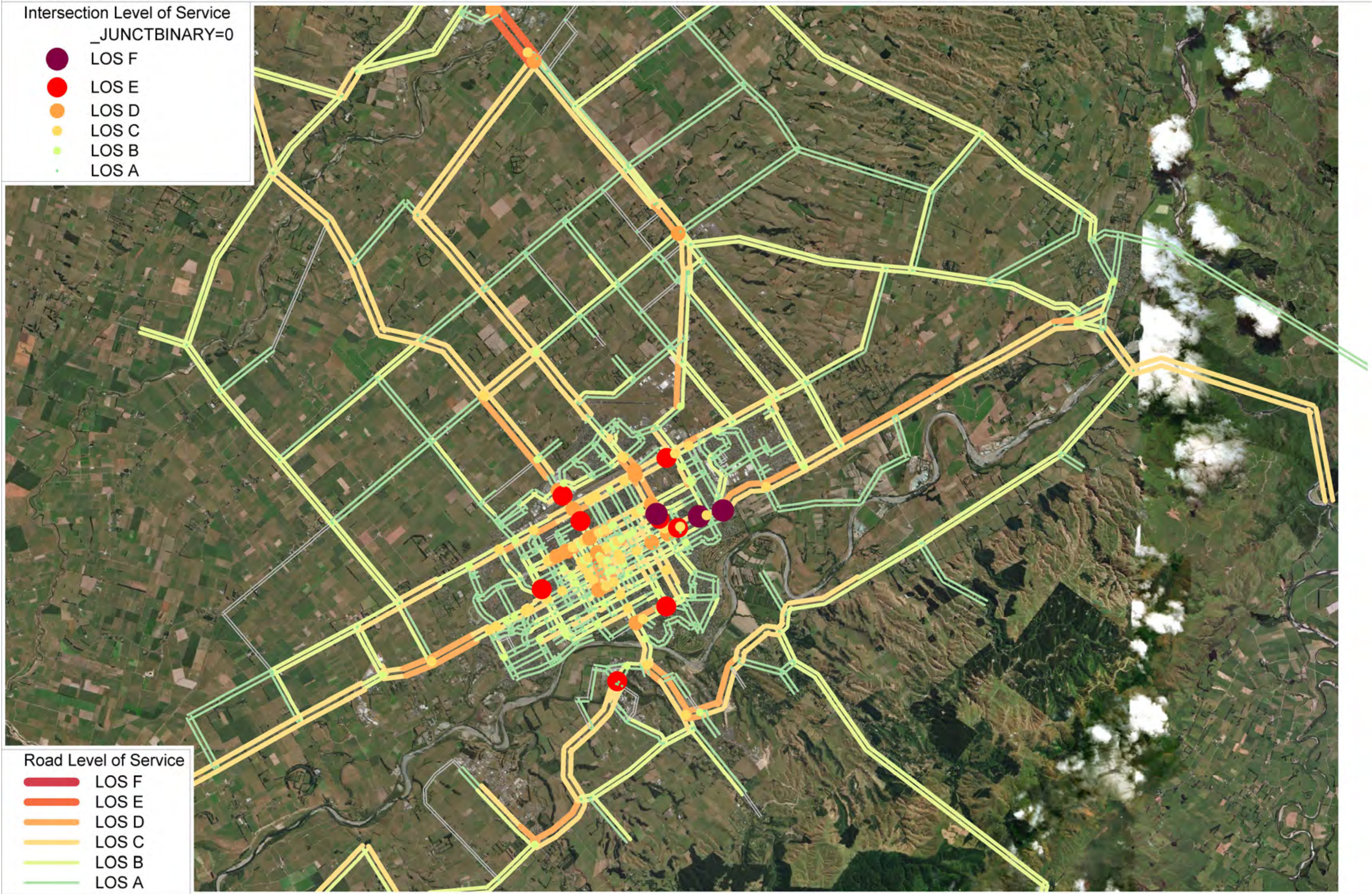
Appendices

We design with community in mind

Map 7.2 North East Industrial Zone



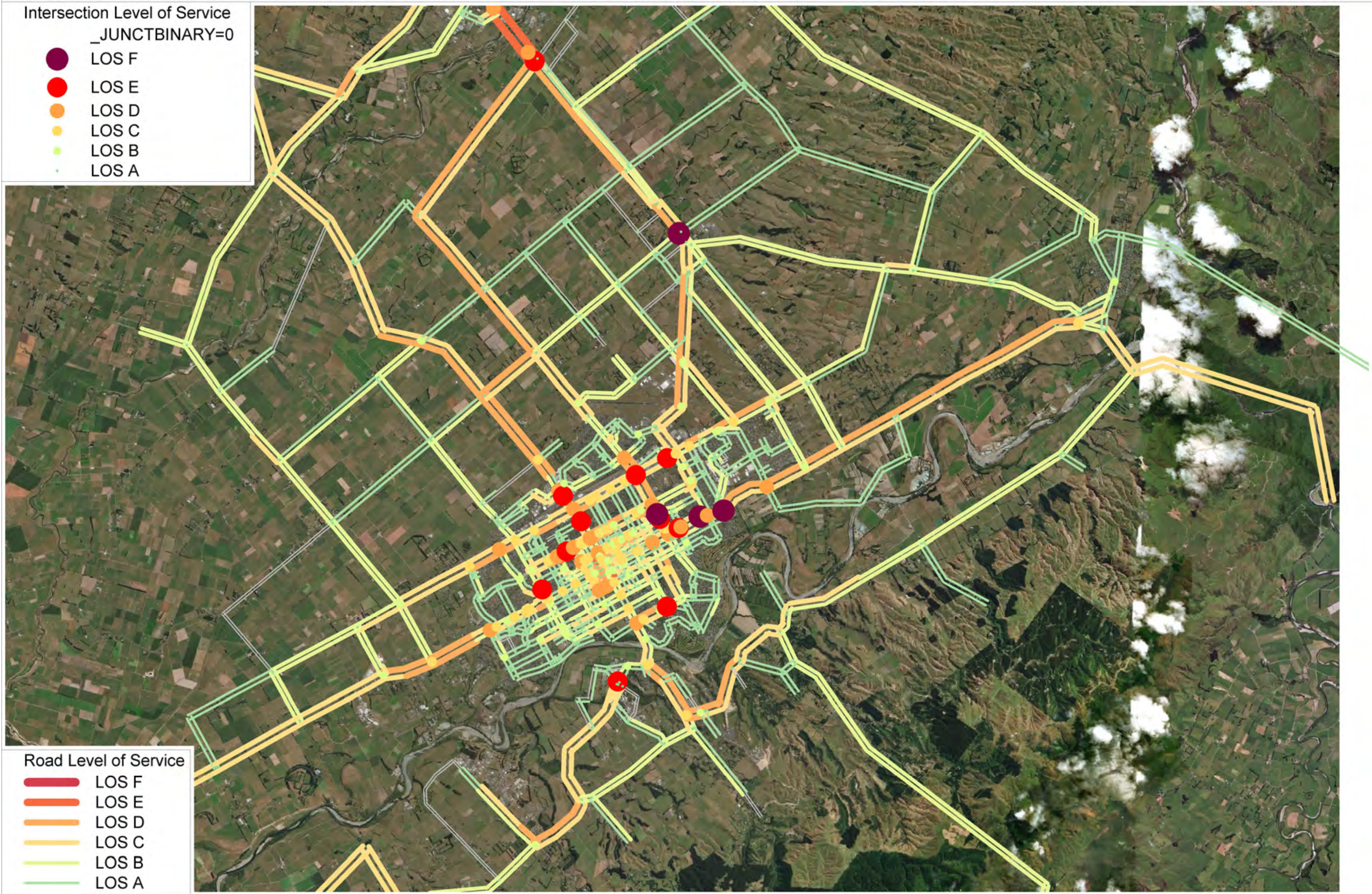
2021 Base LOS PM



C:\Data\PNATM_11Aug2015\Model\Y2021\KR Hub Testing\Existing\s92\LOS_PM.NET

cube (Licensed to Stantec)

2031 Base LOS PM



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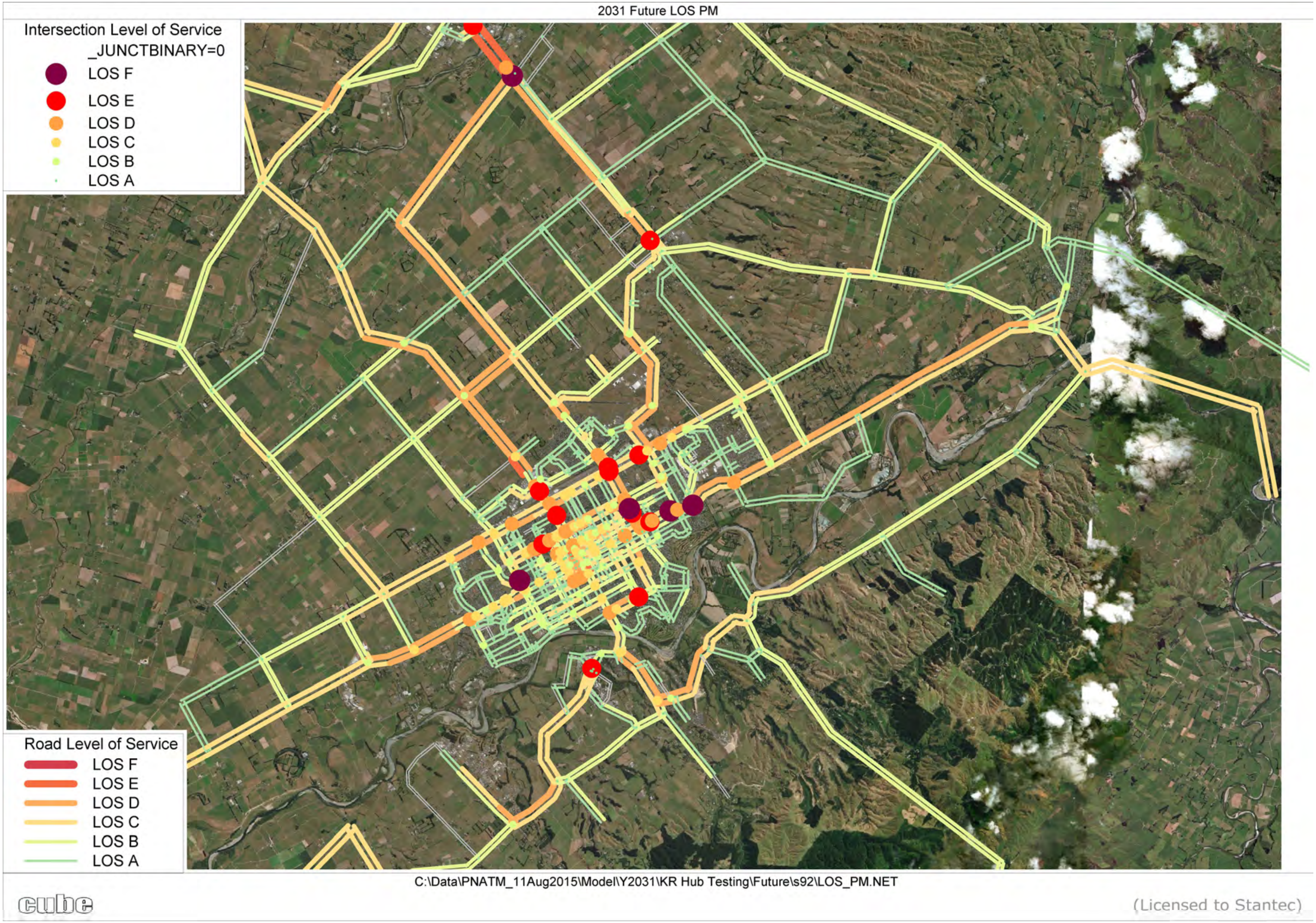
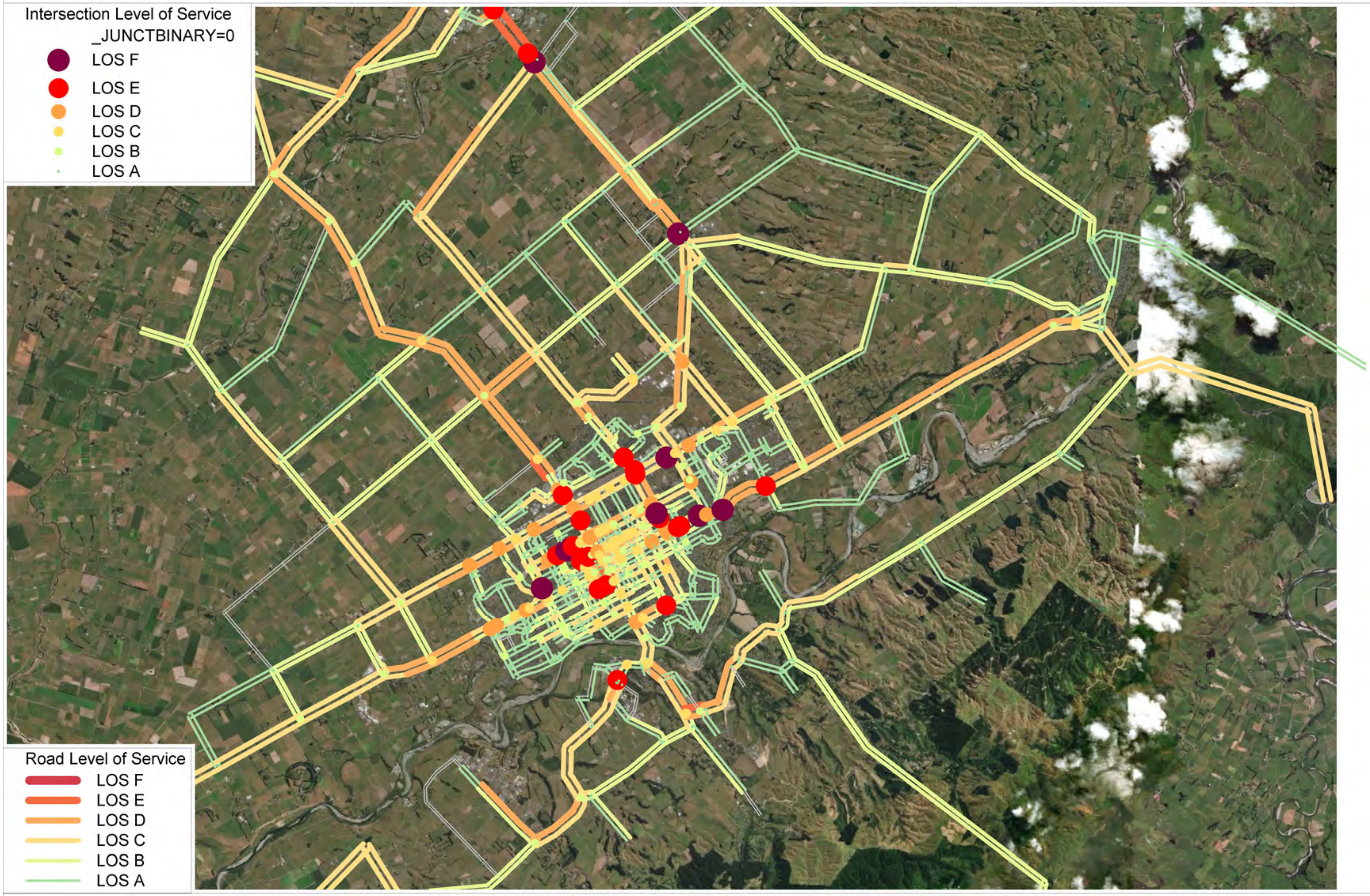
cube

(Licensed to Stantec)


2031 Future LOS PM
Intersection Level of Service
_JUNCTBINARY=0
LOS F
LOS E
LOS D
LOS C
LOS B
LOS A
Road Level of Service
LOS F
LOS E
LOS D
LOS C
LOS B
LOS A
C:\Data\PNATM_11Aug2015\Model\Y2031\KR Hub Testing\Future\s92\LOS_PM.NET
cube
(Licensed to Stantec)

2041 Base LOS PM



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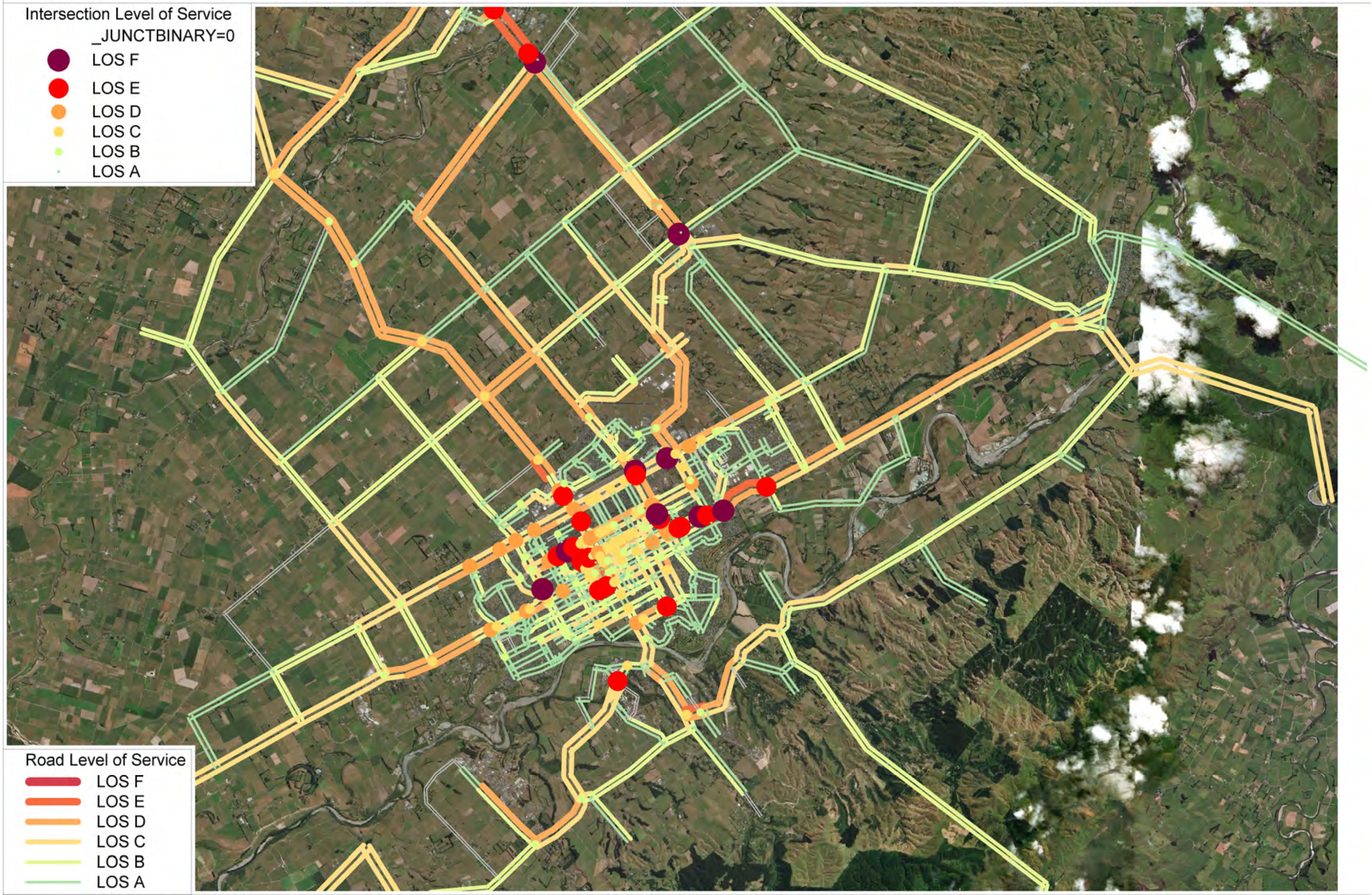
cube

(Licensed to Stantec)

2041 Future LOS PM



C:\Data\PNATM_11Aug2015\Model\Y2041\KR Hub Testing\Future2\s92\LOS_PM.NET

MOVEMENT SUMMARY

Site: 101 [1831_KB_Railway_2051_Base_PM (Site Folder: 2051 Base PM)]

Network: N101 [KB_Campbell_Railway_2051_Base_PM (Network Folder: 2051 Base PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Railway Rd														
1	L2	1	0.0	1	0.0	0.551	11.2	LOS B	1.5	10.7	0.59	1.07	0.89	68.3
3	R2	423	0.0	423	0.0	0.551	13.9	LOS B	1.5	10.7	0.59	1.07	0.89	59.2
Approach		424	0.0	424	0.0	0.551	13.9	LOS B	1.5	10.7	0.59	1.07	0.89	59.2
East: KB (East)														
4	L2	424	9.9	420	9.9	0.270	3.7	LOS A	0.6	4.3	0.02	0.56	0.02	66.0
5	T1	62	11.9	61	11.9	0.034	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		486	10.2	481 N1	10.2	0.270	3.3	LOS A	0.6	4.3	0.01	0.49	0.01	68.9
West: KB (West)														
11	T1	119	8.8	119	8.8	0.065	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	99.5
12	R2	1	0.0	1	0.0	0.065	7.6	LOS A	0.0	0.0	0.00	0.01	0.00	88.0
Approach		120	8.8	120	8.8	0.065	0.1	NA	0.0	0.0	0.00	0.01	0.00	99.3
All Vehicles		1031	5.8	1026 N1	5.8	0.551	7.3	NA	1.5	10.7	0.25	0.67	0.38	66.9

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 101 [1813_SH54_Waughs_2051_Base_PM (Site Folder: 2051 Base PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total	HV]	DEMAND FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
South: Waughs (South)														
1	L2	5	0	5	0.0	0.003	6.4	LOS A	0.0	0.0	0.00	0.61	0.00	59.7
2	T1	615	42	647	6.8	0.347	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	69.7
Approach		620	42	653	6.8	0.347	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.7
North: Waughs (North)														
8	T1	495	37	521	7.5	0.490	1.9	LOS A	3.3	24.6	0.59	0.00	0.67	66.4
9	R2	482	47	507	9.8	0.868	25.4	LOS D	11.1	84.2	0.91	1.56	2.99	43.6
Approach		977	84	1028	8.6	0.868	13.5	NA	11.1	84.2	0.75	0.77	1.82	52.8
West: Sh54														
10	L2	484	28	509	5.8	1.177	188.6	LOS F	59.9	440.1	1.00	4.92	12.38	13.9
12	R2	3	0	3	0.0	1.177	302.6	LOS F	59.9	440.1	1.00	4.92	12.38	13.9
Approach		487	28	513	5.7	1.177	189.3	LOS F	59.9	440.1	1.00	4.92	12.38	13.9
All Vehicles		2084	154	2194	7.4	1.177	50.6	NA	59.9	440.1	0.59	1.51	3.74	33.3

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

MOVEMENT SUMMARY

Site: 101v [1691_Tremaine_Milson_2051_Base_PM (Site Folder: 2051 Base PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 52 seconds (Site Practical Cycle Time)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Ruahine St South														
21	L2	1	0	1	0.0	0.001	13.2	LOS B	0.0	0.1	0.59	0.61	0.59	68.6
22	T1	694	14	731	2.0	* 0.789	15.5	LOS B	17.8	126.5	0.90	0.86	1.02	70.2
23	R2	171	4	180	2.3	0.843	39.2	LOS D	5.6	40.1	1.00	0.96	1.57	45.2
Approach		866	18	912	2.1	0.843	20.2	LOS C	17.8	126.5	0.92	0.88	1.13	63.3
NorthEast: Tremaine Ave North														
24	L2	65	0	68	0.0	0.086	14.4	LOS B	0.8	5.8	0.59	0.72	0.59	66.9
25	T1	412	41	434	10.0	0.821	24.3	LOS C	12.3	93.4	0.99	0.96	1.27	60.1
26	R2	91	2	96	2.2	0.632	36.4	LOS D	2.7	19.0	1.00	0.80	1.17	46.8
Approach		568	43	598	7.6	0.821	25.1	LOS C	12.3	93.4	0.95	0.91	1.18	58.2
NorthWest: Milson Line North														
27	L2	122	2	128	1.6	0.152	13.8	LOS B	1.2	8.9	0.64	0.73	0.64	66.6
28	T1	682	14	718	2.1	0.781	15.1	LOS B	17.1	121.9	0.89	0.85	1.00	70.8
29	R2	165	14	174	8.5	0.864	41.3	LOS D	5.6	42.3	1.00	0.99	1.67	43.3
Approach		969	30	1020	3.1	0.864	19.4	LOS B	17.1	121.9	0.88	0.86	1.07	63.4
SouthWest: Tremaine Ave South														
30	L2	130	10	137	7.7	0.190	15.3	LOS B	1.8	13.3	0.67	0.75	0.67	63.3
31	T1	425	43	447	10.1	* 0.848	26.1	LOS C	13.3	100.9	1.00	0.99	1.35	58.3
32	R2	38	5	40	13.2	0.261	34.9	LOS C	1.0	8.2	0.97	0.72	0.97	46.3
Approach		593	58	624	9.8	0.848	24.3	LOS C	13.3	100.9	0.93	0.92	1.17	58.4
All Vehicles		2996	149	3154	5.0	0.864	21.7	LOS C	17.8	126.5	0.91	0.89	1.13	61.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Ruahine St South												
P5	Full	50	53	20.4	LOS C	0.1	0.1	0.89	0.89	44.9	31.9	0.71
NorthEast: Tremaine Ave North												
P6	Full	50	53	20.4	LOS C	0.1	0.1	0.89	0.89	44.9	31.9	0.71
NorthWest: Milson Line North												

P7	Full	50	53	20.4	LOS C	0.1	0.1	0.89	0.89	44.9	31.9	0.71
SouthWest: Tremaine Ave South												
P8	Full	50	53	20.4	LOS C	0.1	0.1	0.89	0.89	44.9	31.9	0.71
All Pedestrians		0	211	20.4	LOS C	0.1	0.1	0.89	0.89	44.9	31.9	0.71

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

MOVEMENT SUMMARY

▽ Site: 101 [1462_Flygers_SH3_2051_Base_PM (Site Folder: 2051 Base PM)]

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

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3 (South)														
1	L2	1	0	1	0.0	0.001	8.3	LOS A	0.0	0.0	0.02	0.63	0.02	75.2
2	T1	835	42	879	5.0	0.469	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.6
3	R2	160	3	168	1.9	0.185	10.5	LOS B	0.8	5.6	0.59	0.83	0.59	69.7
Approach		996	45	1048	4.5	0.469	1.7	LOS A	0.8	5.6	0.09	0.13	0.09	93.2
East: Flygers (East)														
4	L2	15	2	16	13.3	0.684	87.1	LOS F	2.3	17.8	0.96	1.07	1.44	18.2
5	T1	1	0	1	0.0	0.684	166.8	LOS F	2.3	17.8	0.96	1.07	1.44	18.5
6	R2	15	1	16	6.7	0.684	225.2	LOS F	2.3	17.8	0.96	1.07	1.44	18.4
Approach		31	3	33	9.7	0.684	156.5	LOS F	2.3	17.8	0.96	1.07	1.44	18.3
North: SH3 (North)														
7	L2	17	1	18	5.9	0.013	9.0	LOS A	0.1	0.4	0.26	0.59	0.26	70.7
8	T1	567	40	597	7.1	0.320	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
9	R2	1	0	1	0.0	0.002	12.4	LOS B	0.0	0.0	0.68	0.69	0.68	68.3
Approach		585	41	616	7.0	0.320	0.3	LOS A	0.1	0.4	0.01	0.02	0.01	98.5
West: Flygers (East)														
10	L2	1	0	1	0.0	0.063	15.0	LOS C	0.2	1.2	0.95	0.98	0.95	31.9
11	T1	1	0	1	0.0	0.063	83.9	LOS F	0.2	1.2	0.95	0.98	0.95	31.9
12	R2	1	0	1	0.0	0.063	123.2	LOS F	0.2	1.2	0.95	0.98	0.95	31.9
Approach		3	0	3	0.0	0.063	74.0	LOS F	0.2	1.2	0.95	0.98	0.95	31.9
All Vehicles		1615	89	1700	5.5	0.684	4.3	NA	2.3	17.8	0.08	0.11	0.09	87.7

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

MOVEMENT SUMMARY

Site: 101vv [1837_KB_Campbell_2051_Base_PM - 4arm priority (Site Folder: 2051 Base PM)]

Network: N101 [KB_Campbell_Railway_2051_Base_PM (Network Folder: 2051 Base PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Stoney Creel Road														
21	L2	32	13.3	32	13.3	0.200	8.3	LOS A	0.3	2.6	0.13	0.61	0.13	71.7
22	T1	218	9.2	218	9.2	0.200	7.0	LOS A	0.3	2.6	0.13	0.61	0.13	72.0
23	R2	1	0.0	1	0.0	0.200	9.3	LOS A	0.3	2.6	0.13	0.61	0.13	75.0
Approach		251	9.7	251	9.7	0.200	7.2	LOS A	0.3	2.6	0.13	0.61	0.13	71.9
NorthEast: Dixon Road														
24	L2	1	0.0	1	0.0	0.111	8.4	LOS A	0.1	1.0	0.44	0.68	0.44	67.4
25	T1	37	8.6	37	8.6	0.111	7.7	LOS A	0.1	1.0	0.44	0.68	0.44	58.8
26	R2	11	10.0	11	10.0	0.111	32.4	LOS D	0.1	1.0	0.44	0.68	0.44	64.0
Approach		48	8.7	48	8.7	0.111	13.1	LOS B	0.1	1.0	0.44	0.68	0.44	60.8
NorthWest: Campbell Road														
27	L2	12	9.1	12	9.1	1.012	52.0	LOS F	13.7	103.9	1.00	1.91	5.07	35.0
28	T1	189	9.4	189	9.4	1.012	54.5	LOS F	13.7	103.9	1.00	1.91	5.07	35.0
29	R2	418	10.1	418	10.1	1.012	64.0	LOS F	13.7	103.9	1.00	1.91	5.07	23.2
Approach		619	9.9	619	9.9	1.012	60.8	LOS F	13.7	103.9	1.00	1.91	5.07	27.8
SouthWest: KB Road														
30	L2	517	5.5	517	5.5	0.458	4.7	LOS A	1.2	9.0	0.45	0.65	0.50	64.7
31	T1	28	11.1	28	11.1	0.458	4.2	LOS A	1.2	9.0	0.45	0.65	0.50	62.1
32	R2	19	11.1	19	11.1	0.458	8.3	LOS A	1.2	9.0	0.45	0.65	0.50	61.2
Approach		564	6.0	564	6.0	0.458	4.8	LOS A	1.2	9.0	0.45	0.65	0.50	64.5
All Vehicles		1482	8.3	1482	8.3	1.012	28.9	NA	13.7	103.9	0.62	1.17	2.34	42.2

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

MOVEMENT SUMMARY

Site: 101 [1831_KB_Railway_2051_Future_PM (Site Folder: 2051 Future PM)]

Network: N101 [KB_Campbell_Railway_2051_Future_PM (Network Folder: 2051 Future PM)]

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

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Railway Rd														
1	L2	9	22.2	9	22.2	0.777	16.7	LOS C	2.8	22.7	0.70	1.23	1.61	56.2
3	R2	435	16.9	435	16.9	0.777	20.6	LOS C	2.8	22.7	0.70	1.23	1.61	50.4
Approach		444	17.1	444	17.1	0.777	20.5	LOS C	2.8	22.7	0.70	1.23	1.61	50.6
East: KB (East)														
4	L2	348	25.7	321	25.7	0.223	3.8	LOS A	0.4	3.8	0.06	0.53	0.06	58.7
5	T1	104	9.1	96	9.1	0.052	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		453	21.9	417 N1	21.9	0.223	2.9	LOS A	0.4	3.8	0.04	0.41	0.04	64.8
West: KB (West)														
11	T1	180	6.4	180	6.4	0.114	0.0	LOS A	0.0	0.2	0.02	0.03	0.02	98.2
12	R2	7	28.6	7	28.6	0.114	8.6	LOS A	0.0	0.2	0.02	0.03	0.02	73.9
Approach		187	7.3	187	7.3	0.114	0.4	NA	0.0	0.2	0.02	0.03	0.02	95.8
All Vehicles		1084	17.4	1049 N1	18.0	0.777	9.9	NA	2.8	22.7	0.32	0.69	0.70	61.2

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

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: 101 [1813_SH54_Waughs_2051_Future_PM (Site Folder: 2051 Future PM)]

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

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Waughs (South)														
1	L2	4	1	4	25.0	0.003	6.7	LOS A	0.0	0.0	0.00	0.61	0.00	53.0
2	T1	610	69	642	11.3	0.353	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	69.7
Approach		614	70	646	11.4	0.353	0.1	NA	0.0	0.0	0.00	0.00	0.00	69.6
North: Waughs (North)														
8	T1	501	37	527	7.4	0.516	7.2	LOS A	4.7	34.9	0.63	0.00	1.02	61.5
9	R2	509	74	536	14.5	0.973	46.5	LOS E	21.0	165.1	0.98	2.18	5.17	34.3
Approach		1010	111	1063	11.0	0.973	27.0	NA	21.0	165.1	0.81	1.10	3.11	44.0
West: SH54														
10	L2	492	27	518	5.5	1.335	325.8	LOS F	91.8	673.6	1.00	6.59	17.32	9.1
12	R2	4	1	4	25.0	1.335	522.7	LOS F	91.8	673.6	1.00	6.59	17.32	9.1
Approach		496	28	522	5.6	1.335	327.4	LOS F	91.8	673.6	1.00	6.59	17.32	9.1
All Vehicles		2120	209	2232	9.9	1.335	89.5	NA	91.8	673.6	0.62	2.07	5.53	24.5

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

MOVEMENT SUMMARY

Site: 101v [1691_Tremaine_Milson_2051_Future_PM (Site Folder: 2051 Future PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 60 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total	HV]	DEMAND FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	veh/h	veh/h	%	v/c	sec		veh	m				km/h
SouthEast: Ruahine St South														
21	L2	1	0	1	0.0	0.001	13.9	LOS B	0.0	0.1	0.59	0.61	0.59	67.7
22	T1	716	13	754	1.8	0.757	14.0	LOS B	18.7	133.1	0.85	0.79	0.90	72.3
23	R2	177	4	186	2.3	0.851	43.7	LOS D	6.8	48.7	1.00	0.98	1.55	42.8
Approach		894	17	941	1.9	0.851	19.9	LOS B	18.7	133.1	0.88	0.83	1.03	63.7
NorthEast: Tremaine Ave North														
24	L2	65	0	68	0.0	0.098	14.6	LOS B	0.9	6.3	0.57	0.72	0.57	66.6
25	T1	399	36	420	9.0	* 0.805	26.4	LOS C	13.2	99.4	0.99	0.93	1.20	58.1
26	R2	90	1	95	1.1	0.627	40.0	LOS D	3.0	21.2	1.00	0.80	1.14	44.9
Approach		554	37	583	6.7	0.805	27.2	LOS C	13.2	99.4	0.94	0.89	1.12	56.2
NorthWest: Milson Line North														
27	L2	141	2	148	1.4	0.178	14.3	LOS B	1.5	10.9	0.64	0.74	0.64	66.0
28	T1	698	19	735	2.7	* 0.782	15.1	LOS B	18.8	134.5	0.84	0.80	0.93	70.8
29	R2	171	18	180	10.5	0.894	50.1	LOS D	7.2	55.1	1.00	1.04	1.76	39.1
Approach		1010	39	1063	3.9	0.894	20.9	LOS C	18.8	134.5	0.84	0.83	1.03	61.7
SouthWest: Tremaine Ave South														
30	L2	132	13	139	9.8	0.201	15.8	LOS B	2.0	15.3	0.65	0.75	0.65	62.4
31	T1	399	33	420	8.3	0.801	26.2	LOS C	13.1	98.3	0.99	0.93	1.19	58.3
32	R2	66	11	69	16.7	0.148	26.1	LOS C	1.6	12.5	0.78	0.75	0.78	51.5
Approach		597	57	628	9.5	0.801	23.9	LOS C	13.1	98.3	0.89	0.87	1.03	58.3
All Vehicles		3055	150	3216	4.9	0.894	22.3	LOS C	18.8	134.5	0.88	0.85	1.05	60.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Ped	Dist]	Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		ped	m			sec	m	m/sec
SouthEast: Ruahine St South												
P5	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	48.9	31.9	0.65
NorthEast: Tremaine Ave North												
P6	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	48.9	31.9	0.65

NorthWest: Milson Line North												
P7	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	48.9	31.9	0.65
SouthWest: Tremaine Ave South												
P8	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	48.9	31.9	0.65
All Pedestrians		0	211	24.4	LOS C	0.1	0.1	0.90	0.90	48.9	31.9	0.65

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

MOVEMENT SUMMARY

▽ Site: 101 [1462_Flygers_SH3_2051_Future_PM (Site Folder: 2051 Future PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3 (South)														
1	L2	1	0	1	0.0	0.001	8.3	LOS A	0.0	0.0	0.02	0.63	0.02	75.2
2	T1	856	39	901	4.6	0.480	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	99.6
3	R2	166	3	175	1.8	0.191	10.5	LOS B	0.8	5.8	0.59	0.83	0.59	69.7
Approach		1023	42	1077	4.1	0.480	1.8	LOS A	0.8	5.8	0.10	0.14	0.10	93.1
East: Flygers (East)														
4	L2	33	2	35	6.1	0.771	92.9	LOS F	3.2	23.9	0.95	1.14	1.79	19.8
5	T1	1	0	1	0.0	0.771	181.8	LOS F	3.2	23.9	0.95	1.14	1.79	20.0
6	R2	15	1	16	6.7	0.771	247.6	LOS F	3.2	23.9	0.95	1.14	1.79	19.8
Approach		49	3	52	6.1	0.771	142.1	LOS F	3.2	23.9	0.95	1.14	1.79	19.8
North: SH3 (North)														
7	L2	18	1	19	5.6	0.014	9.0	LOS A	0.1	0.4	0.26	0.59	0.26	70.8
8	T1	565	38	595	6.7	0.318	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	99.8
9	R2	1	0	1	0.0	0.002	12.7	LOS B	0.0	0.0	0.69	0.70	0.69	67.9
Approach		584	39	615	6.7	0.318	0.3	LOS A	0.1	0.4	0.01	0.02	0.01	98.5
West: Flygers (East)														
10	L2	1	0	1	0.0	0.070	15.5	LOS C	0.2	1.3	0.96	0.98	0.96	29.9
11	T1	1	0	1	0.0	0.070	89.5	LOS F	0.2	1.3	0.96	0.98	0.96	30.0
12	R2	1	0	1	0.0	0.070	139.9	LOS F	0.2	1.3	0.96	0.98	0.96	29.9
Approach		3	0	3	0.0	0.070	81.6	LOS F	0.2	1.3	0.96	0.98	0.96	29.9
All Vehicles		1659	84	1746	5.1	0.771	5.5	NA	3.2	23.9	0.09	0.13	0.12	85.1

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

MOVEMENT SUMMARY

Site: 101vv [1837_KB_Campbell_2051_Future_PM - 4arm priority (Site Folder: 2051 Future PM)]

Network: N101 [KB_Campbell_Railway_2051_Future_PM (Network Folder: 2051 Future PM)]

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

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Stoney Creel Road														
21	L2	118	24.1	118	24.1	0.240	8.6	LOS A	0.4	3.5	0.13	0.61	0.13	71.0
22	T1	191	9.4	191	9.4	0.240	7.0	LOS A	0.4	3.5	0.13	0.61	0.13	71.5
23	R2	1	0.0	1	0.0	0.240	10.7	LOS B	0.4	3.5	0.13	0.61	0.13	74.6
Approach		309	15.0	309	15.0	0.240	7.7	LOS A	0.4	3.5	0.13	0.61	0.13	71.4
NorthEast: Dixon Road														
24	L2	1	0.0	1	0.0	0.110	8.9	LOS A	0.1	1.1	0.54	0.74	0.54	66.6
25	T1	34	12.5	34	12.5	0.110	8.5	LOS A	0.1	1.1	0.54	0.74	0.54	57.6
26	R2	11	10.0	11	10.0	0.110	31.3	LOS D	0.1	1.1	0.54	0.74	0.54	63.3
Approach		45	11.6	45	11.6	0.110	13.8	LOS B	0.1	1.1	0.54	0.74	0.54	59.9
NorthWest: Campbell Road														
27	L2	12	9.1	12	9.1	1.135	145.2	LOS F	25.4	200.6	1.00	3.03	9.41	18.4
28	T1	298	8.1	298	8.1	1.135	146.7	LOS F	25.4	200.6	1.00	3.03	9.41	18.4
29	R2	298	21.6	298	21.6	1.135	160.9	LOS F	25.4	200.6	1.00	3.03	9.41	10.6
Approach		607	14.7	607	14.7	1.135	153.6	LOS F	25.4	200.6	1.00	3.03	9.41	14.9
SouthWest: KB Road														
30	L2	463	13.2	463	13.2	0.610	6.2	LOS A	2.5	19.6	0.51	0.73	0.76	56.7
31	T1	66	6.3	66	6.3	0.610	5.9	LOS A	2.5	19.6	0.51	0.73	0.76	59.6
32	R2	84	23.8	84	23.8	0.610	14.1	LOS B	2.5	19.6	0.51	0.73	0.76	51.9
Approach		614	13.9	614	13.9	0.610	7.3	LOS A	2.5	19.6	0.51	0.73	0.76	56.3
All Vehicles		1576	14.4	1576	14.4	1.135	63.9	NA	25.4	200.6	0.62	1.59	3.96	26.3

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

MOVEMENT SUMMARY

Site: 101vvv [1837_KB_Campbell_2051_Base_PM - potential mitigation (Site Folder: 2051 Base PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Stoney Creel Road														
21	L2	30	4	32	13.3	0.292	21.9	LOS C	6.0	45.1	0.65	0.58	0.65	35.6
22	T1	207	19	218	9.2	0.292	13.8	LOS B	6.0	45.1	0.65	0.58	0.65	71.2
23	R2	1	0	1	0.0	0.292	21.2	LOS C	6.0	45.1	0.65	0.58	0.65	65.0
Approach		238	23	251	9.7	0.292	14.8	LOS B	6.0	45.1	0.65	0.58	0.65	66.3
NorthEast: Dixon Road														
24	L2	1	0	1	0.0	0.150	37.0	LOS D	1.6	12.0	0.86	0.68	0.86	50.6
25	T1	35	3	37	8.6	0.150	29.2	LOS C	1.6	12.0	0.86	0.68	0.86	39.1
26	R2	10	1	11	10.0	0.150	37.1	LOS D	1.6	12.0	0.86	0.68	0.86	48.8
Approach		46	4	48	8.7	0.150	31.1	LOS C	1.6	12.0	0.86	0.68	0.86	42.2
NorthWest: Campbell Road														
27	L2	11	1	12	9.1	0.232	21.4	LOS C	4.6	34.9	0.63	0.54	0.63	63.8
28	T1	180	17	189	9.4	0.232	13.3	LOS B	4.6	34.9	0.63	0.54	0.63	72.6
29	R2	397	40	418	10.1	* 0.967	75.0	LOS E	26.2	198.9	1.00	1.08	1.73	20.3
Approach		588	58	619	9.9	0.967	55.1	LOS E	26.2	198.9	0.88	0.90	1.37	30.6
SouthWest: KB Road														
30	L2	491	27	517	5.5	* 0.877	40.3	LOS D	22.9	168.0	0.98	0.95	1.26	30.2
31	T1	27	3	28	11.1	0.077	17.3	LOS B	1.2	9.1	0.67	0.59	0.67	51.9
32	R2	18	2	19	11.1	0.077	20.1	LOS C	1.2	9.1	0.67	0.59	0.67	43.1
Approach		536	32	564	6.0	0.877	38.4	LOS D	22.9	168.0	0.95	0.92	1.21	31.1
All Vehicles		1408	117	1482	8.3	0.967	41.2	LOS D	26.2	198.9	0.87	0.85	1.17	35.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance											
Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Stoney Creel Road												
P5	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	56.3	28.6	0.51
NorthEast: Dixon Road												
P6	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	56.3	28.6	0.51

NorthWest: Campbell Road											
P7	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	58.8	31.9	0.54
SouthWest: KB Road											
P8	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	58.8	31.9	0.54
All Pedestrians		0	211	34.3	LOS D	0.1	0.1	0.93	0.93	57.6	30.3	0.53

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

MOVEMENT SUMMARY

Site: 101v [1462_Flygers_SH3_2051_Base_PM - potential mitigation (Site Folder: 2051 Base PM)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3 (South)														
1	L2	1	0	1	0.0	0.640	7.0	LOS A	9.2	66.5	0.24	0.53	0.24	72.0
2	T1	835	42	879	5.0	0.640	8.2	LOS A	9.2	66.5	0.24	0.53	0.24	71.8
3	R2	160	3	168	1.9	0.640	12.4	LOS B	9.2	66.5	0.24	0.53	0.24	73.3
Approach		996	45	1048	4.5	0.640	8.8	LOS A	9.2	66.5	0.24	0.53	0.24	72.0
East: Flygers (East)														
4	L2	15	2	16	13.3	0.047	11.3	LOS B	0.3	2.2	0.72	0.72	0.72	63.9
5	T1	1	0	1	0.0	0.047	11.7	LOS B	0.3	2.2	0.72	0.72	0.72	68.0
6	R2	15	1	16	6.7	0.047	16.3	LOS B	0.3	2.2	0.72	0.72	0.72	66.8
Approach		31	3	33	9.7	0.047	13.7	LOS B	0.3	2.2	0.72	0.72	0.72	65.4
North: SH3 (North)														
7	L2	17	1	18	5.9	0.501	8.4	LOS A	4.3	31.9	0.55	0.61	0.55	68.7
8	T1	567	40	597	7.1	0.501	9.5	LOS A	4.3	31.9	0.55	0.61	0.55	69.6
9	R2	1	0	1	0.0	0.501	13.6	LOS B	4.3	31.9	0.55	0.61	0.55	72.1
Approach		585	41	616	7.0	0.501	9.5	LOS A	4.3	31.9	0.55	0.61	0.55	69.5
West: Flygers (East)														
10	L2	1	0	1	0.0	0.006	16.5	LOS B	0.0	0.3	0.87	0.66	0.87	62.3
11	T1	1	0	1	0.0	0.006	17.7	LOS B	0.0	0.3	0.87	0.66	0.87	63.3
12	R2	1	0	1	0.0	0.006	21.9	LOS C	0.0	0.3	0.87	0.66	0.87	63.5
Approach		3	0	3	0.0	0.006	18.7	LOS B	0.0	0.3	0.87	0.66	0.87	63.0
All Vehicles		1615	89	1700	5.5	0.640	9.2	LOS A	9.2	66.5	0.36	0.56	0.36	70.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101v [1813_SH54_Waughs_2051_Base_PM - - potential mitigation (Site Folder: 2051 Base PM)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Waughs (South)														
1	L2	5	0	5	0.0	0.750	16.3	LOS B	10.8	80.3	0.96	1.10	1.45	51.8
2	T1	615	42	647	6.8	0.750	17.2	LOS B	10.8	80.3	0.96	1.10	1.45	51.6
Approach		620	42	653	6.8	0.750	17.2	LOS B	10.8	80.3	0.96	1.10	1.45	51.6
North: Waughs (North)														
8	T1	495	37	521	7.5	0.611	5.4	LOS A	9.3	70.1	0.09	0.56	0.09	59.0
9	R2	482	47	507	9.8	0.611	10.2	LOS B	9.3	70.1	0.09	0.56	0.09	57.9
Approach		977	84	1028	8.6	0.611	7.8	LOS A	9.3	70.1	0.09	0.56	0.09	58.5
West: Sh54														
10	L2	484	28	509	5.8	0.833	24.7	LOS C	14.0	102.6	1.00	1.40	1.84	37.4
12	R2	3	0	3	0.0	0.833	28.8	LOS C	14.0	102.6	1.00	1.40	1.84	38.3
Approach		487	28	513	5.7	0.833	24.7	LOS C	14.0	102.6	1.00	1.40	1.84	37.4
All Vehicles		2084	154	2194	7.4	0.833	14.5	LOS B	14.0	102.6	0.56	0.92	0.90	50.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101vvv [1837_KB_Campbell_2051_Future_PM - potential mitigation (Site Folder: 2051 Future PM)]

New Site
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated   Cycle Time = 80 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Stoney Creel Road														
21	L2	112	27	118	24.1	0.458	27.6	LOS C	9.0	70.8	0.78	0.73	0.78	31.5
22	T1	181	17	191	9.4	0.458	19.2	LOS B	9.0	70.8	0.78	0.73	0.78	62.5
23	R2	1	0	1	0.0	0.458	26.6	LOS C	9.0	70.8	0.78	0.73	0.78	57.7
Approach		294	44	309	15.0	0.458	22.4	LOS C	9.0	70.8	0.78	0.73	0.78	50.1
NorthEast: Dixon Road														
24	L2	1	0	1	0.0	0.093	28.2	LOS C	1.2	9.5	0.73	0.60	0.73	57.4
25	T1	32	4	34	12.5	0.093	20.4	LOS C	1.2	9.5	0.73	0.60	0.73	47.1
26	R2	10	1	11	10.0	0.093	28.3	LOS C	1.2	9.5	0.73	0.60	0.73	55.1
Approach		43	5	45	11.6	0.093	22.4	LOS C	1.2	9.5	0.73	0.60	0.73	49.9
NorthWest: Campbell Road														
27	L2	11	1	12	9.1	0.420	26.8	LOS C	8.8	65.6	0.77	0.66	0.77	58.4
28	T1	283	23	298	8.1	0.420	18.7	LOS B	8.8	65.6	0.77	0.66	0.77	65.7
29	R2	283	61	298	21.6	* 1.033	113.6	LOS F	23.0	190.6	1.00	1.18	2.23	14.5
Approach		577	85	607	14.7	1.033	65.4	LOS E	23.0	190.6	0.88	0.92	1.48	29.6
SouthWest: KB Road														
30	L2	440	58	463	13.2	* 0.770	26.2	LOS C	15.7	122.4	0.85	0.85	0.94	36.9
31	T1	63	4	66	6.3	0.221	15.2	LOS B	3.7	29.3	0.66	0.65	0.66	54.5
32	R2	80	19	84	23.8	0.221	18.0	LOS B	3.7	29.3	0.66	0.65	0.66	41.7
Approach		583	81	614	13.9	0.770	23.9	LOS C	15.7	122.4	0.80	0.81	0.87	38.9
All Vehicles		1497	215	1576	14.4	1.033	39.6	LOS D	23.0	190.6	0.83	0.83	1.08	36.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Effective Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
SouthEast: Stoney Creel Road												
P5	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	56.3	28.6	0.51
NorthEast: Dixon Road												
P6	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	56.3	28.6	0.51

NorthWest: Campbell Road											
P7	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	58.8	31.9	0.54
SouthWest: KB Road											
P8	Full	50	53	34.3	LOS D	0.1	0.1	0.93	0.93	58.8	31.9	0.54
All Pedestrians		0	211	34.3	LOS D	0.1	0.1	0.93	0.93	57.6	30.3	0.53

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

Organisation: STANTEC NEW ZEALAND | Licence: NETWORK / Enterprise | Processed: Thursday, 11 February 2021 11:46:06 a.m.
Project: \\NZ4113-PPFSS01\shared_projects\310003007\4 Technical\Phase 3\Transport Assessment\TIA Inputs\Sidra\s92\KR intersection analysis s92.sip9

MOVEMENT SUMMARY

Site: 101v [1813_SH54_Waughs_2051_Future_PM - potential mitigation (Site Folder: 2051 Future PM)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: Waughs (South)														
1	L2	4	1	4	25.0	0.858	27.9	LOS C	16.8	129.3	1.00	1.37	2.04	41.7
2	T1	610	69	642	11.3	0.858	27.3	LOS C	16.8	129.3	1.00	1.37	2.04	44.5
Approach		614	70	646	11.4	0.858	27.3	LOS C	16.8	129.3	1.00	1.37	2.04	44.5
North: Waughs (North)														
8	T1	501	37	527	7.4	0.654	5.2	LOS A	10.9	83.8	0.13	0.55	0.13	60.1
9	R2	509	74	536	14.5	0.654	10.0	LOS B	10.9	83.8	0.13	0.55	0.13	56.3
Approach		1010	111	1063	11.0	0.654	7.7	LOS A	10.9	83.8	0.13	0.55	0.13	58.1
West: SH54														
10	L2	492	27	518	5.5	0.864	28.7	LOS C	16.0	117.5	1.00	1.48	2.01	35.9
12	R2	4	1	4	25.0	0.864	34.5	LOS C	16.0	117.5	1.00	1.48	2.01	36.4
Approach		496	28	522	5.6	0.864	28.7	LOS C	16.0	117.5	1.00	1.48	2.01	35.9
All Vehicles		2120	209	2232	9.9	0.864	18.3	LOS B	16.8	129.3	0.58	1.01	1.12	47.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

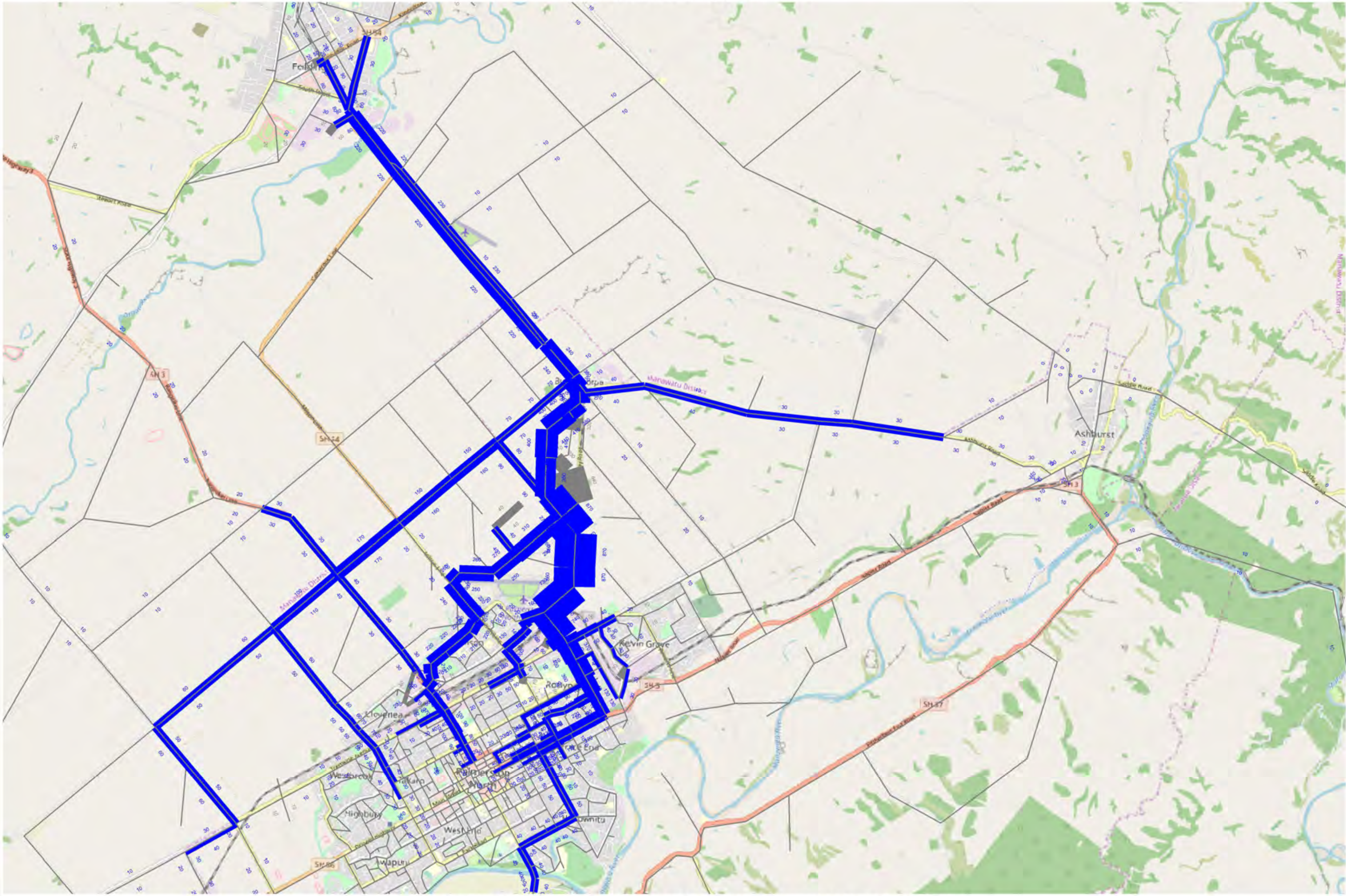
Site: 101v [1462_Flygers_SH3_2051_Future_PM - potential mitigation (Site Folder: 2051 Future PM)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] veh/h	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
South: SH3 (South)														
1	L2	1	0	1	0.0	0.670	6.8	LOS A	10.3	74.8	0.26	0.52	0.26	72.1
2	T1	856	39	901	4.6	0.670	7.9	LOS A	10.3	74.8	0.26	0.52	0.26	71.9
3	R2	166	3	175	1.8	0.670	12.1	LOS B	10.3	74.8	0.26	0.52	0.26	73.3
Approach		1023	42	1077	4.1	0.670	8.6	LOS A	10.3	74.8	0.26	0.52	0.26	72.1
East: Flygers (East)														
4	L2	33	2	35	6.1	0.074	11.0	LOS B	0.5	3.4	0.73	0.75	0.73	66.6
5	T1	1	0	1	0.0	0.074	11.6	LOS B	0.5	3.4	0.73	0.75	0.73	69.0
6	R2	15	1	16	6.7	0.074	16.3	LOS B	0.5	3.4	0.73	0.75	0.73	67.7
Approach		49	3	52	6.1	0.074	12.6	LOS B	0.5	3.4	0.73	0.75	0.73	67.0
North: SH3 (North)														
7	L2	18	1	19	5.6	0.527	8.5	LOS A	4.6	34.4	0.59	0.62	0.59	68.9
8	T1	565	38	595	6.7	0.527	9.4	LOS A	4.6	34.4	0.59	0.62	0.59	69.6
9	R2	1	0	1	0.0	0.527	13.5	LOS B	4.6	34.4	0.59	0.62	0.59	72.1
Approach		584	39	615	6.7	0.527	9.4	LOS A	4.6	34.4	0.59	0.62	0.59	69.6
West: Flygers (East)														
10	L2	1	0	1	0.0	0.007	17.4	LOS B	0.0	0.3	0.88	0.67	0.88	61.4
11	T1	1	0	1	0.0	0.007	18.3	LOS B	0.0	0.3	0.88	0.67	0.88	62.2
12	R2	1	0	1	0.0	0.007	22.6	LOS C	0.0	0.3	0.88	0.67	0.88	62.4
Approach		3	0	3	0.0	0.007	19.4	LOS B	0.0	0.3	0.88	0.67	0.88	62.0
All Vehicles		1659	84	1746	5.1	0.670	9.0	LOS A	10.3	74.8	0.39	0.56	0.39	71.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

2031 Future Hub ADT Light Vehicles SLA



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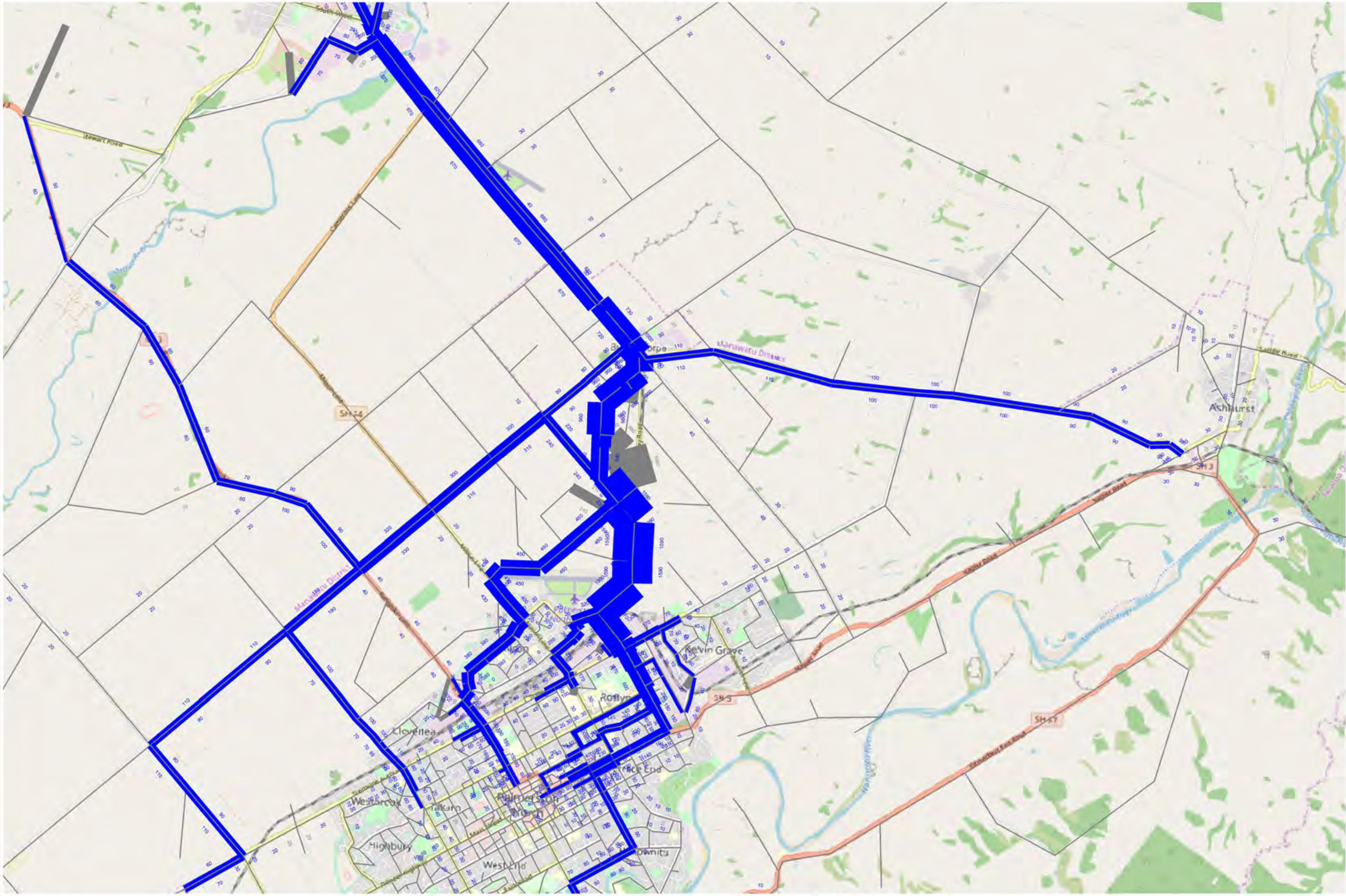
2041 Future Hub ADT Light Vehicles SLA



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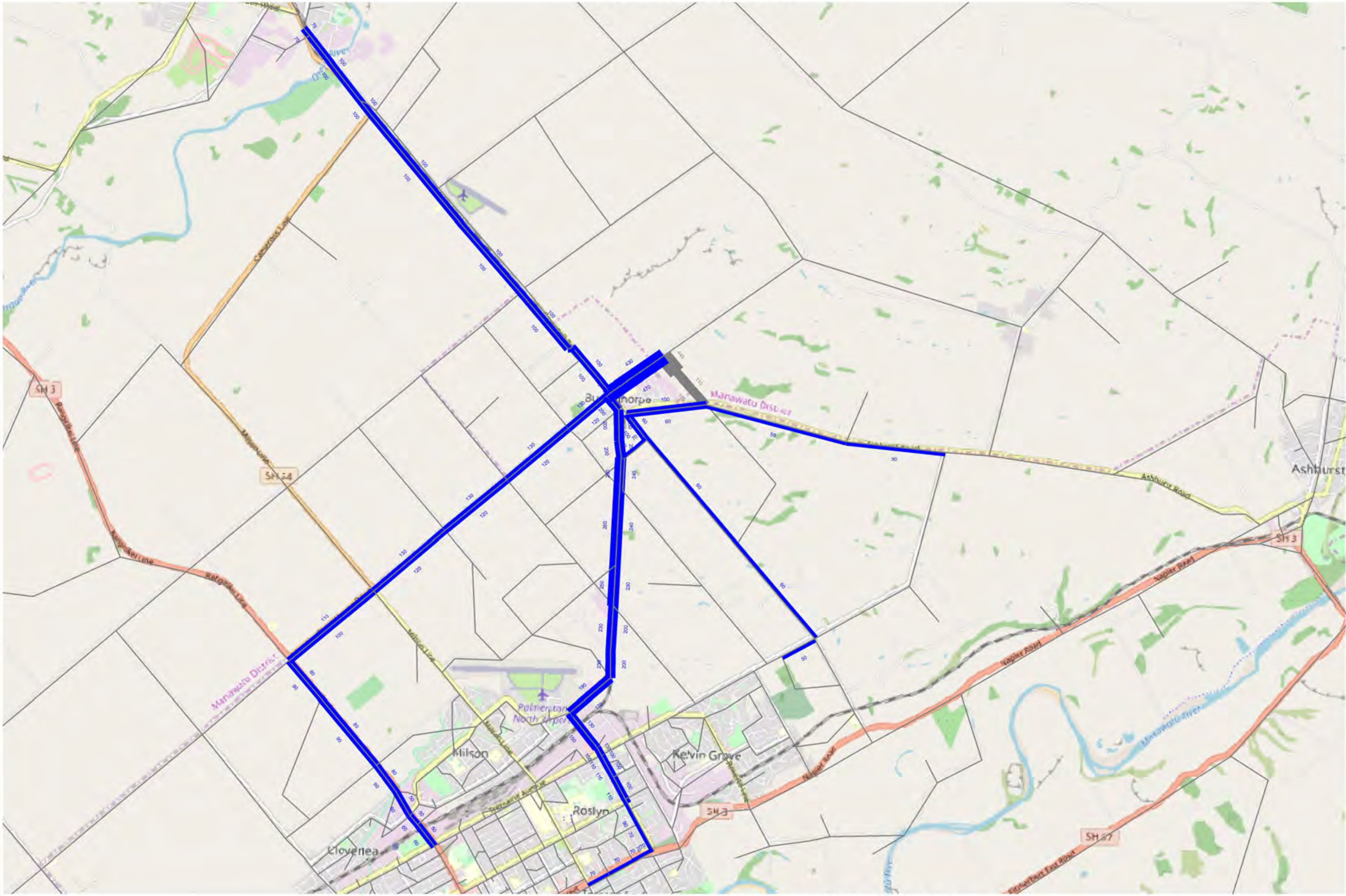
2031 Base Bunnythorpe ADT SLA



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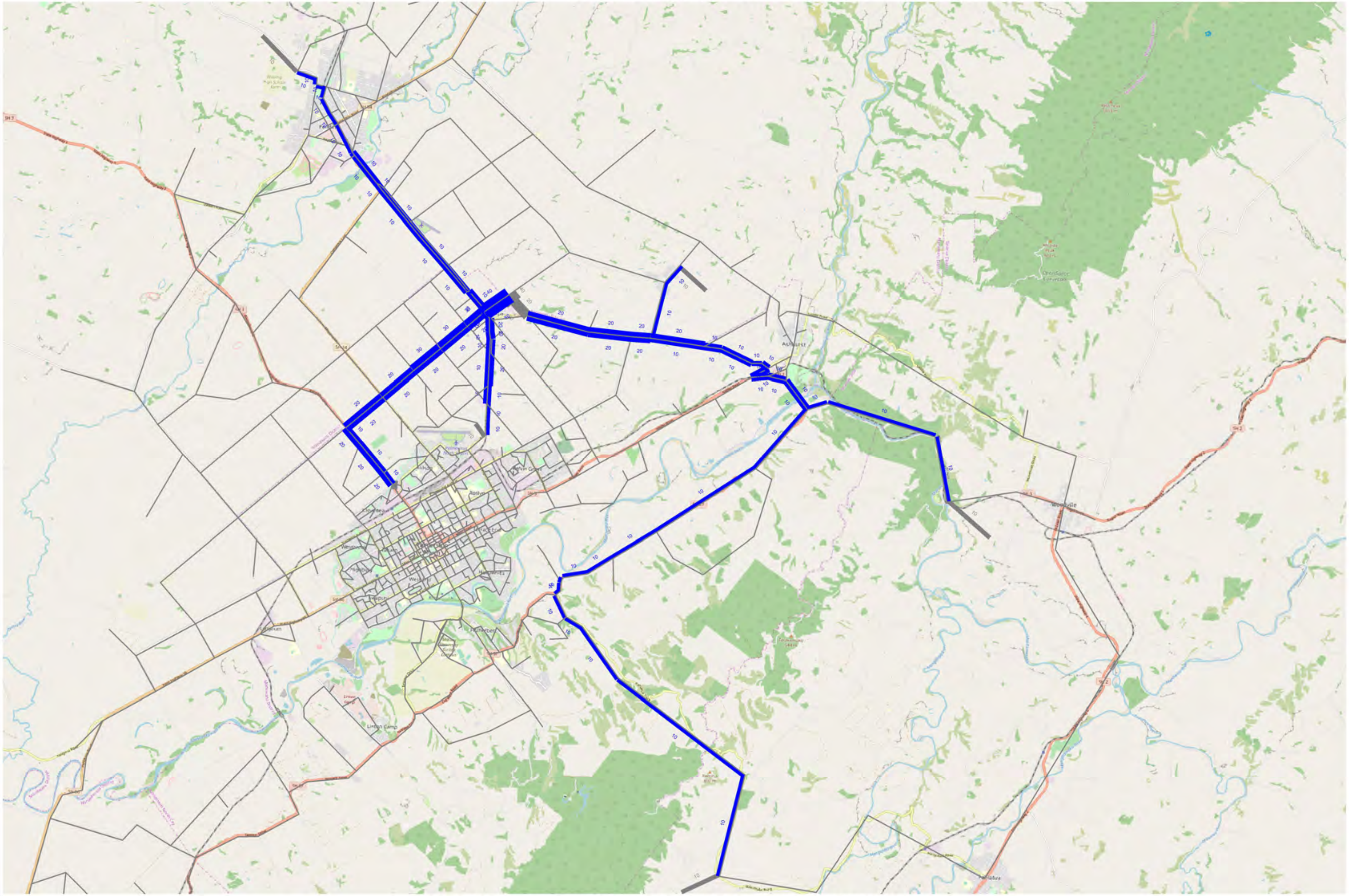
2031 Base Bunnythorpe ADT HCV SLA



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2031 Future Bunnythorpe ADT SLA

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2031 Future Bunnythorpe ADT HCV SLA

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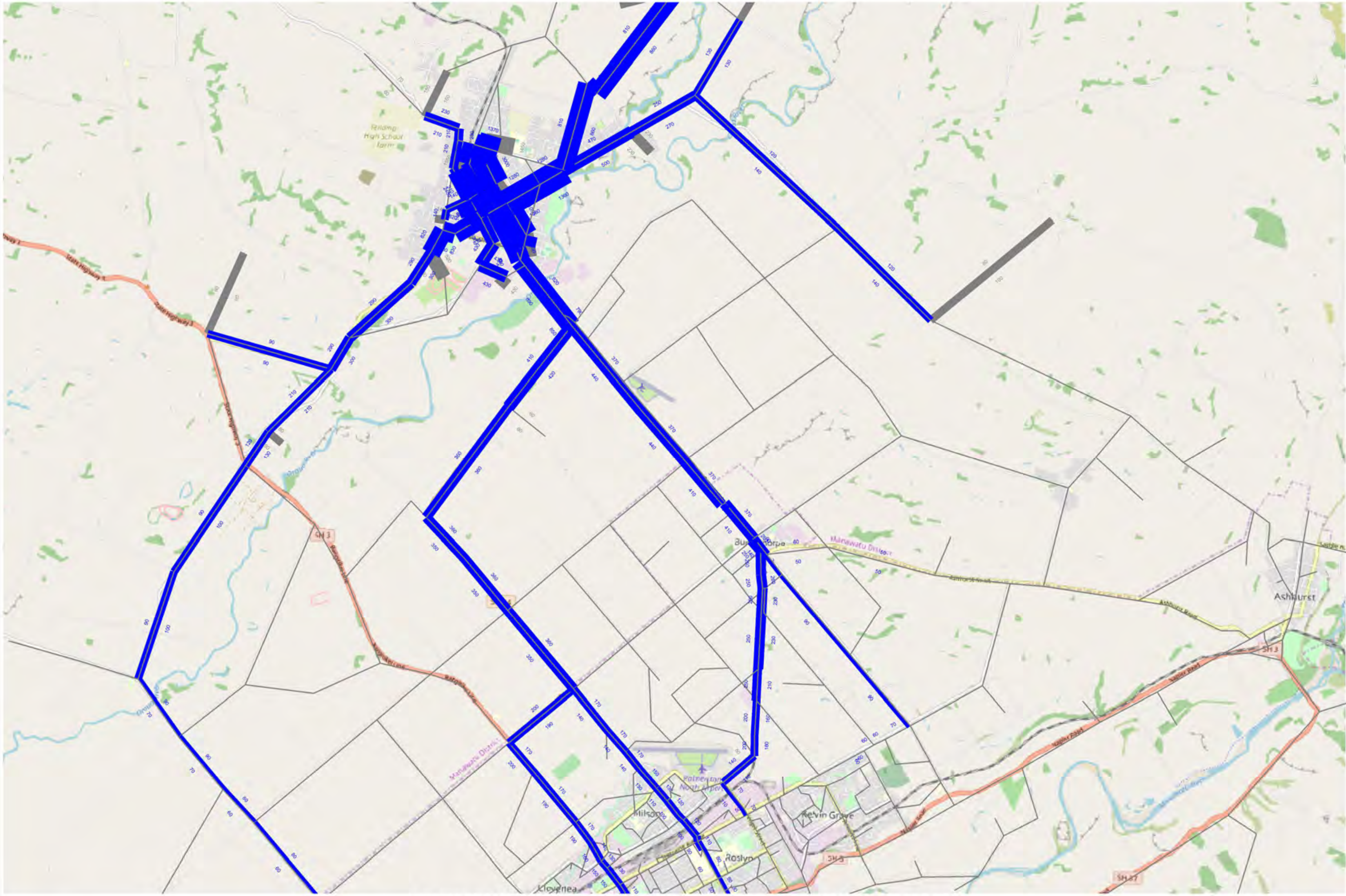
2031 Base Fielding ADT SLA



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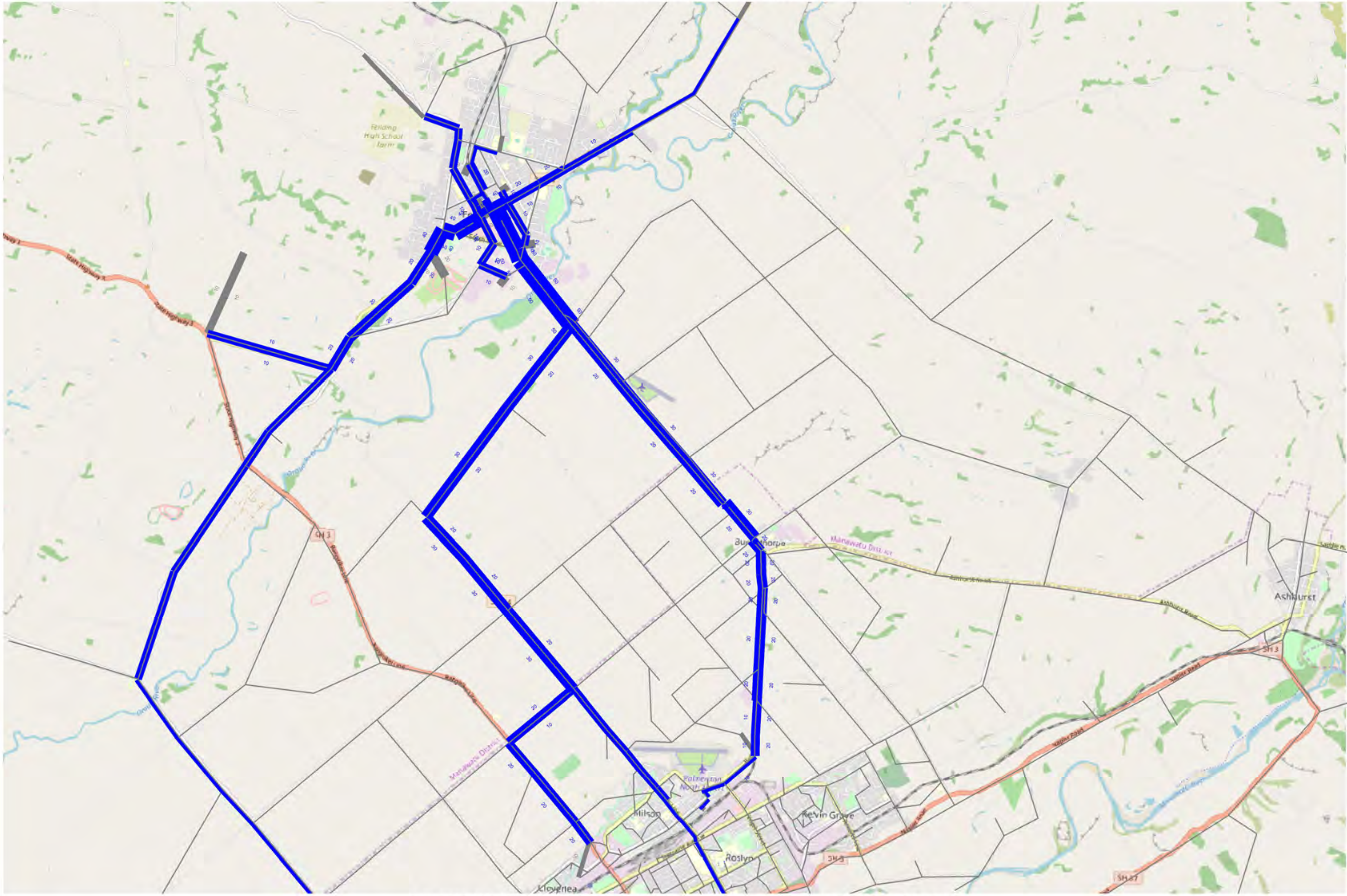
2031 Base Fielding ADT HCV SLA



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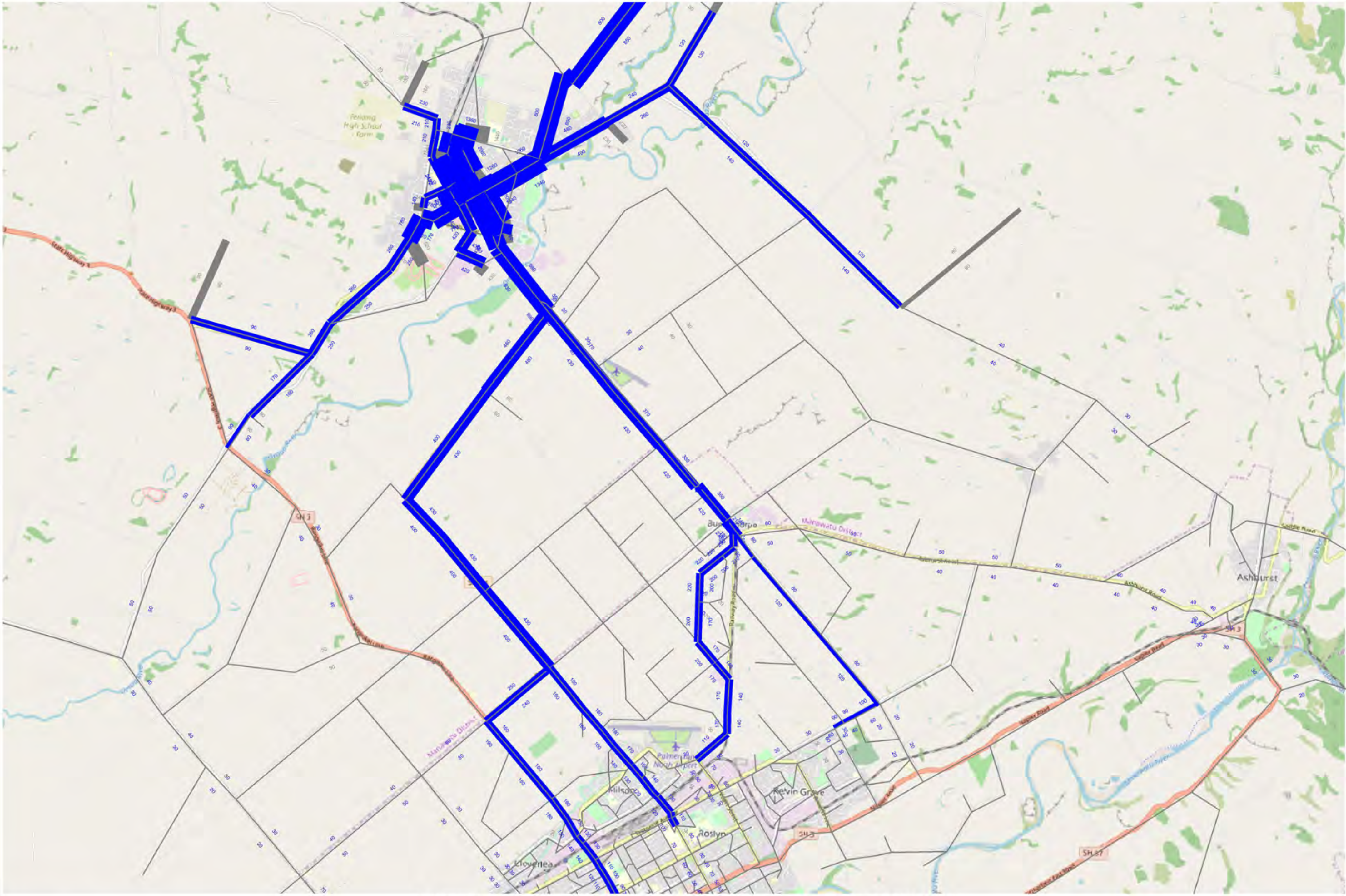
2031 Future Fielding ADT SLA



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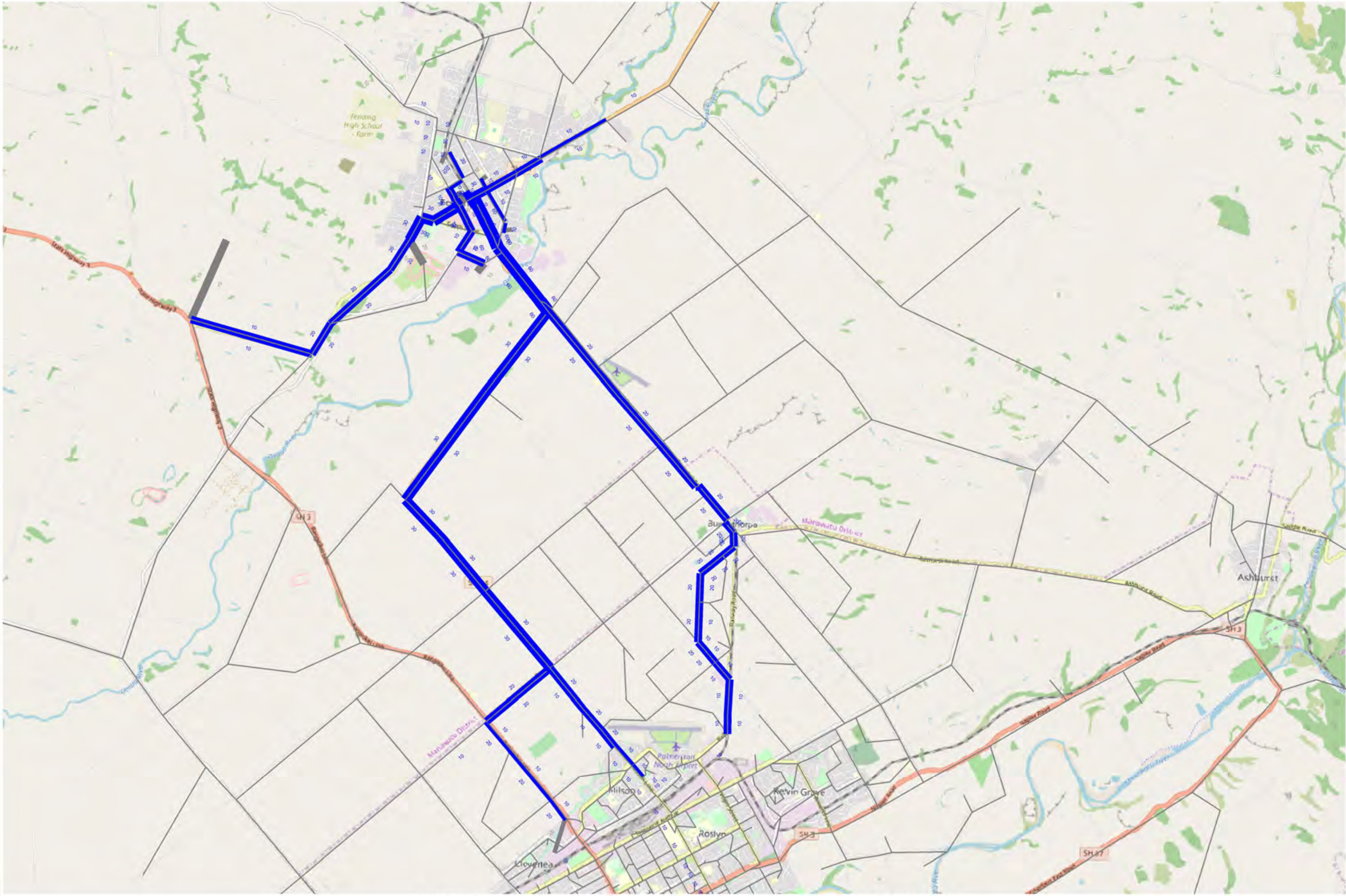
2031 Future Fielding ADT HCV SLA



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Legend.

Stormwater Mitigation
- Stormwater Attenuation Ponds

Noise Mitigation, Features & Fencing
- Planted Earth Bund (Noise Mitigation)
- Vertical Concrete Walls (Noise Mitigation)
- Naturalised Channel
- Possible Future Recreation Track
- 2m High Security Fence
- 1.2m High Post & Wire Fence
- Proposed Specimen Trees

Mitigation Planting
- Tall River Plains Planting (10-15m High)
- Wetland & Naturalised Channel Planting
- Low River Terrace Planting (1-2m High, dotted with Cabbage Trees)
- Amenity Planting (Within the Site)
- Designation Boundary
- Flood Light Column (Indicative)
- Internal Access Lighting (Indicative)
- Building Mounted Lighting (Indicative)
- Perimeter Road Lighting (Indicative)

DRAFT AND INDICATIVE SUBJECT TO CONFIRMATION WITH DETAILED DESIGN

KiwiRail Regional Freight Hub.

Landscape plan.

DRAFT AND INDICATIVE

Appendix 2, LVA, s92 Response

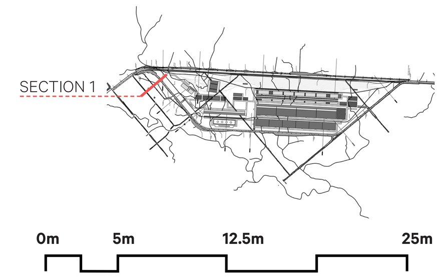
Isthmus.

N

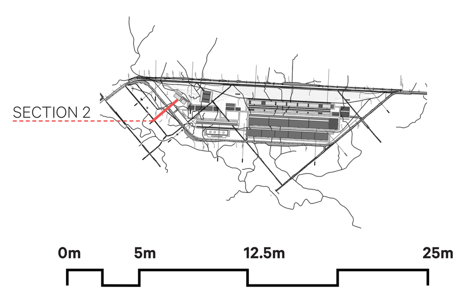
Scale:1:3500@A0

Job: 4198 Date: 12 February 2021 REV 2

SECTION 1 - MAPLE ST
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



SECTION 2 - MAPLE ST
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



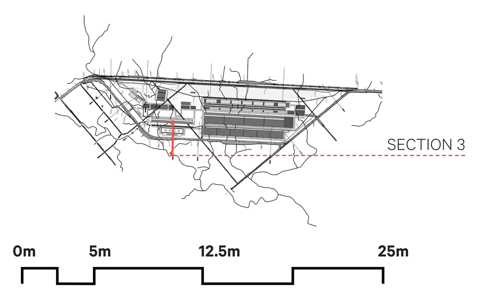
KiwiRail Regional Freight Hub.
Landscape plan Cross Sections.
DRAFT AND INDICATIVE

Isthmus.

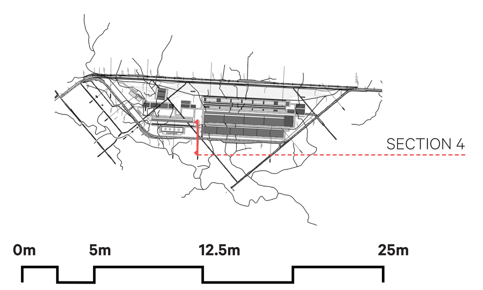
Job: 4198 Date: 12 February 2021 REV 2

Appendix 3, LVA, s92 Response

SECTION 3 - MANGAONE STREAM
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



SECTION 4 - CLEVELY LINE
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



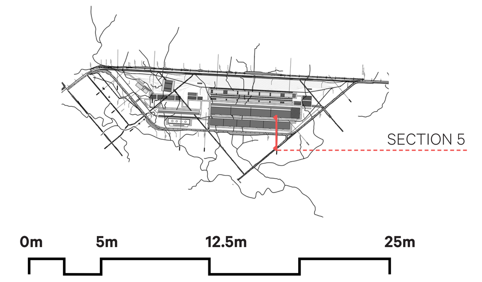
KiwiRail Regional Freight Hub.
Landscape plan Cross Sections.
DRAFT AND INDICATIVE

Isthmus.

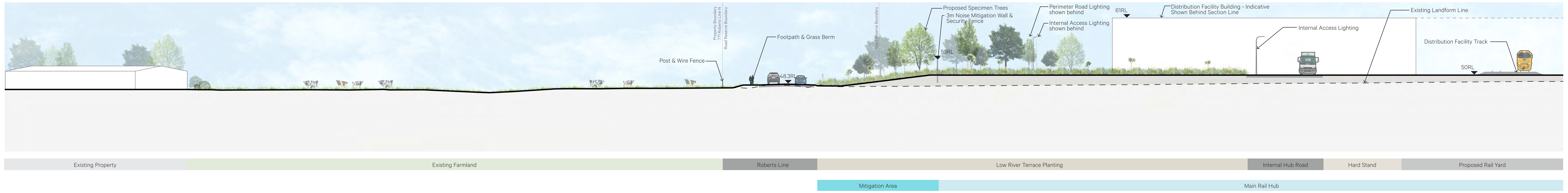
Job: 4198 Date: 12 February 2021 REV 2

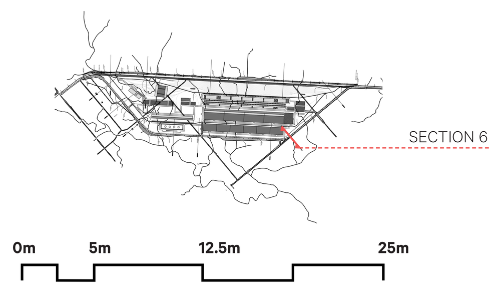
Appendix 3, LVA, s92 Response

SECTION 5 - ROBERTS LINE
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



SECTION 6 - ROBERTS LINE
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3





KiwiRail Regional Freight Hub.
Landscape plan Cross Sections.
DRAFT AND INDICATIVE

Isthmus.

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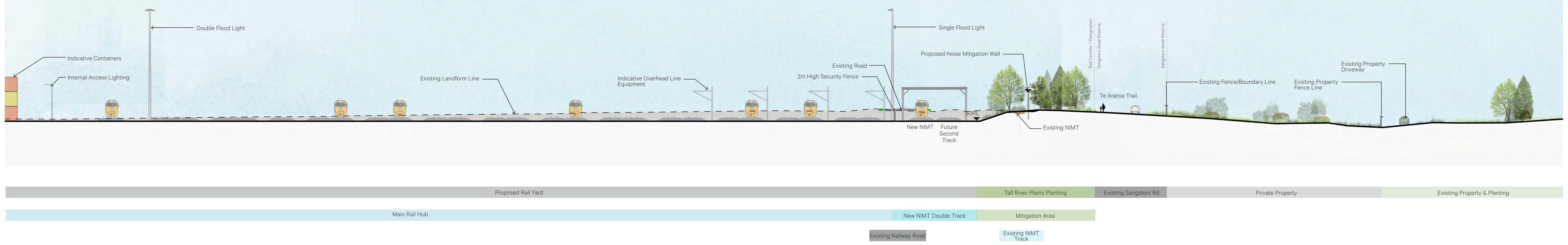
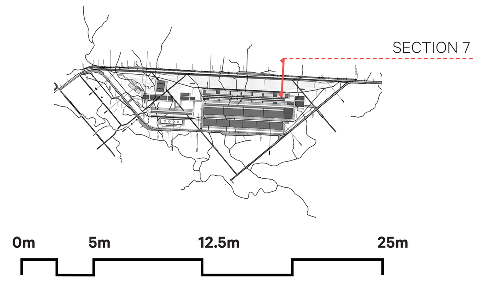
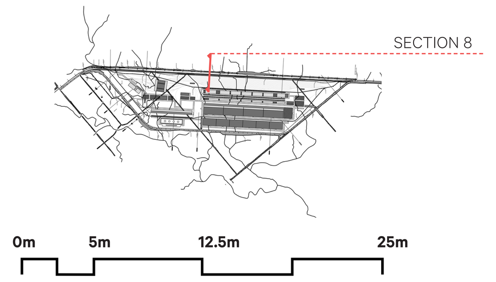
SECTION 7 - SANGSTERS ROAD
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3

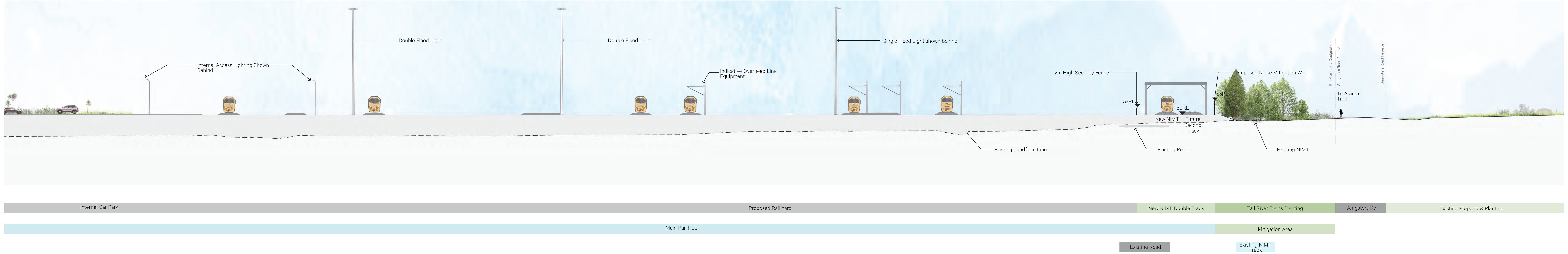


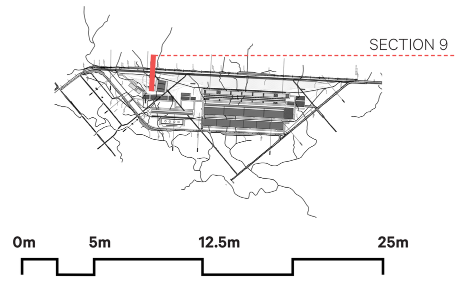


SECTION 8 - SANGSTERS ROAD
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3



SECTION 9 - SANGSTERS ROAD
DRAFT AND INDICATIVE
1:250@A1 / 1:500@A3





KiwiRail Regional Freight Hub.

Landscape plan Cross Sections.

DRAFT AND INDICATIVE

Isthmus.

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CREATING COMMUNITIES

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of belonging. That's why at Stantec, we always **design with community in mind**.

We care about the communities we serve—because they're our communities too. We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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