BEFORE THE HEARINGS PANEL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of proposed Plan Change G: Aokautere Urban Growth to the Palmerston North City Council District Plan

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SECTION 42A TECHNICAL REPORT OF HARRIET BARBARA FRASER ON BEHALF OF PALMERSTON NORTH CITY COUNCIL

TECHNICAL – TRANSPORTATION

Dated 15 September 2023

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A. EXECUTIVE SUMMARY

1. This s 42A transportation report can be summarised as follows:

(a) I authored the Transportation Assessment dated 28 July 2022 (**TA**) which is attached to this report as **Attachment 1.** In short:

(i) The findings of the TA showed that based on existing travel mode share behaviours, there is the potential for the plan change to result in significant additional vehicle traffic on the local road network.

(ii) A number of mitigation measures, included in Table 12 of the TA, were identified to support mode shift towards active and public transport modes as well as to ensure the safe operation of the transport network.

(iii) With these mitigation measures in place, the proposed Structure Plan would allow for the site to be developed for residential and local business centre (local retail/ commercial/ community) purposes in a manner that is consistent with the District Plan traffic and transportation-related objectives and policies.

(b) There have been a number of changes to the transport context and the scope of Proposed Plan Change G – Aokautere Urban Growth (**PCG**) along with the receipt of submissions since the TA was completed. Key changes have been the commissioning of a Safe System Audit Report (**SSA**) to assist with further review of the required mitigation, ongoing liaison with Waka Kotahi, ongoing design work for cycle facilities along Summerhill Drive, the Ministry of Education announcing plans to start construction of a full primary school on their site at the southern end of Ruapehu Drive, and an update to the Regional Public Transport Plan along with minor changes to the residential yield and proposed internal road layout.

(c) The SSA confirmed that the additional traffic activity associated with PCG results in a reduction in the alignment with the Safe System principles along the SH57 corridor and at the intersections, with pedestrians and cyclists being

most affected. The introduction of either signals or roundabouts has been shown to be able to mitigate the adverse safety effects of the additional traffic activity.

(d) The Palmerston North Integrated Transport Initiative (**PNITI**) Network Options Report does not identify either Summerhill Drive or SH57 Aokautere Drive to the east of Summerhill Drive as key elements of the PNITI programme, with a preference shown for traffic flows including freight, to access the City from the west via SH57 and a new river bridge, or via Tennent Drive and the Fitzherbert Bridge. Any additional travel time on Summerhill Drive and SH57 Aokautere Drive as a result of speed limit reductions and intersection changes to manage local traffic movements is not expected to adversely affect the primary traffic and freight routes identified in the PNITI programme.

2. As a result of the further assessment and in response to the submissions, a number of recommended changes to the proposed transport provisions were made.

3. I have concluded with regard to the transportation effects of PCG:

(a) The yield of dwellings is likely to reduce slightly as a result of changes associated with updated noise and erosion assessments discussed by other experts. However, the scale of the reduction is small and will not materially affect the forecast traffic effects associated with PCG or the nature of the mitigation needed;

(b) There are existing vehicle carrying capacity constraints within the local road network including the Fitzherbert Bridge and the intersection of Fitzherbert Avenue with Te Awe Awe Street. There is however spare capacity for active mode travel through the network and increased bus use has the potential to reduce private vehicle use;

(c) There are existing road safety concerns within the local road network, most notably at the Summerhill Drive intersection with Ruapehu Drive and also for pedestrians and cyclists travelling along and across the SH57 Aokautere Drive corridor. The additional vehicle traffic associated with PCG will exacerbate these existing concerns;

(d) The layout and configuration of the internal roads are guided by the Structure Plan which ensures the delivery of a connected and resilient road network that will appropriately accommodate all road users. The Connector Road network provides for both cyclists and potential bus routes;

(e) The SSA identified that either roundabouts or signals would be able to mitigate the adverse safety effects at the SH57 Aokautere Drive intersections. In practice my expectation is that a series of linked traffic signals within a reduced speed environment will result in a safe environment for all road users and allow a coordinated approach to managing through traffic flows on SH57 along this short section of urban network;

(f) Both the increase in population facilitated by PCG and the intersection upgrades, which will improve the safety and efficiency of turning buses, will increase the viability of more frequent bus services along with new and extended routes;

(g) The existing traffic flows on SH57 Aokautere Drive and the lack of pedestrian and cyclist facilities along and across the corridor result in severance and safety concerns. Mitigation measures have been identified and assessed that will address these concerns for existing and future pedestrians and cyclists in this location; and

(h) There remains some uncertainty regarding the future transport context, particularly with regard to the effect on traffic flows on SH57 Aokautere Drive with the opening of Te Ahu a Turanga and the delivery and timing of the PNITI projects. My expectation is that there will be a reduction in traffic flows on SH57 Aokautere Drive with the opening of Te Ahu a Turanga as a result of reduced travel over the Pahiatua Track. With regard to the PNITI projects, if an additional river crossing were constructed to the west of the Fitzherbert Bridge there would be a significant reduction in demand for travel along both Tennent and Summerhill Drives. Given that the bridge is included in the longer term PNITI programme, neither the TA nor this report assumes that an additional river crossing is in place.

4. I remain of the opinion that the adverse safety effects from additional traffic associated with PCG can be mitigated. The proposed intersection upgrades will also assist traffic to turn safely and efficiently at the Summerhill Drive and SH57 Aokautere Drive intersections, bus routes and services are expected to improve, and existing active mode facilities will be upgraded and extended. Further, the transport outcomes of PCG are in good alignment with the national, regional, and local transport context. The proposed Structure Plan and related provisions will ensure the delivery of a connected and resilient internal road network that can safely accommodate all road users.

B. INTRODUCTION

5. My full name is Harriet Barbara Fraser. I hold the qualification of Chartered Professional Engineer and Chartered Member of Engineering NZ. I hold a Bachelor of Civil Engineering degree from Imperial College, University of London and a Master's degree of Science in Transportation Planning and Engineering awarded with distinction by the University of Leeds.

6. My background includes over 30 years consultancy experience in traffic and transportation matters, initially in the UK and Hong Kong. From August 1998 to August 2012, I worked as a Transportation Planner in Lower Hutt in the firm of Traffic Design Group Limited (now Stantec) practising as a transportation planning and traffic engineering specialist throughout New Zealand. Since September 2012 I have been working as a sole practitioner in the field of transportation planning and traffic engineering.

7. I am a certified Hearing Commissioner, having completed the Ministry for the Environment's Making Good Decisions training. Most recently I was a commissioner on the Hearing Panel for a private plan change application in Upper Hutt. This plan change involved the rezoning of General Rural and Rural Production Zones to Settlement Zone creating the potential to develop some 170 to 200 residential units on the site.

8. I have previously assisted Palmerston North City Council (**Council**) with the following:

   (a) Section 42A reporting for the Notice of Requirement for the KiwiRail Regional Freight Hub;

(b) Section 42A reporting for the Notice of Requirement for the Abby Road link in Aokautere;

(c) Section 42A reporting for the Notice of Requirement to construct, operate, use, maintain and improve approximately 11.5km of new State Highway connection between Ashhurst and Woodville (Te Ahu a Turanga);

(d) Several Plan Changes during the sectional District Plan review;

(e) Section 42A reporting on transportation matters associated with the He Ara Kotahi pedestrian and cycle bridge over the Manawatū River; and

(f) The review of transport matters associated with wind farm resource consent applications.

9. I have also provided transportation assessments for applicants seeking resource consents and private plan changes from the Council. As such, I have a good working knowledge of both the transportation elements of the District Plan and the traffic characteristics of Palmerston North and its environs.

10. I have been engaged by Council in relation to PCG , which seeks to rezone a new greenfield growth area in Aokautere for residential development and inserts an accompanying structure plan and provisions (objectives, policies and rules) into the District Plan.

11. I have been involved with PCG since February 2021. My role has involved providing traffic engineering and transportation advice to the project team. As I have noted earlier in this report, I authored the TA, which is at **Attachment 1.**

C. CODE OF CONDUCT

12. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. I confirm that I have stated the reasons for my opinions I express in this report and have considered all the material facts that I am aware of that might alter or detract from those opinions.

13. Statements expressed in this report are within the scope of my expertise, except where I rely on the technical advice I have referred to in paragraphs 16 and 17 of this report.

14. I have all the information necessary to assess the application within the scope of my expertise and am not aware of any gaps in the information or my knowledge.

15. I am familiar with the site for PCG, having visited it on a number of occasions since February 2021.

D. SCOPE

16. In preparing this report, I have reviewed and considered the following information:

    (a) The SSA prepared by WSP dated 4 August 2023. A copy is attached to this report as **Attachment 2**;

    (b) PNITI Network Options Report, dated January 2021 (**PNITI Report**).[1]

17. In addition to my own observations, I rely on the following s 42A reports:

    (a) Urban Design – Mr Andrew Burns.

    (b) Acoustics – Mr Nigel Lloyd.

    (c) Urban Economics – Mr Mike Cullen.

    (d) Strategic Planning – Mr David Murphy.

18. I have reviewed submissions and further submissions on PCG. Of particular note when considering my field of expertise are submissions relating to the following issues:

    (a) Traffic effects on the local road network including:

        (i) Turitea Road;

        (ii) Summerhill Drive including its intersection with Ruapehu Drive;

        (iii) SH57 Aokautere Drive including the intersections between Summerhill Drive and Johnstone Drive inclusive;

[1] The PNITI Report can be accessed at https://www.pncc.govt.nz/files/assets/public/v/1/documents/have-your-say/closed/kiwirail-freight-hub/pncc-technical-evidence/key-docs-referred-to-in-the-technical-reports/pniti-1.pdf.

(iv) Pacific Drive;

(v) Summerhill Drive/ Tennent Drive intersection; and

(vi) General concerns regarding increased traffic activity, congestion and emissions.

(b) Safe provision for active modes including:

(i) Safe access across Aokautere and Summerhill Drives;

(ii) Improved cycle facilities providing access to and from the direction of the Fitzherbert Bridge; and

(iii) Improved pedestrian facilities along Aokautere and Summerhill Drives.

(c) Improved public transport;

(d) River crossing capacity and the need for an additional bridge;

(e) Existing speed limits;

(f) Design of the internal roading including the proposed road hierarchy, road alignment, cross-sections, speed limits and provision for active modes;

(g) Location of road connections with the existing road network including to Turitea Road and Valley Views;

(h) Timing requirement for transport mitigation; and

(i) Alignment with PNITI.

E. BACKGROUND

19. PCG seeks to rezone a new greenfield growth area to the south-east of Palmerston North for residential development and inserts an accompanying Structure Plan and provisions (objectives, policies, and rules) into the District Plan. The plan change will provide for additional housing supply in Aokautere (and the City), to help meet growth projections for Palmerston North over the medium to long term, while addressing the specific topography and environmental issues in Aokautere.

20. My involvement with PCG has involved reviewing the transport elements of the proposed Structure Plan, assessing the related traffic effects, and providing advice on transportation, road design and access. Within the PCG area, my focus has been the delivery of a network of connector roads that support the main transport corridors for accommodating all travel modes. Within the wider area of the existing road network, I have focussed on assessing the need for mitigation measures to address any safety concerns resulting from the additional traffic activity generated within the PCG area.

F. ASSUMPTIONS AND METHODOLOGY

21. The TA that I completed in July 2022 is based on the following assumptions:

(a) PCG would facilitate the development of 1,020 additional residential dwellings within the Aokautere area along with a suburban (local business) centre;

(b) The application of the District Plan road hierarchy to existing roads and the classification of new roads in alignment with the incoming nationwide One Network Framework road hierarchy;

(c) The upgrade of the Turitea Road intersection with Valley Views in accordance with the layout shown in Figure 5 of the TA;

(d) The following observed trip generation rates have been applied to future residential activities:

(i) 8 vehicle movements per day per household;

(ii) 1.0 vehicle movement per hour per household during the weekday PM traffic peak;

(iii) 0.7 vehicle movement per hour per household during the Saturday midday traffic peak.

(e) That Abby Road will be extended to form a link between Pacific Drive and Johnstone Drive;

(f) That the proposed Structure Plan provides for:

(i) a new road connection to Turitea Road, south of Ngahere Park Road, primarily providing access to some 42 rural residential lots;

(ii) potential for some 13 additional lots to have access to the end of Valley Views;

(iii) the remaining 965 additional lots will have vehicle access through the internal road network to SH57 Aokautere Drive via either Pacific or Johnstone Drives;

(iv) two additional road connections onto the existing section of Pacific Drive, one between 129 and 133 Pacific Drive and the other between 151 and 155 Pacific Drive to provide access to the proposed Local Business Centre[2] and surrounding residential area; and

(v) the proposed network of Connector Roads has the potential to accommodate bus routes.

(g) That the cross-sections for the new roads are based on the following parameters:

Footpaths

(i) minimum of 1.8m wide on all urban streets;

(ii) minimum of 2.4m wide on shopping streets or in front of schools.

Cycle provisions

(i) cycle lanes minimum 1.6m wide if not adjacent to parking;

(ii) cycle lanes minimum 1.8m wide if adjacent to parking;

(iii) for connector roads and above if cycles and traffic share a lane, a minimum traffic lane width of 4.2m where not adjacent to parking, increasing to 4.5m if alongside parking;

[2] The Aokautere Neighbourhood Centre.

(iv) for local streets with shared cycles and traffic, the recommended maximum width of a traffic lane (3.2m) is adopted so that cyclists claim road and do not get squeezed. Also, recommend 30km/h or less target speed environment, less than 3,000vpd, not on bus route and not adjacent to high turnover parking;

(v) shared use paths (minimum width 3m) for pedestrians and cyclists only where there are likely to be few if any mobility or visually impaired pedestrians;

Parking

(i) parking lanes with 2m minimum width;

(ii) increase to 2.3m wide if larger vehicles such as trucks parking kerbside; and

Berms

(i) a minimum berm width of 2.5m between the property boundary and the movement lane on all roads where there are vehicle accesses onto the frontage road.

(b) the forecast vehicle activity included in the TA is based on the following assumptions:

(i) 7,950 vehicle movements per day, 994 vehicle movements per hour during the weekday PM peak, 696 vehicle movements per hour during the Saturday midday peak hour, associated with 994 additional dwellings. The traffic activity associated with the increase to 1,020 dwellings, as a result of the refinement of the pre-notification version of the draft Structure Plan, was not reassessed as it is not considered likely to materially change the assessment results;

(ii) Based on existing traffic counts, 61% of trips are inbound and 39% outbound during the weekday PM peak. This changes to 52% inbound and 48% outbound during the Saturday midday peak;

(iii) Based on existing traffic counts, 90% or more of traffic movements during the peak hours are to and from the direction of the City via Summerhill Drive; and

(iv) While both the Palmerston North Transport Plan and the Regional Land Transport Plan include targets for increased active mode and bus travel which could see a reduction in vehicle trips by around 25% for the area that includes Aokautere, the traffic effects have been assessed based on the existing observed vehicle trip generation rates.

2. Given the location of the PCG area, with at least 90% of vehicle traffic travelling to and from the direction of the city via Summerhill Drive, the traffic modelling has involved manual trip distribution and standalone intersection modelling using the internationally recognised SIDRA software; rather than undertaking network-wide traffic modelling.

3. It has been assumed that ongoing traffic growth on SH57 will be balanced by a reduction in through traffic flows once Te Ahu a Turanga opens, and the Pahiatua Track is no longer relied on for crossing the Ranges.

G. OVERVIEW OF TRANSPORTATION ASSESSMENT

4. The findings of the TA were summarised in Section 9 of the report. They are as follows:

(a) in recent years there has been a shift in priority towards the delivery of safe and multi-modal transport infrastructure, with clear targets for improved road safety, increased active mode and public transport use and reduced emissions from land transport;

(b) the existing sections of Pacific Drive and Johnstone Drive have cross sections which are either well-matched or could be readily adjusted to meet the functions of Residential Collector/ Connector Roads;

(c) Turitea Road has a varying cross-section along its length. Overall, it matches most closely the provisions for a Local Rural Road carrying around 1,000vpd although there are sections (Valley Views to SH57) with cross-sections more

aligned with a Connector/Collector Rural Road capable of carrying around 2,500vpd;

(d) Valley Views has a carriageway width of 6m and is accordingly best matched to the provisions for a Local Rural Road carrying around 1,000vpd;

(e) the available sight lines at the various local intersections are generally satisfactory, apart from at the intersection of Valley Views and Turitea Road;

(f) the average daily traffic count on SH57 in the vicinity of Pacific Drive is 12,900vpd. The weekday traffic peak in this location occurs between 5 and 6pm with 1,340vph and on a Saturday between 11am and 12 noon with 1,000vph;

(g) while the traffic carrying capacity of the Fitzherbert Bridge (two traffic lanes in each direction) places a constraint on the amount of traffic that can enter the city in this location, the main capacity constraint is the downstream traffic signals at the intersection of Fitzherbert Avenue and Te Awe Awe Street. It is estimated that this intersection operates at 80-90% of its capacity during the weekday traffic peaks. Scope for capacity improvements is limited with there already being four southbound and three northbound traffic lanes at the Fitzherbert Avenue stop lines. Cycle lanes are marked at the intersection;

(h) based on traffic count data for Pacific Drive and Johnstone Drive the following existing trip generation rates have been calculated:

  (i) Daily: 8.0 vehicle movements per day per household;

  (ii) Weekday PM peak: 1.0 vehicle movements per hour per household;

  (iii) Saturday midday peak: 0.7 vehicle movements per hour per household.

(i) at present, drivers turning right onto SH57 Aokautere Drive from SH57 Old West Road or Pacific Drive, typically look for a gap in both traffic flows rather than pausing in the median;

(j) there are existing safety concerns on Turitea Road to the south of Valley Views due to its narrow cross-section, horizontal and vertical geometry, speed environment and the one-lane bridges;

(k) the Structure Plan facilitates the development of some 1,020 residential lots and a local suburban centre. In terms of transportation matters, the proposed Structure Plan includes provisions for roading connections to the external road network, internal roading layout, proposed road hierarchy and associated cross-section provisions. In particular:

(i) the number and length of 'no exit' roads have been minimised, but the topography associated with the gully systems means that some 'no exit' roads are needed to provide access;

(ii) the network of collector roads has been designed to facilitate circulation by buses. With the recent connection of the two ends of Johnstone Drive, there is now an opportunity for buses to circulate on the existing sections of Pacific Drive and Johnstone Drive. If buses were to travel along the full existing length of Pacific Drive and onto the proposed north-south connector route, most lots within the area would be within 500m of the bus route;

(iii) the inclusion of shared, rather than separated, paths for the use of pedestrians and cyclists has been minimised, but has been necessary along the Connector Roads where the roads cross the gully network. The topography of these areas is challenging, and the road cross-sections need to be minimised. Separate pedestrian and cycle paths are included where the Activity Streets have frontages with shops and businesses;

(iv) a minimum berm width of 2.5m is included between the property boundary and the movement lane (vehicle and/or cycle) on all roads where there are vehicle accesses onto the frontage road. This allows for the driver of an exiting vehicle to be clear of the property boundary prior to the vehicle entering the movement lane;

(l) an increase of active mode share to 30% and of bus share to 4.2% (2018 level for Christchurch and also NZ average), could see a reduction in vehicle trips by around 25% for the Poutoa statistical area (which includes Aokautere) by 2030; and

(m) as set out in Tables 13 and 14 of the TA, there is a good alignment with both the District Plan objectives and policies and the wider regional and national transport context.

5. In summary, the assessment demonstrated that based on existing travel mode share behaviours, there is the potential for PCG to result in significant additional vehicle traffic on the local road network. A number of mitigation measures, included in Table 12 of the TA were identified to support mode shift towards active and public transport modes as well as to ensure the safe operation of the transport network. With these mitigation measures in place, I considered that the proposed Structure Plan would allow for the site to be developed for residential and local business centre (local retail/ commercial/community) purposes in a manner which is consistent with the District Plan traffic and transportation-related objectives and policies.

6. The recommended mitigation measures were implemented through the proposed provisions as notified through Rule 7A.5.2.2. This is set out in **Attachment 3**. The rule requires the completion (and certification) of infrastructure improvements before development, or in some cases, at the identified level of service thresholds as part of the staging of the subdivision and development. Ms Copplestone addresses this Rule further in her s 42A report.

H. FURTHER ASSESSMENT

7. Since the TA, there have been a number of changes to the transport context, along with the receipt of submissions, including:

(a) the Regional Public Transport Plan (**RPTP**) has been updated. Manawatū-Whanganui Regional Council (**Horizons**) has identified the following objectives from the 2022 to 2032 RPTP as being most applicable to PCG:

(i) Provide high quality, safe and accessible public transport infrastructure and information that supports an efficient and connected transport network, and multi-modal travel;

(ii) Contribute to reductions in carbon emissions from transport and improving air quality through increased use of public transport and decarbonising the public transport fleet; and

(iii) Pursue improved, equitable access to public transport across the region.

(b) Mobile Road shows updated traffic flows for SH57 in the vicinity of Pacific Drive of 12,345 vehicles per day in December 2022. This is within 5% of the 12,900 vehicle movements per day used in the TA;

(c) updated reported crash data for the period 2018 to date (3 July 2023) is shown in Figures 1 and 2 below. These show a total of 18 reported crashes which include one fatal crash and one serious injury crash. Both these crashes were included in the earlier data and described in the TA;

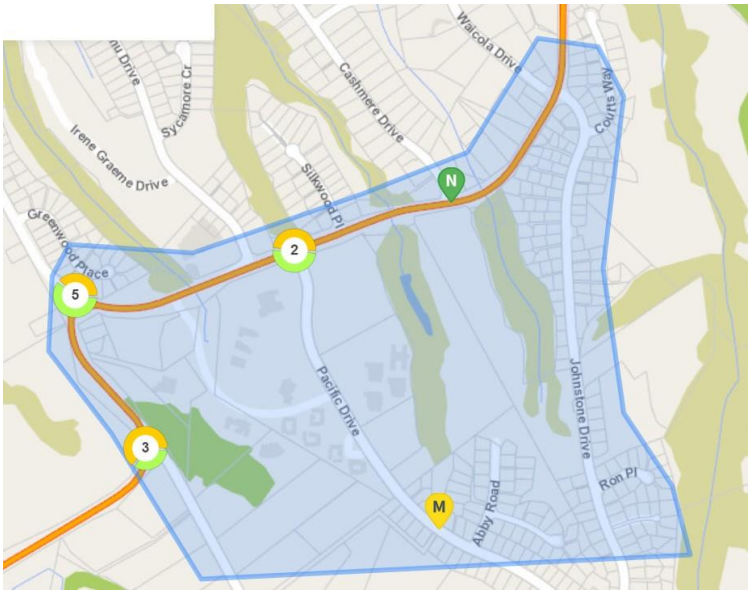

Figure 1: Updated Reported Crashes 2018 to 3 July 2023

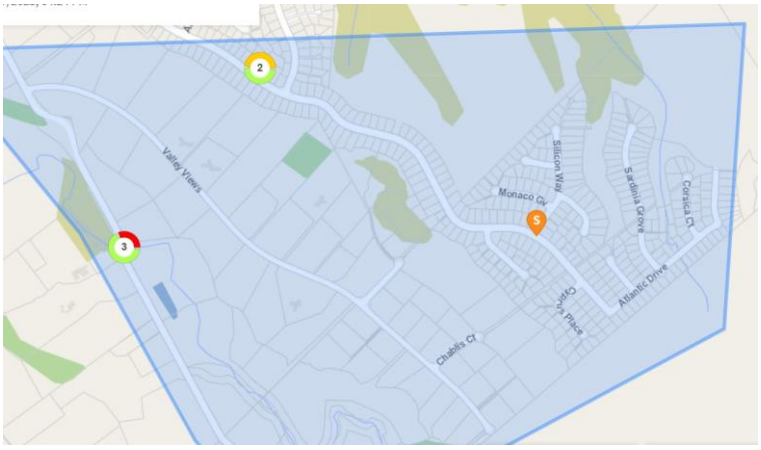

Figure 2: Updated Reported Crashes 2018 to 3 July 2023

(d) the Ministry of Education has announced that it is going to commence the building of a full primary school at the southern end of Ruapehu Drive. This will usefully reduce the existing pattern of primary age children having to cross the Manawatū River to access schools in the City, with an associated reduction in vehicle trips over the Fitzherbert Bridge during the weekday peak times. Equally, it can reasonably be expected that there will be an associated increase in pedestrians and cyclists crossing SH57 Aokautere Drive to access the school from the existing residential areas to the south of Aokautere Drive;

(e) Council have been undertaking ongoing design work with regard to providing improved cycle facilities along Summerhill Drive between Pacific Drive and the Fitzherbert Bridge;

(f) allocation of One Network Framework (**ONF**) road hierarchy to the existing Palmerston North roads. The ONF classifications for existing roads in the vicinity of PCG are included later in my report, at paragraph 53 Table 5;

(g) commissioning of a SSA to further consider the need for and nature of the recommended transport mitigation measures;

(h) ongoing liaison with Waka Kotahi with regard to traffic effects along SH57. These discussions have focussed on:

(i) existing severance caused by the combination of traffic speeds and volumes on SH57 Aokautere Drive;

(ii) the scope and findings of the SSA;

(iii) initiating a Business Case approach to the upgrading of transport infrastructure along SH57;

(iv) the review of speed limits along SH57 Aokautere Drive; and

(v) the alignment of the proposed transport mitigation measures with the outcomes sought through the PNITI.

(i) changes to the connectivity and alignment of the proposed roading within the rural-residential part of the PCG area in order to respond to further noise assessments associated with the activity of the gun club on Turitea Road. The notified roading arrangement is shown in Figure 3 and the modified arrangement in Figure 4. With the internal road link through the Waters' property from the direction of Turitea Road towards Valley Views no longer having the potential to provide frontage access to future rural residential lots, it has been removed from the Structure Plan.

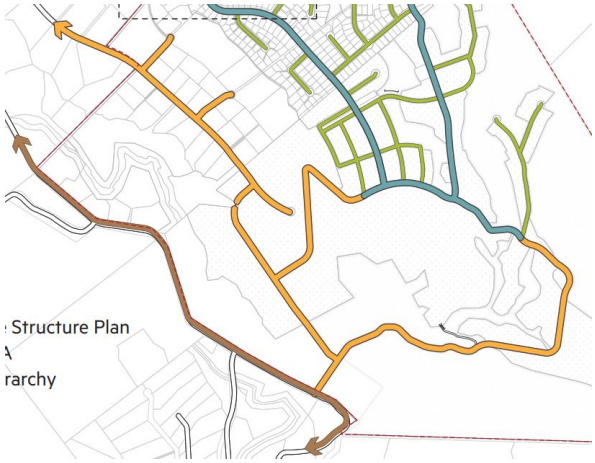

Figure 3: Extract from Notified Map 7A.4A

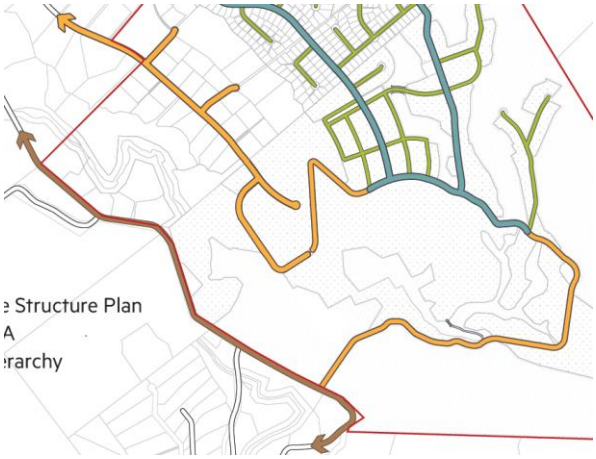

Figure 4: Extract from Updated Map 7A.4A

Safe System Audit

8. The SSA commissioned by Council reviews key elements of the existing road network that will be affected by additional traffic activity associated with residential development facilitated by PCG. As noted earlier, this is at **Attachment 2**.

9. The SSA was undertaken in accordance with the procedures included in the Waka Kotahi NZ Transport Agency Safe System Audit Guidelines. An SSA is an independent review of a transport project to identify any safety concerns that may affect the safety performance of the facility and its alignment with a Safe System. The existing layout and proposed layout of a facility are considered. The 'facility' refers to any piece of road infrastructure - it can be as simple as signage or road marking or as complex as a new or modified intersection. The audit team considers the safety of all road users and qualitatively reports on road safety or opportunities for safety improvement.

10. Table 1 below summarises the scope of the SSA along with the overall scores. The scoring allows for the safety rating to be compared for a range of treatments at an intersection or along a corridor. When completed by the same audit team, as is the case here, some comparisons can also be made between different intersections. The scores are all out of 448 and the lower the number the better the alignment with Safe System principles and the lesser the risk of serious and fatal injury crashes. It is important to note that there is no 'magic' score and the scores represent a level of risk. The scores do not relate to the number of death or serious injury saved or prevented.

Project Element	Safe System Score
SH57 Corridor Assessment (Turitea Road to Johnstone Drive, excluding intersections)	
Option 1: Status Quo, 70km/h speed limit	
Existing traffic	**166**/ 448
With PCG traffic	**206**/448
Option 2: 50km/h speed limit, separated cycleway and removal of left turn slip lanes	
With PCG traffic	**106**/448
SH57 Aokautere Drive (70km/h)/ Summerhill Drive (60km/h) Intersection	
Status Quo	
Existing traffic	**178**/ 448
With PCG traffic	**202**/ 448
Traffic Signals with PCG traffic	**122**/ 448
Urban Roundabout with PCG traffic	**122**/ 448
SH57 Aokautere Drive (70km/h)/ Ruapehu Drive (50km/h) Intersection	
Status Quo	
Existing traffic	**171**/ 448
With PCG traffic	**222**/ 448
Traffic Signals with PCG traffic	**145**/ 448
Urban Roundabout with PCG traffic	**85**/ 448
SH57 Aokautere Drive (70km/h)/ Pacific Drive (50km/h) Intersection	
Status Quo	
Existing traffic	**171**/ 448

Project Element	Safe System Score
With PCG traffic	214/ 448
Traffic Signals with PCG traffic	139/ 448
Urban Roundabout with PCG traffic	82/ 448
SH57 Aokautere Drive (70km/h)/ Johnstone Drive (50km/h) Intersection	
Status Quo	
Existing traffic	**179**/ 448
With PCG traffic	232/ 448
Traffic Signals with PCG traffic	145/ 448
Urban Roundabout with PCG traffic	87/ 448
Summerhill Drive (60km/h)/ Ruapehu Drive (50km/h) Intersection	
Status Quo	
Existing traffic	**168**/ 448
With PCG traffic	223/ 448
Traffic Signals with PCG traffic	86/ 448
Urban Roundabout with PCG traffic	80/ 448

Table 1: Safe System Assessment Summary

11. The additional vehicle traffic activity associated with PCG results in a reduction in the alignment with the Safe System principles along the SH57 corridor and at the intersections.

12. Figures 6, 7 and 9 to 12 of the SSA provide useful insights into which road users and types of crashes are likely to be most adversely affected by the additional traffic activity. In summary:

    (a) Corridor Assessment (Figure 6) – deterioration in pedestrian, cyclist and motorcyclist safety due to the additional traffic activity are the main contributors to the reduced alignment with safe system principles. The

assessed mitigation addresses the safety concerns for cyclists and motorcyclists but the pedestrian scoring remains above existing levels. This is because the assessed mitigation does not include any treatments to assist pedestrians with crossing SH57.

(b) SH57 Aokautere Drive/ Summerhill Drive (Figure 7) - deterioration in pedestrian and cyclist safety due to the additional traffic activity are the main contributors to the reduced alignment with safe system principles. Either the introduction of a roundabout or traffic signals is shown as being able to mitigate the reduction in safety for these road user types.

(c) SH57 Aokautere Drive/ Ruapehu Drive (Figure 9) – pedestrian, cyclist and intersection crashes are the most adversely affected by the additional traffic activity. Either the introduction of a roundabout or traffic signals is shown as being able to mitigate the reduction in safety for these road user and crash types.

(d) SH57 Aokautere Drive/ Pacific Drive (Figure 10) and SH57 Aokautere Drive/ Johnstone Drive (Figure 11) – deterioration in pedestrian and cyclist safety with the additional traffic activity are the main contributors to the reduced alignment with safe system principles. Either the introduction of a roundabout or traffic signals is shown as being able to mitigate the reduction in safety for these road user types in both these locations.

(e) Summerhill Drive/ Ruapehu Drive (Figure 12) – with the forecast additional traffic activity there is an assessed deterioration in pedestrian and cyclist safety and both motorcyclist and intersection crashes continue to have high scores. Either the introduction of a roundabout or traffic signals is shown as being able to mitigate the reduction in safety for these road user and crash types.

13. A reduced speed limit on SH57 Aokautere Drive along with improved facilities for cyclists can be expected to reduce the overall score to below current levels. That is a reduction from 166 (existing infrastructure and existing traffic levels) to 106 (proposed infrastructure and future traffic with PCG) in the first row of Table 1 above. It should however be noted that with the corridor upgrade alone, which includes a 50km/h speed limit and cycle facilities, the score for pedestrian safety would remain higher than

in the existing situation. Introducing either signals or roundabouts is shown to mitigate the safety effects of the additional traffic activity.

14. It should also be noted that the maximum level of traffic flow used in SSA assessments is 10,000+ vpd which is already experienced on SH57 Aokautere Drive and Summerhill Drive. As such the scoring is likely to underestimate the effect of the additional traffic flows associated with PCG on the level of alignment with Safe System principles. In turn, the benefits of the proposed safety mitigation will also have been underestimated.

15. The safety concerns, with the existing road network as used presently, identified through the road safety audit within the SSA are summarised in Table 2. The safety concerns are rated from minor through to serious. Minor and moderate safety concerns are not expected to result in serious and fatal injury crashes. Significant safety concerns have the potential for serious and fatal injury crashes but are generally considered unlikely or very unlikely to occur. Serious safety concerns have the potential for serious and fatal injury crashes and are generally considered likely or very likely to occur.

Safety Concern	Recommendation
5.1 Serious Concern – the operating speeds within the project extents are greater than the survivability threshold speeds for side impact crashes on SH57, vehicle crashes with pedestrians/ cyclists/ motorcyclists, and car collisions with unprotected trees or poles on SH57.	Reduce the speed limit and upgrade infrastructure (e.g. by changing intersection forms) to manage speeds to below the survivability threshold speeds.
5.2.1 Minor Concern – vegetation at the SH57/ Cashmere Drive intersection obstructing sight lines for vehicles exiting Cashmere Drive.	Cut back the vegetation to improve the sight lines and/or reduce the speed limit such that the available sight distance of 120m is satisfactory.
5.2.2 Moderate Concern - vegetation at the Mountain View Road/ Summerhill Drive intersection obstructing sight lines for vehicles exiting Mountain View Road.	Cut back the vegetation to improve the sight lines and/or reduce the speed limit. Consider adding Stop control onto the Mountain View Road approach to the intersection.
5.2.3 Moderate Concern – the southern bank of Aokautere Drive obstructs the visibility for vehicles turning from Pacific Drive.	Improve the slope of the bank to improve sight lines, reduce the speed limit and add Stop control onto Pacific Drive.
5.3.1 Serious Concern – intersection conspicuity and look-through at the SH57	Introduce a raised island and additional chevron indicators to guide drivers into

Safety Concern	Recommendation
intersection with Turitea Road which may increase the risk of loss of control or head-on collisions, particularly during low light conditions.	defined paths. Install roadside barrier to protect nearby roadside hazards, including the trees.
5.3.2 Serious Concern – adverse crossfall for turning vehicles at the SH57 intersection with Turitea Road.	Confirm the nature of the curve geometry.
5.3.3 Minor Concern – conspicuity of the SH57 intersection with Cashmere Drive from the Cashmere Drive approach during both day and night conditions.	Add a median island on the Cashmere Drive approach along with advanced warning signage and a PW-66 chevron board.
5.3.4 Minor Concern – risk of drivers on Mountain View Road approaching the Summerhill Drive intersection at speeds not suitable for Give way control. Also, that northbound cars can enter Mountain View Road at higher speeds due to low angle of deflection.	Construct a median island and kerb extensions of the Mountain View Road approach.
5.4.1 Serious Concern – safety for pedestrians crossing SH57 between Johnstone Drive and Cashmere Drive including risk of fatal injuries.	Install crossing facilities for pedestrians at crossing desire lines with mitigation to reduce impact speeds below the survivability threshold of 30km/h.
5.4.2 Serious Concern – gap in footpath provision along the southern side of SH57 Aokautere Drive between Johnstone Drive and Pacific Drive.	Reduce the speed limit and operating speed on SH57 and reallocate space in the road corridor to extend the footpath to connect into the wider network.
5.4.3 Serious Concern – safety of pedestrians crossing SH57 Aokautere Drive in the vicinity of the Summerhill Shopping Centre.	Reduce vehicle speeds on SH57 Aokautere Drive and reallocate space in the road corridor to reduce total crossing distance for pedestrians.
5.4.4 Significant Concern – lack of tactile and directional pavers at the kerb crossings at intersections.	Install tactile and directional pavers at all existing crossing points along Aokautere Drive.
5.4.5 Serious Concern – restricted visibility between pedestrians and drivers at kerb crossings on Cashmere Drive, Pacific Drive and Silkwood Place where they intersect with SH57 Aokautere Drive.	Remove vegetation or cut back slopes that restrict inter-visibility. Change the form of crossings where inter-visibility cannot be achieved to enable pedestrians to cross safely. Install raised safety platforms to lower the speed below the 30km/h survivable speed threshold.
5.5.1 Significant Concern – narrow shoulder widths on SH57 of 1m to 1.4m. Waka Kotahi guidance is to target sealed shoulder widths	Reallocate space in the road corridor to provide shoulder widths in line with Waka Kotahi guidance.

Safety Concern	Recommendation
of 1.7m for cyclists where there is a speed limit of 70km/h and 8,000 to 18,000vpd.	
5.6.1 Minor Concern – lack of consistency in street lighting along SH57 Aokautere Drive and the street lighting at the SH57 intersection with Turitea Road is inadequate.	Install additional lighting between Johnstone Drive and Silkwood Place. Design and install improved lighting for the SH57/ Turitea Road intersection.
5.6.2 Minor Concern – street light poles with protruding bases of more than 100mm.	Inspect poles and repair as needed.
5.7 Serious Concern – unprotected roadside hazards including drop offs, cut slopes, gully, utility poles and a sight rail on Mountain View Road.	Identify and treat roadside hazards.
5.8 Significant Concern – varying sizes of speed limit signs and missing sign at the SH57/ Summerhill Drive intersection.	Replace the missing sign and add physical infrastructure and speed limit thresholds to narrow road widths.
5.9.1 Significant Concern – service covers in the shoulders and traffic lanes on SH57 resulting in safety concerns for cyclists and motorcyclists. Also, stormwater sump grates that can entrap cyclists' wheels.	Relocate service covers away from curves an braking areas for motorcyclists, replace sump grates with covers that do not risk entrapping bicycle wheels and all service covers should have surface friction treatments.
5.9.2 Comment – damage to the holding rails on the mid-block crossing on Summerhill Drive.	Reinstate the holding rails and reflectorise to enhance conspicuity.

Table 2: Road Safety Audit Summary

16. All of the above matters are safety concerns with regard to the existing use of the road network. I recommend that Waka Kotahi and Council as the Road Controlling Authorities consider the findings of the SSA and investigate addressing at least the significant and serious concerns as part of their safety and maintenance programmes, regardless of the outcome of PCG. I note that a reduction in the speed limit on SH57 Aokautere Drive would assist with addressing a number of the safety concerns.

Strava Data

17. Due to concerns raised in submissions, I have looked at data in the Strava application to assist with gaining further understanding of pedestrian and cyclist activity in the area. The data shows patterns of activity of Strava users in the form of heatmaps rather than numbers of users. The heatmaps show the patterns over the most recent 12

months and are updated monthly. Figures 5 and 6 show the heatmaps for cyclists and pedestrians respectively through the wider network.

Figure 5: Strava Heatmap of Cyclist Activity

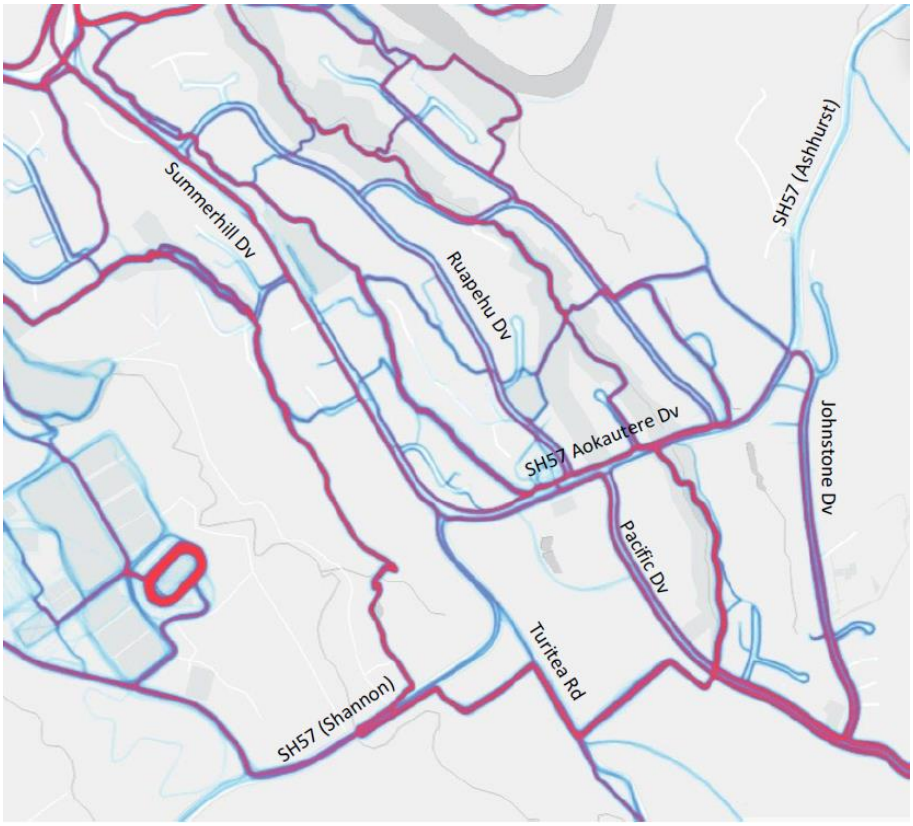

Figure 6: Strava Heatmap of Pedestrian Activity

18. Figure 5 (Cyclist Activity) shows SH57 Aokautere Drive, Summerhill Drive and Turitea Road as the main routes for cyclists. Figure 6 (Pedestrian Activity) shows the use of a wider range of routes including both on and off-road paths.

19. Figures 7 and 8 show the cyclist and pedestrian activity along the SH57 Aokautere Drive corridor.

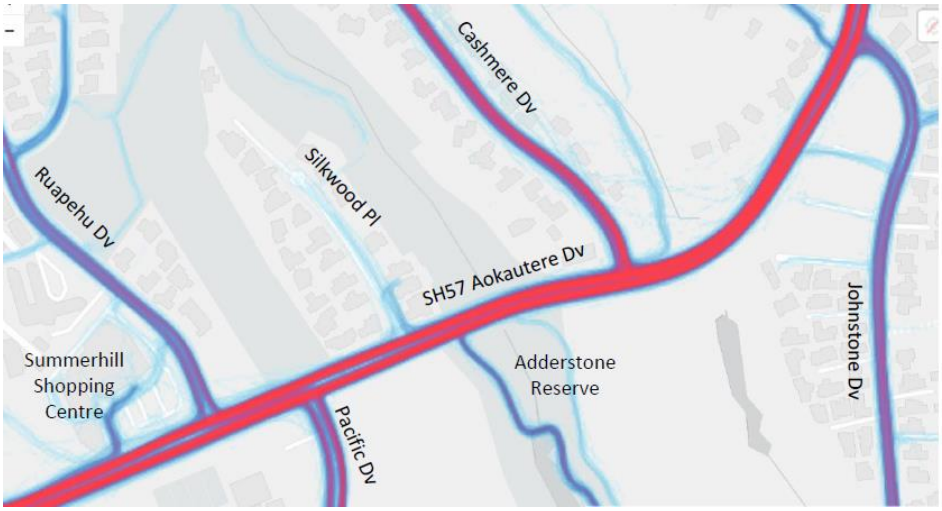

Figure 7: Strava Heatmap of Cyclist Activity on SH57 Aokautere Drive

Figure 8: Strava Heatmap of Pedestrian Activity on SH57 Aokautere Drive

20. While the cyclist activity is predominantly along SH57, the pedestrian activity shows clear desire lines for crossing Aokautere Drive in three locations - in the vicinity of the shopping centre, between the Adderstone Reserve and Silkwood Place, and at Johnstone Drive.

Alignment with PNITI Network Options Report January 2021

21. The TA includes a brief review of the alignment of PCG with PNITI. I have included below some additional context along with an update on the programme.

22. The PNITI Report includes reference to the programme improving safety and access for new housing developments including at Aokautere.[3] The Aokautere area is shown on all the programme drawings as a residential growth area. None of the stages of the programme includes upgrades or changes to either SH57 Aokautere Drive or Summerhill Drive. Investment to the south of the river focuses on improving access from SH57 to the City via Tennent Drive and in the longer-term supporting access from SH57 to a new river crossing to the west of the City.

23. The PNITI Report goes on to identify that SH57 Aokautere Drive severs the community in Aokautere[4] and Figure 5.1 shows long sections of SH57 to the east of Aokautere having a narrow carriageway with less than a 7m width. Figure 5.8 shows SH57 to the west of Summerhill Drive as a High Risk Corridor. Three of the nine crashes in the City

[3] At page iii sixth bullet point.
[4] At section 4.4.2.

involving freight vehicles and cyclists between 2014 and 2018 occurred on Summerhill Drive and Aokautere Drive.[5]

24. The PNITI used the Palmerston North Area Traffic Model (**PNATM**) to test the implications of population and employment growth within the City. PNATM was developed in 2014 using the 2013 Census data. A 2018 review of PNATM found that the model underestimated population growth with the 2021 forecasts having been reached early. The PNITI Report[6] also concludes that given that growth outpaced modelled projections and that the current forecasts do not include all of Council's growth areas, the 2041 forecasted issues could occur 5-10 years sooner than previously anticipated. The PNITI Report does not state whether PNATM included growth in Aokautere and if so, how much. I also note that the modelling also did not include the KiwiRail Freight Hub.[7]

25. Section 13.2 of the PNITI Report describes the traffic modelling. Figure 13.4 shows forecast base year flows for 2031 of 7,400 vehicle movements per day on SH57 to the east of Pacific Drive compared with December 2022 counts of 12,345 vpd as described earlier in my report. This difference between modelled and observed traffic flows is not unexpected given that the traffic model is based on data from 2013, is strategic in nature and that Aokautere is in a peripheral part of the modelled road network. There is a significant underestimation in the traffic model of traffic activity in this part of the network. As a result, the traffic effects of population growth and the need for mitigation will also have been underestimated through the PNITI reporting.

26. The implementation of the PNITI longer term programme, which includes a new downstream bridge, is forecast to result in a reduction in traffic flows across the Fitzherbert Bridge of around 3,900 vpd. Small traffic flow reductions are also forecast on SH57 to the east of Aokautere.

27. The PNITI Report includes the update and revision of PNATM as an action for setting up the implementation of the PNITI programme. The report notes that where material change occurs, the programme will need to be appropriately adjusted to reflect the

[5] At section 5.3.1.
[6] At section 6.3.1.
[7] At page 102 sixth bullet point.

changes that have occurred.[8] I consider it likely that some of the mitigation measures I have identified through my transportation assessment of PCG may be confirmed through the forward PNITI traffic modelling task.

28. In terms of progress with the PNITI programme, I understand from the Council's Chief Engineer that the update to the traffic model is about to be commissioned.

29. Neither Summerhill Drive or SH57 Aokautere Drive to the east of Summerhill Drive are identified as key elements of the PNITI programme in the PNITI Report. Instead, there is a preference for traffic flows including freight, to access the City from the west via SH57 and a new river bridge, or via Tennent Drive and the Fitzherbert Bridge. Any additional travel time on Summerhill Drive and SH57 Aokautere Drive as a result of speed limit reductions and intersection changes to manage local traffic movements is therefore not expected to adversely affect the primary traffic and freight routes identified in the PNITI programme.

Updated Recommendations

30. As a result of the additional investigation and assessments described above, I recommend that the mitigation measures in Table 12 of the TA are updated. The suggested changes are shown in Table 3 below.

Recommended Mitigation (July 2022)	Threshold/ Timing (July 2022)	Amended Recommendation (September 2023)
1. SH57 Old West Road/ Aokautere Drive/ Summerhill Drive		
Improvements to facilitate safe right turns from SH57 Old West Road into SH57 Aokautere Drive. This could be achieved with a wider central median and longer merge lane. The possible signalisation of the intersection would be driven by safety rather than the traffic carrying performance of the intersection with a particular consideration being the safe passage of citybound cyclists across the Old West Road approach.	The level of service and safety of this turn is already a concern. Safety improvements should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. I recommend that the Structure Plan is annotated with 'intersection upgrade' in this location with the timing as previously recommended. The performance standard in R7A.5.2.2 (i) Transport Network Requirements for Aokautere Structure Plan should be updated accordingly.

[8] At Section 15.1.4.

Recommended Mitigation (July 2022)	Threshold/ Timing (July 2022)	Amended Recommendation (September 2023)
2. SH57 Aokautere Drive/ Pacific Drive		
There is already a need to provide for pedestrians and cyclists in this location and given that Pacific Drive will accommodate the majority of traffic associated with the further development of the Aokautere area, it is recommended that the intersection is signalised.	Given the existing need to provide crossing facilities for pedestrians and cyclists in this location, plans for the signalisation of the intersection should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. I recommend that the Structure Plan is annotated with 'intersection upgrade' in this location with the timing as previously recommended. The performance standard in R7A.5.2.2 (i) Transport Network Requirements for Aokautere Structure Plan should be updated accordingly.
3. Mountain View Road/ Ruapehu Drive/ Summerhill Drive		
It is recommended that Ruapehu Drive operates with left in/ left out with an opportunity for U-turns created further to the south along Summerhill Drive. A right turn out of Mountain View Road would need to continue to be accommodated. One possibility would be to introduce a roundabout at the Williams Terrace intersection with Summerhill Drive. This would also assist vehicles turning to and from Williams Terrace.	This is an existing safety concern during the weekday traffic peaks. Safety improvements should be developed, programmed and implemented by the Council prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. Given the topography in this location signals will be preferred to a roundabout and I recommend that the Structure Plan is annotated with 'signalisation of intersection' in this location with the timing as previously recommended. The performance standard in R7A.5.2.2 (i) Transport Network Requirements for Aokautere Structure Plan should be updated accordingly.
4. Northern end of Ruapehu Drive (closest to City)		
Develop an option for safely accommodating cyclists travelling between the northern end of Ruapehu Drive and the City. This might include introducing a crossing facility across Summerhill Drive (signalised or an underpass) or accommodating two-way cycle flows along the eastern side of Summerhill Drive and towards the Fitzherbert Bridge.	This is an existing safety concern during the weekday traffic peaks. Safety improvements should be developed, programmed, and implemented by the Council prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.	The recommended signalisation of this intersection as per the above point will allow cyclists and pedestrians to safely cross Summerhill Drive in this location.
5. Turitea Road/ Valley Views		

Recommended Mitigation (July 2022)	Threshold/ Timing (July 2022)	Amended Recommendation (September 2023)
Some mitigation is already planned as part of a consented 30 lot subdivision at the end of Valley Views. Further review of the safety of the intersection to accommodate additional traffic on the Valley Views and Turitea Road approaches is recommended. Options for safety improvements include a lengthening of the merge for the right turn onto Turitea Road beyond that included for the consented subdivision, a possible change in priority, and the addition of real-time warning signage for vehicles approaching the intersection or changes to the alignment of the Turitea Road approach from the south. Depending on the nature of any mitigation at the intersection, it may be possible to allow for a road connection from the end of Valley Views to the wider area included within the Proposed Plan Change. As such it is recommended that an option for this future connection is accommodated within the Structure Plan.	It is understood that Council has some funds allocated in the Long Term Plan (**LTP**) for improvements to Turitea Road and the Valley Views intersection, beyond the improvements to be completed as part of the consented 30 lot subdivision, to support additional rural-residential growth within the Turitea catchment. As such, it is considered that the traffic associated with the 55 additional lots (13 on Valley Views and 42 on Turitea Road) which are anticipated to rely on Turitea Road for access can be safely accommodated once the improvements as part of the LTP are implemented or in the interim subject to a review of the performance of the intersection as part of a resource consent application.	Upgrades to the intersection are planned for this financial year. Following on the intersection can be expected to safely accommodate the additional traffic associated with PCG in this area, i.e. 55 additional lots. I understand that Council is exploring longer term changes to the intersection, and these may allow for additional connectivity between Valley Views and the wider PCG area. I continue to recommend that an option for a future connection is accommodated within the Structure Plan.
6. Existing Abby Road and Johnstone Drive Intersections with Pacific Drive		
Change of control to either roundabouts or traffic signals.	When the level of service for side road traffic declines to a level of service of E at peak times. Some development within the area of the Proposed Plan Change is likely to be able to be accommodated before any mitigation is needed.	For improved transparency, I recommend that the reference to "a level of service of E" the performance standard in R7A.5.2.2 (i) Transport Network Requirements for Aokautere Structure Plan is replaced with the following wording "when average traffic delays for vehicles turning either left or right from the side road during peak times increase to more than 35 seconds per vehicle".
7. Two future intersections with the existing section of Pacific Drive		
Either constructed as roundabouts or signals once the side roads are needed for access to future development or constructed as Give Way controlled intersections and upgraded to either roundabouts or signals once performance threshold reached.	When the level of service for side road traffic declines to a level of service of E at peak times or when needed to support safe pedestrian access across Pacific Drive to the future Neighbourhood Centre. Some development within the area of the Proposed Plan Change is likely to be able to be	As above, I recommend replacing the level of service E in the performance standard in R7A.5.2.2 (i) with "average traffic delays for vehicles turning either left or right from the side road during peak times increase to more than 35 seconds per vehicle".

Recommended Mitigation (July 2022)	Threshold/ Timing (July 2022)	Amended Recommendation (September 2023)
	accommodated before any mitigation is needed.	
8. SH57 Aokautere Drive between Johnstone Drive and Pacific Drive		
The planned shared path along the southern side of SH57 Aokautere Drive is needed to connect Johnstone Drive and Pacific Drive and to provide access to the Adderstone Reserve from both directions on SH57. A pedestrian crossing facility, most likely in the form of dropped kerbs and a median island, is also needed at a point along the section of SH57 Aokautere Drive between Cashmere Drive and Johnstone Drive.	Safety improvements for active modes should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the northeast area of the Structure Plan being loaded onto the road network.	The SSA, Road Safety Audit and the Strava data all demonstrate the need for improved facilities for active modes along and across SH57 Aokautere Drive. This should be progressed as soon as possible. I am of the view that the improvements are needed regardless of PCG. There is no change to my earlier recommendation .
9. Travel routes to and from the City		
Introduction of high-frequency bus services which can be accessed from throughout the suburban part of the Proposed Plan Change area. The internal road network has been designed to accommodate bus services circulating through the area. Facilitation of commuter cycling between Aokautere and the City. Either connection into the recently upgraded facilities on Summerhill Drive (9a) or given the desire line along with lower traffic volumes and the target of providing for a significant increase in cyclist numbers, provision along the Ruapehu Drive corridor (9b). This could include a mix of on and off-road facilities.	Ongoing planning with Horizons Regional Council. A commuter cycle route should be identified by Council and any associated upgrades programmed and implemented prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.	No change to my earlier recommendation. Horizons are actively looking to improve bus services to the area. I understand that the signalisation of the Ruapehu Drive intersection with Summerhill Drive will open up route options as a result of the improved provision for buses turning right out of Ruapehu Drive towards the City. Council are continuing to work on improved cycle facilities along the corridor between Pacific Drive and the Fitzherbert Bridge.

Table 3: Updated Recommended Mitigation Measures

31. I have recommended related changes to the PCG provisions later in my report.

I. SUBMISSIONS

32. I have considered the submissions and further submissions for PCG. I have identified a number of key issues, which I address by reference to submissions in detail below.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
1. Turitea Road Ralph Sims S31.002 Douglas Pringle S35.003 Tabitha Prisk S84.001 Mary-Ann Bailey S88.001 David Prisk S91.002 Waka Kotahi FS2	S31.002 and S35.003 are concerned about the impact of additional traffic on the recreational use and values of Turitea Road. S31.002 requests only active mode connections to the PCG area. S35.003, S84.001, S88.001 and S91.002 seek upgrades to Turitea Road and the one-lane bridges. S91.002 also seeks upgrades to Ngahere Park Road. Waka Kotahi support the request in S84.001 that there is further investigation of the effects and mitigation on Turitea Road.	The road connection onto Turitea Road is located to provide access to a limited number of rural-residential properties (some 42 lots) within the PCG area (as notified) and to provide an emergency link for the wider PCG area. This level of additional day-to-day activity, with up to 42vph at the busiest times, does not trigger the need for two-laning of the bridges and widening of the road. In times of emergency and additional traffic loadings, temporary traffic management including reduced speed limits if needed, can be expected to be used, depending on the circumstances. The addition of up to 42vph on the section of Turitea Road from the proposed new road connection to Valley Views is not expected to result in a significant change in amenity from existing levels for recreational users of the road. I understand that some 8.5ha of land have been recommended for removal from the rural-residential overlay since notification of PCG and accordingly there would be fewer than 42 lots with associated reduced levels of additional traffic activity. Given the no exit nature of Ngahere Park Road and the limited number of rural-residential properties within the PCG area that are expected to access Turitea Road, little if any additional traffic is expected on Ngahere Park Road as a result of PCG.
2. Alignment of internal roading PN Industrial and Residential Developments Ltd S45.002 Sue Cooper S32.002 Ashok Poduval S87.001 Waka Kotahi FS2	Submitter S45 seeks to straighten the 'dog leg' in Road A on Map 7A.4D. S32.002 encourages the inclusion of cul de sacs within the new roading layout. S87.001 opposes changes to existing cul de sacs. Waka Kotahi FS2 oppose the inclusion of cul de sacs instead	I understand that the proposed alignment is needed to allow for the road to traverse the terrace that separates the urban and rural-residential parts of the PCG area. Other alignments may be able to achieve the same outcome and can be reviewed as part of a resource consent application. The Structure Plan and accompanying plan provisions discourage the inclusion of cul de sacs, while recognising that topography can result in the need for

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
	requiring the transport network to be well connected.	some no-exit roads such as along the promontories. I note that S87.001 opposed changes to existing cul de sacs. PCG includes a 'Potential Future Connection' between Silicon Way and the development area. The primary function of this link would be to create a link for vehicles, pedestrians and cyclists, connecting the 80 dwellings accessed from Silicon Way with the proposed Local Business Centre and surrounding residential area. The link would be lightly trafficked providing an improved local access function rather than being a through route.
3. Road connection onto Turitea Road Mary Morgan-Richards S13.002 PN Industrial and Residential Developments Ltd S45.004 Ngawai Farms Ltd S61.005 Russell Poole S68.002	S13.002 requests that the connection shown is for active mode use only. S45.004 and S61.005 seek a road connection to Turitea Road from the Green Block. S68.002 supports a connection to Turitea Road but has concerns about the length and nature of the route.	The connection to Turitea Road is intended to provide access to the rural-residential part of PCG and only emergency access for the wider PCG area. The location of the connection onto Turitea Road and nature of the route support this desired function.
4. Valley Views connection to PCG area Mary Morgan-Richards S13.002 PN Industrial and Residential Developments Ltd S45.005 Jayne Hewson S86.001	S45.005 requests that a road connection is provided between Valley Views and the PCG area. S13.002 seeks an active mode only link and S86.001 seeks no connection between Valley Views and the PCG area.	The Structure Plan allows for some 13 more lots to be connected to Valley Views in addition to those that are already consented. A pedestrian and cyclist connection to the wider PCG area is included. A future road connection between Valley Views and the wider PCG area is reliant on further assessment and review of the safety and performance of the Valley Views intersection with Turitea Road. A future road connection between Valley Views and the wider PCG area is not expected to result in large additional day to day traffic flows on Valley Views due to the convoluted nature of the route. The provision of any connection will be driven by a need for improved network resilience and to connect the two communities.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
5. Access to Mr Waters property Ngawai Farms Ltd S61.005	Submitter seeks inclusion of road access to his property to the north east.	The forming of the existing track from Turitea Road to the water tank to a road will only be triggered as a result of the Waters' property being subdivided into rural-residential lots. As such the Waters will have control over the provision of access to their property.
6. Abby Road Susan and Yann Le Moigne S71.001 Rob Campbell S79.001 Heather Turnbull S99.002	S99.002 is concerned that Abby Road is not wide enough to accommodate the extra traffic. S71.001 and S79.001 are not in favour of Abby Road being extended to connect with Johnstone Drive. S71.001 seeks that the proposed housing adjacent to the Adderstone Reserve connects only with Johnstone Drive.	The extension of Abby Road through to Johnstone Drive has been separately assessed through a Notice of Requirement process. PCG would result in the potential for 30 additional residential lots to access Abby Road from the direction of Adderstone Reserve, with associated traffic flows of up to 30 vehicle movements per hour. If needed, I am of the view that Council can balance the traffic carrying and kerbside parking functions of Abby Road through measures such as indented parking bays or sections of 'no stopping' lines.
7. Speed Limits – internal roads Chris Teo-Sherrell S43.009	The submitter requests speed limits of 40km/h on Urban Connectors, 30km/h on Local Roads and 10km/h on Activity Streets.	I consider the key matter to be the target speed which is relied on for design purposes. Given their traffic carrying function I would expect Urban Connectors to have a target speed of 50km/h. Local Streets where cyclists share the road with vehicles should have a target speed of 30km/h and Local Streets without footpaths (Type C) could reasonably have a target speed of 10 to 20km/h in line with the provisions of NZS4404:2020.
8. Shared Paths Chris Teo-Sherrell S43.010 and 021	The submitter requests that pedestrians, cyclists and vehicles are all separated from each other.	The choice to include shared paths is a result of the topography associated with the gully systems and minimising earthworks and structures associated with wider road cross-sections in these environments. Where on-road cycle lanes are shown there may be options for these to have some protection from vehicle traffic depending on the parking and access arrangements. Along SH57 Aokautere Drive there are cross-section constraints that make it unlikely that a separate footpath and

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
		cycle facility can be achieved along the southern side.
9. Road cross-sections – internal roading Chris Teo-Sherrell S43.011	The submitter requests changes to the cross-section of Connector Roads A to provide increased width for footpaths and cycle lanes.	This cross-section applies to the existing section of Pacific Drive where the footpaths were constructed with a narrower width. It is only recently that best practice suggests a minimum footpath width of 1.8m. The carriageway width is such that there are options for adjustments to the width allocated to parking, cycling and traffic flow. The retrofitting of cycle lanes will require detailed design and also road safety auditing. Adjustments will be able to be made as needed through these processes.
10. Proposed Road Hierarchy Chris Teo-Sherrell S43.008 PNCC S50.018 Waka Kotahi FS2	S43.008 requests that Urban Connector shown as A in Map 7A.4C Precinct Plan is changed to a Local Street with a 30km/h speed limit. PNCC request that the following explanatory note be added to Section 20.6 Road Hierarchy: *Note to Plan Users* *For the purpose of interpreting Map.4D1-17 the following road typologies are to be assessed as follows:* • *Urban Connectors shall be considered Collector Roads except Pacific Drive which is considered a Minor Arterial* • *Activity Streets shall be considered Pedestrian Streets* • *Local Streets shall be considered Local Roads* • *Peri-urban Roads shall be considered Local Roads* Waka Kotahi support the use of the One Network Road Classification.	I agree that vehicle speeds of around 30km/h would be more appropriate in this location, rather than 50km/h. However, the Urban Connector status reflects the importance of this route which can be expected to accommodate buses and delivery/ service vehicles. I would expect that a reduced speed limit throughout the wider precinct might be appropriate regardless of the road hierarchy (in the same way that we are seeing reduced speed limits being introduced in town centres). However, this matter would be addressed outside the plan change process. I agree that adding a Note to Plan Users as requested by Council will be useful. I suggest some revised wording below.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
11. Mitigation – Transportation Infrastructure Brian Hewson S16.002 Dennis Thomas S22.001, 003 and 007 Sue Cooper S32.003 PN Industrial and Residential Developments Ltd S45.006, 007 and 009 CTS Investments Ltd, Woodgate Ltd & Terra Civil Ltd S58.013, 022 and 023 Jessica Costall S66.002 and 003 Ben Somerton S83.003 Ashok Poduval S87.001 David Prisk S91.001 Paul Hewitt S101.006 Waka Kotahi FS2	S45.006, 007 and 009, and S58.013, 022 and 023 oppose the requirement through proposed Objective 7A: 5, associated Policies and Rule 7A.5.2.2(h) that transport mitigation be in place ahead of development and associated triggering of non-complying activity status. S22.001 and 007, S32.003, S83.003, S87.001 and S91.001 support the requirement for transport mitigation measures. S22.003 seeks improvements for residents accessing Summerhill Drive. S16.002 requested additional assessment of the traffic effects at a number of locations. S66.002 and 003, seek improved safety for all road users on Summerhill Drive. S101.006 seeks that Summerhill and Aokautere Drives are upgraded to four lanes and that a bypass of SH57 is included. Waka Kotahi seeks that submissions S45.006, 007 and 008 and S58.022 and 023 are disallowed.	In response to these and other submissions the SSA was undertaken by WSP to assist with the assessment of transport safety effects associated with PCG. The findings of the SSA have been discussed earlier in my report. I have also recommended changes to the mitigation measures included in Table 12 of the TA, along with amendments to the plan provisions as described below. The traffic flows along Summerhill Drive and the urban section of SH57 Aokautere Drive need to be managed so that all road users can move safely through the road network. The local topography is such that a by-pass of SH57 is not an option.
12. Ruapehu Drive/ Summerhill Drive Intersection David Basire S5.003 and 004 Sue Cooper S32.003 Chris Teo-Sherrell S43.018 Jessica Costall S66.002, 003 and 005 Gareth Orme S75.003 Ashok Poduval S87.001	S5.004, S32.003, S43.018, S66.002, 003 and 005, S75.003 and S89.001 support the signalising of Ruapehu Drive/ Summerhill Drive. S87.001 seeks a roundabout at Ruapehu Drive/ Summerhill Drive. S5.003 requests that right turns are included at the intersection. S105.001 has concerns regarding the proposed mitigations at this intersection and requests further investigation and consultation.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. It is understood that this will be included in draft programmes that will be referred to Council as part of the 2024-34 LTP.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Joy Vanderpoel S89.001 Bruce Wilson S105.001		
13. SH57 Aokautere Drive/ Pacific Drive David Basire S5.002 Douglas Pringle S35.002 Rob Campbell S79.001 Ashok Poduval S87.001	S5.002, S35.002 and S79.001 support the signalisation of the SH57/ Pacific Drive intersection. S87.001 would prefer a roundabout at this intersection.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. It is understood that this will be included draft programmes that will be referred to Council as part of the 2024-34 LTP.
14. SH57 Aokautere Drive/ Johnstone Drive Rob Campbell S79.001 Ben Somerton S83.003 Ashok Poduval S87.001	S79.001 and S87.001 would like a roundabout at the SH57/ Johnstone Drive intersection. S83.003 seeks additional upgrades at this intersection.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. It is understood that this will be included in draft programmes that will be referred to Council as part of the 2024-34 LTP.
15. SH57 Aokautere Drive/ Ruapehu Drive Dennis Thomas S22.003 Sue Cooper S32.003 Heather and Grant Morgan S40.001 Chris Teo-Sherrell S43.017 Gareth Orme S75.003 Joy Vanderpoel S89.001	S43.017, S75.003 and S89.001 seek off-set traffic signals at the intersections of Pacific Drive and Ruapehu Drive with SH57. S32.003 requests either signals or a roundabout at the Ruapehu Drive intersection with SH57. S22.003 and S40.001 seek measures to improve access from Summerhill Shopping Centre onto SH57.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. It is understood that this will be included in draft programmes that will be referred to Council as part of the 2024-34 LTP.
16. Cashmere Drive/ SH57 Aokautere Drive Intersection	The submitters have concerns about the safety of the intersection including visibility and the lack of a right turn bay.	The SSA findings include a speed limit reduction on SH57 to mitigate adverse safety effects associated with the additional PCG traffic activity. The Road Safety Audit part of the SSA identified a

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Audrey Shepherd S4.003 Stewart Davies S14.001 Lynne Rea S15.001 Gareth Orme S75.003 Ashok Poduval S87.001 Anne Ridler S96.001 Robert Gardner S102.001	S14.001 and S15.001 request a speed limit reduction on this section of SH57. S15.001 and S75.003 request that consideration be given to including a roundabout. S87.001 requests that Stop control is added on the Cashmere Drive approach.	number of safety concerns at the intersection that should be addressed by Council and Waka Kotahi as part of their maintenance and safety improvement activities, regardless of PCG. I have recommended earlier in this report that a review/investigation into options get underway between Waka Kotahi and the Council.
17. Summerhill Drive/ SH57 (Aokautere Drive & Old West Road) Intersection David Basire S5.001 Jessica Somerton S6.002 Alan Smeaton S7.002 Sue Cooper S32.003 Chris Teo-Sherrell S43.009 Joy Vanderpoel S89.001 Colin Perrin S90.004 Sara Burgess S98.001	S5.001 seeks improvements to the right turns at the intersection. S6.002, S43.009 and S90.004 request consideration of a roundabout at this intersection. S7.002 would support a roundabout at this intersection as it would facilitate u-turning for residents on Summerhill Drive who could turn left out of driveways and side roads and then turn towards the City at the roundabout. S32.003, S89.001 and S98.001 request traffic signals are installed at this intersection.	The SSA has shown that either a roundabout or signals would be able to mitigate the adverse safety effects associated with the additional traffic resulting from the development facilitated by PCG. It is anticipated that this will be included in the soon to be published LTP. I agree that a roundabout would assist residents on the eastern side of Summerhill Drive to access the City at peak times. If a roundabout is not provided consideration should be given to including a median u-turning facility on the City side of the intersection.
18. Pedestrian Crossings on SH57 Aokautere Drive Audrey Shepherd S4.002 Jessica Somerton S6.002 Chris Teo-Sherrell S43.021 Waka Kotahi S63.004 Gareth Orme S75.003	S6.002 supports the addition of a pedestrian crossing on SH57 Aokautere Drive. S43.021 supports a pedestrian crossing of SH57 in the vicinity of the Adderstone Reserve and suggests that it should be raised and possibly have on-demand signals. S83.003 and 004 request that the crossing is either an under or overpass and located closer to the shopping centre. S4.002 seeks consideration of an underpass.	The SSA, Road Safety Audit and the Strava data all demonstrate the need for improved facilities for active modes along and across SH57 Aokautere Drive. This should be progressed as soon as possible, with the improvements needed regardless of PCG. It is understood that this will be included in draft programmes that will be referred to Council as part of the 2024-34 LTP.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Ben Somerton S83.003 and 004	S75.003 requests that the proposed pedestrian crossing point on SH57 Aokautere Drive is located between Cashmere Drive and Silkwood Place where there is better visibility. Waka Kotahi acknowledge that there may be an existing pedestrian safety deficiency across SH57 Aokautere Drive to the west of Pacific Drive and are exploring options. They seek mitigation for the worsening of active mode severance as a result of PCG.	
19. Speed Limit Reductions David Basire S5.002 Jessica Somerton S6.002 James Irwin S19.001 Ralph Sims S31.002 Jessica Costall S66.005 Ashok Poduval S87.001	S5.002 and S6.002 request a speed limit reduction on SH57 Aokautere Drive. S19.001 and S66.005 request a speed limit reduction on Summerhill Drive. S87.001 requests speed limit reductions on both SH57 Aokautere Drive and Summerhill Drive. S31.002 requests a speed limit reduction on Turitea Road.	While PCG cannot require a speed limit reduction, the proposed intersection changes along SH57 Aokautere Drive and Summerhill Drive will reduce vehicle speeds along these roads. This will support a reduced speed environment. Any future speed limit changes on Turitea Road would need to be undertaken through a separate process (initiated by Council).
20. Pacific Drive Stephen and Carole Sorsby S10.002 Chris Teo-Sherrell S43.020 Ashok Poduval S87.001	S10.002 is concerned about additional traffic on Pacific Drive and seek that alternative connections to SH57 are provided. S43.020 seeks roundabouts are provided at the intersections of Pacific Drive with each of Abby Road and Johnstone Drive. S87.001 opposes the introduction of a roundabout at the intersection of Pacific Drive with Johnstone Drive.	Pacific Drive is classified as a Minor Arterial Road in the District Plan Road Hierarchy. The closest equivalent classification in the Council's Engineering Standards is a Collector Road, which can be expected to carry 3,000-10,000 vehicle movements per day. Forecast traffic flows with PCG will remain within this range. I agree that as the development of the area progresses, intersection upgrades will be needed along Pacific Drive, and these have been provided for through the proposed plan provisions.
21. Public Transport Robyn Johnston S28.001	S55.003, S66.002, 003 and 004 request improved bus services.	As the area develops and the demands increase, more bus routes and increased service frequencies can be expected. Horizons have planned improvements to the existing service. It is also

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Chris Teo-Sherrell S43.015 and 022 Christine Scott S55.003 Horizons S60.007 and 008 Jessica Costall S66.002, 003 and 004 Waka Kotahi FS2	S43.022 requests that a high frequency bus service is in place ahead of further development. Horizons request that provisions are included requiring the development layout to enable the safe movement of public transport and the location of public transport infrastructure to be aligned with higher density areas and community facilities. S43.015 is concerned that only Aokautere Drive is shown as a public transport route on Map 7A.4D. S28.001 seeks public transport links to the City, Massey and the Science Centre are in place ahead of further development. Waka Kotahi seek that the Horizons submission S60.007 is allowed.	understood that the signalisation of the Summerhill Drive/ Ruapehu Drive intersection will add future route options as a result of improved safety for right-turning buses. The expectation is that the proposed Connector Roads would be capable of accommodating buses with good flexibility with regard to future options for bus routes. I recommend that the plan provisions are strengthened to make it clear that as well as the cross-sections, the horizontal and vertical alignments of the Connector Roads should provide for buses to be safely and comfortably accommodated. The potential to accommodate bus stops should also be demonstrated, however, they do not need to be constructed unless a bus route has been confirmed. The key for Map 7A.4D includes the label 'Transit Corridor' for SH57 Aokautere Drive. This is misleading and should be labelled State Highway Corridor as the intention is that SH57 and all the Connector Roads have the potential to accommodate bus routes.
22. Active Modes James Irwin S19.001 Dennis Thomas S22.002 Robyn Johnston S28.001 Chris Teo-Sherrell S43.023 Barry Scott S54.004 Christine Scott S55.003 Sport Manawatu S57.001, 002 and 004 Scott Knowles S64.007 Jessica Costall S66.005	S19.001, S57.001 and S64.007 request that priority is given to non-private vehicles. S19.001, S66.005 and S98.001 seek separated cycle facilities. S19.001 requests consideration of off-road cycle routes. S83.007 and S95.002 seek inclusion of a dedicated cycle route along Ruapehu Drive, Cashmere Drive and Cliff Road. S55.003 requests that additional consideration is given to provisions for cyclists. S43.023 requests unobstructed cycle facilities from Johnstone Drive to the Fitzherbert Bridge. S91.001 seeks cycle lanes on Aokautere and Summerhill Drives and improved pedestrian access to the City. S22.002 requests that	Key focuses of the transport component of PCG are providing for the safe movement for all road users and the inclusion of pedestrian and cycle facilities to support mode shift to active modes. There is a separate ongoing Council project looking at cycle facilities from Pacific Drive through to the Fitzherbert Bridge. The section of SH57 Aokautere Drive between Johnstone Drive and Pacific Drive has a constrained corridor width due to the topography. It is likely to accommodate a footpath and an on-road cycle lane on the northern side and a shared path along the southern side. Cycle routes will be available along the Aokautere Drive/ Summerhill Drive Route and the interior routes via Cashmere Drive, Ruapehu Drive and Cliff Road. These routes will include a mixture of treatments depending on

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Susan and Yann Le Moigne S71.002 and 006 Ben Somerton S83.007 David Prisk S91.001 Anna Berka S95.002 Sara Burgess S98.001 Paul Hewitt S101.004 Waka Kotahi FS 2	the detail of the cycle provisions is confirmed. S66.005 supports the inclusion of a footpath along the Adderstone Reserve side of Aokautere Drive. S71.002 requests that the shared path is provided on the City side rather than the Adderstone Reserve side of Aokautere Drive. S101.004 requests that there are footpaths along both sides of Aokautere and Summerhill Drives. S22.002 requests cycle and micro-transport facilities that provide access from the residential areas to the Local Business Centre and also to SH57 Aokautere Drive. S71.006 seeks additional off-road shared paths within the development area. S28.001 seeks active mode links to the City, Massey and the Science Centre are in place ahead of further development. Sport Manawatu request a separated cycle route from Johnstone Drive to the Fitzherbert Bridge and separated cycle lanes on Pacific Drive. Sports Manawatu and S98.001 request no roundabouts on the cycle routes. Sport Manawatu seek a safe pedestrian and cycle route to the planned new school on Ruapehu Drive is also requested. S54.004 is concerned about cyclist safety with the additional traffic. Waka Kotahi seek that Sport Manawatu S57.001 and S57.002 submissions are allowed.	vehicle speeds and volumes and the frequency of side roads and driveways. Improved cycling access to Massey and the Science Centre can be expected to be part of the Tennent Drive improvements included in the PNITI programme. As demands increase, improved bus services between Aokautere and both Massey and the Science Centre may become viable. Within the PCG area the proposed road cross-sections include either shared paths or cycle lanes on the Connector Roads. On the Local Roads which have lower vehicle volumes and a target vehicle speed of no more than 30km/h, cyclists are expected to be able to safely share the street with vehicles. My expectation is that signals will be preferred to roundabouts where there is significant pedestrian and cyclist activity. The use of signals would also enable priority to be given to through traffic movements along SH57. The proposed mitigation measures include the addition of a shared path along the Adderstone Reserve side of Aokautere Drive, facilitating pedestrian movement to and from the Adderstone Reserve and between the northern ends of Johnstone and Pacific Drives.
23. Summerhill Drive/ Tennent Drive Sue Cooper S32.001 Jessica Costall S66.002 and 003	These submitters are concerned about congestion in this location. S32.001 requests that consideration is given to adding signals.	This intersection is a grade-separated interchange. There are options available to Council, such as partial signalisation and/or reallocation of traffic lanes to balance congestion on the various approaches if needed. As noted previously, I consider that the main

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
		capacity constraint for vehicle travel within the immediate road network is the signals at the Fitzherbert Avenue/ Te Awe Awe Street intersection.
24. River Crossing Capacity Mark Currin S2.002 Warren Sara S8.001 Karen Wilton S9.005 Shaun Henry S25.001 Maher Fuad S26.001 Linda Rowan S27.003 Lew Thompson S37.002 Heather and Grant Morgan S40.001 Christine Scott S55.003 Jessica Costall S66.002, 003 and 005 Gareth Orme S75.002 Jayne Hewson S86.002 David Prisk S91.001 Tracey Yung S92.004 Catherine Sims S106.001	These submission points are concerned with congestion in the vicinity of the existing bridge and some seek an additional bridge over the river ahead of any development.	In practice it is the Te Awe Awe Street traffic signals with Fitzherbert Avenue that are the capacity constraint, rather than the existing Fitzherbert Bridge. There is potential for additional people to move across the bridge through a greater take up of active modes and public transport as well as increased shared use of private vehicles. Given the equal travel times (taken from Google Maps) for travel from Shannon to The Square via either SH56 or SH57, additional travel times via SH57 can be expected to result in more of the longer distance drivers accessing the City via SH56. For City traffic travelling towards Napier, once Te Ahu a Turanga opens across the ranges it will be 2-4 minutes faster (Google Maps) to access the new road via SH3 Napier Road rather than via SH57 Aokautere Drive. Again, any increased congestion on Fitzherbert Avenue will increase the attractiveness of the SH3 Napier Road route.
25. Travel to Schools Jessica Costall S66.002 and 003	This submitter is concerned about the reliance on schools on the other side of the river and the transport implications.	The recent announcement by the Ministry of Education that they plan to develop a primary school on their site at Ruapehu Drive will reduce the existing and future reliance on crossing the river to access primary-age schools. College students will still need to access schools in the City but will benefit from improved bus services and cycle routes.
26. Traffic Congestion Robyn Johnston S28.001	These submitters are concerned about increased traffic activity and congestion.	There is potential for additional people to move through the transport network with greater take up of active modes and public transport, as well as

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
Anthony and Rosemary Gear S39.003 Christine Scott S55.003 Craig Hindle S82.002 Jayne Hewson S86.002 Tracey Yung S92.004 Gert Starker S94.001 Sara Burgess S98.004 Paul Hewitt S101.006		increased shared use of private vehicles. PCG will result in additional vehicle traffic activity and an increase in congestion at the busiest times. It is however noted that congestion can be one of the triggers to assist with encouraging shifts to travel modes which have spare capacity.
27. VKT/ emissions Robert McLachlan S18.001 and 002 Patrick Morgan S20.001 and 002 Ralph Sims S31.001 Chris Teo-Sherrell S43.003 Barry Scott S54.003 Kat Lyons S62.002 Karen Lyons S69.001 Anna Berka S95.001 and 003 Kevin Low S73.001 Waka Kotahi S63.005	These submitters have concerns that vehicle emissions will increase as a result of PCG. Waka Kotahi and Kevin Low are also concerned about increases in vehicle kilometres travelled (VKT). Waka Kotahi seek improved active mode provision and more detailed analysis on how VKT and transport emissions reductions will be achieved.	See above comments under the heading Travel to Schools and Traffic Congestion. The local transport network has limited capacity for additional private vehicle movements, particularly the Fitzherbert Bridge and the intersection of Fitzherbert Avenue with Te Awe Awe Street. There is however capacity for more people to move through the transport network via active and public transport modes. Aokautere is within cycling distance of the City and increased populations will increase the viability of additional and more frequent bus services. A discussion on emissions is included in the evidence of Mr David Murphy.
28. Road Surface Condition Prabandha Samal S107.003	This submitter is concerned that there is existing damage to the surfaces of the roads that will be exacerbated by the additional traffic.	Council have ongoing maintenance programmes for existing roads.
29. Vehicle Crossing Width Douglas Pringle S35.005	This submitter requests wider vehicle crossing provisions for truck use in the Local Business Centre.	The design and width of commercial vehicle crossings is best addressed at the resource consent stage when both the truck activity and size of the trucks is fully understood.

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
30. Summary of Technical Reports Chris Teo-Sherrell S43.019	This submitter seeks clarification with regard to which intersection is referred to on page 2, 5th bullet point of the Summary of Technical Reports.	The bullet point refers to the intersection of Valley Views with Turitea Road.
31. Funding of Identified Mitigation Measures Waka Kotahi S63.003	Waka Kotahi seek clarification regarding the source of funding for the proposed infrastructure upgrades.	Addressed by others.
32. Silkwood Place/ SH57 Aokautere Drive Intersection Ashok Poduval S87.001	S87.001 requests that Stop control is added on the Silkwood Place approach.	The SSA findings include a speed limit reduction on SH57 to mitigate adverse safety effects associated with the additional PCG traffic activity. The Road Safety Audit part of the SSA identified a couple of safety concerns at the intersection that should be addressed by Council and Waka Kotahi as part of their maintenance and safety improvement activities regardless of PCG.
33. Construction Effects Jason Raman S53.001	This submitter is concerned about access to their property at 206 Pacific Drive while the extension to Pacific Drive is constructed through 208 Pacific Drive.	My expectation is that the effects on property access associated with the construction of the link would be managed through a Construction Traffic Management Plan, which would include measures for ensuring ongoing access to 206 Pacific Drive during construction. The day-to-day access to the property would be managed through a Temporary Traffic Management Plan.
34. Alignment with PNITI Waka Kotahi S63.001 Heritage Estates 2000 Ltd FS5	Waka Kotahi is concerned that the intersection and likely associated speed limit changes associated with the proposed mitigation measures will increase travel times on SH57 and compromise the routes freight carrying function included in PNITI and Accessing Central NZ business cases. FS5 request that the statutory weight of PNITI is confirmed and that the decision on PCG is consistent with the integrated growth initiatives for Palmerston	The section of SH57 that will be affected is short, around 1.1km from Old West Road to Johnstone Drive. There are existing delays for vehicles turning right onto Aokautere Drive from Old West Road. If a series of signalised intersections were installed along SH57 Aokautere Drive, the phasing of the lights could be coordinated and a 'green wave' created to minimise delays to through traffic on SH57. Given the existing equal travel times (taken from Google Maps) for travel from Shannon to The Square via either SH56 or SH57, there will be an ongoing balancing between route choice for

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
	North that have statutory weight in decision making.	both light and heavy vehicles. Route selection will depend on whether and where they have a destination in the City or if they are bypassing the City. For City traffic travelling towards Napier, once Te Ahu a Turanga opens across the ranges, and based on existing travel times, it will be 2-4 minutes faster (Google Maps) to access the new road via SH3 Napier Road rather than via SH57 Aokautere Drive. Any increased congestion on Fitzherbert Avenue as a result of PCG will increase the attractiveness of the SH3 Napier Road route for these trips.
35. SH57 Old West Road/ Turitea Road Intersection Catherine Sims S106.001	This submitter requests that consideration is given to upgrading the existing intersection to a roundabout.	On a typical day, the traffic activity associated with PCG is forecast to result in some additional 55vph on the Turitea Road approach to the intersection. This level of additional traffic activity is not expected to have a significant effect on either the safety or the efficiency of the existing intersection.
36. Proposed Provisions PNCC S50.013 Waka Kotahi FS2	Council request an amendment to Policy 5.8 from 'roads' to 'the transport network' and to bring Policy 5.12 into Policy 5.8. Waka Kotahi support the requested amendment by Council.	I agree with the use of the term 'the transport network'. I suggest a merging of the fourth and eighth bullet points to read: • Produces a highly connected street layout that: a. Integrates with the existing surrounding transport network; b. Provides permeable and connected neighbourhoods; c. Includes pedestrian access, cycleways, and recreational trails which link to the open space corridors; d. Includes a choice of pathways; and e. Provides access from two directions for most households.
37. Emergency Access Fire and Emergency New Zealand S33	S33 require adequate access for new developments and subdivisions to ensure that Fire	The required standards for the design of roads are set out in the Council's Engineering Standards. These include at 3.5.5. (Table 6) the widening needed on curves to accommodate a rigid truck or

Topic & Submission Point Reference	Submitter Concerns/ Requested Mitigation	Comment
	and Emergency can respond to emergencies.	bus. In response to the submission from Horizons Regional Council it is recommended that the plan provisions are strengthened in relation to the need to accommodate buses on Connector Roads. This will also ensure access for emergency vehicles. With regard to access to individual properties existing R20.4.2 (a) Vehicle Access (xii) provides for access for firefighting purposes. No further changes to the plan provisions are considered necessary.
38. Previous financial contributions to local roading improvements PN Industrial and Residential Developments Ltd S45.013	The submitter has already paid financial contributions for works at the Turitea Road/ Valley Views intersection which have yet to be implemented and seek 'credits' for this contribution against future contributions.	Council has some funds allocated in the LTP for safety improvements to the Turitea Road/ Valley Views intersection (see Figure 5 of TA), beyond the improvements to be completed as part of the consented 30 lot subdivision. These works which include variable warning signage are expected to be completed in 2023. Further improvements to the intersections to allow for increased through traffic movement are to be investigated (with budgets added to the draft LTP). Future consented development relying on traffic movement through the intersection can reasonably be expected to contribute to the intersection upgrade.

Table 4 : Comments on Submissions

District Plan Rule 20.4.2

33. Rule 20.4.2 of the District Plan refers to the road hierarchy included in the District Plan. The rule will be superseded by the Waka Kotahi One Network Framework (**ONF**). Table 5 below shows the existing District Plan road hierarchy within the vicinity of the PCG area and the anticipated ONF hierarchy for the same sections of road.

Road	District Plan Road Hierarchy	ONF Road Hierarchy
SH57 Aokautere Drive (Summerhill Drive to the Pahiatua Track)	Major Arterial	Peri-Urban Road

Road	District Plan Road Hierarchy	ONF Road Hierarchy
SH57 from Summerhill Drive to Tennent Drive	Major Arterial	Interregional Connectors
Summerhill Drive	Major Arterial	Urban Connector
Pacific Drive	Minor Arterial	Urban Connector
Cashmere Drive	Collector Road	Local Street
Johnstone Drive	Collector Road	Urban Connector
Ruapehu Drive	Collector Road	Activity Street
Turitea Road	Local Road	Peri-Urban Road
All other roads eg. Valley Views, Abby Road, Silkwood Place, Mountain View Road	Local Roads	Local Streets

Table 5: Existing Roads District Plan/ ONF Road Hierarchy Equivalence

34. The new sections of road included in the Aokautere Structure Plan Street Types Map 7A.4D for the purposes of District Plan Rule 20.4.2 have the following equivalent District Plan road hierarchy classifications.

Road	Aokautere Structure Plan Map 7A.4D/ ONF Road Hierarchy	Equivalent District Plan Road Hierarchy
Urban Connectors A to F	Urban Connector	Collector
Activity Streets A to C	Activity Streets	Collector where part of the main thoroughfare connection to Pacific Drive and otherwise, Local Road.
Local Streets A to F	Local Streets	Local Roads
Peri-Urban Roads A and B	Peri-Urban Roads	Local Roads

Table 6: Future PCG Roads District Plan/ ONF Road Hierarchy Equivalence

35. In my opinion, the above road hierarchy should be included in the plan provisions but with application only to the PCG area as the equivalents may not apply for other areas.

J. RECOMMENDATIONS

36. As a result of the further assessment and in responding to the submissions, I recommend the following changes to the proposed provisions:

PCG Proposed Provisions – Transport Related	Recommended Changes
R7A.5.2.2 Performance Standards for Restricted Discretionary Activity **(i) Transport Network Requirements for Aokautere Structure Plan** As part of any subdivision within the Aokautere Residential Area the following infrastructure requirements must be completed and certified by Council before development, or in the case of (iii), (iv) and (v) below, completion and certification of the infrastructure requirements at the identified level of service thresholds must be provided for as part of the staging of the subdivision and development: (i) Implementation of improvements at the following locations before any development:	
• Improvements to facilitate safe right turns at SH57 Old West Road/Aokautere Drive/Summerhill Drive.	• Upgrade of the SH57 Old West Road/Aokautere Drive/Summerhill Drive intersection to signals or a roundabout.
• Improvements to facilitate pedestrians and cyclists (signalization) at SH57 Aokautere Drive/Pacific Drive.	• Upgrade of the SH57 Aokautere Drive/Pacific Drive intersection to signals or a roundabout.
• Improvements to facilitate a left in/left out at Ruapehu Drive/Summerhill Drive, with the right turn continuing out of Mountain View Road, and an opportunity for U-turns to be created further to the south along Summerhill Drive.	• Signalisation of the Summerhill Drive/ Ruapehu Drive/ Mountain View Road intersection.
• An option for safely accommodating cyclists travelling between the northern end of Ruapehu Drive and the City.	With the signalisation of the Summerhill Drive/ Ruapehu Drive/ Mountain View Road intersection, cyclists will be able to safely cross Summerhill Drive in this location and access the

PCG Proposed Provisions – Transport Related	Recommended Changes
	on-road cycle lanes. This bullet point can be removed.
	• Upgrade of the SH57 Aokautere Drive/Ruapehu Drive intersection to signals or a roundabout.
(ii) Implementation of safety improvements at Turitea Road/Valley Views, as scheduled under the 10-Year Plan 2021-2031.	These works are programmed for later this year and may be underway by the time the Hearing starts.
(iii) Improvements at the existing Abby Road and Johnstone Drive intersections with Pacific Drive when the Level of Service for side road traffic declines to a level of service of E at peak times, with either a change of control to roundabouts or traffic signals.	(iii) Improvements at the existing Abby Road and Johnstone Drive intersections with Pacific Drive when the level of service for side road traffic declines to a level where average traffic delays for vehicles turning either left or right from the side road during peak times increase to more than 35 seconds per vehicle, with either a change of control to roundabouts or traffic signals.
(iv) Two future intersections with the existing section of Pacific Drive, either constructed as roundabouts or signals once the level of service for side road traffic declines to a Level of Service of E at peak times or when needed to support safe pedestrian access across Pacific Drive to the Aokautere Neighbourhood Centre.	(iv) Two future intersections with the existing section of Pacific Drive, either constructed as roundabouts or signals when the level of service for side road traffic declines to a level where average traffic delays for vehicles turning either left or right from the side road during peak times increase to more than 35 seconds per vehicle, or when needed to support safe pedestrian access across Pacific Drive to the Aokautere Neighbourhood Centre.
(v) Safety improvements for active modes through a shared path along the southern side of SH57 Aokautere Drive to connect Johnstone Drive and Pacific Drive and to provide access to Adderstone Reserve from both directions, prior to the traffic associated with the northeast area of the Structure Plan being loaded onto the network.	When weekday peak hour two-way traffic flows are 1,000vph or greater, when measured at a location on SH57 between Johnstone Drive and Cashmere Drive, provide an active mode shared path between Johnstone Drive and Pacific Drive which provides access to Adderstone Reserve from both directions.
	When weekday peak hour two-way traffic flows are 1,000vph or greater, when measured at a location on SH57 between Johnstone Drive and Cashmere Drive, upgrade the SH57 Aokautere Drive/ Johnstone Drive intersection to either signals or a roundabout.
	When weekday peak hour two-way traffic flows are 1,000vph or greater, when measured

PCG Proposed Provisions – Transport Related	Recommended Changes
	at a location on SH57 between Johnstone Drive and Cashmere Drive, introduce an active mode crossing facility, including a pedestrian/ cyclist refuge on SH57 Aokautere Drive between the Adderstone Reserve entry and Silkwood Place.
(vi) The restrictions on development set out in (iii), (iv) and (v) must be secured through consent notices imposed on titles at the time of subdivision.	No change to the proposed provision.
(vii) Any subdivision that does not comply with this performance standard will be a non-complying activity.	No change to the proposed provision.
Map 7A.4	• Add an insert to include the SH57 Old West Road/Aokautere Drive/Summerhill Drive intersection with the label 'intersection upgrade'. • Amend the description for M to 'Intersection Upgrade at SH57 Aokautere Drive/ Pacific Drive'. • Based on the Strava data and that intersection upgrades will provide for pedestrians and cyclists to cross SH57 at Pacific Drive and Johnstone Drive, amend the description for P to 'New pedestrian crossing of SH57 between Adderstone Reserve and Silkwood Place'. • Add an insert to include the Summerhill Drive/ Ruapehu Drive/ Mountain View Road intersection with a label 'signalisation of intersection'. • Add an insert to include the SH57 Aokautere Drive/Ruapehu Drive intersection with a label 'intersection upgrade'. • Add 'intersection upgrade' label for the SH57 Aokautere Drive/Johnstone Drive intersection.
Map 7A.4A	• Replace 'Transit Corridor' label for SH57 with 'State Highway Corridor'. • Include equivalence with District Plan road hierarchy as per Table 5 of this report.
Map 7A. 4C	• Amend 'F On-Street Parking' to 'F On-Street Parking/ Bus Stops'.

PCG Proposed Provisions – Transport Related	Recommended Changes
Map 7A.4D	• Replace 'Transit Corridor' label for SH57 with 'State Highway Corridor'. • Include equivalence with District Plan road hierarchy as per Table 5 of this report.
Map 7A. 4D (1-17)	• 7A.4D 1 Urban Connector A add notation 'target operating speed 50km/h'. • 7A.4D 2 Urban Connector B add notation 'target operating speed 50km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 3 Urban Connector C add notation 'target operating speed 50km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 4 Urban Connector D add notation 'target operating speed 50km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 5 Urban Connector E add notation 'target operating speed 50km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 6 Urban Connector F add notation 'target operating speed 50km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 7 Activity Streets A add notation 'target operating speed 30km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 8 Activity Streets B add notation 'target operating speed 30km/h' and 'cross-section and horizontal alignment to allow for bus routes and stops'. • 7A.4D 9 Activity Streets C add notation 'target operating speed 30km/h'. • 7A.4D 10 Local Streets A add notation 'target operating speed 30km/h'. • 7A.4D 11 Local Streets B add notation 'target operating speed 30km/h'. • 7A.4D 12 Local Streets C add notation 'target operating speed 10 to 20km/h'.

PCG Proposed Provisions – Transport Related	Recommended Changes
	• 7A.4D 13 Local Streets D add notation 'target operating speed 10 to 20km/h'. • 7A.4D 14 Local Streets E add notation 'target operating speed 30km/h'. • 7A.4D 15 Local Streets F add notation 'target operating speed 30km/h'. • 7A.4D 16 Peri-Urban Roads A add notation 'target operating speed 50km/h'. • 7A.4D 17 Peri-Urban Roads B add notation 'target operating speed 50km/h'.
7A Policy 5.8	Replace 'roads' with 'the transport network' and merge the fourth and eighth bullet points regarding connectivity and accommodating potential bus routes and associated facilities.

Table 7: Recommended Changes to Transport-Related Provisions

Harriet Fraser

15 September 2023

K. ATTACHMENTS

- **Attachment 1:** Transportation Assessment dated 28 July 2022
- **Attachment 2**: Safe System Audit Report dated 4 August 2023
- **Attachment 3:** Palmerston North District Plan - Rule 7A.5.2.2 Performance Standards

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28 July 2022

Michael Duindam
Palmerston North City Council
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Palmerston North

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Dear Michael

Palmerston North City Council – Aokautere Structure Plan
Transportation Assessment

Further to your request, I am pleased to provide below a transportation assessment for the proposed plan change involving the introduction of a Structure Plan to support residential development in Aokautere, Palmerston North. As you are aware my involvement with the proposed plan change has involved assisting with reviewing the structure plan, assessing the related traffic effects, and providing advice on transportation, road design, access and parking. The assessment that follows includes a review of the existing local transportation characteristics, recommendations regarding the proposed internal road network and its connections with the existing road network, and a summary of the potential traffic effects associated with the development of the wider Aokautere area for residential purposes under the proposed zoning.

In summary, the findings of the assessment show that based on existing travel mode share behaviours, there is the potential for the plan change to result in significant additional vehicle traffic on the local road network. A number of mitigation measures, included in Table 12, have been identified to support mode shift towards active and public transport modes as well as to ensure the safe operation of the transport network. With these mitigation measures in place, the proposed Structure Plan would allow for the site to be developed for residential and local business centre (local retail/ commercial/ community) purposes in a manner which is consistent with the District Plan traffic and transportation related objectives and policies.

1. Background

Aokautere is located on the southern edge of the City, to the south of SH57 Aokautere Drive and to the east of Turitea Road. The area currently connects with the external road network at the intersections of each of Pacific Drive and Johnstone Drive with SH57 Aokautere Drive. The northern and southern sections of Johnstone Drive have recently been connected and the link vested in Council. Summerhill Drive is a primary access point to the City with most of the existing traffic from this area travelling to and from the direction of the City via Summerhill Drive and the Fitzherbert Bridge. Any new traffic can be expected to have a similar desire line. The peak hour traffic capacity of this corridor is largely determined by the intersection of Fitzherbert Avenue with Te Awe Awe Street. While there are constraints on the peak hour capacity for vehicle access to the City, more people would be able to access the City with an uptake in bus and cycling for commuter trips.

There are currently around 592 existing suburban lots (496 houses) within the area served by Pacific and Johnstone Drives. These roads also provide access to the International Pacific College, the IPU Tertiary Institute NZ and the One School Global Palmerston North. It is anticipated that the area could accommodate up to a further 1,020 residential lots, and a suburban (local business) centre.

The undeveloped part of the area is rural in nature with the topography comprising of a series of gully systems.

2. Transport Context

The following statutory provisions and strategic documents are relevant to the traffic and transportation aspects of the Proposed Plan Change:

- Government Policy Statement Land Transport 2021("**GPS Land Transport**")
- Road to Zero – Road Safety Strategy 2020-2030 ("**Road to Zero**")
- Horizons Regional Land Transport Plan 2021-2031("**RLTP**")
- Horizons Regional Public Transport Plan 2015-2025 ("**RPTP**")
- Palmerston North Transport Plan 2021-2031 ("**PNTP**")
- Palmerston North Urban Cycle Network Masterplan 2019
- Palmerston North City District Plan ("**District Plan**")
- PNCC 10 Year Plan 2021-2031
- PNITI – Network Options Report January 2021

Key elements of the above documents are included in Appendix 1.

Apart from improving freight connections to support economic development, the GPS Land Transport focuses on safety for all road users and access to a range of travel modes. The RLTP similarly focuses on safety and travel mode choice, with efficiency included for the regional transport network. The RPTP includes objectives of a reliable, integrated, accessible and sustainable public transport system with increased patronage. The PNTP focuses on delivering an integrated, multimodal, and safe transport network. The Urban Cycle Network Masterplan includes the vision of enabling more people to choose cycling more often. Key features of the Masterplan local to Aokautere are:

- The existing provision of connected cycle facilities along Summerhill Drive across the bridge and along Fitzherbert Avenue towards the city centre; and
- The proposed cycle provisions along the Ruapehu Drive corridor from Aokautere Drive to Summerhill Drive.

The Masterplan recognises four main challenges in delivering the city-wide desired outcomes, being:

- Limited funding;
- Competing needs for road width at intersections;
- Vehicle speeds deterring cyclists; and
- Balancing the uses of streets, in particular challenges with effects on on-street parking.

As well as safety and multi-modal priorities, the District Plan transportation objectives and policies include the efficiency of the transport network as an objective. The 10 Year Plan includes city-wide road safety and active transport projects. Funding is allocated for the completion of the ongoing pedestrian and cyclist improvements along Summerhill Drive. PNITI includes projects on Tennent Drive in the short and medium term and the longer-term upgrade of SH57 between Tennent Drive and Summerhill Drive.

As expected, there are a lot of commonalities between the various documents. I summarise the main themes that have relevance to the Proposed Plan Change as follows:

- A transport system where no-one is killed or seriously injured (including active and public transport modes) with a target of a 40% reduction by 2030;
- Better and affordable travel options with 15% of travel in the region by active and public transport modes by 2030 (PNITI target of 30% active mode travel by 2030);
- Reduced emissions from land transport while improving safety and inclusive access with a target of a 30% reduction by 2030;
- Road safety principles include safety as a critical decision-making priority, designing for human vulnerability, allowing for mistakes, strengthening all parts of the road transport system and shared responsibility for improving road safety;
- A reliable, integrated, accessible and sustainable public transport system with increased patronage;
- Integrated transport network with clear priorities for all road users based around place and movement principles;
- Timely provision of transport infrastructure to support city growth with increased investment in active and public transport as a proportion of the transport budget;
- Speed limits and traffic speeds are appropriate for the conditions throughout the transport network;
- New growth areas have well-connected, multi-modal, visually attractive streets which are designed and constructed to meet performance standards and function according to their place in the road hierarchy;
- Space is prioritised within the transport network for active and public transport;
- The land transport network is maintained and developed to ensure that people and goods move safely and efficiently through and within the city;
- Maintain and upgrade existing roads and provide for new roads to meet the current and future needs of the city;
- The safety and efficiency of land transport is protected from the adverse effects of land use, development and subdivision activities;
- Alignment with the Palmerston North City Council 10 Year Plan; and
- Alignment with the anticipated outcomes of the PNITI Network Options Report.

This summary list is used later in this assessment as the basis for reviewing the alignment of the transport aspects of the Proposed Plan Change with the various national, regional, and local statutory provisions and strategic documents.

3. Existing Traffic Environment

3.1 Road Geometry

The cross-section of SH57 Aokautere Drive between Silkwood Place and Cashmere Drive is shown in Figure 1. This shows the transition from a cross-section with a flush median and turning bays towards the west and traffic lanes separated by a centre line towards the east. There is a single traffic lane in each direction with a footpath along the northern side of the road. There is a footpath on both sides to the west of Pacific Drive with a pedestrian crossing point with a central refuge along the frontage to the Summerhill Shopping Centre.

SH57 is a Major Arterial in the Palmerston North road hierarchy and has a speed limit of 70km/h along this section from just west of the intersection of Old West Road (SH57) with Summerhill Drive.

Figure 1: Cross-section Aokautere Drive (SH57)

The existing cross-section on Pacific Drive in the vicinity of its intersection with Johnstone Drive is shown in Figure 2. Pacific Drive has a generous cross-section comprising wide traffic lanes with adjacent parking lanes with a footpath set within a wide berm along each side.

Pacific Drive is a Minor Arterial Road in the Palmerston North road hierarchy and has a speed limit of 50km/h.

As shown in Figure 2, Johnstone Drive, heading to the north from Pacific Drive, has a two-lane traffic width with additional width for parking along each side. Footpaths run along both sides of the road. Johnstone Drive is a Collector Road in the Palmerston North road hierarchy and has a speed limit of 50km/h.

Turitea Road is a local road in the Palmerston North road hierarchy and has a speed limit of 80km/h. It is a rural road providing access to local farms and rural residential properties. It has a variable alignment both in terms of vertical and horizontal geometry. There are two single lane bridges between the intersections with Valley Views and Ngahere Park Road. The section of Turitea Road between SH57 and just beyond Ngahere Park Road typically has a sealed width of between 5.5 and 7.0m. The cross-section in the vicinity of Ngahere Park Road is shown in Figure 3.

Valley Views is a no exit Local Road which connects with Turitea Road to the west. The existing road is approximately 1,100m long and has a carriageway width of 6m within a road reserve width of 16m. It has a speed limit of 80km/h and provides access to rural residential properties. A typical cross-section is shown in Figure 4.

Figure 2: Cross-section of Pacific Drive and Johnstone Drive (southern end)

Figure 3: Cross-section of Turitea Road near Ngahere Park Road

Figure 4: Cross-section of Valley Views

The existing local traffic characteristics are summarised in Table 1.

Road Name	Status in PNCC District Plan Road Hierarchy	Weekday Traffic Volume (vpd)	Weekday Peak Hour Traffic Volume (vph)
SH57 Aokautere Drive	Major Arterial Road	12,900	1,340
Pacific Drive (at SH57)	Minor Arterial Road	2,465	281
Johnstone Drive (at SH57)	Collector Road	465	52
Turitea Road	Local Road	1,318	Not known
Valley Views	Local Road	216[1]	27[1]

Table 1: Existing Local Traffic Characteristics

Notes:
1. Estimate based on 27 households with 8 vehicle movements per day per household and one vehicle movement per household during the weekday evening.

Both the Council's provisions for road cross-sections included in the Engineering Standards for Land Development and the Street Design Manual along with those included in the New Zealand Standard 4404:2010 Land Development and Subdivision Infrastructure are summarised and compared in Table 2. The Engineering Standards include for arterial roads to be designed by specific design in consultation with the appropriate road controlling authority. NZS 4404:2010 includes guidance for up to connector/ collector status roads.

Based on the Council's Street Design Manual, as SH57 Aokautere Drive transitions from a rural to an urban arterial there will be a need to provide for pedestrian movements on both sides and to ensure that cyclists are safely accommodated. The 2021-2031 Long Term Plan includes provision for a separated 3m wide sealed shared path along the southern edge of Aokautere Drive, running from Old West Road to Polson Hill Drive.

While classified as a Minor Arterial Road, Pacific Drive carries traffic volumes more in line with a Residential Collector, it is unlikely that Pacific Drive will accommodate more than 10,000vpd. The existing section of Pacific Drive and Johnstone Drive have cross sections which are either well matched or could be readily adjusted to meet the provisions of NZS4404:2010 for Residential Collector Roads.

Turitea Road has a varying cross-section along its length. Overall, it matches most closely with the provisions of NZS4404:2010 for a Local Rural Road carrying around 1,000vpd although there are sections with cross-sections more aligned with a Connector/ Collector Rural Road capable of carrying around 2,500vpd. The section of Turitea Road from Valley Views to SH57 could reasonably be expected to safely accommodate 2,500vpd.

Valley Views has a carriageway width of 6m and is accordingly best matched to the provisions of NZS4404:2010 for a Local Rural Road carrying around 1,000vpd.

The available sight lines at the various local intersections are generally satisfactory apart from at the intersection of Valley Views and Turitea Road. The available sight line for a vehicle exiting Valley Views looking towards northbound traffic on Turitea Road is around 80m. This compares to the Austroads guidance to provide a safe intersection sight distance of 123m for a 60km/h design speed, being the speed that vehicles are estimated to be travelling on this approach to the intersection. Figure 5 shows a planned

minor upgrade to the intersection that is triggered by the existing consent for 30 additional lots off the end of Valley Views. The improvements include the introduction of Stop control and the widening of the northbound carriageway through the intersection. While this arrangement does not improve the sightlines, it does provide additional seal width if a northbound vehicle on Turitea Road needs to take evasive action.

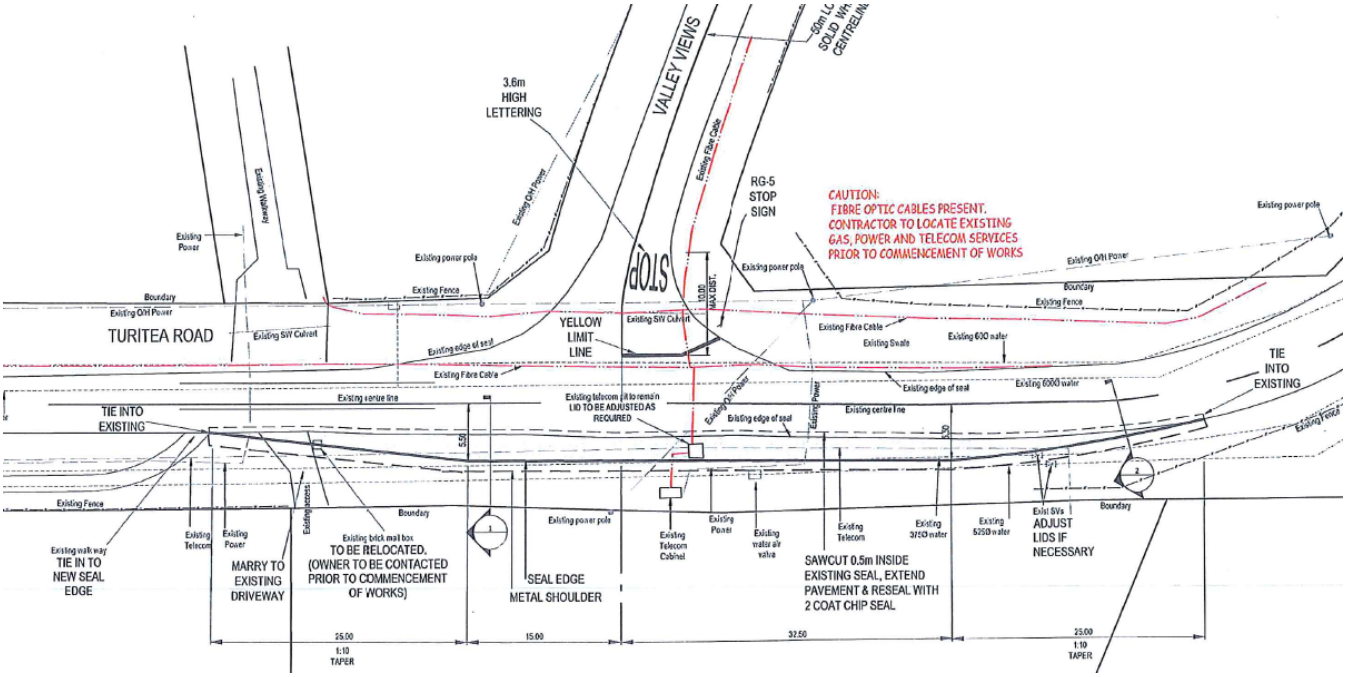


Figure 5: Planned Improvements at Turitea Road/ Valley Views Intersection

	PNCC Engineering Standards			PNCC Street Design Manual			NZS4404: 2010		
	Residential Local Road	**Residential Collector Road**	**Rural Local & Collector Roads**	**Rural Local Road**	**Residential Collector Road**	**Urban Arterial**	**Rural Local**	**Rural Connector/ Collector**	**Residential Connector/ Collector**
Typical Daily Traffic Volumes (vpd)	0-3,000	3,000-10,000	3,000-10,000	0-3,000	3,000-10,000	8,000-20,000	Up to 1,000	Up to 2,500	Up to 8,000
Min. Road Reserve Width (m)	15.5	19.1	18.6	18.5-23.5	20.5-23.5	19.7-22.7 single traffic lanes	15	20	20
Footpaths (m)	2*1.8	2 * 2.5	None	None	2 * 2.5-3.0	2 * 2.0-3.0	Shared on shoulder and berm	Separate from the carriageway 2*1.5	2 * 2.0
Grass Berms (m)	2 * 1.9	2 * 1.5	2*4.0	2 * 3.5-4.5	2 * 1.5-2.0	2 * 1.5-2.0	8.3m total	12.8m total	7.6m total unless some needed for cycle facilities
Cycle Lanes (m)	Shared with traffic	2 * 1.5	Sealed shoulder	Shared with traffic	2 * 1.5m separate provision	2 * 1.5m separate provision	Shared with traffic	On sealed shoulder where it is part of local authority defined route	Separate provision for cyclists if part of local authority defined route
Traffic Lanes (m)	2 * 3.0	2 * 3.0	2*3.5 +2*1.8m sealed shoulder	2 * 2.75-3.75	2 * 2.75-3.25	2 (or 4)* 3.25-3.75	5.5-5.7	5.5-5.7	2 * 4.2
Parking Lanes (m)	1*2.1	1 * 2.1	None	None	2 * 2.0	2 * 2.1	None	None	Separate parking lanes
Min. Carriageway Width (m)	8.1	11.1	10.6	7.5	9.5 including parking lanes	12.7 inc. parking lanes but excl. separated cycle lanes	6.5	7.0	8.4 plus parking & cycle lanes if needed

Table 2: Comparison of Local and National Roading Provisions

3.2 Traffic Flows

Waka Kotahi (NZTA) have provided traffic count data for the following three sites on SH57:

- immediately to the west of Pacific Drive;
- west of Albany Drive (west of SH57 entry to Massey); and
- east of the Pahiatua Track.

The following information has been extracted from these traffic counts:

- the average daily traffic count on SH57 in the vicinity of Pacific Drive is 12,900vpd. The weekday traffic peak in this location occurs between 5 and 6pm with 1,340vph and on a Saturday between 11am and 12 noon with 1,000vph. There has been 8% traffic growth in this location between February 2020 and February 2021;
- since the permanent closure of SH3 through the Manawatu Gorge in July 2017, there has been an annual increase in traffic flow of 8% at the site to the east of the Pahiatua Track. The traffic count in this location for October and November 2020 shows an average daily traffic flow of 1,930vpd with 8% heavy vehicles; and
- since the closure of SH3 through the Gorge, there has been an annual increase in traffic flow of 10% at the site to the west of Albany Drive. The traffic count in this location for August to November 2020 shows an average daily traffic flow of 3,060vpd with 11% heavy vehicles.

There has been strong traffic growth with a significant proportion of heavy vehicle traffic in all three SH57 locations.

While the traffic carrying capacity of the Fitzherbert Bridge (two traffic lanes in each direction) places a constraint on the amount of traffic that can enter the city in this location, the main capacity constraint is the downstream traffic signals at the intersection of Fitzherbert Avenue and Te Awe Awe Street. Based on discussions with Council officers, it is estimated that the intersection operates at 80-90% of its capacity during the weekday traffic peaks. Scope for capacity improvements is limited with there already being four southbound and three northbound traffic lanes at the Fitzherbert Avenue stop lines. Cycle lanes are marked at the intersection.

Council counts for Pacific Drive, between Abby Road and Johnstone Drive, and on Johnstone Drive to the south of Stratford Court undertaken in March 2021 show the following:

Pacific Drive

- average daily traffic flow of 2,465vpd with 8% heavy vehicles;
- weekday evening peak hour flows of 281vph between 5 and 6pm;
- Saturday peak hour flows of 183vph between 10 and 11am;

Johnstone Drive

- average daily traffic flow of 465vpd with 18% heavy vehicles;
- weekday evening peak hour flows of 52vph between 3 and 4pm; and
- Saturday peak hour flows of 50vph between 7 and 8am and then between 3 and 4pm.

The Pacific Drive count excludes traffic activity associated with the IPU Tertiary Institute, the International Pacific College and around 71 houses (mainly on Abby Road and Woodgate Court). The location and timing of the Johnstone Drive count have resulted in it reflecting the existing construction traffic activity that is occurring in this location rather than capturing the traffic activity associated with the dwellings accessing Johnstone Drive to the north of the count location. It is estimated that there are around 76

houses with access to Johnstone Drive to the north of the count location. With an estimated 496 houses within the existing catchment to Pacific and Johnstone Drives and excluding the traffic activity of those houses that were not captured by the traffic counts, the following existing trip generation rates have been calculated:

- Daily: 8 vehicle movements per day per household
- Weekday PM peak: 1.0 vehicle movements per hour per household
- Saturday midday peak: 0.7 vehicle movements per hour per household.

As part of this assessment the traffic flows at the intersections of each of SH57 with Summerhill Drive, Pacific Drive and Johnstone Drive were counted. The existing layout of each of these intersections is shown in Figures 6, 7 and 8.

Figure 6: SH57/ Summerhill Drive

Figure 7: SH57 Aokautere Drive/ Pacific Drive

Figure 8: SH57/ Johnstone Drive

The surveys were undertaken in April 2021 outside of the school holiday period. The results are shown in Figures 9 and 10.

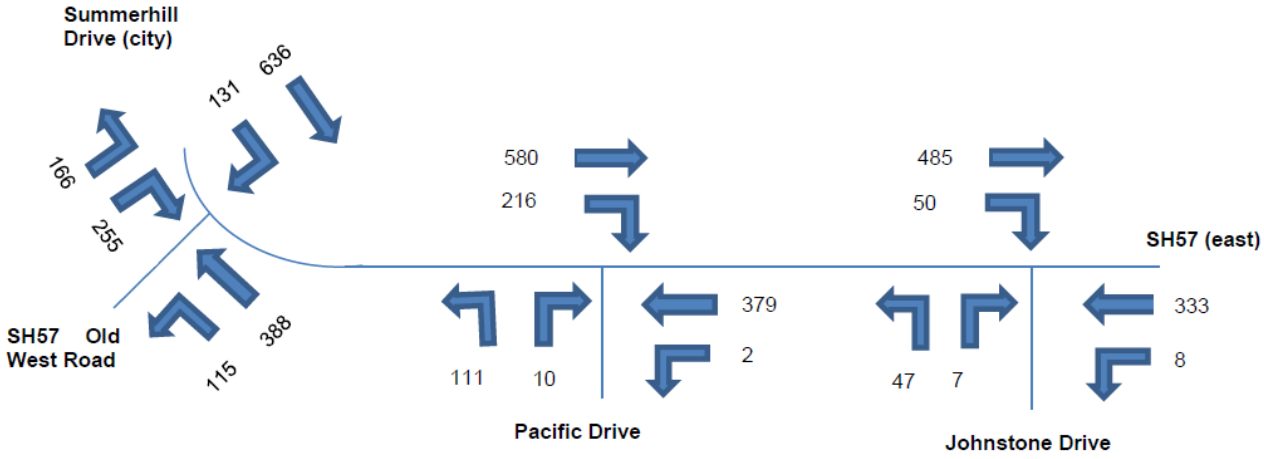


Figure 9: Surveyed Traffic flows – Weekday PM Peak (vph)

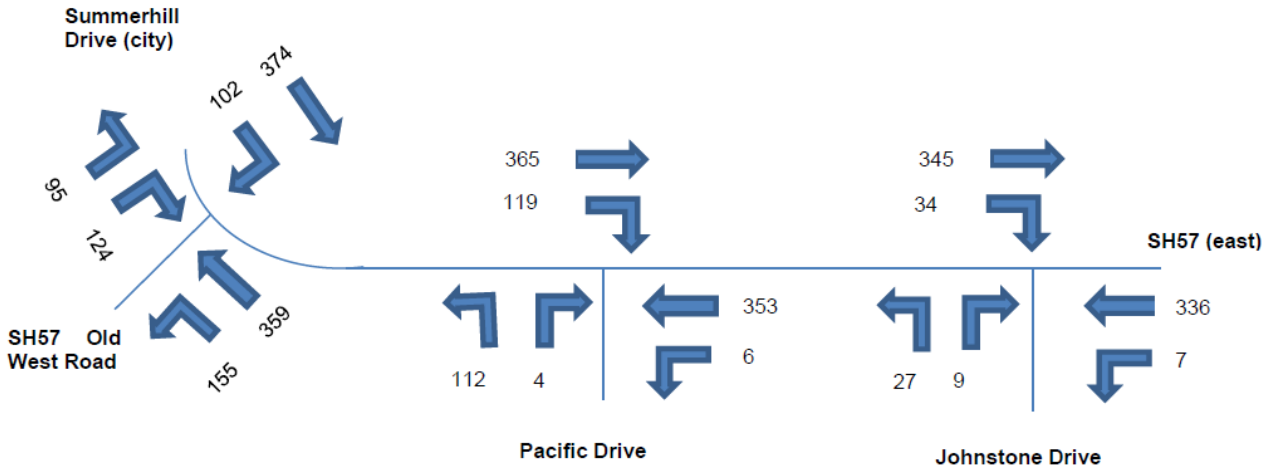


Figure 10: Surveyed Traffic Flows – Saturday Midday PM Peak (vph)

3.3 Existing Intersection Performance

The existing performance of the three SH57 intersections was modelled using the SIDRA intersection analysis software. The intersections were modelled with the existing speed limits on each of the approaches. The results of this analysis are summarised in Tables 3, 4 and 5.

The Levels of Service included in the intersection performance results are based on the average delay per vehicle at a sign-controlled intersection as follows:

Level of Service (LOS)	Average delay per vehicle (s)
A	d≤10
B	10<d<15
C	15<d<25
D	25<d<35
E	35<d<50
F	50<d

Levels of service of E and F are undesirable and can lead to drivers accepting unsafe gaps in the traffic flow with an associated risk of crashes. Longer delays are typically considered acceptable at roundabouts and traffic signals given that the through traffic flows are more controlled with improved turning opportunities for vehicles on all approaches.

SH57/ Summerhill Drive

Time Period	SH57 Old West Rd		Summerhill Drive		SH57 Aokautere Dv		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	166	255	636	131	388	115	1,691
Ave. Delay (s)	7	8	4	5	4	5	5
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	1	2	0	0	0	0	
Saturday Midday							
Input Flow (vph)	95	124	374	102	359	155	1,209
Ave. Delay (s)	6	7	4	5	4	5	5
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	0	1	0	0	0	0	

Table 3: SH57/ Summerhill Drive Intersection – Existing Performance

As shown, the modelling shows that the SH57/ Summerhill Drive intersection performs well if all traffic turning right out of SH57 Old West Road makes the turn in two parts, first onto the median and then merging with the through traffic. Casual observations indicate that drivers typically look for a gap in both traffic flows and make the turn in a single manoeuvre. The right turn out of SH57 Old West Road has a Level of Service of E during the weekday evening peak if all drivers seek a gap in both traffic flows. It is considered likely that the SH57 Old West Road approach is currently performing with or close to a level of Service of E during the weekday traffic peaks. At this level of service there is increased risk taking by drivers as they take smaller gaps in the traffic with an associated increased risk of crashes.

SH57 Aokautere Drive/ Pacific Drive

Time Period	Pacific Drive		SH57 Aokautere Dv (W)		SH57 Aokautere Dv (E)		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	111	10	580	216	379	2	1,298
Ave. Delay (s)	6	9	0	7	0	5	2
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	0	0	0	1	0	0	
Saturday Midday							
Input Flow (vph)	112	4	365	119	353	6	959
Ave. Delay (s)	6	8	0	6	0	5	2
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	0	0	0	1	0	0	

Table 4: SH57/ Pacific Drive Intersection – Existing Performance

As shown, the modelling shows that this intersection of SH57 Aokautere Drive/ Pacific Drive performs well if traffic turning right out of Pacific Drive makes the turn in two parts, first onto the median and then merging with the through traffic. Similarly, to at the Summerhill Drive/SH57 intersection, casual observations indicate that drivers typically look for a gap in both traffic flows and make the turn in a single manoeuvre. The right turn out of Pacific Drive has a level of service of C during the weekday evening peak if all drivers seek a gap in both traffic flows.

SH57 Aokautere Drive/ Johnstone Drive

Time Period	Johnstone Drive		SH57 Aokautere Dv (W)		SH57 Aokautere Dv (N)		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	47	7	485	50	333	8	930
Ave. Delay (s)	6	8	0	7	0	5	1
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	0	0	0	0	0	0	
Saturday Midday							
Input Flow (vph)	27	9	345	34	336	7	758
Ave. Delay (s)	6	7	0	7	0	5	1
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	0	0	0	0	0	0	0

Table 5: SH57/ Johnstone Drive Intersection – Existing Performance

As shown, the existing intersection performs well. The road layout includes road markings to encourage and support drivers turning right out of Johnstone Drive to make the turn in two parts.

3.4 Walking and Cycling Links

Figure 11 shows an extract from the Council's walkway and cycleway map. As shown, paths in the vicinity of the site include:

- existing on-road cycle facility along Summerhill Drive and as far as the intersection with Pacific Drive; and
- a proposed extension east of the on-road cycle facility in the form of a shared path along SH57 towards the Pahiatua Track.

With regard to the Summerhill Drive facility, Council is currently finalising the cycle lanes south of Springdale Grove. It is understood that due to existing and forecast traffic volumes on Summerhill Drive, Council is considering future plans to separate the cycle lane section between Williams Terrace and the Tennent Drive overpass, using the existing carriageway width. Future improvements will also be needed to connect the cycleway to the shared path that runs adjacent to Tennent Drive.

As included in Appendix 1, the Ruapehu Drive corridor is also identified as a possible future cycle route.

Figure 11: Cycling and Shared Path Network (Extract from Council's 2018 Active and Public Transport Plan)

There is also a pedestrian connection into the Adderstone Reserve as shown in Figure 12. This connection is immediately to the east of the Silkwood Place intersection. As shown, there is no particular provision to assist pedestrians crossing SH57 in this location.

Figure 12: Pedestrian Access to the Adderstone Reserve from SH57 (extract from Google Streetview)

At the southern end, the Adderstone Reserve Walkway connects with the footpath along the eastern side of Pacific Drive as shown in Figure 13.

Figure 13: Pedestrian Access to Adderstone Walkway from Pacific Drive (extract from Google Streetview)

There is currently no infrastructure to assist pedestrians and cyclists crossing SH57 Aokautere Drive in the vicinity of Pacific Drive. This raises concerns with regard to the safety of vulnerable road users, severance between the communities on each side of the road and ongoing reliance on vehicle travel if the active mode options are not considered to be safe. This is an existing problem that is getting worse as traffic flows on SH57 grow and residential catchment accessed via Pacific Drive also grows.

3.5 Public Transport

There are currently no bus services along either Pacific Drive or Johnstone Drive beyond the IPU Tertiary Institute at the northern end of Pacific Drive. The recent connection of the two ends of Johnstone Drive creates a loop within Aokautere that may make a bus service feasible. The proposed collector road network within the Proposed Plan Change also forms a loop and has been designed with the possibility of accommodating a bus route. Accordingly, Horizons will have the necessary flexibility to determine appropriate bus routes and bus stop locations when there is sufficient demand to make these services viable.

3.6 Road Safety

A search of the Waka Kotahi (NZTA) crash database for the local area for the most recent five-year period shows a total of 24 reported crashes. Twelve of these crashes, six minor injury and six non-injury, were on SH57 as shown in Figure 14. Seven of these crashes were on Turitea Road, one fatal, two minor injury and four non-injury and five were on Pacific Drive, two serious injury, two minor injury and one non-injury crash, as shown in Figure 15.

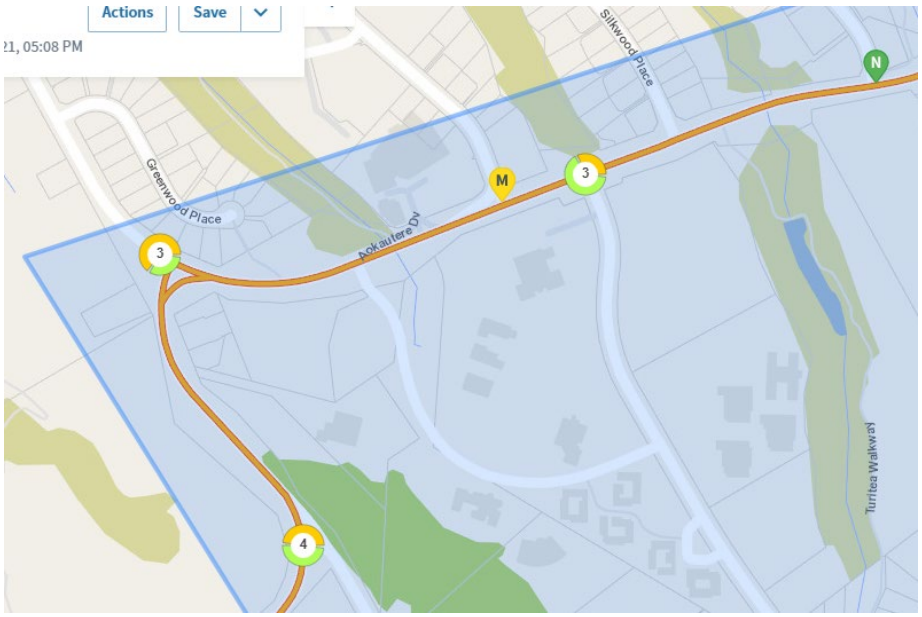


Figure 14: SH57 Reported Crashes

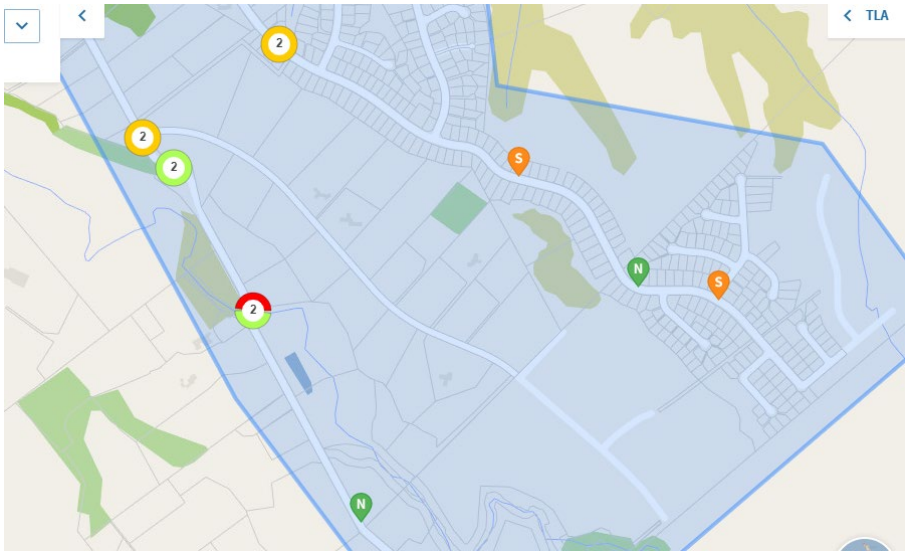


Figure 15: Turitea Road and Pacific Drive Reported Crashes

The fatal and injury crashes can be summarised as follows:

SH57

- a minor injury crash at the intersection with Pacific Drive involving a car turning right being hit by a westbound vehicle on SH57;

- a minor injury crash at the intersection with Ruapehu Drive involving a merging van hitting an eastbound cyclist;
- a minor injury crash 49m to the north of Old West Road involving an eastbound vehicle hitting an eastbound vehicle turning right from the centreline;
- a minor injury crash at the intersection with Summerhill Drive involving a northbound motorcyclist on Old West Road losing control when turning;
- a minor injury crash at the intersection with Turitea Road involving a northbound car on SH57 Old West losing control turning left;
- a minor injury crash at the intersection with Turitea Road involving a vehicle turning right into Turitea Road hitting a southbound cyclist;

Pacific Drive

- a minor injury crash at the intersection with Abby Road involving a northbound vehicle on Pacific Drive losing control and going off the road;
- a minor injury crash at the intersection with Abby Road involving a northbound vehicle on Pacific Drive hitting a parked car;
- a serious injury crash at the intersection with Johnstone Drive involving a westbound vehicle on Pacific Drive losing control turning right;
- a serious injury crash at the intersection with Silicon Way involving a westbound motorcycle on Pacific Drive hitting the rear of a vehicle turning right from the centreline;

Turitea Road

- a minor injury crash 50m to the south of Valley Views involving a southbound vehicle on Turitea Road losing control turning left; and
- a minor injury crash 20m to the north of Valley Views involving a southbound vehicle and a cyclist;
- a fatal crash involving a head-on collision on one of the single lane bridges.

Patterns emerging from the crash records include three of the injury crashes involving cyclists and two involving motorcyclists. Given the traffic flows on each road, the crash risk is greater on Turitea Road than Pacific Drive. Two of the three injury crashes on Turitea Road involved the road environment, one being the combined vertical and horizontal geometry to the south of the Valley Views intersection and the other being one of the single lane bridges. The faster speed environment on Turitea Road compared with the suburban road network increases the risk of serious injury or death when there is a crash.

3.7 Future Transport Environment

The future roading environment will include an extension to Abby Road such that it forms a through connection between Pacific Drive and Johnstone Drive. This is a separate project to the proposed plan change. The link usefully improves the connectivity between existing parts of Aokautere and to future residential areas that would be facilitated by the proposed plan change.

4. Proposed Structure Plan

Aokautere is identified as a growth area in Council's City Development Strategy 2018. Aokautere is located on the southern edge of the City, to the south of SH57 Aokautere Drive and to the east of Turitea Road. The Structure Plan facilitates the development of some 1,020 residential lots and a suburban (local business) centre. In terms of transportation matters, the proposed Structure Plan includes provisions for roading connections to the external road network, internal roading layout, proposed road hierarchy and associated cross-section provisions.

The proposed roading layout is included here as Figure 16. The key transportation related aspects of the Structure Plan can be summarised as follows:

- connections with the external road network are via the existing intersections of each of Pacific Drive and Johnstone Drive with SH57 Aokautere Drive;
- a new connection is included to Turitea Road, south of Ngahere Park Road, primarily providing access to some 42 rural residential lots;
- potential for around 13 lots have access to the end of Valley Views;
- the remaining 965 additional lots will have vehicle access through the internal road network to SH57 Aokautere Drive via either Pacific or Johnstone Drives;
- two road connections onto the existing section of Pacific Drive are included, one between 129 and 133 Pacific Drive and the other between 151 and 155 Pacific Drive;
- the internal road layout includes the extension of Pacific Drive towards the south. A network of new Connector Roads provides access to Local Streets and residential lots located along the various gully systems. The Connector Road system runs from the south of the site through to the northern end of Johnstone Drive. The roading within the southern part of the site will be rural in nature providing access to rural residential properties. The Structure Plan also includes a pocket of residential development accessed from Abby Road;
- proposed cross-sections have been included for the following anticipated road types:
    - one-way links (Royal Crescent and Local Centre) (Local Streets)
    - shared surface links (Local Streets)
    - Local Streets with options of buildings on one or both sides
    - cross-gully links (Urban Connectors)
    - Local Streets with options of gully both sides, houses both sides, gully one side
    - Urban Connectors with options of gully both sides, houses both sides, gully one side
    - Activity Streets with commercial/ mixed use/ retail frontages
    - Peri-Urban Streets providing access to rural residential properties
    - Connector Roads: modified (existing Pacific Drive)
- reduced speed limits of 30km/h are included for some road typologies.

The terminology used for the road hierarchy within the Structure Plan is based on the Waka Kotahi NZTA One Network Framework which is gradually being adopted throughout the country. It balances the movement and place function of road corridors. In due course it can be expected that both the District Plan and the Engineering Standards are updated to reflect this national system of road classification.

In designing the layout of new roads an effort has been made to minimise the number and lengths of any no-exit roads. This is in line with guidance included in documents such as NZS4404:2010 Land Development and Subdivision Infrastructure which at Section 3.3.8 includes:

'No-exit' roads should not be provided where through roads and connected networks can be designed. Where no-exit roads are provided, they should ensure connectivity for pedestrians and cyclists.

However, the nature of the topography associated with the system of gullies means that some no-exit roads are needed to provide access.

The Council's Engineering Standards (2021) at Section 3.4.2 include for no-exit roads in urban areas to have a maximum length of 100m and serve up to 20 households. In rural areas, the length increases to 300m with up to 25 households. The standard also requires that pedestrian connectivity is provided.

The network of Connector Roads has been designed to facilitate circulation by buses. With the recent connection of the two ends of Johnstone Drive, there is now an opportunity to circulate on the existing sections of Pacific Drive and Johnstone Drive. If buses were to travel along the full existing length of Pacific Drive and onto the proposed north-south collector route, most lots within the area would be within 500m of the bus route.

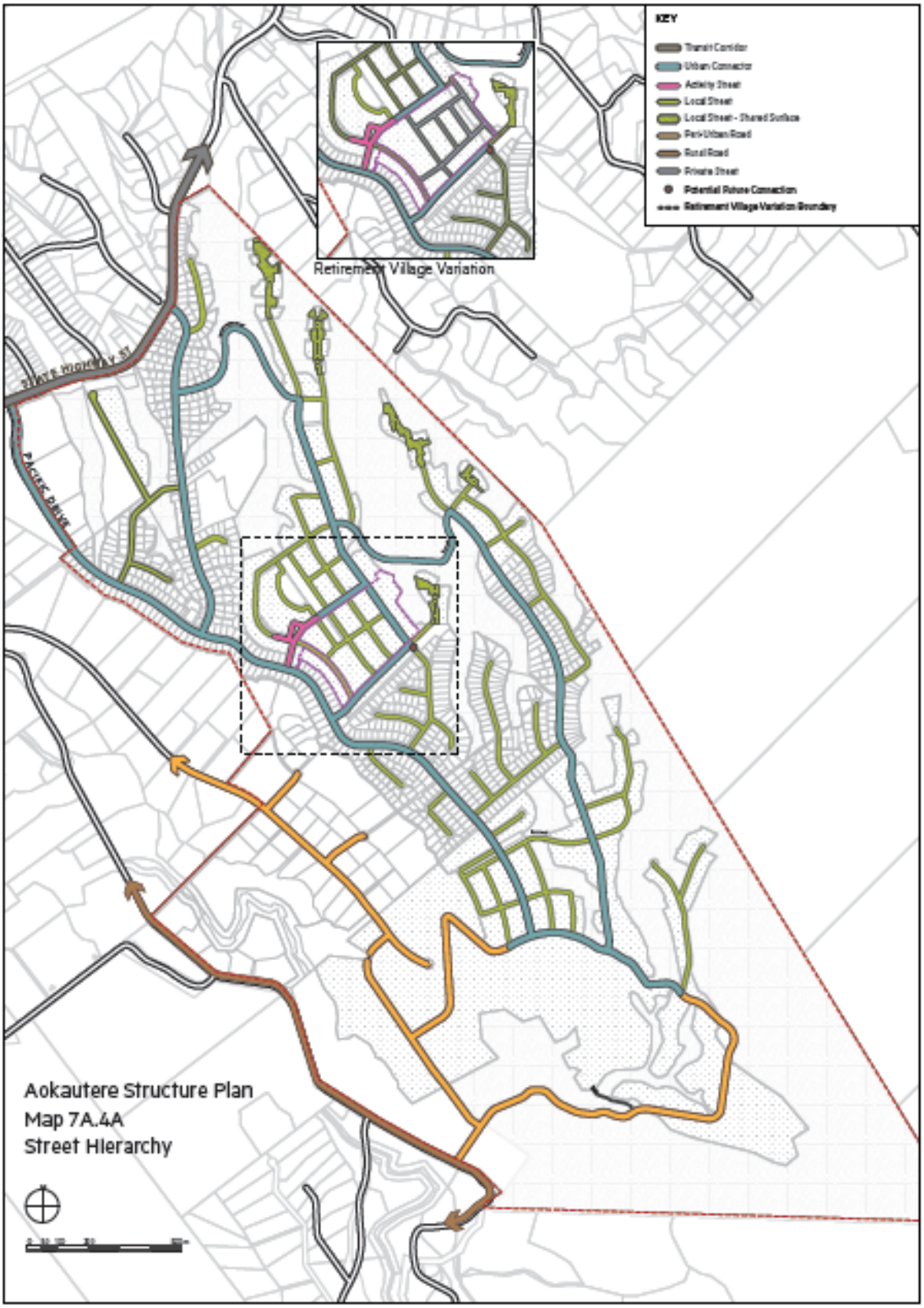


Figure 16: Proposed Aokautere Structure Plan – Roading Layout

The proposed road cross-sections are included in the McIndoe Urban reporting. Again, given the nature of the topography, it has been necessary to develop bespoke cross-sections for roads with either one or both frontages to a gully. From a transportation perspective the cross-section provisions have been guided

by both the Engineering Standards and the following design parameters which are generally based on the latest guidance from Waka Kotahi (NZTA):

Footpaths

- minimum of 1.8m wide on all urban streets;
- minimum of 2.4m wide on shopping streets or in front of schools;

Cycle provisions

- cycle lanes minimum 1.6m wide if not adjacent to parking;
- cycle lanes minimum 1.8m wide if adjacent to parking;
- for connector roads and above if cycles and traffic shared in lane minimum traffic lane width of 4.2m if not adjacent to parking, increasing to 4.5m if alongside parking;
- for local streets with shared cycles and traffic, recommend maximum of 3.2m traffic lane width so that cyclists claim road and do not get squeezed. Also, best with 30km/h or less speed environment, less than 3,000vpd, not on bus route and not adjacent to high turnover parking;
- shared use paths (minimum width 3m) for pedestrians and cyclists only where there are likely to be few if any mobility or visually impaired pedestrians;

Parking

- parking lanes with 2m minimum width; and
- increase to 2.3m wide if larger vehicles such as trucks parking kerbside.

The inclusion of shared, rather than separated, paths for the use of pedestrians and cyclists has been minimised however it has been necessary to include them along the Connector Roads where the roads cross the gully network. The topography of these areas is challenging, and the road cross-sections need to be minimised. Separate pedestrian and cycle paths are included where Activity Streets have frontages with shops and businesses.

A minimum berm width of 2.5m is included between the property boundary and the movement lane (vehicle and/or cycle) on all roads where there are vehicle accesses onto the frontage road. This allows for the driver of an exiting vehicle to be clear of the property boundary prior to the vehicle entering the movement lane.

In summary, it is concluded that the location of the future residential area and the transport connections are generally appropriate and provide good links to significant transport corridors, with support for passenger transport options and multi-nodal connections to the wider area beyond the structure plan area.

A further consideration is the possibility that part of the area of the Proposed Plan Change, close to the proposed Local Business Zone may be developed as a retirement village. In that scenario, from a transport and connectivity perspective, the key matters would be that public road connections are provided along the solid red lines in Figure 17 and that at least one of the dashed red line public road connections is provided in order to facilitate local traffic movement through the local street network, for instance to and from the Local Business centre, without unnecessarily needing to use Pacific Drive. Pedestrian linkages to the commercial centre should also be included to minimise walk distances to/from the centre and all parts of the retirement village.

Figure 17: Key Public Road Links

5. Traffic Effects

Based on the existing trip generations, it is anticipated that the additional 994 lots that would be facilitated by the Structure Plan would generate the following traffic activity:

- Daily: 7,950vpd
- Weekday PM peak: 994vph
- Saturday midday peak: 696vph.

Since the analysis of the traffic effects was undertaken the number of potential additional residential lots has increased to 1,020 to1,064 dwellings depending on the number of residential units included above commercial and retail activities within the proposed commercial centre. This increase of 26 to 70 residential units will not materially change the assessment results and the analysis of the traffic associated with 994 lots has not been updated for the higher yield.

If part of the area of the Proposed Plan Change close to the proposed Local Business Zone is developed as a retirement village, it is understood that the site of the retirement village would potentially replace some 184 residential lots (mix of low and medium density). Retirement villages typically have lower peak traffic generations than the standard residential activity that could be accommodated within the same site. The timing of traffic peaks associated with retirement villages also tends to occur during the inter-peak period on the local road networks. As such, the replacement of part of the residential area with a retirement village would be expected to result in lower weekday peak hour traffic flows. Accordingly, this traffic scenario has not been assessed.

While the replacement of standard residential dwellings with a retirement village is expected to result in less traffic activity during the traffic peaks on the local road network, the scale of the reduction will be modest and does not change the overall findings and recommendations of this assessment.

The April 2021 intersection traffic counts show the following split between inward and outward trips for the catchment of Pacific and Johnstone Drives during the peak hours:

- Weekday PM peak: 61% inward, 39% outward
- Saturday midday peak: 52% inward, 48% outward.

The April 2021 intersection traffic counts show the following split in travel direction onto and off SH57 Aokautere Drive for the catchment of Pacific and Johnstone Drives during the peak hours:

Weekday PM Peak

- Inward: 92% from west (Summerhill), 8% from east (Pahiatua)
- Outward: 91% to west, 9% to east

Saturday Midday Peak

- Inward: 96% from west (Summerhill), 4% from east (Pahiatua)
- Outward: 90% to west, 10% to east

The traffic associated with the 994 additional lots is forecast to load onto the external road network as follows:

- Valley Views: 13 houses (104vpd)
- Turitea Road: 42 houses (336vpd)
- Johnstone Drive: 244 houses (1,952vpd)
- Pacific Drive: 695 houses (5,560vpd)

These levels of forecast traffic activity are based on existing trip generation rates and mode choices and can be considered conservative. The 2018 Census data includes the following journey to work data for Palmerston North as a whole and Poutoa (the statistical area unit which includes the area of the Proposed Plan Change):

Palmerston North

- Bus 1.6%
- Bike/ walk/ jog 10.2%

Poutoa

- Bus 1.5%
- Bike/ walk/ jog 8.1%

The Palmerston North Transport Plan includes targets of 15% mode share for active modes by 2024 increasing to 30% by 2030. The Regional Land Transport Plan includes a target of increased patronage on public transport. An increase of active mode share to 30% and of bus share to 4.2% (2018 level for Christchurch and also NZ average), could see a reduction in vehicle trips by around 25% for the Poutoa statistical area by 2030. Factors influencing this change include the availability and standard of public transport and active mode facilities, level of congestion along the vehicle route and availability and cost of parking at the destination. The increased take up of electric bicycle use reduces the disincentive of distance and topography.

The assessment that follows is based on the conservative forecasts based on existing travel mode splits. The key potential traffic effects associated with the proposed structure plan and associated residential development are:

- effects on SH57 Aokautere Drive and its intersections;
- effects on Summerhill Drive;
- safe performance of Turitea Road, including the intersection with Valley Views;
- safe performance of Valley Views;
- effects on the internal roading within the Aokautere area;
- safe provision for pedestrians and cyclists moving within the internal transport network and within the external transport network where interaction with vehicle traffic will increase as a result of the increased residential activity; and the
- ability to accommodate potential future bus services.

Each of these potential traffic effects are discussed in turn below.

5.1 SH57 Aokautere Drive

With 90 to 96% of the existing Aokautere traffic travelling to/ from the direction of central Palmerston North and based on existing trip generation rates and mode choices, up to some additional 6,700 to 7,200vpd could be expected on SH57 Aokautere Drive to the west of Pacific Drive. Weekday evening peak hour and Saturday midday peak hour increases would be 860vph and 610vph, respectively. This would result in daily traffic flows of around 20,000vpd and weekday evening and Saturday midday peak hour traffic flows of 2,200vph and 1,600vph respectively on this section of SH57.

These forecast traffic flows are approaching capacity for an arterial road with a single traffic lane in each direction. There may be some balancing of ongoing traffic growth on SH57 once the Pahiatua Track is no longer relied on for crossing the Ranges.

The forecast additional traffic flows through each of the Summerhill Drive, Pacific Drive and Johnstone Drive intersections with SH57 for each of the peak hours are shown in Figures 18 and 19. These forecasts include the assumption that the additional traffic to and from Turitea Road is all travelling to and from the City. It has also been assumed that 15% and 10% of trips between the west and Pacific and Johnstone Drives travels to/from SH57 Old West Road during the weekday evening and Saturday midday peaks, respectively.

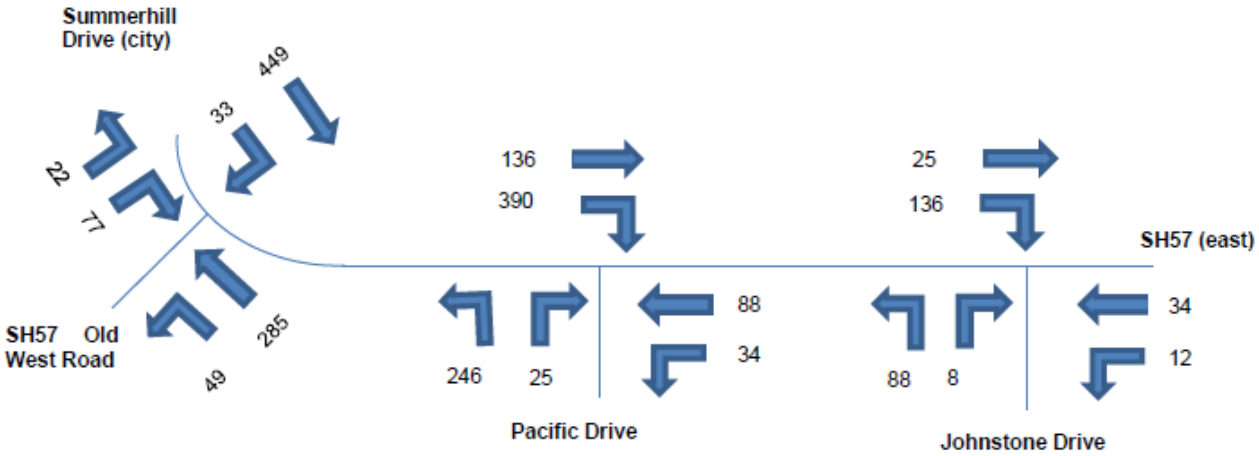


Figure 18: Forecast Additional Traffic – Weekday PM Peak (vph)

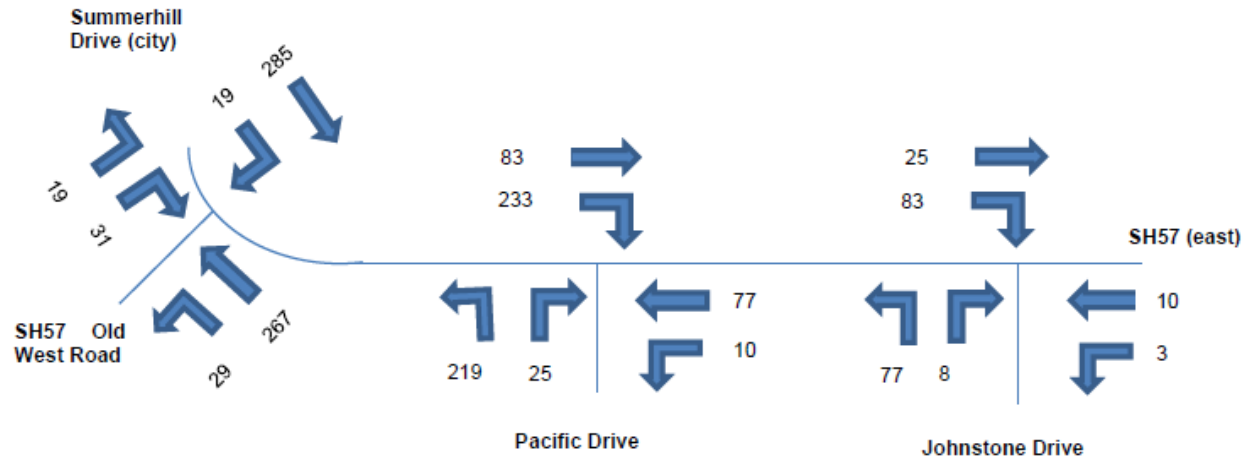


Figure 19: Forecast Additional Traffic – Saturday Midday Peak (vph)

Figures 20 and 21 show the combined existing and forecast additional traffic flows. Traffic associated with the 30 consented lots at the end of Valley Views has also been included.

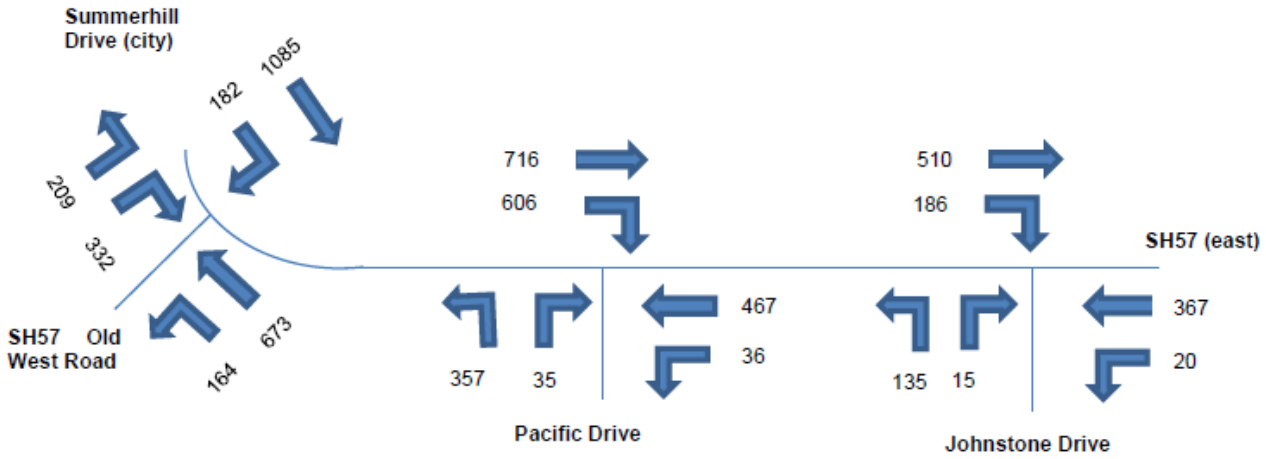


Figure 20: Forecast Traffic – Weekday PM Peak (vph)

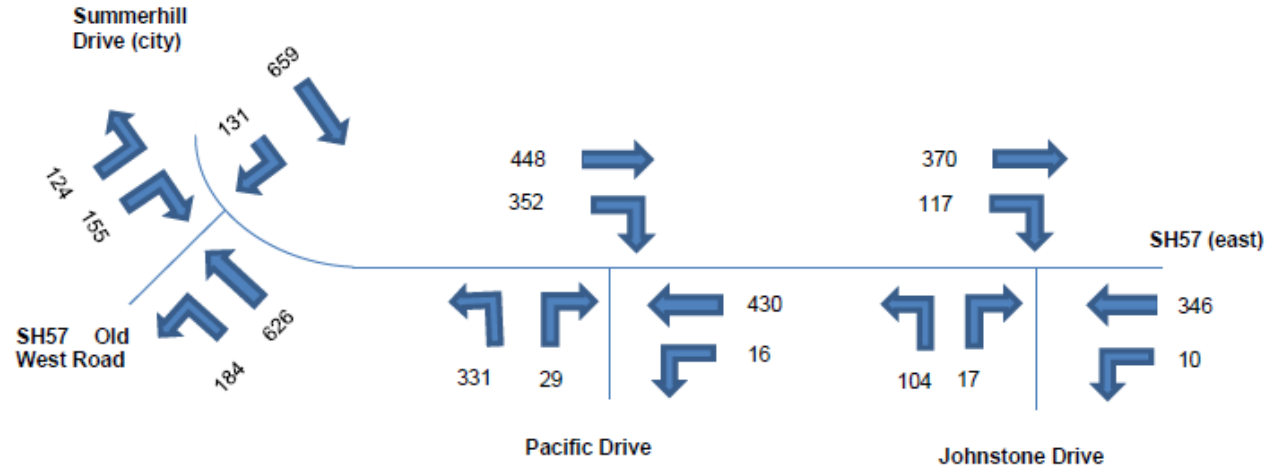


Figure 21: Forecast Traffic – Saturday Midday Peak (vph)

These forecast traffic volumes have then been used to model the forecast performance of each of the intersections using the SIDRA intersection modelling software. Heavy vehicle proportions of 8% have been assumed throughout. The forecast performance is summarised in Tables 6, 7 and 8.

Time Period	SH57 Old West Rd		Summerhill Drive		SH57 Aokautere Dv		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	209	332	1,085	182	673	164	2,645
Ave. Delay (s)	10	23	5	5	4	6	7
Level of Service	B	C	A	A	A	A	A
95%ile Queue (veh)	2	6	0	1	0	1	
Saturday Midday							
Input Flow (vph)	124	155	659	131	626	184	1,879
Ave. Delay (s)	9	12	4	5	4	5	5
Level of Service	A	B	A	A	A	A	A
95%ile Queue (veh)	1	2	0	0	0	1	

Table 6: SH57/ Summerhill Drive Intersection – Forecast Performance

For the intersection to perform satisfactorily, as shown above, it will be essential for the right turn from Old West Road to be upgraded such that drivers are comfortable making the turn in two stages. This will assist with ensuring the ongoing safe and efficient operation of the SH57 route.

Time Period	Pacific Drive		SH57 Aokautere Dv (W)		SH57 Aokautere Dv (E)		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	357	35	716	606	467	36	2,217
Ave. Delay (s)	8	20	0	12	0	5	5
Level of Service	A	C	A	B	A	A	A
95%ile Queue (veh)	2	1	0	7	0	0	
Saturday Midday							
Input Flow (vph)	331	29	448	352	430	16	1,606
Ave. Delay (s)	8	12	0	8	0	5	4
Level of Service	A	B	A	A	A	A	A
95%ile Queue (veh)	2	0	0	2	0	0	

Table 7: SH57/ Pacific Drive Intersection – Forecast Performance

During the weekday evening peak there is a modelled queue of seven vehicles for the right turn into Pacific Drive. This length of queue will use up all the storage space back to the Ruapehu Drive intersection. Any additional queuing would block back through the adjacent intersection. Again, the satisfactory performance of the right turn out of Pacific Drive relies on drivers making the turn in two parts. If drivers wait for a gap in both traffic flows before turning right out, the forecast average delay for the turn is 86 seconds with a level of service of F during the weekday evening peak. This level of delay can also result in increased risk taking with drivers taking smaller gaps in the traffic to make turns.

Time Period	Johnstone Drive		SH57 Aokautere Dv (W)		SH57 Aokautere Dv (N)		Total
	L	R	T	R	T	L	
Weekday PM							
Input Flow (vph)	135	15	510	186	367	20	1,233
Ave. Delay (s)	7	10	0	7	0	5	2
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	1	0	0	1	0	0	
Saturday Midday							
Input Flow (vph)	104	17	370	117	346	10	964
Ave. Delay (s)	7	8	0	7	0	5	2
Level of Service	A	A	A	A	A	A	A
95%ile Queue (veh)	1	0	0	1	0	0	

Table 8: SH57/ Johnstone Drive Intersection – Forecast Performance

As shown, the intersection of Johnstone Drive and SH57 Aokautere Drive is expected to continue to perform well with its existing layout.

5.2 Cashmere Drive/ Aokautere Drive

The existing intersection of Cashmere Drive and SH57 Aokautere Drive does not include a right turn bay and merge arrangement as shown in Figure 22. Traffic counts were undertaken at the intersection and the performance checked to establish if upgrades are needed. The forecast performance of the intersection is summarised in Table 9. As shown, the intersection in its current form can accommodate the forecast additional traffic.

Figure 22: Cashmere Drive/ Aokautere Drive (SH57)

Time Period	Cashmere Drive		SH57 Aokautere Dv (W)		SH57 Aokautere Dv (E)		Total
	L	R	L	T	T	R	
Weekday AM							
Input Flow (vph)	10	65	5	423	816	8	1,317
Ave. Delay (s)	6	28	5	0	0	9	1
Level of Service	A	D	A	A	A	A	A
95%ile Queue (veh)	0	1	0	0	0	0	
Weekday PM							
Input Flow (vph)	8	17	20	713	527	5	1,290
Ave. Delay (s)	9	23	5	0	0	13	1
Level of Service	A	C	A	A	A	B	A
95%ile Queue (veh)	0	0	0	0	0	0	

Table 9: SH57/ Cashmere Drive Intersection – Forecast Performance

5.3 Summerhill Drive

With the potential for more than 2,000vph forecast on Summerhill Drive during the weekday evening peak, there will be limited gaps in the traffic flows. Traffic counts were undertaken at the intersection of Ruapehu Drive and Summerhill Drive and the performance checked to establish if upgrades are needed. The existing intersection layout is shown in Figure 23 and the forecast performance of the intersection is

summarised in Table 10. As shown, the increased through traffic flows results in the side road traffic not being able to access Summerhill Drive.

Figure 23: Ruapehu Drive/ Summerhill Drive

Time Period	Ruapehu Dv			Summerhill Dv (City)			Summerhill Dv (Aokautere)			Mountain View Rd			Total
	L	T	R	L	T	R	L	T	R	L	T	R	
Weekday AM													
Input Flow (vph)	6	1	114	73	650	4	1	1486	5	12	1	1	2354
Ave. Delay (s)	9	>3600	>3600	5	0	67	6	1	8	258	467	410	485
Level of Service	A	F	F	A	A	F	A	A	A	F	F	F	F
95%ile Queue (veh)	0	96	96	0	0	0	0	0	0	2	2	2	
Weekday PM													
Input Flow (vph)	11	1	71	136	1319	9	1	906	9	5	1	1	2470
Ave. Delay (s)	51	>3600	>3600	5	1	11	5	0	58	39	515	273	203
Level of Service	F	F	F	A	A	B	A	A	F	E	F	F	F
95%ile Queue (veh)	0	61	61	0	0	0	0	0	0	1	1	1	

Table 10: Ruapehu Drive/ Summerhill Drive Intersection – Forecast Performance

The intersection was then modelled with signals and the concept layout used for analysis purposes in SIDRA is shown in Figure 24. The forecast performance of the intersection is summarised in Table 11. As shown, with signals the intersection can perform satisfactorily. However, the topography in this location makes it unlikely that traffic signals with the necessary multiple traffic lanes can be accommodated as well as maintaining cycle lanes for cyclists. The key effects that need addressing are the safety of the right turns into and out of Ruapehu Drive and Mountain View Road and the safety of cyclists travelling along Ruapehu Drive and accessing the citybound cycle lane on Summerhill Drive.

Possible mitigation measures include Ruapehu Drive operating as a left in/ left out intersection with an opportunity for u-turns created further to the south along Summerhill Drive. A right turn out of Mountain View Road would continue to need to be accommodated. One possibility would be to introduce a roundabout at the Williams Terrace intersection with Summerhill Drive. This would also assist vehicles turning to and from Williams Terrace. Options for safely accommodating cyclists travelling between the northern end of Ruapehu Drive and the city include introducing a crossing facility across Summerhill Drive, either signalised or an underpass, or accommodating two-way cycle flows along the eastern side of Summerhill Drive and towards the Fitzherbert Bridge.

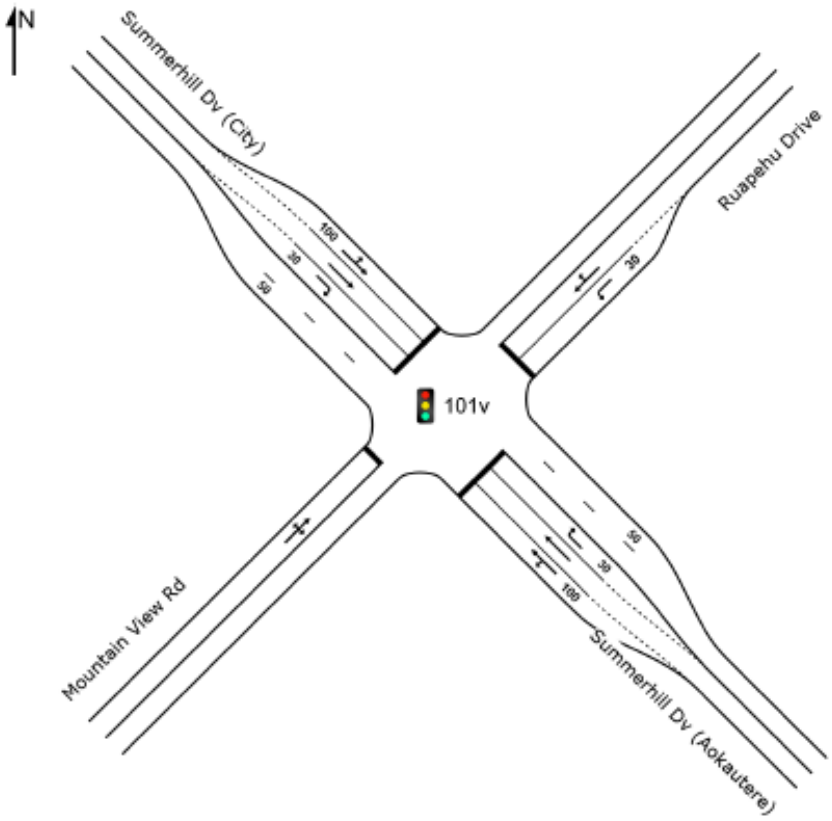


Figure 24: Ruapehu Drive/ Summerhill Drive Signals

Time Period	Ruapehu Dv			Summerhill Dv (City)			Summerhill Dv (Aokautere)			Mountain View Rd			Total
	L	T	R	L	T	R	L	T	R	L	T	R	
Weekday AM													
Input Flow (vph)	6	1	114	73	650	4	1	1486	5	12	1	1	2354
Ave. Delay (s)	58	63	68	7	4	25	8	7	10	61	54	59	9
Level of Service	E	E	E	A	A	C	A	A	A	E	D	E	A
95%ile Queue (veh)	0	8	8	2	10	0	5	37	0	1	1	1	
Weekday PM													
Input Flow (vph)	11	1	71	136	1319	6	1	906	9	5	1	1	2467
Ave. Delay (s)	67	66	70	7	4	9	6	3	17	65	60	65	6
Level of Service	E	E	E	A	A	A	A	A	B	E	E	E	A
95%ile Queue (veh)	1	5	5	4	28	0	2	11	0	0	0	0	

Table 11: Ruapehu Drive/ Summerhill Drive Intersection – Forecast Performance - Signals

Council are separately progressing works to introduce a flush median and pedestrian refuges on Summerhill Drive along with separated cycle lanes.

5.4 Turitea Road

While connectivity from the Aokautere area to Turitea Road is desirable, it is recommended that additional traffic activity onto Turitea Road (including via Valley Views) from the Aokautere area is restricted to facilitating access between the local communities rather than risking becoming a competing route for traffic travelling to and from the city, for the following reasons:

- restriction of future development and growth within the Turitea Road catchment. Recent traffic count data indicates a daily traffic flow of 1,318vpd on the busiest section of Turitea Road close to SH57 at the northern end. This is forecast to increase to 1,558vpd, an 18% increase, with the consented but yet to be occupied lots at the end of Valley Views. There is further land that could be subdivided within the Turitea Road catchment that has no alternative option for connecting to the road network;
- road safety concerns at the intersection of Turitea Road and Valley Views. Whether there is more traffic on the Turitea Road southern approach or on the Valley Views or a combination of the two, the risk of crashes between vehicles on the two approaches increases as a result of the limited sight line;
- road safety concerns associated with the two one-lane bridges on Turitea Road to the south of Valley Views. There has been a fatal crash on one of the bridges and increased traffic flows will increase the risk of future crashes;
- the variable and narrow carriageway width along the length of Turitea Road. The seal width varies between around 5.5 and 7m. Based on the provisions of NZS4404:2010 which is less conservative than both the Council's Engineering Standards and Street Design Manual, the existing seal width can accommodate around 1,000vpd. Again, based on NZS4404:2010 a consistent seal width of 7.0m could be expected to accommodate up to 2,500vpd;
- even if there were a speed limit reduction, the conflict between traffic at the intersection of Turitea Road and Valley Views is not addressed. The existing approach speed from the south is estimated to be up to 60km/h and the available sight line is significantly less than the Austroads requirement for the safe intersection sight distance in a 60km/h speed environment; and
- the challenges of delivering safety improvements at the intersection of Turitea Road and SH57 are also a factor given the vertical and horizontal geometry of the road alignments through the intersection.

It is understood that Council has some funds allocated in the Long Term Plan for improvements to Turitea Road and the Valley Views intersection to support additional rural-residential growth within the Turitea catchment. As such, it is considered that the traffic associated with some 55 additional lots (13 on Valley Views and 42 on Turitea Road) which are anticipated to rely on Turitea Road for access can be safely accommodated. With the introduction of a roundabout or a change in priority at the intersection, additional traffic flows could potentially be safely accommodated on Valley Views and at the intersection. To ensure a future option for a road connection between Valley Views and Aokautere it is recommended that provision is made for a future road connection where the proposed Structure Plan currently shows a break in the road at the end of the Valley Views extension. In the short term this link can provide for pedestrian and cyclist connectivity between the two areas.

5.5 Valley Views

Valley Views has a 6m wide carriageway with estimated existing traffic flows of 216vpd based on 27 households with a trip generation rate of 8 vehicle movements per day per household. There is an existing consent to develop 30 additional houses at the end of Valley Views. As such, the base traffic flows are estimated to be 456vpd (57 households). The Structure Plan allows for some 13 additional lots with access to Valley Views. This will result in an estimated total daily traffic volume of 560vpd. This is well within the available capacity of Valley Views which based on the guidance in NZS4404:2010 could be expected to

accommodate at least 1,000vpd. Subject to safety improvements at the intersection with Turitea Road, Valley Views could readily accommodate additional traffic beyond that resulting from the proposed Plan Change.

5.6 Internal Roading

The main traffic effects within the development area are expected to be associated with the additional traffic on Pacific Drive. The intersection traffic counts showed two-way traffic flows at the northern end of Pacific Drive of 340vph and 240vph during the weekday evening and Saturday midday peaks, respectively. Based on the number houses it is estimated that existing traffic flows at the southern end of Pacific Drive are around 90vph and 63vph during the weekday evening and Saturday midday peaks, respectively.

It is estimated that some 365 additional households will access the southern end of Pacific Drive with 365vph and 256vph additional traffic flows during the weekday evening and Saturday midday peaks, respectively. Traffic flows at the northern end of Pacific Drive are forecast to increase by 695vph and 487vph during the weekday evening and Saturday midday peaks, respectively.

With forecast traffic flows increasing from 455vph at the existing southern end of Pacific Drive to 1,035vph at SH57, it is anticipated that intersection control in the form of either roundabouts or signals will be needed at the intersections of Pacific Drive with each of Abby Road, Johnstone Drive and the next two proposed intersections to the south. The introduction of intersection controls along Pacific Drive as well as providing for turning vehicles will assist with controlling vehicle speeds for through traffic. Signalised intersections or roundabouts on raised platforms will also have safety benefits for pedestrians crossing Pacific Drive.

Regarding the two new intersection connections to the existing section of Pacific Drive, it is noted that the vehicle crossing for 133 Pacific Drive will be close to the new intersection. The vehicle crossing to 127 Pacific Drive is located at the boundary with 125 Pacific Drive. The other intersection between 151 and 155 Pacific Drive has already been formed and the driveways to 151 and 155 Pacific Drive have usefully been constructed connecting onto the side road. It is recommended that, if possible, the side road goes through 129 Pacific Drive and that 131 Pacific Drive become available for development. This would maximise the separation to adjacent vehicle crossings on Pacific Drive with 131 Pacific Drive having access to the new side road and this arrangement has been reflected in the proposed roading and lot configuration.

5.7 Public Transport and Active Modes

Given the direction at a regional level for increased bus use, it is considered desirable to allow for accommodating future bus services on the collector road network. This would result in most of the dwellings being within 500m of a bus route. A minimum road reserve width of 16.6m is included for the collector roads with a trafficable width, clear of parking, of at least 6.5m. The proposed collector road network includes two links across gully systems. At this stage it is unclear where future bus routes will go. It is understood that Horizons' current thinking is to provide high frequency services along main thoroughfares with less penetration into the local road network. The road network has been designed to deliver a range of options for the delivery of bus services.

The network of existing and proposed walkways, cycle lanes and shared paths include the existing walkway through the Adderstone Reserve and the Te Araroa Trail connection from Pacific Drive through to Turitea Road. A shared path along the southern side of SH57 Aokautere Drive is included such that there is a continuous path from Johnstone Drive to Pacific Drive.

The safety and capacity improvements to the SH57 intersections should also include provision for pedestrians crossing SH57 Aokautere Drive, in particular to the west of the Pacific Drive intersection and also in the vicinity of Silkwood Place to provide a link to the Adderstone Reserve. The traffic activity on

SH57 Aokautere Drive already creates a degree of severance between the Aokautere and Summerhill communities and this will continue to get worse with increased traffic flows on SH57.

6. Mitigation Measures

Table 12 provides a summary of the assessed transport effects associated with the Proposed Plan Change and includes recommended mitigation measures along with triggers for these upgrades. The recommended mitigation measures that are within the area of the proposed plan change are shown on the Structure Plan. The locations of the recommended off-site mitigation measures are shown in Figure 25. The numbers in Figure 25 refer to those in Table 12.

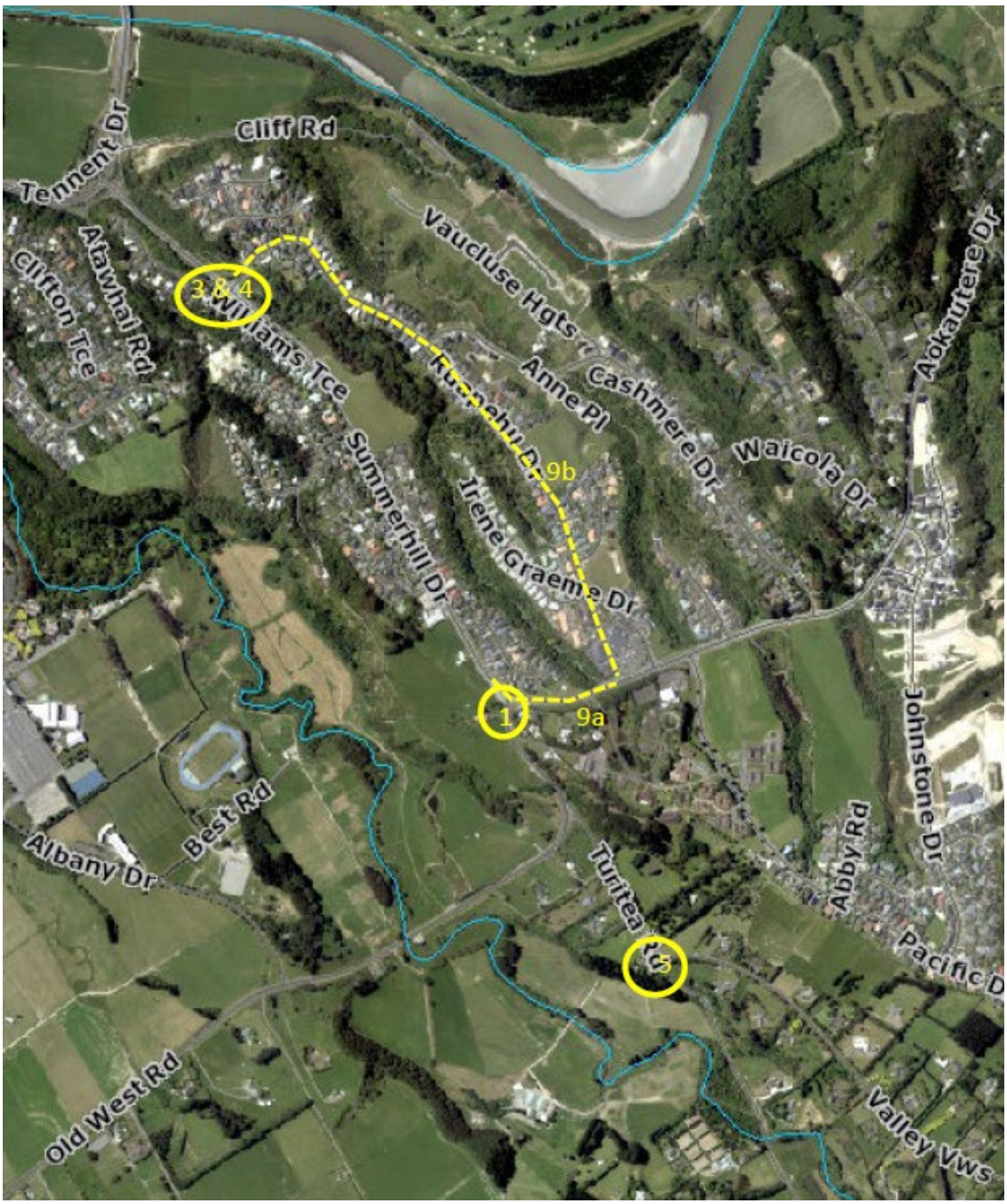


Figure 25: Location of Off-Site Recommended Mitigation

Location	Transport Effect	Recommended Mitigation	Threshold/ Timing
1. SH57 Old West Road/ Aokautere Drive/ Summerhill Drive	The right turn out of SH57 Old West Road has an existing Level of Service of E during the weekday evening peak if all drivers seek a gap in both traffic flows. The level of service and safety of this turn will deteriorate further with the additional traffic associated with the Proposed Plan Change.	Improvements to facilitate safe right turns from SH57 Old West Road into SH57 Aokautere Drive. This could be achieved with a wider central median and longer merge lane. The possible signalisation of the intersection would be driven by safety rather than the traffic carrying performance of the intersection with a particular consideration being the safe passage of citybound cyclists across the Old West Road approach	The level of service and safety of this turn is already a concern. Safety improvements should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.
2. SH57 Aokautere Drive/ Pacific Drive	There are no existing facilities to assist pedestrians and cyclists crossing Aokautere Drive at Pacific Drive. There is existing demand for these movements for Aokautere residents accessing the Summerhill shopping centre or cycling to/from work, school, university or for recreational purposes. This has safety and severance effects and increases the reliance on cars for access. Forecast delays for the right turn out of Pacific Drive with the traffic associated with the Proposed Plan Change will result in increased risk taking by drivers and an associated increase in the risk of crashes.	There is already a need to provide for pedestrians and cyclists in this location and given that Pacific Drive will accommodate the majority of traffic associated with the further development of the Aokautere area, it is recommended that the intersection is signalised.	Given the existing need to provide crossing facilities for pedestrians and cyclists in this location, plans for the signalisation of the intersection should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.
3. Mountain View Road/ Ruapehu Drive/ Summerhill Drive	The existing delays for traffic turning right out of Ruapehu Drive during the weekday traffic peaks has reached a level where drivers get frustrated and move into smaller gaps in the traffic with an associated increased risk of crashes.	It is recommended that Ruapehu Drive operates with left in/ left out with an opportunity for u-turns created further to the south along Summerhill Drive. A right turn out of Mountain View Road would need to continue to be accommodated. One possibility would be to introduce a roundabout at the Williams Terrace	This is an existing safety concern during the weekday traffic peaks. Safety improvements should be developed, programmed and implemented by the Council prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.

Location	Transport Effect	Recommended Mitigation	Threshold/ Timing
		intersection with Summerhill Drive. This would also assist vehicles turning to and from Williams Terrace.	
4. Northern end of Ruapehu Drive (closest to City)	As a result of existing peak hour traffic flows on Summerhill Drive, safety concerns for cyclists crossing Summerhill Drive to access the downhill cycle lane close to the intersection with Ruapehu Drive. This will be exacerbated by additional traffic flows on Summerhill Drive as a result of the Proposed Plan Change.	Develop an option for safely accommodating cyclists travelling between the northern end of Ruapehu Drive and the City. This might include introducing a crossing facility across Summerhill Drive (signalised or an underpass) or accommodating two-way cycle flows along the eastern side of Summerhill Drive and towards the Fitzherbert Bridge.	This is an existing safety concern during the weekday traffic peaks. Safety improvements should be developed, programmed, and implemented by the Council prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.
5. Turitea Road/ Valley Views	The horizontal and vertical alignment of the Turitea Road approach from the south results in restricted sight lines at the intersection with Valley Views. This is particularly a problem for vehicles turning right out of Valley Views. Even if there were a speed limit reduction on Turitea Road, the conflict between traffic at the intersection of Turitea Road and Valley Views is not addressed. The existing approach speed from the south is estimated to be up to 60km/h and the available sight line is significantly less than the Austroads requirement for the safe intersection sight distance in a 60km/h speed environment	Some mitigation is already planned as part of a consented 30 lot subdivision at the end of Valley Views. Further review of the safety of the intersection to accommodate additional traffic on the Valley Views and Turitea Road approaches is recommended. Options for safety improvements include a lengthening of the merge for the right turn onto Turitea Road beyond that included for the consented subdivision, a possible change in priority, and the addition of real-time warning signage for vehicles approaching the intersection or changes to the alignment of the Turitea Road approach from the south. Depending on the nature of any mitigation at the intersection, it may be possible to allow for a road connection from the end of Valley Views to the wider area included within the Proposed Plan Change. As such it is recommended that an option for	It is understood that Council has some funds allocated in the Long Term Plan for improvements to Turitea Road and the Valley Views intersection, beyond the improvements to be completed as part of the consented 30 lot subdivision, to support additional rural-residential growth within the Turitea catchment. As such, it is considered that the traffic associated with the 55 additional lots (13 on Valley Views and 42 on Turitea Road) which are anticipated to rely on Turitea Road for access can be safely accommodated once the improvements as part of the Long Term Plan are implemented or in the interim subject to a review of the performance of the intersection as part of a resource consent application.

Location	Transport Effect	Recommended Mitigation	Threshold/ Timing
		this future connection is accommodated within the Structure Plan.	
6. Existing Abby Road and Johnstone Drive Intersections with Pacific Drive	Additional traffic associated with the development of the area of the Proposed Plan Change will result in additional delays for side road traffic accessing Pacific Drive. Once the delays decline to a level of service of E on the side roads there is an associated safety risk as drivers take smaller gaps in the traffic flow.	Change of control to either roundabouts or traffic signals.	When the level of service for side road traffic declines to a level of service of E at peak times. Some development within the area of the Proposed Plan Change is likely to be able to be accommodated before any mitigation is needed.
7. Two future intersections with the existing section of Pacific Drive	Delay and associated safety concerns for future traffic accessing Pacific Drive from side roads. Ensuring safe pedestrian and cyclist access to the future Neighbourhood Centre.	Either constructed as roundabouts or signals once the side roads are needed for access to future development or constructed as Give Way controlled intersections and upgraded to either roundabouts or signals once performance threshold reached.	When the level of service for side road traffic declines to a level of service of E at peak times or when needed to support safe pedestrian access across Pacific Drive to the future Neighbourhood Centre. Some development within the area of the Proposed Plan Change is likely to be able to be accommodated before any mitigation is needed.
8. SH57 Aokautere Drive between Johnstone Drive and Pacific Drive	Existing lack of connectivity and safety for pedestrians and cyclists along this section of SH57 will be exacerbated by additional vehicle traffic (some from the Proposed Plan Change Area and some external) on SH57 and additional demands for pedestrian and cyclist travel along this section including access to the Adderstone Reserve.	The planned shared path along the southern side of SH57 Aokautere Drive is needed to connect Johnstone Drive and Pacific Drive and to provide access to the Adderstone Reserve from both directions on SH57. A pedestrian crossing facility, most likely in the form of dropped kerbs and a median island, is also needed at a point along the section of SH57 Aokautere Drive between Cashmere Drive and Johnstone Drive.	Safety improvements for active modes should be developed, programmed, and implemented with Waka Kotahi prior to the traffic associated with the northeast area of the Structure Plan being loaded onto the road network.

Location	Transport Effect	Recommended Mitigation	Threshold/ Timing
9. Travel routes to and from the City	Peak hour traffic congestion and a decline in road safety associated with additional vehicle movements if existing mode choice patterns continue.	Introduction of high frequency bus services which can be accessed from throughout the suburban part of the Proposed Plan Change area. The internal road network has been designed to accommodate bus services circulating through the area. Facilitation of commuter cycling between Aokautere and the City. Either connection into the recently upgraded facilities on Summerhill Drive (9a) or given the desire line along with lower traffic volumes and the target of providing for a significant increase in cyclist numbers, provision along the Ruapehu Drive corridor (9b). This could include a mix of on and off-road facilities.	Ongoing planning with Horizons Regional Council. A commuter cycle route should be identified by Council and any associated upgrades programmed and implemented prior to the traffic associated with the Proposed Plan Change being loaded onto the road network.

Table 12: Recommended Mitigation

7. District Plan Transportation Requirements

Objectives and policies included in the District Plan which have an influence on transportation matters within this development area include:

District Plan Provision	Comment on Alignment
City View Objectives	
1. Planning for residential, industrial, commercial, and rural-residential growth sustains a compact, orderly, and connected urban form which avoids the adverse environmental effects of uncontained urban expansion into the rural zone.	The reliance on connections to SH57 Aokautere Drive provides ready access to the urban road network. Only a small number of rural-residential properties are expected to rely on Turitea Road for connection to the wider road network.
3. The integrated and efficient provision of, and access to, infrastructure, network utilities and local services is facilitated for all residents.	The development area has ready access to the strategic road network via SH57 and Summerhill Drive.
9. Subdivisions, buildings, and infrastructure are designed and constructed to promote a coordinated, healthy, and safe environment.	A number of mitigation measures including the introduction and change in control at intersections, new sections of footpath and shared paths are expected to result in a safe travel environment for all road users.
23. Infrastructure operates in a safe and efficient manner, and the effects of activities which could impact on the safe and efficient operation of this infrastructure are avoided, remedied, or mitigated.	Mitigation measures, in particular for the intersections along SH57 Aokautere Drive are included to ensure the ongoing safe and efficient operation of the arterial road network.
24. All forms of transport, including public transport, walking, cycling, and private vehicles are adequately provided for to assist with sustainable energy use and a healthy lifestyle.	Active modes and private vehicles can be readily accommodated within the development area. Allowance is included for the possible introduction of bus services on the collector road network in the future.
25. Infrastructure and physical resources of regional or national importance are recognised and provided for by enabling their establishment, operation, maintenance, upgrading and protection from the effects of other activities.	Mitigation measures are proposed to ensure the ongoing safe and efficient operation of the SH57 intersections.
Subdivision Objective 2 ***To ensure that subdivision is carried out in a manner which recognises and gives due regard to the natural and physical characteristics of the land and its future use and development, and avoids, remedies, or mitigates any adverse effects on the environment.***	
Policies	
2.1 To require lots to have areas and dimensions to meet the needs of users and to sustain the land resource by ensuring that:	
1. Lots in the Residential Zone have the necessary area and dimensions to enable the siting and construction of a dwelling and accessory buildings, the provision of private outdoor space, service courts, vehicle access and parking in accordance with the relevant Permitted Activity Performance Standards.	The indicative site layout includes lot sizes and shapes that allow for vehicle access to on-site parking. Noting that the NPS Urban Development 2020 removes the requirement to provide on-site parking in Palmerston North.
2.2 To ensure that all new lots have safe and adequate vehicle access from the roading network by providing that:	
1. Every lot is to have access from a formed existing road, or a new road to be formed, to enable vehicles to enter the site with the dimensions of access sufficient to accommodate the	The indicative site layout allows for each lot to have its own access to frontage roading. Given the individual accesses to single residential lots with frontages to local or

District Plan Provision	Comment on Alignment
level of vehicle usage anticipated. The access should be designed to enable vehicles to turn within the lot and to leave it in a forward direction.	collector roads the Permitted Activity Performance Standard for on-site turning does not apply. The extension to Pacific Drive is expected to be a collector rather than an extension of the existing minor arterial classification.
2. *The construction is to be to a standard and of materials to support the anticipated traffic, require minimum maintenance and to control and dispose of stormwater runoff.*	Noted.
3. *Any allotment with frontage to a Major or Minor Arterial road which has no alternative means of access to an existing public road in the local road network, shall have access arrangements approved by Council, in terms of an Access Management Structure Plan.*	Two new lots are shown with frontage to the existing section of Pacific Drive. These lots also have frontage to a proposed side road.
2.3 To ensure safe, convenient, and efficient movement of people, vehicles, and goods in a high quality environment with minimum adverse effects by providing that:	
1. *The layout of the transport network shall, as appropriate for their position in the roading hierarchy, ensure that people, vehicles, and goods can move safely, efficiently, and effectively, minimise any adverse effect on the environment, make provision for network utility systems and make provision for amenity values. The layout of the transport network shall:*	
• *provide adequate vehicular access to each lot;*	The indicative site layout allows for each lot to have its own access to frontage roading.
• *link to, and provide for, and be compatible with the existing and future transport networks, taking into account orderly and integrated patterns of development and adjoining developments;*	The Aokautere Drive section of SH57 is transitioning from a rural to an urban context.
• *connect to all adjoining roads, providing for choice of routes where practicable;*	While a single connection to Turitea Road is included, further connection to Turitea Road has not been included to minimise adverse road safety effects. An option for a future connection to Valley Views has been included.
• *identify significant destinations and provide for safe and convenient access to these by all modes;*	Based on existing traffic patterns almost all traffic movements are expected to be to or from the direction of the City.
• *encourage multi-modal street links, providing pedestrian links; and*	The Structure Plan includes provision for footpaths, cycle lanes, shared paths, and connections with existing walkways.
• *provide adequate access for emergency vehicles.*	The road layout included in the Structure Plan can be expected to allow for emergency vehicle access to all properties.
2. *The development provides for a high quality public realm considering;*	
• *the potential for the street to be a place of recreational walking and cycling;*	A mix of footpaths, shared paths, cycle lanes and shared space streets are included.
• *the safety and visibility of pedestrians;*	Pedestrians are provided for on footpaths or shared paths.
4. *The structure of a road shall:*	
• *have a design life of at least 25 years based on Equivalent Design Axle, or equivalent design methods;*	Noted.
• *be constructed from materials suitable for the intended use;*	Noted.
• *maintain adequate surface smoothness; and*	Noted.

District Plan Provision	Comment on Alignment
• *be protected from the adverse effects of surface and ground water.* 6. *Urban roads are to be well lit by specifically designed street lighting, are to be constructed to such standards and in such materials as will result in minimum maintenance having regard to the anticipated levels and types of traffic.* ***2.4 To improve land utilisation, to safeguard people, property, and the environment from the adverse effects of unstable land by ensuring that:*** *3. When land is subdivided that the resultant lots contain safe and adequate building sites and have roading and access suitable for activities.*	Noted. Lighting will be able to be provided to the required standard. The number and length of no exit roads has been minimised although not totally avoided given the extensive gully systems. The layout of the road network has been designed to provide route choice options for the majority of properties.
Residential Zone Objective 1 ***To enable the sustainable use and development of the Residential Zone to provide for the City's current and future housing needs.*** ***Policies*** *1.3 To promote the efficient use of the urban infrastructure and other physical resources.* *1.4 To ensure network infrastructure and services are available to support residential development and intensification.*	Ready connection to the arterial road network. As above.
Land Transport Objective 1 ***The City's land transport networks are maintained and developed to ensure that people and goods move safely and efficiently through and within the City.*** ***Policies*** *1.1 Identify and apply the roading hierarchy to ensure the function of each road in the City is recognised and protected in the management of land use, development, and the subdivision of land.* *1.2 All roads in the City have function and design characteristics consistent with their place in the roading hierarchy.* *1.3 Maintain and upgrade the existing roads in the City and provide for new roads to meet the current and future needs of the City.* *1.4 The road network stormwater control system shall protect the road, road users and adjoining land from the adverse effects of water from roads and minimise any adverse effect on the environment.* *1.5 Require all new public roads, private roads, accessways and privateways to be designed and constructed to meet performance standards relating to the safety and efficiency of vehicle movement, and to ensure the safe use of the road transport network for all users, particularly in respect of:* *a) Road width and alignment which should be sufficient for two vehicle lanes except where traffic volumes are insufficient;* *b) The formation and surface sealing of all roads, accessways and privateways to standards appropriate to the volume of traffic expected to be carried;*	The internal road network includes local and collector roads. Particular consideration has been given to the roads that provide links between the gullies. As above. Mitigation measures have been identified for a number of intersections to ensure the ongoing safe and efficient operation of existing roads. Noted. Allowed for in road cross-sections. Readily achievable.

District Plan Provision	Comment on Alignment
c) Provision for necessary network utility facilities within roads; and	Anticipated.
d) Safe design and construction of roads, road access points and intersections, including alignment, gradient, vehicle parking, manoeuvring, and turning requirements.	As shown in the Structure Plan, a safe design for the internal roading and access arrangements is expected.
1.6 Encourage the development of safe and accessible pedestrian paths and cycleways, as well as convenient and accessible cycle parking, to support the opportunity for people to use active and non-vehicular modes of transport throughout the City.	Footpaths, shared paths, and cycle lanes included. Council have already included in their strategic planning, a shared path along SH57 between Pacific Drive and Johnstone Drive.
1.7 To support and encourage the provision of public transport and its use throughout the City as an integral part of the transportation system.	The internal road network allows for the possible future circulation of buses.
1.8 Convenient, safe, and accessible car parking, loading and manoeuvring facilities are available for residents, staff, visitors, and customers for all activities without creating congestion or conflicts with moving vehicles, pedestrians, or cyclists on adjacent roads.	Anticipated that private on-site and kerbside parking will be available. Rubbish collection trucks will be able to efficiently circulate through the internal road layout.
Land Transport Objective 2	
The land transport network is safe, convenient, and efficient while avoiding, remedying, or mitigating adverse effects in a way that maintains the health and safety of people and communities, and the amenity values and character of the City's environment.	
Policies	
2.1 Restrict the through movement of traffic where the movement has adverse visual, noise and safety effects on the adjoining areas by using the road hierarchy to direct higher volume and heavy traffic movements on identified arterial routes and discouraging this traffic from other areas, such as residential areas.	The roading layout provides for efficient connection to the arterial road network. Adverse traffic effects on Turitea Road have been minimised.
2.2 Avoid, remedy, or mitigate the impact of roads and parking areas on visual amenity values of the community by requiring the provision of landscaping.	Addressed in the urban design assessment.
2.4 Avoid adverse effects on amenity and character by ensuring that new roads are well designed and visually complement the character of the surrounding area.	Addressed in the urban design assessment.
Land Transport Objective 3	
The safety and efficiency of the land transport network is protected from the adverse effects of land use, development, and subdivision activities.	
Policies	
3.1 Avoid, remedy, or mitigate the adverse effects of increased traffic or changes in traffic type, which would compromise the safe and efficient operation of any road, or the safe and convenient movement of pedestrians and cyclists on roads.	Mitigation measures, in particular upgrades to intersections and provisions for pedestrians and cyclists have been identified.
3.2 Require vehicle crossing places and vehicle entrances from public roads to be located, constructed, and maintained to standards appropriate to the expected traffic volume, pedestrian movement, and speed environment of each road.	Detail to be included at resource consent stage.
3.3 Ensure that buildings and activities do not compromise the necessary clear sight lines for trains and road vehicles at level rail crossings, or of vehicles at road intersections.	Road cross-sections and building setbacks will allow for satisfactory sight lines at internal intersections. This will be demonstrated at resource consent stage.

District Plan Provision	Comment on Alignment
3.4 Ensure adequate on-site parking and manoeuvring space is provided for each type of activity in a safe and visually attractive manner. *3.5 Ensure that buildings and activities make provision for adequate and safe on-site loading.*	Detail to be included at resource consent stage. Loading provisions for the commercial area will need to be considered at the resource consent stage. The internal road layout is such that rubbish collection trucks will be able to efficiently circulate through the site.

Table 13: Alignment with District Plan Provisions

As such the proposed Structure Plan and associated development that would be facilitated are well aligned with the transport related objectives and policies of the District Plan.

8. Alignment with Transport Strategies

Commentary on the alignment of the Proposed Plan Change with the transport context included in Section 2 of this report is provided in Table 14 below:

National/ Regional/ Local Transport Context	Comment on Alignment
A transport system where no-one is killed or seriously injured (including active and public transport modes) with a target of a 40% reduction by 2030	The recommended mitigation measures include safety improvements that will benefit existing and future road users.
Better and affordable travel options with 15% of travel in the region by active and public transport modes by 2030 (PNITI target of 30% active mode travel by 2030)	Active modes and public transport are provided for within the area of the Proposed Plan Change and improvements are recommended to accommodate active mode connections better and more safely onto and through the wider road network.
Reduced emissions from land transport while improving safety and inclusive access with a target of a 30% reduction by 2030	Provision is included for increased active mode and public transport use which will in turn assist with reducing emissions from land transport.
Road safety principles include safety as a critical decision-making priority, designing for human vulnerability, allowing for mistakes, strengthening all parts of the road transport system and shared responsibility for improving road safety	The recommended mitigation measures include many safety improvements that will benefit existing and future road users.
A reliable, integrated, accessible and sustainable public transport system with increased patronage	The proposed collector road network within Aokautere area can accommodate buses.
Integrated transport network with clear priorities for all road users based around place and movement principles	The proposed road hierarchy and road cross-sections have been selected in line with place and movement principles.
Timely provision of transport infrastructure to support city growth with increased investment in active and public transport as a proportion of the transport budget	Mitigation measures have been identified for implementation from the outset of further development within the Aokautere area.
Speed limits and traffic speeds are appropriate for the conditions throughout the transport network	Both Waka Kotahi and Council can be expected to undertake ongoing speed reviews throughout the city.
New growth areas have well-connected, multi-modal, visually attractive streets which are designed and constructed to meet performance standards and function according to their place in the road hierarchy	The internal streets have been designed to accommodate all road users. Most travel will be to and from SH57 Aokautere Drive via

National/ Regional/ Local Transport Context	Comment on Alignment
	Pacific Drive and Johnstone Drive, but local connections are included to Turitea Road (all modes) and Valley Views (pedestrian/cycle).
Space is prioritised within the transport network for active and public transport	The internal streets have been designed to accommodate all road users.
The land transport network is maintained and developed to ensure that people and goods move safely and efficiently through and within the city	The current focus at a national, regional and local level is primarily on safety and promoting active and public transport modes rather than efficiency with the exception of regional traffic routes. The proposed mitigation includes a number of safety improvements but also seeks to ensure that vehicles can move efficiently along the SH57 corridor.
Maintain and upgrade existing roads and provide for new roads to meet the current and future needs of the city	Given the capacity constraints in the wider road network, in particular the intersections on the city side of the river and the targets of increased active and public mode use, the focus is on providing for improved cycle and bus connectivity with the city.
The safety and efficiency of land transport is protected from the adverse effects of land use, development and subdivision activities	The proposed mitigations include safety improvements along with measures to ensure safe and efficient traffic flow along the SH57 route.
Alignment with the Palmerston North City Council 10 Year Plan	The 10 Year Plan has a strong focus on improved cycle facilities and connectivity throughout the city and includes provision for the completion of the works on Summerhill Drive. The need for additional cycle treatments along the Ruapehu Drive corridor have also been identified as part of this assessment.
Alignment with the anticipated outcomes of the PNITI Network Options Report	The PNITI projects that will have the most significant effect on this part of the road network are indicated for the long term and therefore have less certainty, being a new river crossing to the west of the city and the upgrade of SH57 from Tennent Drive to Summerhill Drive.

Table 13: Alignment with National/ Regional/ Local Transport Context

As such the proposed Structure Plan and associated development has good alignment with the national, regional and local transport context.

9. Summary and Conclusion

The findings of this assessment can be summarised as follows:

- in recent years there has been a shift in priority towards the delivery of safe and multi-modal transport infrastructure with clear targets for improved road safety, increased active mode and public transport use and reduced emissions from land transport;

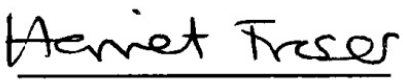
- the existing section of Pacific Drive and Johnstone Drive have cross sections which are either well matched or could be readily adjusted to meet the provisions of NZS4404:2010 for Residential Collector Roads;
- Turitea Road has a varying cross-section along its length. Overall, it matches most closely with the provisions of NZS4404:2010 for a Local Rural Road carrying around 1,000vpd although there are sections with cross-sections more aligned with a Connector/ Collector Rural Road capable of carrying around 2,500vpd. The section of Turitea Road from Valley Views to SH57 could reasonably be expected to safely accommodate 2,500vpd;
- Valley Views has a carriageway width of 6m and is accordingly best matched to the provisions of NZS4404:2010 for a Local Rural Road carrying around 1,000vpd;
- the available sight lines at the various local intersections are generally satisfactory apart from at the intersection of Valley Views and Turitea Road;
- the average daily traffic count on SH57 in the vicinity of Pacific Drive is 12,900vpd. The weekday traffic peak in this location occurs between 5 and 6pm with 1,340vph and on a Saturday between 11am and 12 noon with 1,000vph;
- while the traffic carrying capacity of the Fitzherbert Bridge (two traffic lanes in each direction) places a constraint on the amount of traffic that can enter the city in this location, the main capacity constraint is the downstream traffic signals at the intersection of Fitzherbert Avenue and Te Awe Awe Street. It is estimated that the intersection operates at 80-90% of its capacity during the weekday traffic peaks. Scope for capacity improvements is limited with there already being four southbound and three northbound traffic lanes at the Fitzherbert Avenue stop lines. Cycle lanes are marked at the intersection;
- based on traffic count data for Pacific Drive and Johnstone Drive the following existing trip generation rates have been calculated:
  Daily: 8 vehicle movements per day per household
  Weekday PM peak: 1.0 vehicle movements per hour per household
  Saturday midday peak: 0.7 vehicle movements per hour per household.
- at present drivers turning right onto SH57 Aokautere Drive from SH57 Old West Road or Pacific Drive, typically look for a gap in both traffic flows rather than pause in the median;
- there are existing safety concerns on Turitea Road to the south of Valley Views due to its narrow cross-section, horizontal and vertical geometry, speed environment and the one-lane bridges;
- the Structure Plan facilitates the development of some 1,020 residential lots and a suburban centre. In terms of transportation matters, the proposed Structure Plan includes provisions for roading connections to the external road network, internal roading layout, proposed road hierarchy and associated cross-section provisions;
- the number and length of ‘no exit’ roads have been minimised, but the topography associated with the gully systems means that some ‘no exit’ roads are needed to provide access;
- the network of collector roads has been designed to facilitate circulation by buses. With the recent connection of the two ends of Johnstone Drive, there is now an opportunity to circulate on the existing sections of Pacific Drive and Johnstone Drive. If buses were to travel along the full existing length of Pacific Drive and onto the proposed north-south connector route, most lots within the area would be within 500m of the bus route;
- the inclusion of shared, rather than separated, paths for the use of pedestrians and cyclists has been minimised but has been necessary along the Connector Roads where the roads cross the gully network. The topography of these areas is challenging, and the road cross-sections need to be minimised. Separate pedestrian and cycle paths are included where the Activity Streets have frontages with shops and businesses;
- a minimum berm width of 2.5m is included between the property boundary and the movement lane (vehicle and/or cycle) on all roads where there are vehicle accesses onto the frontage road. This allows for the driver of an exiting vehicle to be clear of the property boundary prior to the vehicle entering the movement lane;

- an increase of active mode share to 30% and of bus share to 4.2% (2018 level for Christchurch and also NZ average), could see a reduction in vehicle trips by around 25% for the Poutoa statistical area by 2030; and
- there is a good alignment with both the District Plan objectives and policies and the wider regional and national transport context.

In summary, the findings of the assessment show that based on existing travel mode share behaviours, there is the potential for the plan change to result in significant additional vehicle traffic on the local road network. A number of mitigation measures, included in Table 12, have been identified to support mode shift towards active and public transport modes as well as to ensure the safe operation of the transport network. With these mitigation measures in place, the proposed Structure Plan would allow for the site to be developed for residential and local business centre (local retail/ commercial/ community) purposes in a manner which is consistent with the District Plan traffic and transportation related objectives and policies.

Please do not hesitate to be in touch should you require clarification of any of the above.

Yours faithfully



Harriet Fraser

Appendix 1: Transport Context

Government Policy Statement Land Transport 2021 (GPS Land Transport)

The GPS Land Transport has the following strategic priorities:

a. Developing a transport system where no-one is killed or seriously injured;
b. Providing people with better travel options to access places for earning, learning, and participating in society;
c. Improving freight connections to support economic development; and
d. Transforming to a low carbon transport system that supports emissions reductions aligned with national commitments, while improving safety and inclusive access.

Road to Zero – Road Safety Strategy 2020-2030

The vision of Road to Zero is “a New Zealand where no one is killed or seriously injured in road crashes” and has the target reducing death and serious injuries on New Zealand roads by 40% over the next decade. The seven principles identified to guide the design of the network and for making road safety decisions are:

a. Promote good choices but plan for mistakes;
b. Design for human vulnerability;
c. Strengthen all parts of the road transport system;
d. Shared responsibility for improving road safety;
e. Actions are grounded in evidence and evaluated;
f. Road safety actions support health, wellbeing and liveable places; and
g. Safety is a critical decision-making priority.

Horizons Regional Land Transport Plan 2021-2031 (RLTP)

The RLTP has the 30 year vision of: A region that connects central New Zealand and supports safe, accessible and sustainable transport options. The objectives included in the RLTP are:

Objective 1: Travel Choice - Transport users in the region have access to affordable transport choices that are attractive, viable, and encourage multi-modal travel.

Objective 2: Connectivity and Efficiency - The regional transport network connects central New Zealand and is efficient, reliable, and resilient.

Objective 3: Safety - The transport network is safe for all users.

Objective 4: Environment - The impact of transport on the environment and the transport system's vulnerability to climate change is minimised.

Objective 5: Land Use Integration - Transport and land use are integrated to support well connected communities that promote a strong regional economy and liveable region.

The RLTP includes aspirational targets intended to signal the desire to drive change in certain areas of the regional transport system. These targets are:

Mode share: 15% of travel in the region to be active and public transport modes by 2030.

Safety: 40% reduction in deaths and serious injuries on the region's roads by 2030.

Resilience: 20% reduction in road closures on priority routes associated with natural hazards or unplanned events.

Carbon emissions: 30% reduction in regional carbon emissions from land transport by 2030.

Horizons Regional Public Transport Plan 2015-2025 (RPTP)

The following objectives apply to all public transport service units, taxi services and shuttle services that Horizons provides financial assistance to:

a. A reliable, integrated, accessible and sustainable public transport system;
b. An effective procurement system that delivers the desired public transport services;
c. A safe and accessible network of supporting infrastructure; and
d. Increasing patronage.

Palmerston North Transport Plan: Strategic Transport Chapter 2021-2031 (PNTP)

The purpose of the PNTP Strategic Transport Chapter is to provide transport infrastructure that supports day-to-day city activity and city growth in ways that integrate active and public transport. Desired outcomes of the PNTP and as relevant to this Proposed Plan Change include:

a. Palmerston North has an integrated transport network with clear priorities for all users based around place and movement principles.
b. The Palmerston North Integrated Transport Initiative (PNITI)/ Regional Freight Ring Road to be completed.
c. Palmerston North has safe streets, with zero deaths or serious injuries.
d. The urban network supports amenity outcomes, prioritises active and public transport, and directs freight to the Regional Freight Ring Road.
e. There is timely provision of transport infrastructure to support city growth and economic development opportunities.
f. Speed limits and traffic speeds are appropriate for the conditions throughout the transport network.
g. Street design is responsive to land-use, place and movement.
h. More people choose modes of transport other than motor vehicles.
i. New growth areas have well-connected, multi-modal streets.
j. Roads are designed to minimise long-term financial liabilities.

Palmerston North Transport Plan: Active and Public Transport Chapter 2021-2031 (PNTP)

The purpose of the PNTP Active and Public Transport Chapter is to increase the availability and uptake of active and public transport options. Desired outcomes relevant to this Proposed Plan Change include:

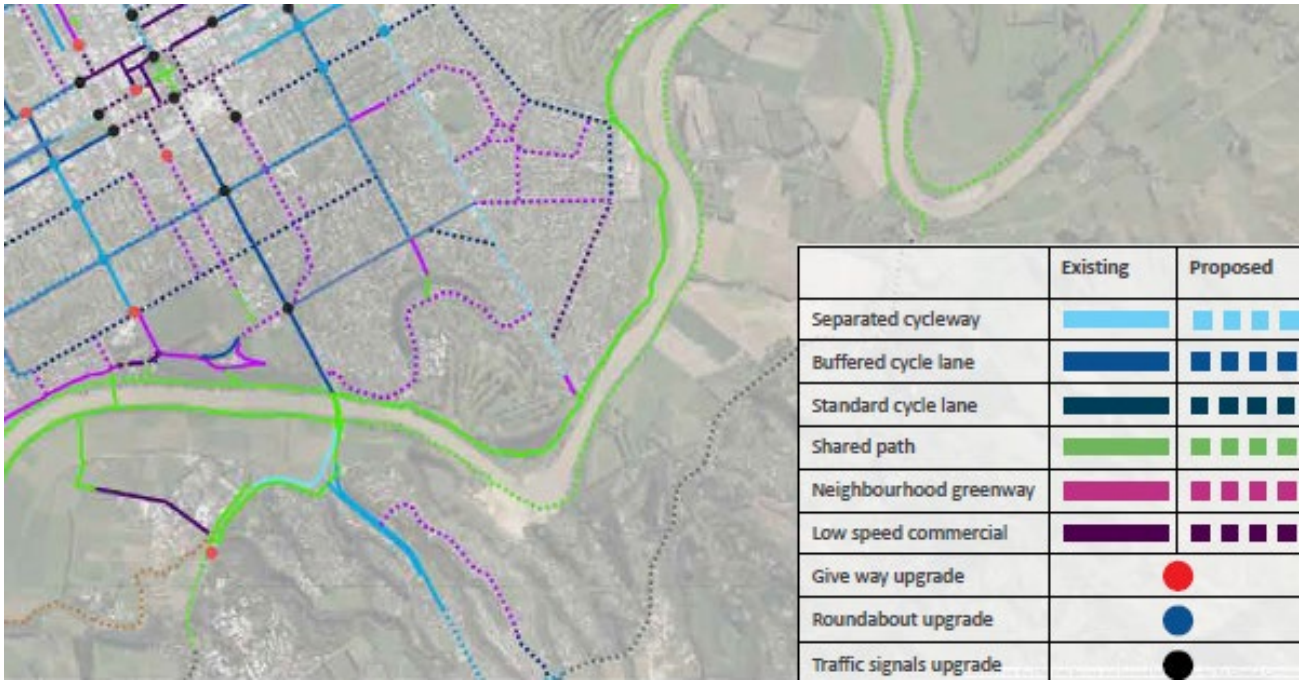
a. An integrated multi-modal transport network that connects people with destinations and place.
b. The transport network prioritises walking and cycling alongside other modes.
c. Active transport participation is increased to 15% of all journeys by 2024, to 20% by 2027; and to 30% by 2030.
d. There is increased investment in active and public transport as a proportion of the transport budget.

e. Active and public transport are genuine mode choices.
f. There is a significant mode-shift to active and public transport.
g. There are zero deaths and serious injuries from active and public transport.
h. The city has a strong cycling culture.
i. Walking and cycling journeys are safe and positive experiences.
j. An active transport network provides for commuting and recreational users.
k. People choose transport modes that reduce carbon emissions.
l. Space is prioritised within the transport network for active and public transport.
m. Traffic speeds are reduced through street design and speed limit bylaws to encourage the use of active and public transport and keep users safe.
n. There is increased investment in active and public transport.

Palmerston North Urban Cycle Network Masterplan 2019

The vision for the Urban Cycle Network Masterplan is that the Urban Cycle Network investment results in an environment and culture change that enables more people in Palmerston North to choose cycling more often.

The figure below is an extract from a diagram in the masterplan which shows urban cycle network opportunities.



Key features of this diagram are:

- The existing provision of connected cycle facilities along Summerhill Drive across the bridge and along Fitzherbert Avenue towards the city centre; and
- The proposed cycle provisions along the Ruapehu Drive corridor from Aokautere Drive to Summerhill Drive.

The Masterplan recognises four main challenges in delivering the desired outcomes, being:

- Limited funding;

- Competing needs for road width at intersections;
- Vehicle speeds deterring cyclists; and
- Balancing the uses of streets, in particular challenges with effects on on-street parking.

Palmerston North City District Plan (District Plan)

The Land Transport section of the District Plan includes the following objectives and policies that apply to the Proposed Plan Change:

Objective 1 - The City's land transport networks are maintained and developed to ensure that people and goods move safely and efficiently through and within the City.

Policy 1.1 - Identify and apply the roading hierarchy to ensure the function of each road in the City is recognized and protected in the management of land use, development and the subdivision of land.

Policy 1.2 - All roads in the City have function and design characteristics consistent with their place in the roading hierarchy.

Policy 1.3 - Maintain and upgrade the existing roads in the City and provide for new roads to meet the current and future needs of the City.

Policy 1.5 - Require all new public roads, private roads and vehicle accesses to be designed and constructed to meet performance standards relating to the safety and efficiency of vehicle movement, and to ensure the safe use of the road transport network for all users.

Policy 1.6 - Encourage the development of safe and accessible pedestrian paths and cycleways, as well as convenient and accessible cycle parking, to support the opportunity for people to use active and non-vehicular modes of transport throughout the City.

Policy 1.7 - To support and encourage the provision of public transport and its use throughout the City as an integral part of the transportation system.

Objective 2 - The land transport network is safe, convenient and efficient while avoiding, remedying or mitigating adverse effects in a way that maintains the health and safety of people and communities, and the amenity values and character of the City's environment.

Policy 2.1 - To restrict the through movement of traffic where the movement has adverse visual, noise and safety effects on adjoining areas by using the roading hierarchy to direct higher volume and heavy traffic movements on identified arterial routes and discouraging this traffic from other areas, such as residential areas.

Policy 2.2 - To avoid, remedy or mitigate the impact of roads and parking areas on visual amenity values of the community by requiring the provision of landscaping.

Policy 2.4 - Avoid adverse effects on amenity and character by ensuring that new roads are well designed and visually complement the character of the surrounding areas.

Objective 3 - The safety and efficiency of the land transport network is protected from the adverse effects of land use, development and subdivision activities.

Policy 3.1 - Avoid, remedy or mitigate the adverse effects of increased traffic or changes in traffic type, which would compromise the safe and efficient operation of any road or level crossing, or the safe and convenient movement of pedestrians and cyclists on roads or at level crossings.

Policy 3.2 - Require vehicle crossing places and vehicle entrances from public roads to be located, constructed, and maintained to standards appropriate to the expected traffic volume, pedestrian movement and speed environment of each road.

Policy 3.3 - Ensure that buildings and activities do not compromise land transport network safety, including maintaining the necessary clear sight lines for road vehicles at level crossings and road intersections.

Palmerston North 10 Year Plan 2021-2031

The current 10 Year Plan includes the following new capital projects which are relevant to the Proposed Plan Change:

Roading

- Road to Zero – Transport Safety Improvements
- PNITI
  - Intersection & Bridge Improvements
  - Strategic Transport Corridor Improvements
  - Urban Transport Projects Enabling PNITI

Active and Public Transport

- City-wide – Urban Cycle Infrastructure Network Improvements
- Urban Cycle Network Development
- City-wide – Cycle Phases at Intersections
- Summerhill Drive – Pedestrian and Cyclist Improvements
- City-wide – Off Road Shared Path Network Improvements
- City-wide – Footpath Improvements
- City-wide – Public transport Infrastructure Improvements
- City-wide – Supporting Cycle Infrastructure Improvements
- Regional Shared Path Network Improvements
- Summerhill Drive – On-street Parking Infrastructure

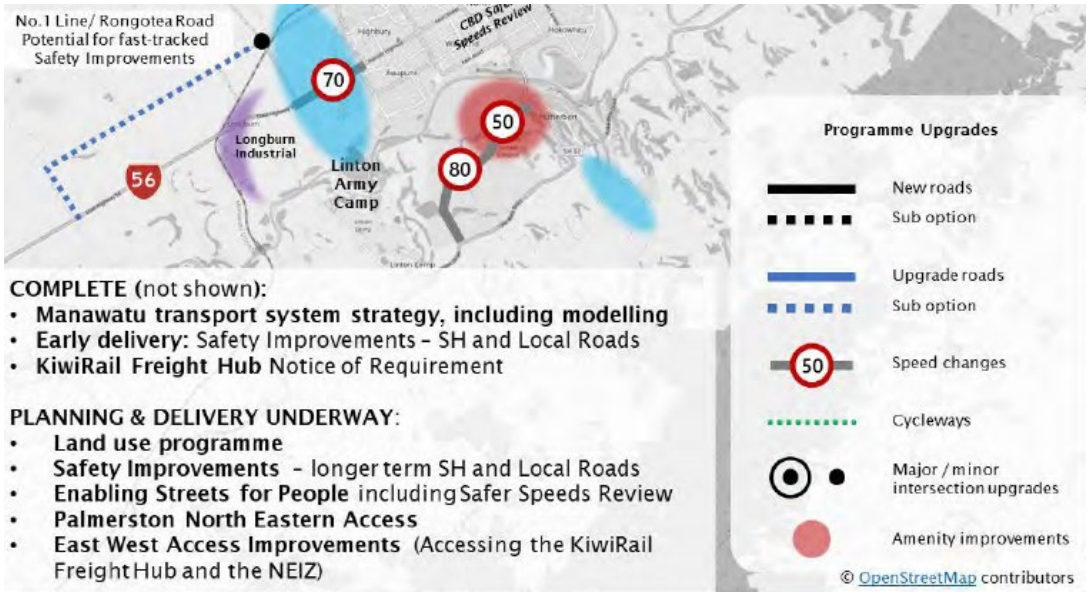
Palmerston North Integrated Transport Initiative (PNITI) Network Options Report January 2021

The PNITI Report prepared by Waka Kotahi includes a suite of programmes divided into short, medium and longer term projects. The report indicates that the full programme could potentially be delivered by around 2030. The works are intended achieve the following:

- Reduce freight movements on residential and place-based streets by up to 50%;
- Support and enable Urban Cycling Masterplan initiatives and investments….:
- Reduce the number of congested intersections by 50% and improve journey times on key freight routes by up to 10 minutes;

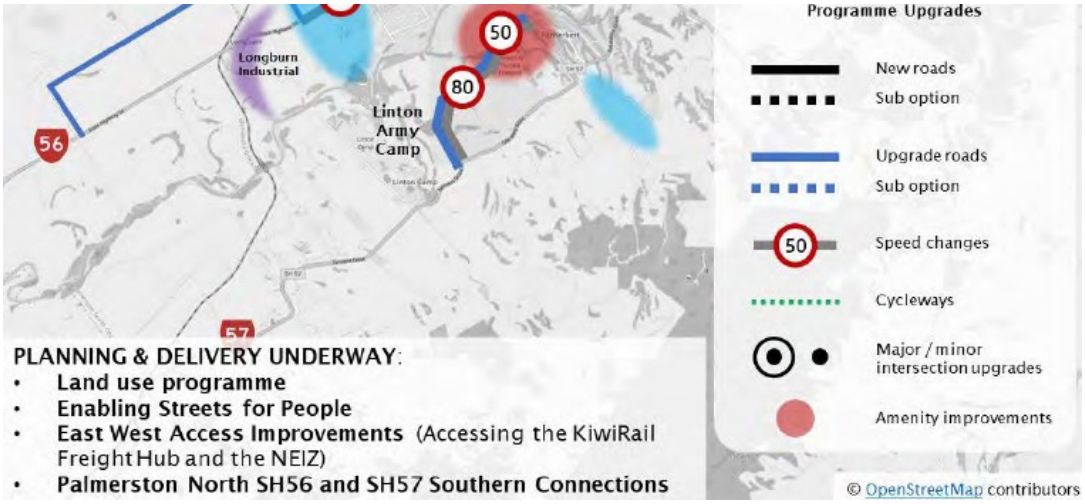
- Reduce deaths and serious injuries by 35-40% across the rural freight network;
- Support economic development…; and
- Improves safety and access for new housing developments at Whakarongo, Aokautere and City West.

The Short Term projects in the vicinity of Aokautere are shown in Figure 0-1 of the PNITI report. An extract is included below. The projects include speed limit and amenity improvements on Tennent Drive between SH57 and the Fitzherbert Bridge.



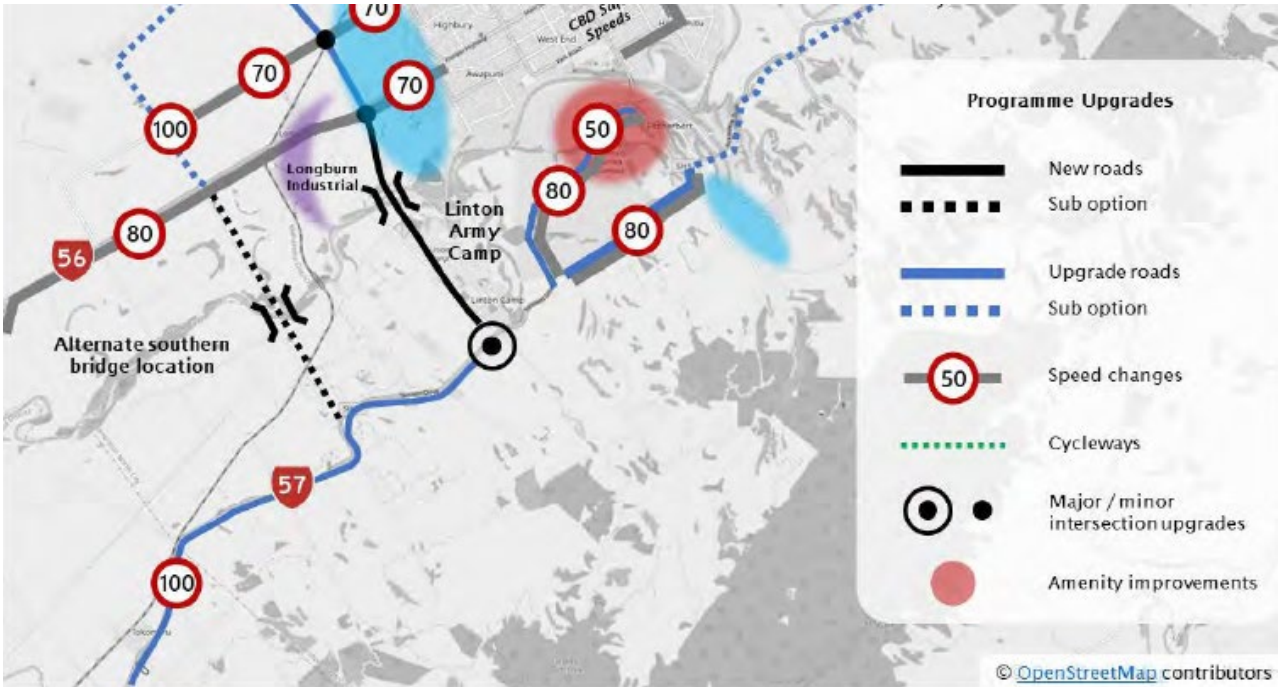
PNITI Short Term Works

The Medium Term projects in the vicinity of Aokautere are shown in Figure 0-2 of the PNITI report. An extract is included below. Road upgrades are shown along Tenent Drive between SH57 and the Fitzherbert Bridge.



PNITI Medium Term Works

The Longer Term projects in the vicinity of Aokautere are shown in Figure 0-3 of the PNITI report, an extract is included below.



PNITI Longer Term Works

The Longer Term projects include a new road bridge and associated roading connecting SH57 and SH56 to the wets of the city, upgrades and speed limit changes on SH57 between Tennent Drive and Summerhill Drive and a sub option of upgrading SH57 Aokautere Drive to the east of Summerhill Drive.

Project Number: 5-P1569.CT

Aokautere Plan Change G SSA

Schematic Level Safe System Audit

4 August 2023

wsp

150 YEARS IN AOTEAROA

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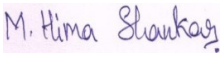

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Document History and Status

Revision	Date	Author	Reviewed by	Approved by	Status
V1	20/06/2023	HM	CM	MP	Final
V2	03/08/2023	HM	Harriet Fraser	MP	Final

Revision Details

Revision	Details
V1	Issued for client only
V2	Issued for client use in Plan Change evidence

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Disclaimers and Limitations

This report ('**Report**') has been prepared by WSP exclusively for Palmerston North City Council ('**Client**') in relation to Proposed Plan Change G in Aokautere, Palmerston North ('**Purpose**') and in accordance with the Design Panel Contract. The findings in this Report are based on and are subject to the assumptions specified in the Report and Offer of Service dated 30 April 2023. WSP accepts no liability whatsoever for any reliance on or use of this Report, in whole or in part, for any use or purpose other than the Purpose or any use or reliance on the Report by any third party.

In preparing the Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('**Client Data'**) provided by or on behalf of the Client. Except as otherwise stated in the Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable in relation to incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented, or otherwise not fully disclosed to WSP.

The findings and recommendations in the Report are based on an examination of the available relevant plans, the specified road and its environs, and the opinions of the Safe System Audit Team. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safe System audits do not constitute a design review nor an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the Safe System Audit Team or their organisations.

1 Safe System Auditing for Transport Projects

A Safe System audit is an independent review of a future transport project to identify any safety concerns that may affect the safety performance and alignment to a Safe System. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A Safe System audit is therefore a formal examination of a transport project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc), carried out by an independent competent team who identify and document Safe System alignment and road safety concerns.

A Safe System audit is intended to help deliver a safe road system and is not a review of compliance with standards.

1.1 Safe System Audit Procedure

The primary objective of a Safe System audit is to deliver a project that achieves an outcome consistent with the Safe System approach, that is, minimisation of death and serious injury. The Safe System audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a Safe System audit is summarised as:

> *To deliver completed projects that contribute towards a Safe System by identifying and ranking potential safety concerns for all road users and others affected by a transport project.*

A Safe System audit should be undertaken at project milestones such as:

- Concept Stage (part of Business Case);
- Scheme or Preliminary Design Stage (part of Pre-Implementation);
- Detailed Design Stage (Pre-implementation / Implementation); and
- Pre-Opening / Post-Construction Stage (Implementation / Post-Implementation).

A Safe System audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines.

Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the design team on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the *"Waka Kotahi NZ Transport Agency Safe System Audit Guidelines"* the audit report should be submitted to the client who will instruct the design team to respond. The design team should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the design team to make the necessary changes and/or additions. As a result of this instruction the design team shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the Safe System audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the design team, safety engineer and client for each issue documenting the design team's response, client decision and action taken.

A copy of the report including the design team's response to the client and the client's decision on each recommendation shall be given to the Safe System audit team leader as part of the important feedback loop. The Safe System audit team leader will disseminate this to team members.

1.2 Report Format

The potential road safety problems identified have been ranked as follows:

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Safety concern risk rating matrix below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

		Severity outcome				
		Non-injury	**Minor**		**Serious**	**Fatal**
		Property damage only (PDO)	Injury which is not 'serious' but requires first aid, or which causes discomfort or pain to the person injured.	**Safe System injury threshold**	Injury (fracture, concussion, severe cuts, or other injury) requiring medical treatment or removal to and retention in hospital.	A death occurring as the result of injuries sustained in a road crash within 30 days of the crash.
Probability of a crash	**Very likely** (One per year)	Minor	Moderate		Serious	Serious
	Likely (1 to 3 years)	Minor	Moderate		Serious	Serious
	Unlikely (3 to 7 years)	Minor	Minor		Significant	Serious
	Very unlikely (7 years +)	Minor	Minor		Significant	Significant

Figure 1: Safety concern risk rating matrix.

2 Safe System Audit Details

2.1 Type of Audit

Scheme or Preliminary Design Level Safe System Audit

2.2 Audit Team

The Safe System Audit Team (SSAT) is made up of the following members:

- Mercia Prinsloo, Senior Transportation Engineer, WSP – Safety Audit Reviewer
- Hima Madasu, Transport Engineer, WSP – Safety Audit Team Member
- Catherine Mills, Senior Engineer Transport, WSP – Safety Audit Team Leader

2.3 Meetings and Site Inspections

A briefing meeting was held on May 12, 2023, at 10 am. We discussed an overview of the outcomes of the Safe System Assessment and Road Safety Audit. During this meeting, it was identified that the proposed plan change would have more than a minor effect on the northern intersection of Ruapehu Drive and Summerhill Drive, which was not originally included in the scope of the SSA. As a result, the SSA scope was amended to include the additional intersection as a variation, and a second inspection was conducted.

The debriefing meeting was held with the following people present:

- SSAT Team
- Anita (Kahu Enviro Ltd)
- Harriet Fraser (Harriet Fraser Transport Specialist)
- Michael Duindam (Principal Planner at PNCC)

A second meeting was also held between Catherine and Harriet on the evening of Monday, May 15, 2023, to review the Safe System Assessments together.

The first site visits for the day and night audits took place on March 30, 2023, between 1:00 pm and 3:00 pm and between 8:00 pm and 10:00 pm, respectively. The site visit for the day and night audits for the variation scope was conducted on June 14, 2023, between 10:30 am and 12:00 pm and between 6:00 pm and 8:00 pm, respectively.

3 Project Description

3.1 Project Background and Objective

Aokautere is a suburb on the south of Palmerston North. To support the growth of residential development, Plan Change G is proposed to guide future growth and urban development in the Palmerston North District Plan. As shown in Figure 2, Plan Change G seeks to rezone a new greenfield growth area in Aokautere for residential development. It is anticipated that the plan change area could accommodate up to a further 1,020 residential lots, and a suburban (local business) centre.

Figure 2: Aokautere Development Area

As part of the Plan Change Process, a Traffic Impact Assessment (TIA) was completed. To support the TIA and the application, council are now seeking the outcome of a Safe System Assessment where the TIA identified more than minor effects on the transport network adjacent to the plan change. This includes SH57 Aokautere Drive between Turitea Road and Johnstone Drive, and the intersection of Summerhill Drive and Ruapehu Drive.

There are several projects we have considered in our SSA with respect to performance of this corridor in both the existing and future transport network:

- School on Ruapehu Drive
- The Urban Cycle Network Masterplan includes the vision of enabling more people to choose cycling more often. Key features of the Masterplan local to Aokautere are:
    - The existing provision of connected cycle facilities along Summerhill Drive across the bridge and along Fitzherbert Avenue towards the city centre; and
    - The proposed cycle provisions along the Ruapehu Drive corridor from Aokautere Drive to Summerhill Drive

3.2 Existing Conditions and Context

Aokautere is located on the southern edge of the city, to the south of SH57 Aokautere Drive and to the east of Turitea Road. The area currently connects with the external road network at the intersections of each of Pacific Drive and Johnstone Drive with SH57 Aokautere Drive. The northern and southern sections of Johnstone Drive have recently been connected, and the link has been vested in Council. Summerhill Drive is a primary access point to the city, with most of the existing traffic from this area traveling to and from the direction of the city via Summerhill Drive and the Fitzherbert Bridge.

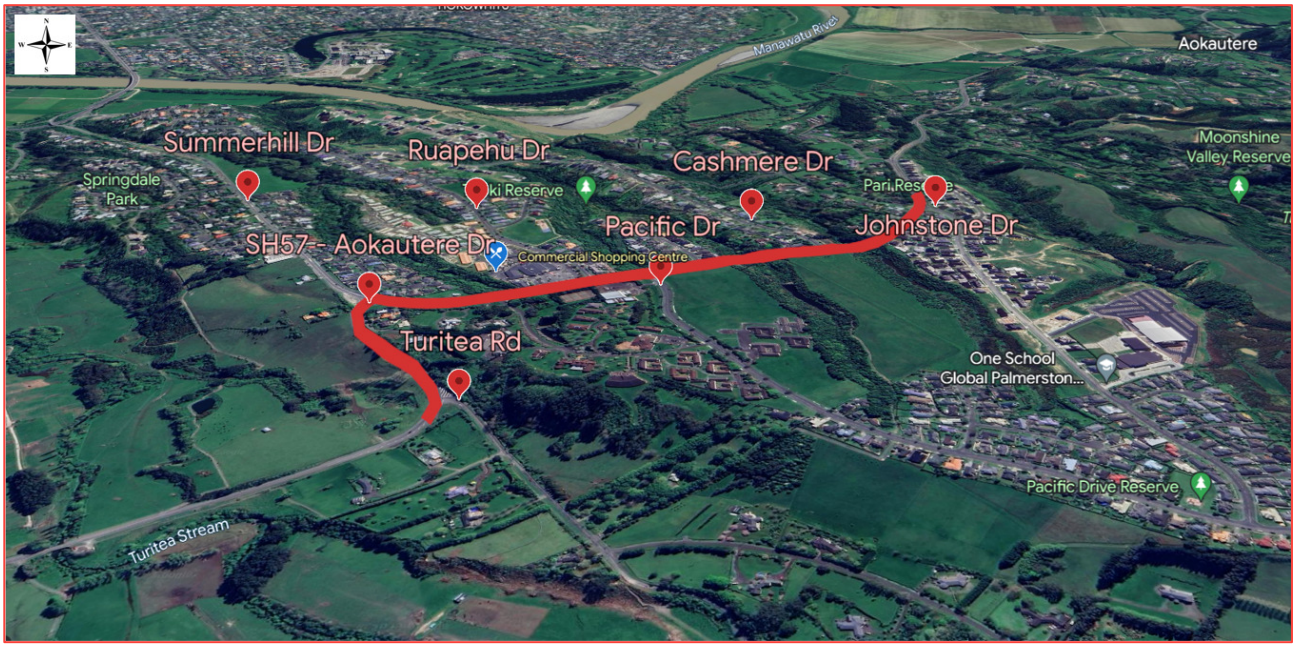

Figure 3: Project Scope on Aokautere Drive SH57

There are currently around 592 existing suburban lots (496 houses) within the area served by Pacific and Johnstone Drives. These roads also provide access to the International Pacific College, the IPU Tertiary Institute NZ, and the One School Global Palmerston North. It is anticipated that the area could accommodate up to a further 1,020 residential lots and a suburban (local business) centre as part of Plan Change G.

The existing and future local traffic characteristics are summarised in Table 1 and Table 2.

Table 1: Summary of existing traffic characteristics

Road Name	AADT[1]	ONF Classification	Posted Speed Limit (km/h)	MegaMaps[2] Data	
				Operating Speed (km/h)	Safe and Appropriate Speed (SaAS) (km/h)
SH57 Old West Rd	2,943 (14.8% HV)	Interregional Connectors	100	75	80
Turitea Rd	1,527 (8% HV)	Peri-Urban Road	80	62	60
SH57 Aokautere Dr	12,705 (4.7% HV)	Peri-Urban Road	70	72	80
Summerhill Dr	11,546 (7% HV)	Urban Connector	60	60	40
Ruapehu Dr	824 (7% HV)	Activity Street	50	37	30
Pacific Dr	2,957 (6% HV)	Urban Connector	50	44	40
Silkwood Pl	145 (3% HV)	Local Street	50	22	30
Cashmere Dr	881 (4% HV)	Local Street	50	35	30
Johnstone Dr	426 (17% HV)	Urban Connector	50	38	40

Table 2: Summary of future traffic characteristics with Plan Change G[3]

Road Name	Vehicles Per Day
SH57 Old West Rd	3,500
Turitea Rd	2,000
SH57 Aokautere Dr	20,000
Summerhill Dr	20,000
Ruapehu Dr	1,500
Pacific Dr	8,500
Johnstone Dr	2,500

[1] Mobileroads.org
[2] https://maphub.nzta.govt.nz/megamaps
[3] appendix-5-transport-assessment-proposed-plan-change-g-notification-version-2022

3.3 Crash History

CAS has records of 25 crashes for the 10-year period between 2013 and 2022, as well as crashes reported up to the present time in 2023. Of these 25 crashes, there has been no fatalities, one serious injury, 12 minor injuries and 15 non-injury crashes. Of the 13 injuries, 11 occurred at intersections, while two took place on the SH57 midblock between Turitea Road and Johnstone Drive.

The collision diagram and a tabulation of key statistics are shown below.

Table 3: Summary of Crash History

Movement Group	Injuries
Bend- Lost Control/ Head on	3
Crossing/ Turning	7
Read End/ Obstruction	2
Straight-Lost Control/Head on	1
TOTAL	**13**

Road users	Injuries
Cyclists	4
Drivers	6
Motorcyclists	1
Passengers	2
TOTAL	**13**

Natural Light Conditions	Crashes
Light/overcast	22 (88%)
Dark/twilight	2 (8%)
Unknown	1 (4%)
TOTAL	**25**

Road Surface Conditions	Crashes
Dry	21 (84%)
Wet	3 (12%)
Null	1 (4%)
TOTAL	**25**

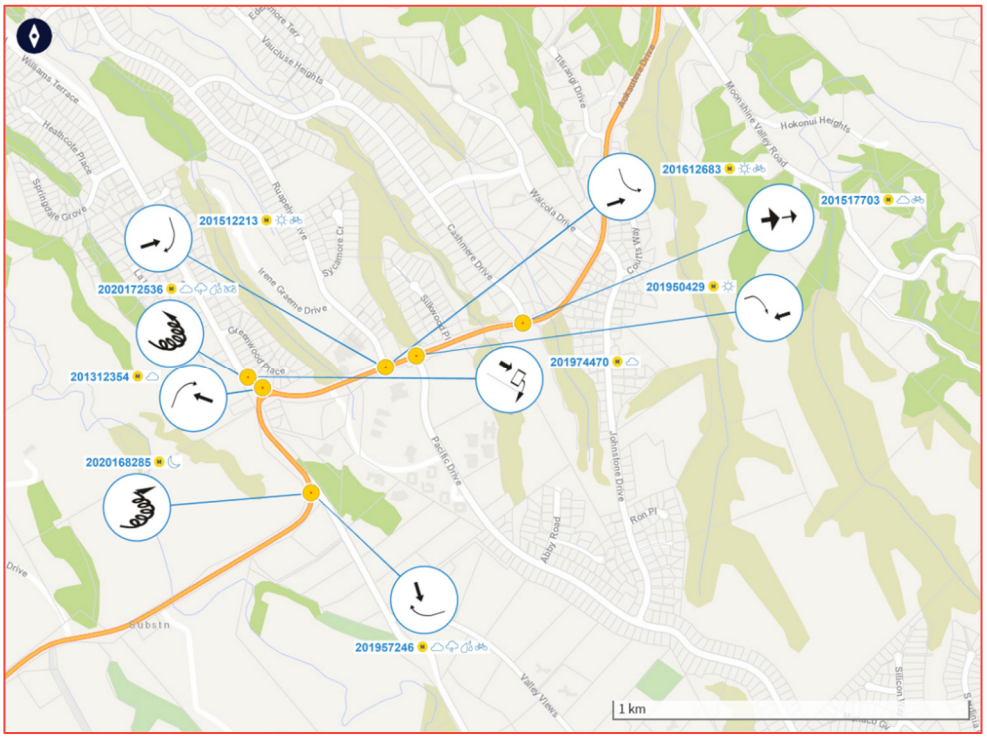

Figure 4: Collision Diagram for injury crashes on SH57.

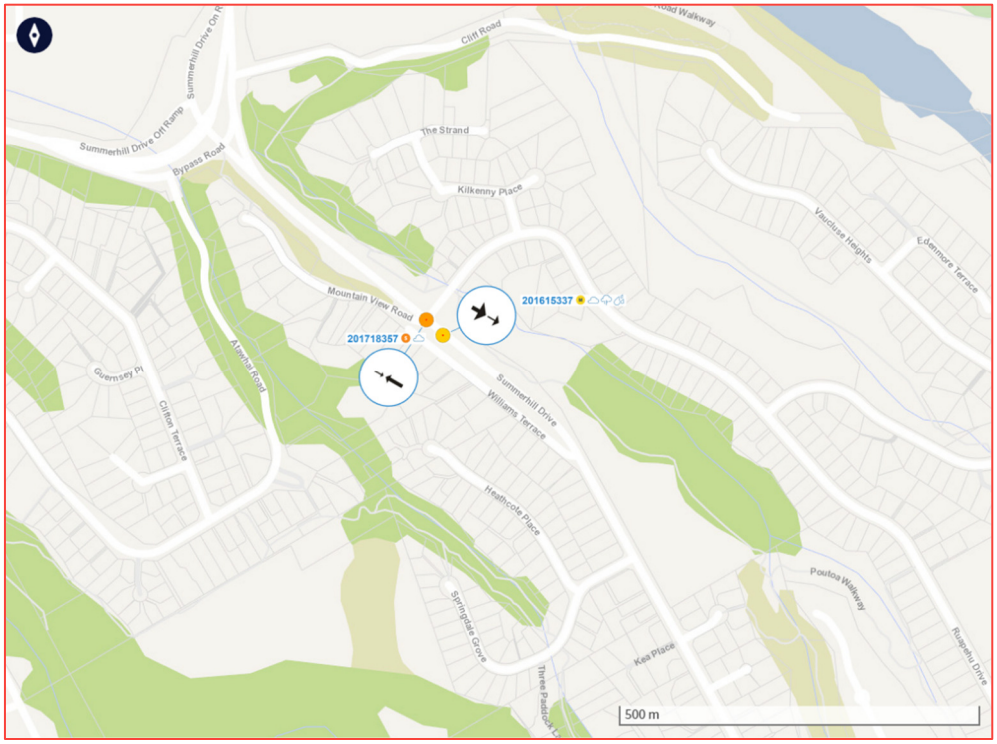

Figure 5: Collision Diagram for injury crashes at Ruapehu Dr and Summerhill Dr intersection.

3.4 Proposed Works

The Palmerston North City Council (PNCC) has requested high-level Safe System Assessments to support the proposed Plan Change G. Since there are no concept designs available for the proposed solutions yet, this will be a schematic-level audit.

The Safety Review portion of the Safe System Audit (Section 5 of the audit report) will only assess the existing infrastructure of the affected corridor.

High-level Safe System Assessments have been undertaken for all the options for existing conditions and future growth, as detailed in the Offer of Service. Few assumptions were made based on the TCD Manual Part 4[4] to assess the options for typical roundabout and signalised intersection layouts. The assessment also includes infrastructure for cyclists and pedestrians to meet an acceptable level of service.

The scope is as detailed below:

1. Corridor Assessment (Turitea Road to Johnstone Drive, excluding intersections)

Option 1: Status Quo
Option 2: Reduced speed limit to 50km/h, Separated Cycleway, and the removal of Left- turn Slip lanes.

2. Summerhill Dr/SH57 Intersection

Option 1: Status Quo
Option 2: Traffic Signals with pedestrian and cycle facilities
Option 3: Urban Roundabout

[4] https://www.nzta.govt.nz/assets/consultation/tcd-part-4-traffic-control-devices-used-at-intersections/tcd-part-4-draft-for-consultation-august-2021.pdf

3. Ruapehu Drive/ SH57 Intersection

Option 1: Status Quo
Option 2: Traffic Signals with pedestrian and cycle facilities
Option 3: Urban Roundabout

4. Pacific Drive/SH57 Intersection

Option 1: Status Quo
Option 2: Traffic Signals with pedestrian and cycle facilities
Option 3: Urban Roundabout

5. Johnstone Drive/SH57 Intersection

Option 1: Status Quo
Option 2: Traffic Signals with pedestrian and cycle facilities
Option 3: Urban Roundabout

6. Ruapehu Drive/Summerhill Driver Intersection

Option 1: Status Quo
Option 2: Traffic Signals with pedestrian and cycle facilities
Option 3: Urban Roundabout

3.5 Documents Provided

The SAT has been provided with document of Aokautere Structure Plan Transportation Assessment, prepared by Harriet Fraser Traffic Engineering & Transport Planning.

Since the SSAT was not provided concept designs for the options aside from Status Quo, we have made several assumptions in our assessments of Safe System alignment in section 4 of this report. These assumptions are based on the Transport Assessment and on relevant design guidance, are recorded in our SSA spreadsheets and are available on request.

3.6 Previous Safe System/Road Safety Audit Findings

The SSAT is unaware of any previous Safe System/safety audits undertaken.

4 Assessment of Safe System Alignment

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in the below sections. In addition to the current and proposed design options, each of the options has also been assessed with both current vehicle, pedestrian and cycle volumes, and future volumes factoring in the increased use from the proposed Plan Change. The detailed assessments are presented in Appendix A.

4.1 Project Design Safe System Assessment Summary

4.1.1 Corridor Assessment (Turitea Road to Johnstone Drive, excluding intersections)

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 4, and the scores for each crash type are shown in Figure 6. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future traffic volume scenarios are:

- Status Quo
- Corridor upgrade - reduced speed limit to 50km/h, Separated Cycleway, and the removal of Left- turn Slip lanes.

Table 4: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	166 / 448	N/A
Status Quo with Plan Change	206 / 448	+24%
Corridor Upgrade Current	89 / 448	-47%
Corridor Upgrade with Plan Change	106 / 448	-36%

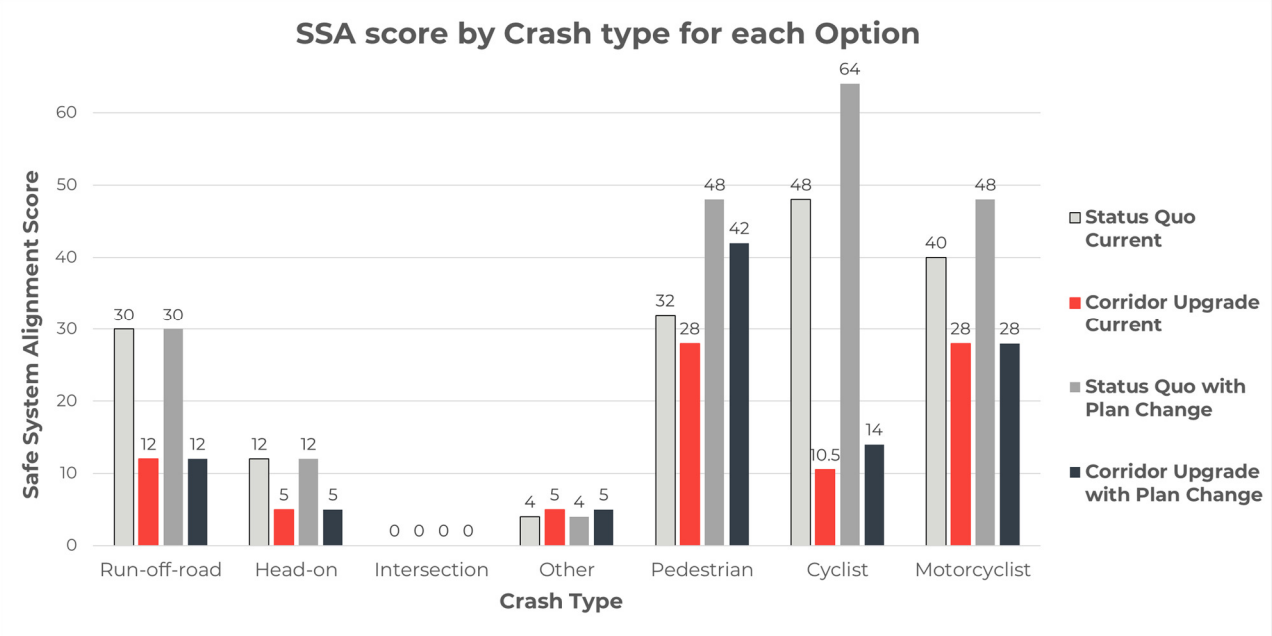

Figure 6: Safe System assessment score summary table for SH57 midblocks.

Without the Corridor Upgrade, we anticipate that the increase in use from the proposed Plan Change would make the SH57 midblocks less safe, particularly for pedestrians and cyclists. If the corridor is upgraded to accommodate increased use from the Plan Change, we anticipate that this would be safer overall for motorcyclists and cyclists, but that there is an increased risk of crashes

involving pedestrians. We suggest the consideration of pedestrian crossing facilities on the midblock at several locations away from intersections to create safe crossing locations. Walking patterns in the area would need to be carefully considered to ensure any crossing facilities in the midblock are cognisant of current and future pedestrian desire lines. Consideration should also be given on how to lower the speed of approaching traffic to the survivability threshold speed of 30km/h for pedestrian vs. vehicle impacts, e.g., by using Raised Safety Platform crossings or other supporting treatments.

4.1.2 Summerhill Drive/SH57 Intersection

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 5, and the scores for each crash type are shown in Figure 7.. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future scenarios are:

- Status Quo Current
- Status Quo with Plan Change
- Traffic Signals (with pedestrian and cycle facilities) Current
- Traffic Signals (with pedestrian and cycle facilities) with Plan Change
- Urban Roundabout (2/1 Alberta) Current
- Urban Roundabout (2/1 Alberta) with Plan Change

Table 5: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	178 / 448	N/A
Status Quo with Plan Change	202 / 448	+13%
Traffic Signals Current	100 / 448	-44%
Traffic Signals with Plan Change	122 / 448	-31%
Urban Roundabout Current	104 / 448	-42%
Urban Roundabout with Plan Change	122 / 448	-31%

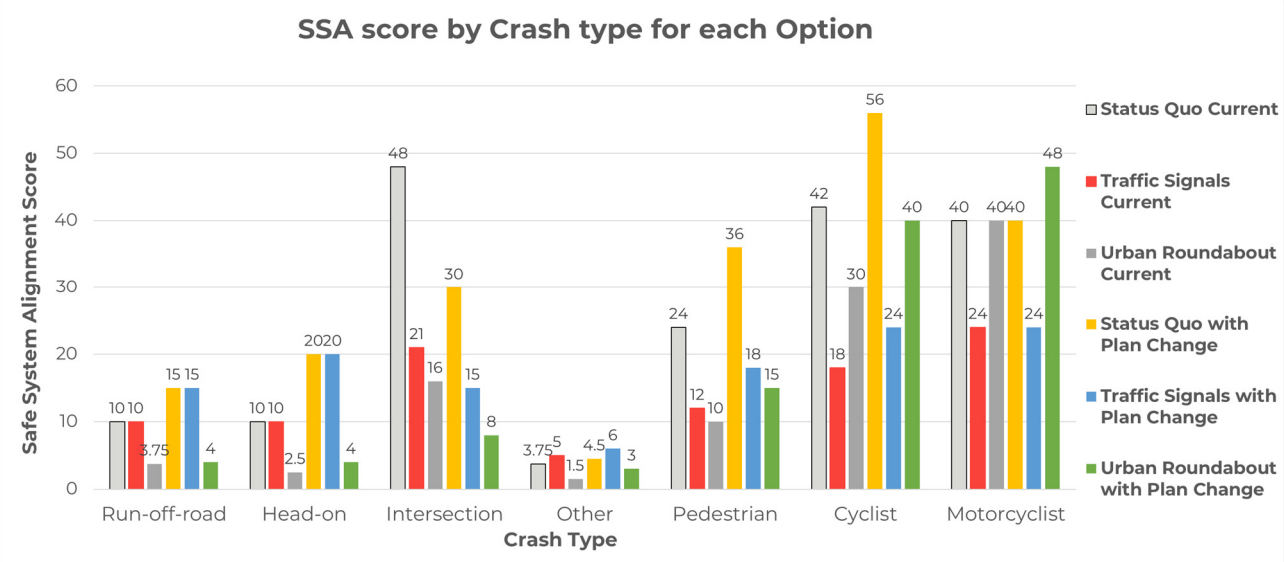

Figure 7: Safe System assessment score summary table for Summerhill Drive/SH57 intersection.

Without upgrading the intersection, we anticipate that the increase in use from the proposed Plan Change would make the intersection less safe for all road users. The urban roundabout and signalised intersection have similar overall safety performance both in the current and Plan

Change scenarios; however, the safety risks are not spread equally amongst different modes of travel. For instance, the roundabout improves safety for intersection crashes involving two or more motorised vehicles; however, it's not as safe as signals for cyclists and motorcyclists. This is because a 2/1-lane Alberta roundabout would be required for capacity reasons, and multilane roundabouts have higher risk of cyclists and motorcyclist not being seen, due to visibility being temporarily obstructed by the presence of other vehicles in the circulating lanes. This is even if separated cycle facilities are provided, as not all cyclists would use these facilities. For this reason, traffic signals may be preferred. The SSA does not include raised safety platforms as one of the design assumptions for traffic signals, and these would considerably improve the safety performance of the signals.

The difference in layout between a single-lane roundabout and a 2/1 lane roundabout are shown in Figure 8 below. The 'Alberta' line marking method involves the placement of roundabout lane lines within the circulating roadway of a roundabout to separate vehicles and guide drivers through the intersection.

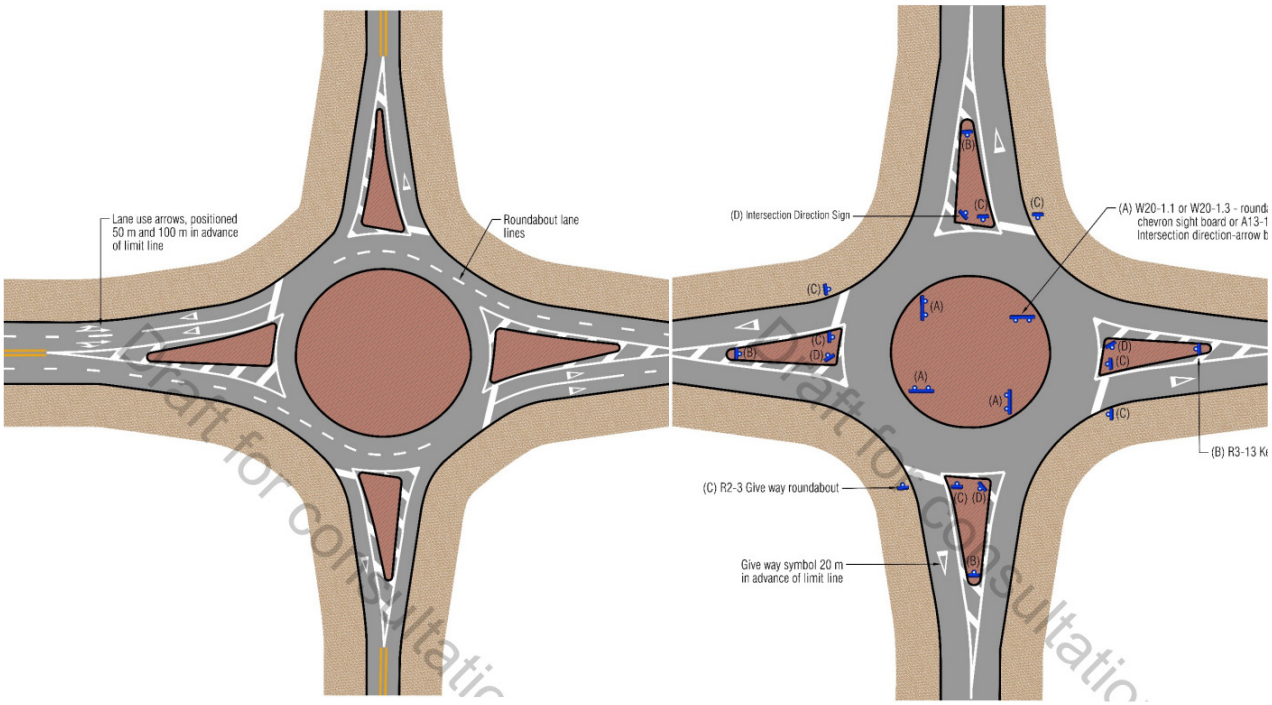

Figure 8: 2/1 lane roundabout with Alberta lane-line markings (left), single-lane roundabout (right), both images from TCD Part 4 (draft).

4.1.3 Ruapehu Drive / SH57 Intersection

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 6, and the scores for each crash type are shown in Figure 9. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future scenarios are:

- Status Quo Current
- Status Quo with Plan Change
- Traffic Signals (with pedestrian and cycle facilities) Current
- Traffic Signals (with pedestrian and cycle facilities) with Plan Change
- Urban Roundabout (single lane) Current
- Urban Roundabout (single lane) with Plan Change

Table 6: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	171 / 448	N/A

Status Quo with Plan Change	222 / 448	+30%
Traffic Signals Current	111 / 448	-35%
Traffic Signals with Plan Change	145 / 448	-15%
Urban Roundabout Current	62 / 448	-64%
Urban Roundabout with Plan Change	85 / 448	-51%

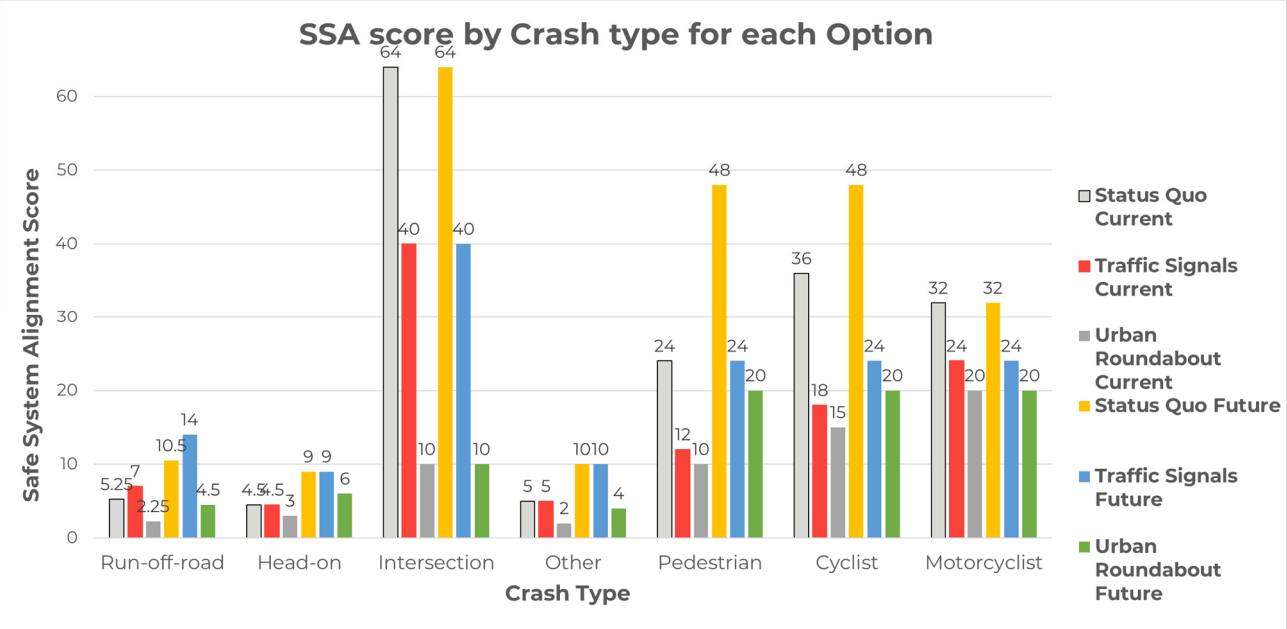

Figure 9: Safe System assessment score summary table for Ruapehu Drive/SH57 intersection.

For this intersection, the urban single lane roundabout provides the safest intersection form for both the current and plan change scenarios. This is because it reduces the risk of intersection crash types by reducing the both the impact speeds (and thus severity) and number of conflict point (thus likelihood), whereas the traffic signals reduce likelihood but not severity so do not score as well. Compared to the SH57/Summerhill Drive intersection, the single-lane urban roundabout does not have the same visibility shadowing issues which can affect motorcyclist and cyclist safety as the Alberta 2/1 roundabout, so the urban roundabout scores better here. The urban roundabout does not score as well for pedestrian safety as the traffic signals. Either raised platform zebra crossings or raised platform signalised crossings would improve pedestrian safety at this intersection.

One potential issue with the SSA methodology is that the proximity of intersections and form of other intersections nearby are unable to be considered as part of the assessment. For instance, Pacific Drive and Ruapehu Drive are in close proximity to each other, and from a network operability and consistency perspective, it would be preferable to have both intersections with signals, or both intersections with roundabouts. There are also potential issues with intersection form related to the from of the adjacent intersection which are unable to be captured in the SSA, e.g. look-through at adjacent sets of traffic signals, and cycle safety at adjacent sets of roundabouts.

4.1.4 Pacific Drive/SH57 Intersection

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 7. The scores for each crash type are shown in Figure 10. The detailed assessments are presented in Appendix A. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future scenarios are:

- Status Quo Current
- Status Quo with Plan Change

- Traffic Signals (with pedestrian and cycle facilities) Current
- Traffic Signals (with pedestrian and cycle facilities) with Plan Change
- Urban Roundabout (single lane) Current
- Urban Roundabout (single lane) with Plan Change

Table 7: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	171 / 448	N/A
Status Quo with Plan Change	214 / 448	+25%
Traffic Signals Current	111 / 448	-35%
Traffic Signals with Plan Change	139 / 448	-19%
Urban Roundabout Current	60 / 448	-65%
Urban Roundabout with Plan Change	82 / 448	-52%

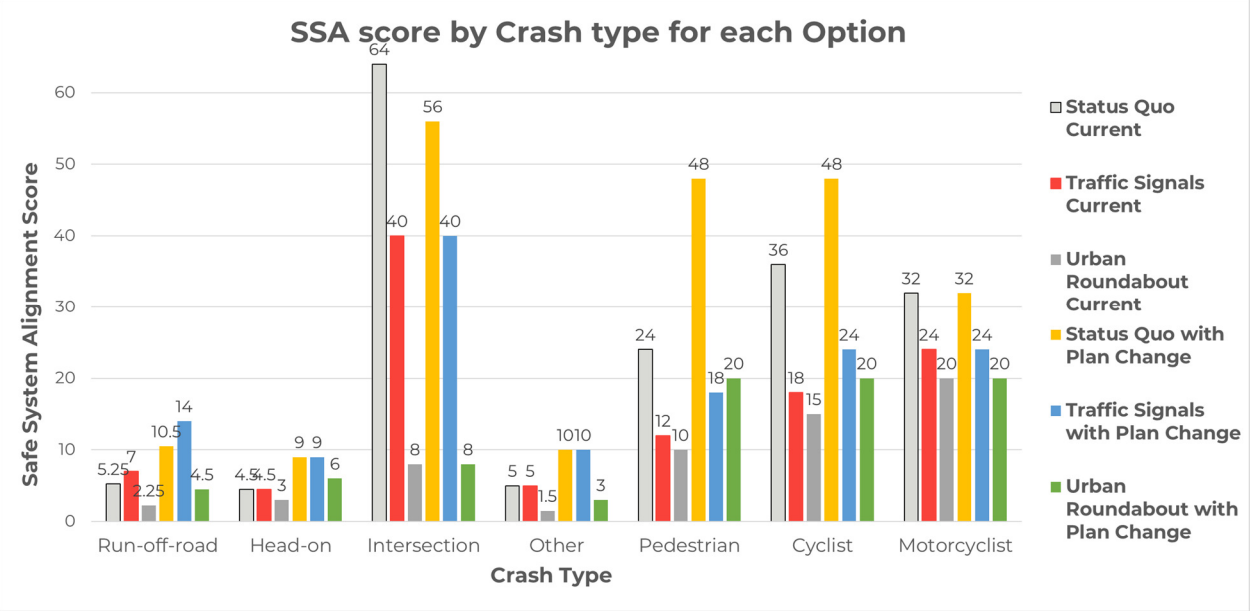

Figure 10: Safe System assessment score summary table for Pacific Drive/SH57 intersection.

For this intersection, the urban single lane roundabout provides the safest intersection form for both the current and plan change scenarios. This is because it reduces the risk of intersection crash types by reducing the both the impact speeds (and thus severity) and number of conflict point (thus likelihood), whereas the traffic signals reduce likelihood but not severity so do not score as well. This intersection scores similarly overall to the Ruapehu Drive intersection and has similar issues of the SSA being unable to consider form and proximity of adjacent intersections.

4.1.5 Johnstone Drive/SH57 Intersection

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 8: Safe System assessment score summary table.. The scores for each crash type are shown in Figure 11. The detailed assessments are presented in Appendix A. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future scenarios are:

- Status Quo Current
- Status Quo with Plan Change
- Traffic Signals (with pedestrian and cycle facilities) Current

- Traffic Signals (with pedestrian and cycle facilities) with Plan Change
- Urban Roundabout (single lane) Current
- Urban Roundabout (single lane) with Plan Change

Table 8: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	179 / 448	N/A
Status Quo with Plan Change	232 / 448	+30%
Traffic Signals Current	133 / 448	-26%
Traffic Signals with Plan Change	145 / 448	-19%
Urban Roundabout Current	65 / 448	-64%
Urban Roundabout with Plan Change	87 / 448	-52%

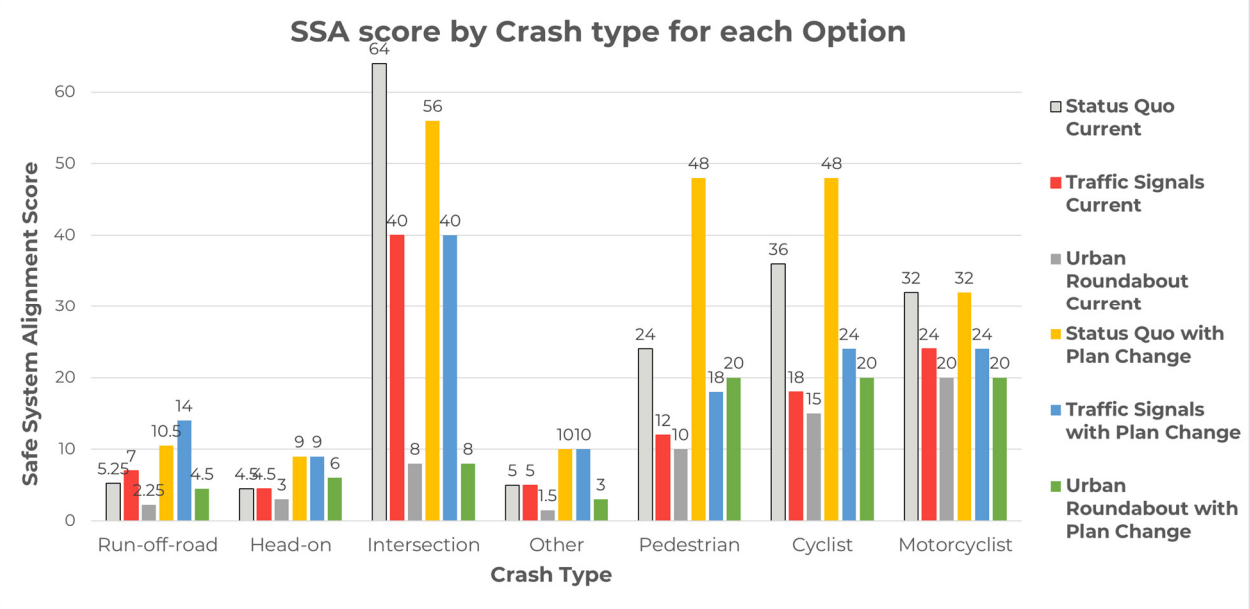

Figure 11: Safe System assessment score summary table for Johnstone Drive/SH57 intersection.

For this intersection, the urban single lane roundabout provides the safest intersection form for both the current and plan change scenarios. This is because it reduces the risk of intersection crash types by reducing the both the impact speeds (and thus severity) and number of conflict point (thus likelihood), whereas the traffic signals reduce likelihood but not severity so do not score as well. Compared to the SH57/Pacific Drive intersection, this intersection does not score quite as well for many of the options due to the higher-speed approach on SH57, which transitions from an urban to a rural environment on the northern approach to the intersection. This results in slightly higher severity scores across the board. The severity of all crashes at this intersection could be managed through the implementation of a speed reduction treatment on approach to the intersection, e.g. threshold signs.

4.1.6 Ruapehu Drive / Summerhill Drive Intersection

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 9. The scores for each crash type are shown in Figure 12. The detailed assessments are presented in Appendix A. The lower the score, the better the alignment with Safe System principles. The design options considered for current and future scenarios are:

- Status Quo Current

- Status Quo with Plan Change
- Traffic Signals (with pedestrian and cycle facilities) Current
- Traffic Signals (with pedestrian and cycle facilities) with Plan Change
- Urban Roundabout (single lane) Current
- Urban Roundabout (single lane) with Plan Change

Table 9: Safe System assessment score summary table.

Option	Score	Reduction From Existing
Status Quo Current	168 / 448	N/A
Status Quo with Plan Change	223 / 448	+33%
Traffic Signals Current	64 / 448	-62%
Traffic Signals with Plan Change	86 / 448	-49%
Urban Roundabout Current	61 / 448	-64%
Urban Roundabout with Plan Change	80 / 448	-52%

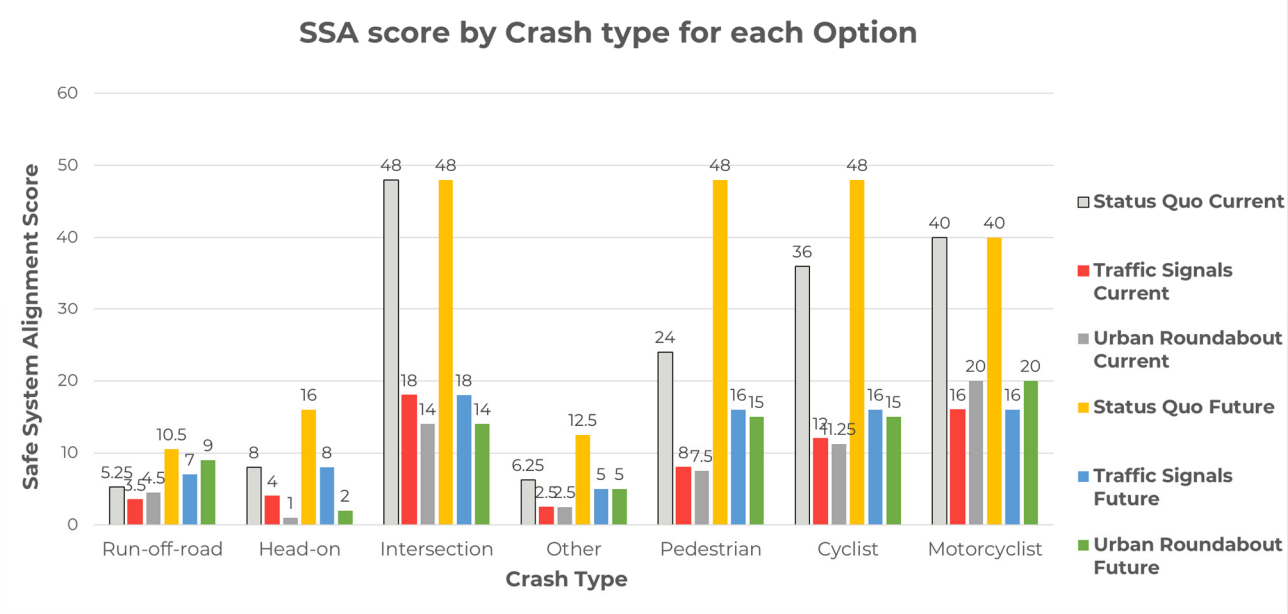

Figure 12: Safe System assessment score summary table for the Ruapehu Drive / Summerhill Drive intersection.

For this intersection, the traffic signals provide the safest intersection form for both the current and plan change scenarios. Compared to most of the other intersections where a single-lane urban roundabout is preferred, traffic signals here perform slightly better because of the lower speed limit and operating speeds, and because the gradient of Summerhill Drive means the roundabout would have unusual / sloped geometry leading to more loss of control crashes and motorcycle crashes. The safety of the traffic signals could be further improved by installing raised safety platforms.

4.2 Treatments to Improve Safe System Alignment

Table 10 and Table 11 list treatments that will improve the Safe System alignment of the project.

Primary treatments are those measures that have the potential to eliminate or come close to eliminating the risk of fatal and serious injury (FSI) crashes.

Supporting treatments are effective in reducing the risk of FSI crashes but not to the extent of a primary treatment (i.e., there is a residual moderate or significant FSI crash risk). Implementation of a primary treatment should be given priority over a supporting treatment that may be targeting a similar crash risk.

Table 10: Primary Treatments.

Treatments for consideration	Project response
Raised table intersections if/where signals are progressed	
Raised safety platforms at all pedestrian and cyclist crossing locations/desire lines (intersections and midblock) on both SH57 and local roads.	
Roadside barriers to protect roadside hazards	

Table 11: Supporting Treatments.

Treatments for consideration	Project response
Midblock crossing facilities to accommodate pedestrian desire lines – refuges, signals or zebra crossing.	
Speed threshold treatment on SH57 northeast of Johnstone Drive	
Static speed camera or Electronic Speed Warning Sign (Speed indicator device) on SH57 between Pacific Drive and Johnstone Drive.	

5 Safety Concerns

5.1 Operating speeds in relation to survivability threshold speeds

5.1.1 Project extents *Serious Concern*

The operating speeds within the project extents are greater than the survivability threshold speeds for the types of impacts we would anticipate given the road users present and the existing infrastructure. Figure 13 below shows the survivability threshold speeds for different types of impacts. The survivability threshold is the impact speed where the risk of death or serious injury surpasses 10% for a given impact type, i.e. for a side impact at 50km/h there is a 10% risk of death or serious injury, and for a side impact at 100km/h there is an 80% risk of death or serious injury.

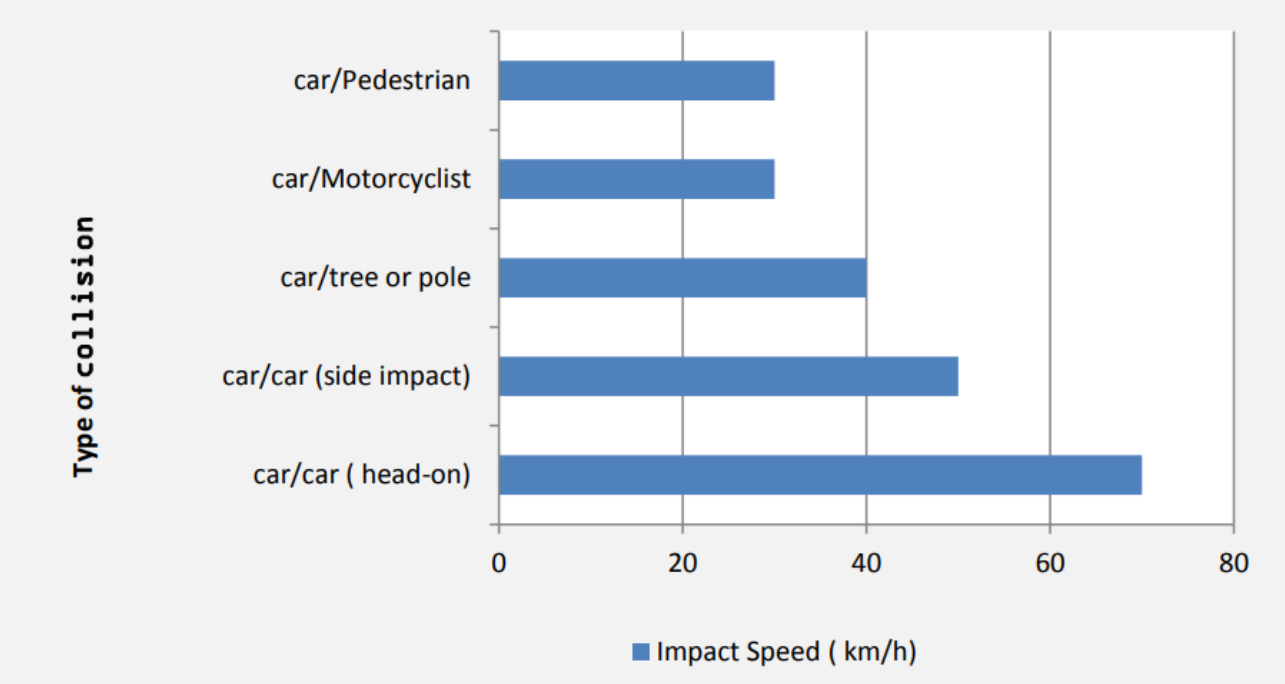

Figure 13: Survivable impact speeds for different crash types, from the Waka Kotahi High-Risk Intersections Guide.

Given that the existing operating speeds in Table 1, the following impact types are likely to occur above the survivability threshold speed:

- Side impacts at all intersections as the operating speed on SH57 is above 50km/h
- Car/pedestrian, car/cyclist and car/motorcyclist impacts throughout the project extents
- Car/tree or pole where there are unprotected roadside hazards on SH57.

The remaining issues in following section tend to exacerbate this issue.

Recommendation: *It is recommended that both the speed limit is reduced, and that infrastructure is upgraded (e.g. by changing intersection form) to manage speeds below the survivability threshold speeds.*

Probability Rating: *Crashes are*	Very Likely	***Severity Outcome Rating:*** *Injury severity is*	Fatal
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		

Client Decision:	Click here to enter text.
Action Taken:	Click here to enter text.

5.2 Sight Distance

5.2.1 Cashmere Drive Intersection *Minor Concern*

The vegetation inside the curve between Cashmere Drive and Johnstone Drive obstructs the visibility of conflict points at the Cashmere Drive intersection. According to Austroads guidance on safe intersection sight distance[5], the minimum sight distance required is 151m for a 70km/h speed zone with a reaction time of 2.0 seconds, however, approximately 120m of sight distance is achieved looking east on SH57 Aokautere Drive. This increases the risk of side impact crashes at the intersection.

Figure 14: Cashmere Drive intersection looking East on SH57 Aokautere Drive

Recommendation: *It is recommended that the vegetation is cut back to improve the sight lines and/or the speed limit is lowered to reduce the minimum required sight distance below 120m.*

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.2.2 Mountain View Road intersection *Moderate Concern*

Currently, the Mountain View Road serves as a minor approach to Summerhill Drive, controlled by a Give Way sign. However, during a site visit, it was observed that the vegetation along the western bank of Summerhill Drive obstructs the visibility for vehicles turning from Mountain View Road.

[5] Guide to Road Design Part 4A: Unsignalised and Signalised Intersections

According to Austroads guidance on safe intersection sight distance[6], a minimum sight distance of 123 meters is required for a 60 km/h speed zone, assuming a reaction time of 2.0 seconds. However, only approximately 90 meters of sight distance is currently achieved when looking north on Summerhill Drive.

This obstruction forces drivers to edge forward onto the marked cycle lane to improve their sight lines for making turns. However, this manoeuvre poses a risk of potential vehicle-cyclist crashes.

Figure 15: Mountain View Road intersection looking North on Summerhill Dr

Recommendation: *It is recommended to address the issue by cutting back the vegetation and/or reducing the speed limit. In addition to vegetation clearance and speed limit reduction, it is also recommended to consider implementing a Stop control for Mountain View Road. With a Stop control, drivers on Mountain View Road will be required to come to a complete stop before proceeding, allowing them to have a better view of approaching traffic on Summerhill Drive and ensuring safer manoeuvring.*

Probability Rating: Crashes are	Likely	*Severity Outcome Rating:* Injury severity is	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.2.3 Pacific Drive Intersection *Moderate Concern*

At the intersection of Pacific Drive and SH57 Aokautere Drive, Pacific Drive is currently controlled by a Give Way sign. However, during observations, it was noticed that the southern bank of Aokautere Drive obstructs the visibility for vehicles turning from Pacific Drive.

According to Austroads guidance on safe intersection sight distance, a minimum sight distance of 151 meters is required for a 70 km/h speed zone, assuming a reaction time of 2.0 seconds. However, currently, only approximately 110 meters of sight distance is achieved when looking east on SH57 Aokautere Drive.

[6] Guide to Road Design Part 4A: Unsignalised and Signalised Intersections

Figure 16: Pacific Drive Intersection looking East on Aokautere Drive SH57

Recommendation: *It is recommended that the bank slope is improved for clear sight lines from Pacific Drive intersection, that the speed limit is reduced, and that Pacific Drive is converted to stop control.*

Probability Rating: *Crashes are*	Very Likely	***Severity Outcome Rating:*** *Injury severity is*	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.3 Geometric Concerns

5.3.1 Conspicuity of Turitea Road Intersection *Serious Concern*

The Turitea Road Intersection is currently located on the outside of the curve of SH57 Old West Road, as shown in the Figure 17. However, the exit from southbound of SH57 into Turitea Road is tangential to the curve. This situation can lead to issues with intersection conspicuity and look-through, and may increase the risk of loss of control or head-on collisions, particularly during low light conditions. The roadside environment here has several non-frangible hazards, including trees.

Although the intersection is marked with paint to improve visibility, it does not provide an adequate level of delineation so that the intersection is visible during all natural lighting conditions.

Figure 17: Conspicuity of Turitea Road Intersection

Recommendation: *It is recommended that a raised island and additional PW-67 chevron indicators be implemented at the intersection. This island would serve to guide drivers into defined paths and ensure they reach the correct position on the road, minimizing conflicts such as corner cutting at the intersection. We also recommend the provision of roadside barrier at the intersection to protect nearby roadside hazards, including the trees.*

Probability Rating: *Crashes are*	Very Likely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.3.2 Superelevation at Turitea Road Intersection *Serious Concern*

The gradient of SH57 Old West Road changes from 6.8% to 8.0% at the Turitea Road Intersection, travelling north.

During the site visit, it was observed that this transition does not align well with the intersection environment and results in adverse cross fall for turning traffic. The presence of superelevation and changes in superelevation (i.e., crossfall) within an intersection can have a detrimental effect on driver and passenger comfort and vehicle stability, particularly for heavy vehicles.

Figure 18: Superelevation at Turitea Road/ SH57 Old West Road Intersection

Recommendation: *It is desirable for drivers to not be surprised by a significant increase in adverse crossfall throughout the turning movement, nor for the shoulders to have a different crossfall to the traffic lanes in support of swept paths for heavy vehicle stability. To confirm the nature of the curve geometry, we recommend plotting the most recent high-speed data survey results, including superelevation changes against 1/Radius.*

Probability Rating: Crashes are	Very Likely	*Severity Outcome Rating:* Injury severity is	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.3.3 Conspicuity of Cashmere Drive *Minor Concern*

The audit team has observed that the intersection of SH57 Aokautere Dr/Cashmere Dr is difficult to locate while approaching from Cashmere Drive, as shown in the Figure 19 for both day and night conditions.

The poor correlation of horizontal and vertical alignment of the road makes it challenging to judge the size of the intersection and the crossing facilities for vulnerable road users, which could lead to sudden braking and potentially cause intersection type crashes..

Figure 19: Cashmere Drive approach at SH57 Aokautere Dr Intersection

Recommendation: *It is recommended to enhance the conspicuity of the intersection approach on Cashmere Drive by constructing a median island and providing*

additional advanced warning signage and a PW-66 chevron board. The design of the median island should take into consideration the needs of pedestrians and cyclists who may be crossing the road at the intersection.

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.3.4 Conspicuity of Mountain View Road — Minor Concern

The presence of a horizontal curve compounded with the vertical alignment at the intersection poses a risk for vehicles approaching the intersection at speeds that are not suitable for a Give-Way situation. Furthermore, it has been observed that northbound traffic exiting Summerhill Drive onto Mountain View Road can exit at higher speeds due to a less significant angle of deflection.

As noted in the Section 5.2.2, it has been identified that this intersection fails to meet the requirements for sight distances for traffic turning out of Mountain View Road. This deficiency increases the risk of side impact crashes. While the intersection is adequately delineated, it does not provide a sufficient level of physical control to manage impact speeds below the survivability threshold.

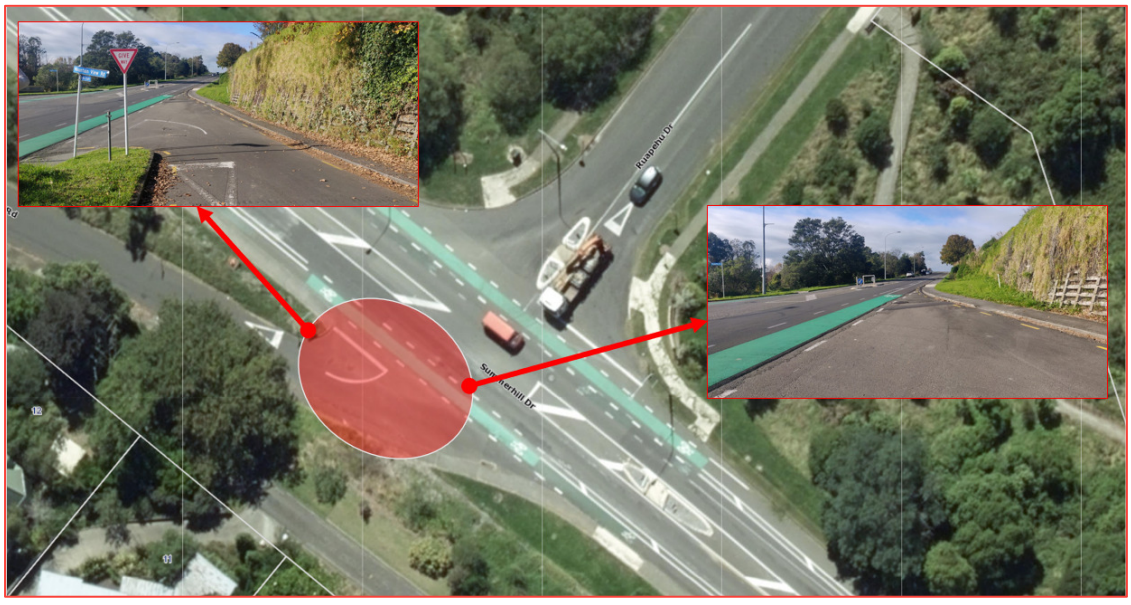

Figure 20: Mountain View Road intersection on Summerhill Drive

Recommendation: *It is recommended to construct a median island with kerb extensions to mitigate the high-speed turning movements from Summerhill Drive onto Mountain View Road and to improve the conspicuity of intersection approach. The design of the median island should take into consideration the needs of pedestrians and cyclists who may be crossing the road at the intersection.*

Probability Rating: Crashes are	Very Unlikely	*Severity Outcome Rating:* Injury severity is	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.4 Pedestrian Crossing Facilities

5.4.1 North-South Footpath Transition on East of Johnstone Dr Serious Concern

The footpath currently runs along the southern side of Aokautere Drive SH57, starting from Johnstone Drive and extending 150m to the west in a 70km/h speed zone. At this location, pedestrians must cross SH57 to continue walking along the northern side of the road where there is no pedestrian crossing facility provided for this transition, as shown in Figure 21. Currently, this is on a horizontal curve, resulting in limited visibility for both pedestrians and drivers.

According to Section 3.10 of the Pedestrian Planning and Design Guide[7] (PNG Guide), a pedestrian hit at 30 km/h has a 5 percent chance of dying, compared to a 40 percent risk of death at 50 km/h. If a pedestrian is hit at 70 km/h, the probability of death increases to 96 percent. The large crossing distance of 10m and high-speed zone significantly increase the risk of a pedestrian being struck and suffering fatal outcomes.

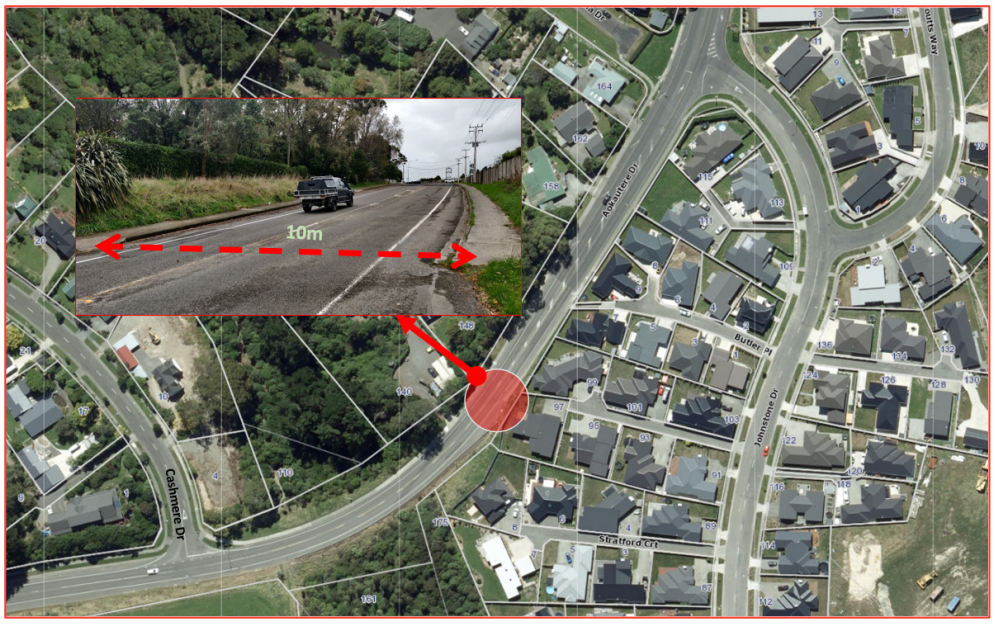

Figure 21: North-South Footpath Transition on East of Johnstone Dr

Recommendation: *It is recommended to install crossing facilities for pedestrians at crossing desire lines with mitigation to reduce impact speeds below the survivability threshold of 30km/h.*

[7] https://www.nzta.govt.nz/assets/resources/pedestrian-planning-guide/docs/pedestrian-planning-guide.pdf

Probability Rating: Crashes are	Likely	*Severity Outcome Rating:* Injury severity is	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.4.2 Lack of footpath along Aokautere Drive — Serious Concern

In Section 5.4.1, it is noted that there is no footpath for a 500-meter stretch along the southern side of Aokautere Drive SH57, between Pacific Drive and Johnstone Drive.

Although the area has a rural nature and lacks direct access to residential dwellings, there may still be an interest in walking along this section of the road. Therefore, it is important to consider that if a crash were to occur due to the absence of a footpath, the severity of the incident could result in death or serious injury for pedestrians.

The lack of footpath also contributes to pedestrians needing to cross SH57 at locations without adequate visibility between pedestrians and drivers.

Figure 22: Lack of footpath along Aokautere Drive

Recommendation: *it is recommended to reduce the posted speed limit and operating speed on Aokautere Drive, while reallocating space in the road corridor to extend the footpath to connect into the wider network.*

Probability Rating: Crashes are	Likely	*Severity Outcome Rating:* Injury severity is	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		

Action Taken:	Click here to enter text.

5.4.3 Midblock Crossing on Aokautere Dr near Ruapehu Dr intersection
Serious Concern

The pedestrian crossing across Aokautere Drive by the shopping centre is currently provided by a median refuge in a 70km/h speed zone. However, the total crossing distance, including a turning slip lane into Ruapehu Drive, is approximately 18.7m, which provides a poor level of service for pedestrians. This is due to the large crossing distance and conflict with turning traffic. Additionally, facilities such as a rest home, kindergarten, and proposed school on Ruapehu Drive are likely to result in a high demand for this crossing involving elderly individuals and children.

Figure 23: Midblock Crossing on Aokautere Dr near Ruapehu Dr Intersection

Recommendation: *As outlined in Section 5.4 of the PNG Guide, is to consider reducing the traffic speed on Aokautere Drive while reallocating space in the road corridor to reduce total crossing distance.*

Probability Rating: Crashes are	Likely	*Severity Outcome Rating: Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.4.4 Tactile Pavers at Kerb Crossings at Intersections *Significant Concern*

Currently, there are no tactile or directional pavers installed at the kerb crossings at intersections within the project scope. This can create issues for vision-impaired pedestrians to identify safe crossing locations, and result in pedestrian versus vehicle crashes. It can also inhibit vision-impaired people's ability to participate in society if they do not have infrastructure to enable them to walk in their community.

Section 2 of the RTS 14 Guidelines for facilities for blind and vision-impaired pedestrians[8] advises that Tactile Ground Surface Indicators (TGSI) should be prioritized for installation in areas of high pedestrian activity and areas where pedestrians who are blind or have low vision are present. The guidelines also note that TGSI at existing road crossing points should be prioritized, particularly in the vicinity of shopping centres and along arterial roads where substantial pedestrian activity is anticipated.

[8] https://www.nzta.govt.nz/assets/resources/road-traffic-standards/docs/rts-14.pdf

As noted in Section 3 of this report regarding existing conditions and future growth of residents in the area, it is anticipated that the demand for pedestrian movements will grow involving elderly residents from retirement village and schools on Ruapehu Drive.

Recommendation: *It is recommended that tactile and directional pavers be installed at all existing crossing points along Aokautere Drive.*

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.4.5 Visibility at Kerb Crossings at Intersections *Serious Concern*

The figures below show that visibility at the kerb crossings at the intersections of Cashmere Drive, Pacific Drive and Silkwood Place with Aokautere Drive is limited due to existing land features such as cut slopes, vertical alignment and vegetation. The two critical visibility factors that are necessary for pedestrian crossing facilities are:

- approach sight distance for drivers to stop in time, if a pedestrian unexpectedly steps into their path
- crossing sight distance for pedestrians to choose a gap in traffic to cross where pedestrians do not have priority.

Without having measured the available sight distances at each crossing, the nature and proximity of some of the obstructions to intervisibility photographed below means that people cannot cross the local roads intersecting SH57 safely at present without risking a pedestrian versus vehicle crash. The table below summarizes the minimum crossing sight distance required for Cashmere Drive, Pacific Drive and Silkwood Place in various directions as per the Waka Kotahi Pedestrian Network Guidance

Table 12: Summary of required Sight Distances

Crossing Location	Approach	Speed Zone (Km/h)	Crossing Distance (m)	Required Crossing Sight Distance (m)	Required Approach Sight Distance (m)
Cashmere Drive	Towards East	70	13.7	254	70
	Towards North	50		190	40
Silkwood Place	Towards West	70	13.7	126	70
Pacific Drive	Towards East	70	9	167	70

Figure 24: Visibility obstruction at Pacific Drive Intersection towards East

Figure 25: Visibility obstruction at Cashmere Drive Intersection towards East and North

Figure 26: Visibility at Silkwood Pl Intersection towards West

Recommendation: *Remove vegetation or cut back slopes restricting intervisibility between drivers and pedestrians. Change the form of crossing where crossing sight distance cannot be provided so that pedestrians do to need to choose a gap to be safe. Install raised safety platforms to lower the speed below the 30km/h survivable speed threshold.*

Probability Rating: *Crashes are*	Very Likely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		

Safety Engineer:	Click here to enter text.
Client Decision:	Click here to enter text.
Action Taken:	Click here to enter text.

5.5 Cycling Facilities

5.5.1 Narrow Shoulders *Significant Concern*

The shoulder width on both sides of SH57 within the project scope varies from 1m to 1.4m. Table 1 of Waka Kotahi's Sealed Shoulder Considerations for Cyclists[9] recommends that the target shoulder seal width for the state highway cycling network should be 1.7m wide in a 70km/h speed limit zone and 2m wide in a 100km/h speed limit zone for an AADT ranging from 8000-18000 vpd.

Figure 27: Shoulder on SH57 Aokautere Dr Eastbound and Westbound

Figure 28: Shoulder on SH57 Old West Rd Northbound and Southbound

Recommendation: *It is recommended that space in the road corridor be reallocated to provide appropriate shoulder widths for cyclists as per Waka Kotahi NZTA standards, considering future growth in the area.*

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		

[9] https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/between-intersections/sealed-shoulders/

Client Decision:	Click here to enter text.
Action Taken:	Click here to enter text.

5.6 Lighting

5.6.1 Consistency of Street Lighting *Minor Concern*

The audit team has identified two issues related to street lighting. Firstly, the lack of consistency in street lighting along SH57 Aokautere Drive may cause visual fatigue and reduce visibility for drivers.

Secondly, the street lighting at the intersection of Turitea Road and SH57 is insufficient and may hinder drivers' ability to see the exit lane from SH57 Old West Rd onto Turitea Road.

It is worth noting that road lighting has a significant road safety benefit for rural intersections, where a 30% reduction in all injury crashes at night has been estimated[10].

Figure 29: Inconsistent lighting in miblock between Johnstone Drive and Cashmere Drive

Figure 30: Inconsistent lighting in miblock between Cashmere Drive and Silkwood Pl

Figure 31: Lighting at the intersection (Turitea Road/SH57 Old West Road)

[10] Austroads Guide to Road Design Part 6B: Roadside Environment

Recommendation:

- *It is recommended that additional streetlighting infrastructure is installed in the midblock of SH57 Aokautere Drive between Johnstone Drive and Silkwood Place to provide consistent lighting.*
- *It is recommended that sufficient lighting be designed for the Turitea Rd intersection in line with all appropriate NZ standards in particular the AS/NZS 1158 series. The intersection should have adequate lighting to provide visibility to drivers entering/exiting the intersection. The lights should be bright enough to allow drivers to see any potential hazards or other vehicles approaching the intersection should also be illuminated to help drivers navigate through the intersection safely.*

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Minor
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.6.2 Streetlight Poles *Significant Concern*

During the site inspection, it was noted that several street light poles, particularly those near Ruapehu Drive, had protruding pole bases of more than 100mm, as shown in Figure 32. This is a cause for concern as a collision between a vehicle and such a protruding base could result in significant damage to the vehicle and potential injury to the driver or passengers.

Section 3.12.2 of M26 specification for lighting columns[11] notes that the base shall not protrude more than 100mm above finished ground level to prevent forming a hazard to the underside of the vehicle.

[11] https://www.nzta.govt.nz/assets/resources/lighting-columns/docs/m26-specification-for-lighting-columns.pdf

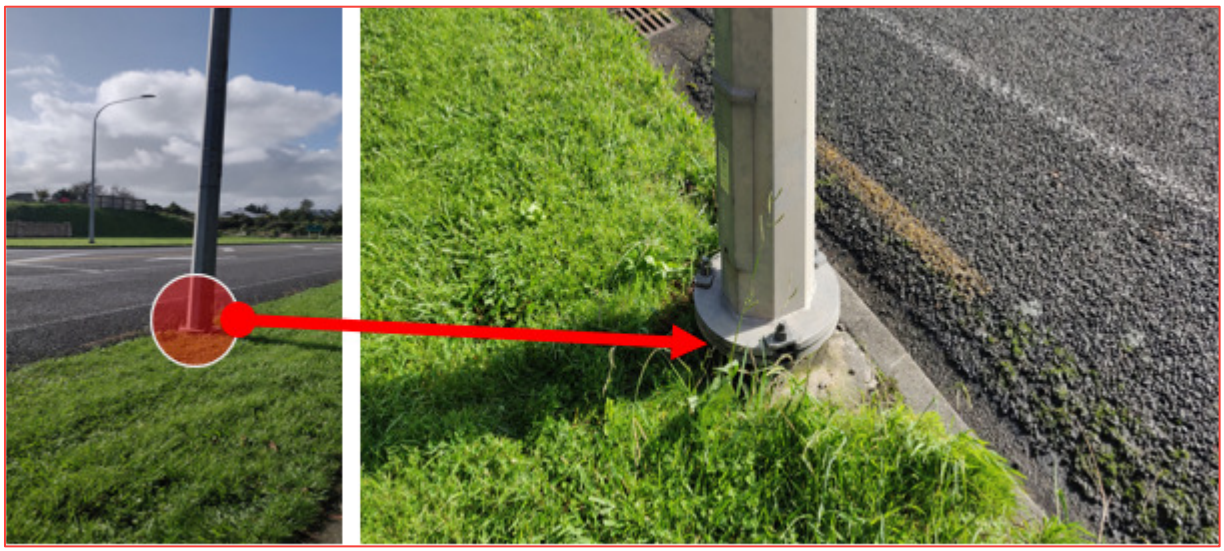

Figure 32: Streetlight Pole

Recommendation: *It is recommended that these poles be inspected and repaired as soon as possible to reduce the risk crash severity and ensure the safety of road users in the area.*

Probability Rating: Crashes are	Unlikely	*Severity Outcome Rating:* Injury severity is	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.7 Roadside Hazards — Serious Concern

During the site visit, the Safety Audit Team noted several locations where unprotected roadside hazards were present, as shown in the figures below. These hazards could pose a significant risk to motorists and should be addressed promptly to ensure the safety of road user.

- Unprotected drop offs
- Unprotected cut slopes
- Unprotected gully
- Unprotected utility poles
- Sight rail on Mountain View Road

Figure 33: Drop-off on SH57 Old West Road – Northbound

Figure 34: Cut Slope at Cashmere Dr intersection on SH57 Aokautere Dr

Figure 35: Gully opposite to Pacific Dr intersection on SH57 Aokautere Dr

Figure 36: Gully near Silkwood Pl intersection on SH57 Aokautere Dr

Figure 37: Utility Poles at Johnstone Dr Intersection on SH57 Aokautere Dr

Figure 38: Sight Rail on Mountain View Road

Recommendation: *Ensure that all roadside hazards within the project extents are identified and that their treatment is prioritized based on suitable methods, such as the level of risk they present to errant vehicles.*

Probability Rating: *Crashes are*	Very Likely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.8 Speed Limit Signs — Significant Concern

The speed limit on State Highway 57 transitions from 100 km/h to 70 km/h on the east at Moonshine Valley Rd and continues until the turn off at Summerhill Drive intersection. The speed limit for Summerhill Drive changes to 60 km/h travelling north.

Currently, the speed signs are circular discs of varying sizes. Additionally, the speed sign at the intersection of Summerhill Dr and SH57 Old West Rd is missing.

Figure 39: SH57 Old West Rd/Summerhill Dr Intersection looking South

Figure 40: Speed signs on SH57 at Moonshine Valley Rd on East

Figure 41: Speed Signs at Summerhill Drive/ Aokautere Drive Intersection

Recommendation: *Ensure that the missing speed sign is replaced as soon as possible to provide a clear and consistent message to drivers about the speed limit. It is also recommended that speed signs are designed for thresholds with appropriate physical infrastructure to narrow the road widths.*

Probability Rating: Crashes are	Unlikely	*Severity Outcome Rating:* Injury severity is	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		
Action Taken:	Click here to enter text.		

5.9 General Concerns

5.9.1 Service Covers *Significant Concern*

During the site visit, it is noted that there are many service covers along southbound and northbound SH57 Aokautere Drive, as shown in below figures. Given the narrow shoulder space, these service covers can create safety issues for cyclists because they reduce the available space and may have to move into traffic lane to avoid these, which further increases the risk of a collision with a passing vehicle. They also increase the risk of loss of traction/control crashes for motorcyclists where the service covers are in the traffic lane. Therefore, it is important to ensure that service covers are placed away from curves for motorcyclists, and that any service covers in the shoulder can not entrap cyclists' wheels.

Also, the stormwater sump grates as shown in Figure 44 are of particular concern as a bicycle wheel may get caught between the bars of the grate or any gap between the edge of the grate and the road surface. In general, grates that are perpendicular to the travel path of cyclists is preferable. However, this is not always possible depending on surface drainage and stormwater considerations. Hence Waka Kotahi NZTA's cycling network guidance[12] recommends that sump

[12] https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/between-intersections/cycle-lanes/

designs with grates in a zigzag or wavy pattern can be used to maximise flow rates whilst minimising the risk of bicycle wheels being caught.

Figure 42: Service covers along Southbound of Aokautere Drive

Figure 43: Service covers along Northbound of Aokautere Drive

Figure 44: Stormwater Grates on SH57 Aokautere Drive

Recommendation: *It is recommended that the service covers located along the shoulder of SH57 Aokautere Drive are upgraded to avoid entrapping cyclists' wheels, and that service covers in the traffic lanes are located away from curves and braking areas for motorcyclists. All service coves should have surface friction treatments.*

Probability Rating: *Crashes are*	Unlikely	***Severity Outcome Rating:*** *Injury severity is*	Serious
Design Team Response:	Click here to enter text.		
Safety Engineer:	Click here to enter text.		
Client Decision:	Click here to enter text.		

Action Taken:	Click here to enter text.

5.9.2 Holding Rails at midblock crossing on Summerhill Drive Comment

During the site visit, it was noted that the holding rails on the median refuge at the midblock crossing on Summerhill Drive were broken. Considering the presence of heavy vehicle traffic along Summerhill Drive, it is recommended that these holding rails be reflectorized with red tape to enhance their conspicuity.

Figure 45: Holding rails on Summerhill Drive at median refuge (day and night)

Recommendation: *It is recommended that the holding rails are reinstated and are improved for conspicuity.*

6 Safe System Audit Statement

We certify that we have used the available plans and have examined the specified roads and streets to assess the Safe System alignment and identified any safety concerns that could be changed, removed, or modified in order to improve road safety outcomes. The safety concerns identified have been noted in this report.

Signed: ..... Date: 20/06/2023
Catherine Mills, BE(hons), CPEng, CMEngNZ, IntP.E.(NZ)
Senior Transportation Engineer, WSP

Signed: ..... Date: 20/06/2023
Hima Madasu, BE (Civil), Mengistu (Civil)
Engineer - Transportation, WSP

Signed: ..... Date: 17/05/2023
Mercia Prinsloo, BEng (Civil), BEng Hons (Transportation)
Senior Transportation Engineer, WSP

Design Team:	*Name*.....	*Position*.....
	Signature.....	*Date*.....
Safety Engineer:	*Name*.....	*Position*.....
	Signature.....	*Date*.....
Project Manager:	*Name*.....	*Position*.....
	Signature.....	*Date*.....
Action Completed:	*Name*.....	*Position*.....
	Signature.....	*Date*.....

Project Manager to distribute audit report incorporating decision to design team, Safety Audit Team Leader, Safety Engineer, and project file.

Date: .....

Appendix A
Safe System Assessment Matrices

1 Corridor Assessment
2 Summerhill Dr/SH57 Intersection
3 Pacific Drive/SH57 Intersection
4 Johnston Dr/SH57 Intersection
5 Ruapehu Dr/SH57 Intersection
6 Ruapehu Dr/Summerhill Intersection

1 Corridor Assessment

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project extents /length of the corridor being 2.5km long approximately short the exposure is still high	**Total volume of vehicles (AADT) using the road: 12,700 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project extents /length of the corridor being 2.5km long approximately short the exposure is still high	**Total volume of vehicles entering the intersection: 0** Assessed as individual intersections	**Total volume of vehicles (AADT) using the road: assume 2000vpd using flush median for turning manoeuvres** Assumed crash type is vehicles using accesses and intersections interacting in the flush median High volume of vehicles passing through the site increases the exposure risk. Only length between IPU driveway and Silverwood place a concern due to intersection proximity reduces exposure as	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	4	4	0	2	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Narrow sealed shoulders means less room for recovery • Curved horizontal alignment increases risk • Roadside hazards are present along most of the length (banks, drop-offs, trees, cut slopes, power poles) and are relatively clsoe to SH57 increases risk **Factors that decrease the likelihood include:** • Barrier protects one corner decreasing the risk • Pavement condition looked okay • Mostly verticaly flat corridor • Speed limit and operating speed approx. 70km/h so reduces likelihood of losing traction	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • overtaking is possible in flush median even if not allowed	**Factors that increase the likelihood include:** • • • • **Factors that decrease the likelihood include:** • • • • • •	**Factors that increase the likelihood include:** • Intersections are relatively close which increases the risk • Intersections are staggered on opposite side of the road • • • • **Factors that decrease the likelihood include:** • Flush median is very wide • Drivers travelling slow so have more time to react when performing the manoeuvres • • •	**Factors that increase the likelihood include:** • Few pedestrian crossing facilities present • Uncontrolled crossings on road with >12,000 vpd • Type of pedesrians - kindy and elderly home nearby • Long crossing distances **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • high speed and high traffic • Lots of roadside hazrads • Temporary sightline restrictions from turning vehicles • **Factors that decrease the likelihood include:** • Flat alignments, good pavement cond • one lane in each direction
Likelihood Score:	2.5	1	0	2	4	4	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 70 km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 70 km/h (combined 140km/h) and survivable impact speed is 70km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • •	**Factors that increase the severity include:** • Operating Speed is 70 km/h, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 70 km/h, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • • Operating Speed is 70 km/h, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3	3	0	1	4	4	4
Product (multiply scores above for crash type)	30	12	0	4	32	48	40
						TOTAL	166

Safe System Assessment - Status Quo Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project extents /length of the corridor being 2.5km long approximately short the exposure is still high	**Total volume of vehicles (AADT) using the road: 20,000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project extents /length of the corridor being 2.5km long approximately short the exposure is still high	**Total volume of vehicles entering the intersection: 0** Assessed as individual intersections	**Total volume of vehicles (AADT) using the road: assume 3000vpd using flush median for turning manoeuvres** Assumed crash type is vehicles using accesses and intersections interacting in the flush median High volume of vehicles passing through the site increases the exposure risk. Only length between IPU driveway and Silverwood place a concern due to intersection proximity reduces exposure as	**Number of pedestrians:** 50 per day	**Number of cyclists:** 150 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	4	4	0	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Narrow sealed shoulders means less room for recovery • Curved horizontal alignment increases risk • Roadside hazards are present along most of the length (banks, drop-offs, trees, cut slopes, power poles) and are relatively clsoe to SH57 increases risk **Factors that decrease the likelihood include:** • Barrier protects one corner decreasing the risk • Pavement condition looked okay • Mostly verticaly flat corridor • Speed limit and operating speed approx. 70km/h so reduces likelihood of losing traction	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • overtaking is possible in flush median even if not allowed	**Factors that increase the likelihood include:** • • • • **Factors that decrease the likelihood include:** • • • • • •	**Factors that increase the likelihood include:** • Intersections are relatively close which increases the risk • Intersections are staggered on opposite side of the road • • • • **Factors that decrease the likelihood include:** • Flush median is very wide • Drivers travelling slow so have more time to react when performing thee manoeuvres • • •	**Factors that increase the likelihood include:** • Few pedestrian crossing facilities present • Uncontrolled crossings on road with >20,000 vpd • Type of pedesrians - kindy and elderly home nearby • Long crossing distances **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • high speed and high traffic • Lots of roadside hazrads • Temporary sightline restrictions from turning vehicles, more turning vehicles • **Factors that decrease the likelihood include:** • Flat alignments, good pavement cond • one lane in each direction
Likelihood Score:	2.5	1	0	2	4	4	3
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 70 km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 70 km/h (combined 140km/h) and survivable impact speed is 70km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 km/h, survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 km/h, survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • • Operating Speed is 65 km/h, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	3	3	0	1	4	4	4
Product (multiply scores above for crash type)	30	12	0	4	48	64	48
						TOTAL	206

Safe System Assessment - Corridor Upgrade Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project	**Total volume of vehicles (AADT) using the road: 12,700 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project	**Total volume of vehicles entering the intersection: 0** Assessed as individual intersections	**Total volume of vehicles (AADT) using the road: assume 2000vpd using flush median for turning manoeuvres** Assumed crash type is vehicles	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	4	4	0	2	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • Roadside hazards are present along most of the length (banks, drop-offs, trees, cut slopes, power **Factors that decrease the likelihood include:** • Barrier protects one corner decreasing the risk • Pavement condition looked okay • Mostly verticaly flat corridor	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths	**Factors that increase the likelihood include:** • • • • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • Intersections are relatively close which increases the risk • Intersections are staggered on opposite side of the road • Variable width flush median **Factors that decrease the likelihood include:** • Drivers travelling slow so have more time to react when performing thee manoeuvres • •	**Factors that increase the likelihood include:** • Few pedestrian crossing facilities present • Uncontrolled crossings on road with >12,000 vpd • Type of pedesrians - kindy and **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • •	**Factors that increase the likelihood include:** • **Factors that decrease the likelihood include:** • High-quality separated cycle lane • •	**Factors that increase the likelihood include:** • moderate speed and high traffic • Lots of roadside hazrads • Temporary sightline restrictions from turning vehicles **Factors that decrease the likelihood include:** • Flat alignments, good pavement cond • one lane in each direction
Likelihood Score:	1.5	0.5	0	2.5	4	1	2
Severity Comments:	Factors that increase the severity include: • Operating Speed is 55 km/h and survivable impact speed is 40km/h • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h (combined 110km/h) and survivable impact speed is 70km/h • • • • - Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • • • • Factors that decrease the severity include: • Drivers travelling slow when trying to merge • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •
Severity Score:	2	2.5	0	1	3.5	3.5	3.5
Product (multiply scores above for crash type)	12	5	0	5	28	10.5	28
						TOTAL	88.5

Safe System Assessment - Corridor Upgrade Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project	**Total volume of vehicles (AADT) using the road: 20,000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to project	**Total volume of vehicles entering the intersection: 0** Assessed as individual intersections	**Total volume of vehicles (AADT) using the road: assume 3000vpd using flush median for turning manoeuvres** Assumed crash type is vehicles	**Number of pedestrians:** 50 per day	**Number of cyclists:** 150 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	4	4	0	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • Roadside hazards are present along most of the length (banks, drop-offs, trees, cut slopes, power **Factors that decrease the likelihood include:** • Barrier protects one corner decreasing the risk • Pavement condition looked okay • Mostly verticaly flat corridor	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths	**Factors that increase the likelihood include:** • • • • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • Intersections are relatively close which increases the risk • Intersections are staggered on opposite side of the road • Variable width flush median **Factors that decrease the likelihood include:** • Drivers travelling slow so have more time to react when performing thee manoeuvres • •	**Factors that increase the likelihood include:** • Few pedestrian crossing facilities present • Uncontrolled crossings on road with >12,000 vpd • Type of pedesrians - kindy and **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • •	**Factors that increase the likelihood include:** • **Factors that decrease the likelihood include:** • High-quality separated cycle lane • •	**Factors that increase the likelihood include:** • moderate speed and high traffic • Lots of roadside hazrads • Temporary sightline restrictions from turning vehicles • **Factors that decrease the likelihood include:** • Flat alignments, good pavement cond • one lane in each direction
Likelihood Score:	1.5	0.5	0	2.5	4	1	2
Severity Comments:	Factors that increase the severity include: • Operating Speed is 55 km/h and survivable impact speed is 40km/h Factors that decrease the severity include:	Factors that increase the severity include: • Operating Speed is 55 km/h (combined 110km/h) and survivable impact speed is 70km/h. Factors that decrease the severity include:	Factors that increase the severity include: • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • • • • Factors that decrease the severity include: • Drivers travelling slow when trying to merge • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •	Factors that increase the severity include: • Operating Speed is 55 km/h, survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • • • • • •
Severity Score:	2	2.5	0	1	3.5	3.5	3.5
Product (multiply scores above for crash type)	12	5	0	5	42	14	28
						TOTAL	106

2 Summerhill Dr/SH57 Intersection

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersection interacting in the flush median. Due to shorter length of site, the exposure less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved alignment of Summerhill/Aokautere through intersection • High speed approach on SH57 Old West Rd. • Narrow sealed shoulder on SH57 Old West Rd. **Factors that decrease the likelihood include:** • Approach to intersection • Pavement condition looked okay • Few roadside hazards which aren't frangible	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h so reduces likelihood of losing traction	**Factors that increase the likelihood include:** • Priority-controlled T intersection • Multiple auxiliary lanes • High volume of right turns • • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • • •	**Factors that increase the likelihood include:** • High speed traffic • Temporary sightline restrictions from turning vehicles • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction
Likelihood Score:	2.5	2.5	3	1.5	3	3.5	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs (150km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivability speed for a T-Bone crash is 50km/h. • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 70km/h • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	4	4	4	2.5	4	4	4
Product (multiply scores above for crash type)	10	10	48	3.75	24	42	40
						TOTAL	177.75

Safe System Assessment - Status Quo Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 20,000 vpd** High volume of vehicles passing through the site increases the exposure risk. Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 20,000 vpd** High volume of vehicles passing through the intersection increases the exposure risk	**Total volume of vehicles (AADT) using the road: 20,000 vpd** Assumed crash type is vehicles using nearby access and intersection interacting in the flush median. Due to shorter length of site, the exposure less.	**Number of pedestrians:** 50 per day	**Number of cyclists:** 150 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	2	2	4	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved alignment of Summerhill/Aokautere through intersection • High speed approach on SH57 Old West Rd. • Narrow sealed shoulder on SH57 Old West Rd. **Factors that decrease the likelihood include:** • Approach to intersection • Pavement condition looked okay • Few roadside hazards which aren't frangible	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection • Multiple auxiliary lanes • High volume of right turns • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • One median refuge • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • Temporary sightline restrictions from turning vehicles • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction
Likelihood Score:	2.5	2.5	3	1.5	3	3.5	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs (130km/h max combined) and survivable impact speed is 70km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 50km/h for a T-Bone crash • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 70km/h • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** •Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	3	4	2.5	1.5	4	4	4
Product (multiply scores above for crash type)	**15**	**20**	**30**	**4.5**	**36**	**56**	**40**
						TOTAL	**201.5**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved alignment of Summerhill/Aokautere through intersection. • High speed approach on SH57 Old West Rd. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2.5	2.5	1.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs (150km/h max combined) and survivable impact speed is 70km/h • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 50km/h for a T-Bone crash. • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and, survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	4	4	3.5	2.5	4	4	4
Product (multiply scores above for crash type)	**10**	**10**	**21**	**5**	**12**	**18**	**24**
						TOTAL	100

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 20,000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 20,000.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 50 per day	**Number of cyclists:** 150 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved alignment of Summerhill/Aokautere through intersection. • High speed approach on SH57 Old West Rd. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2.5	2.5	1.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs (130km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and a survivable impact speed of 70km/h • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	3	4	2.5	1.5	4	4	4
Product **(multiply scores above for crash type)**	**15**	**20**	**15**	**6**	**18**	**24**	**24**
						TOTAL	122

Safe System Assessment - Urban Roundabout, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to roundabout intersection environment, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lane in roundabout. • Curved alignment of Summerhill/Aokautere through intersection. • High speed approach on SH57 **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. • Multi lane crossing **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • Multiple lanes creates possibility for visibility shadowing **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2.5	2.5	2	1.5	3	4	4
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs (150km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 60 to 75 Km/h on intersection legs and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	**3.75**	**7.5**	**8**	**1.5**	**15**	**30**	**40**
						TOTAL	**105.75**

Safe System Assessment - Urban Roundabout, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Due to roundabout intersection environment, the exposure is high.	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 20,000 vpd.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 50 per day	**Number of cyclists:** 150 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Curved alignment of Summerhill/Aokautere through intersection. • High speed approach on SH57 **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. • **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • Many cyclists unlikely to use separated path at roundabout, possbility for visibility shadowing from multiple lanes **Factors that decrease the likelihood include:** • Separated cycle facility • Median refuge for cyclist crossing. • •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	2	2	1.5	2	4	4
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs (130km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is between 50 to 65 Km/h on intersection legs and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	6	12	8	3	15	40	40
						TOTAL	124

3. Pacific Dr/SH57 Intersection

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Aokautere Dr. • Curved approach on Pacific Dr **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Pacific Dr. • Multiple auxiliary lanes • Staggered intersection movements • Inadequate visibility • • **Factors that decrease the likelihood include:** • • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • No footpath on southern side of Aokautere Dr. • Limited visibility from kerb on west side, due to banks. **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Pacific Drive. • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	1.5	1.5	4	2	3	3	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed is 40km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr (144km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr , survivable speed is 70km/h • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and, survivable impact speed 30km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**5.25**	**4.5**	**64**	**5**	**24**	**36**	**32**
						TOTAL	170.75

Safe System Assessment - Status Quo, Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Aokautere Dr. • Curved approach on Pacific Dr **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Pacific Dr. • Multiple auxiliary lanes • Staggered intersection movements • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • No footpath on southern side of Aokautere Dr. • Type of pedesrians - elderly home nearbySchool kids (young age group) **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Pacific Drive. • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	1.5	1.5	4	2	3	3	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed is 40km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr (144km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr . • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and, survivable impact speed 30km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	3.5	2.5	4	4	4
Product (multiply scores above for crash type)	**10.5**	**9**	**56**	**10**	**48**	**48**	**32**
						TOTAL	**213.5**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved approach on Pacific Dr. • High speed approach on Aokautere Dr. • Narrow sealed shoulders., signal poles aren't typically frangible **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	1.5	2.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed is 40km/h. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed is 50km/h for a T-Bone crash. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**7**	**4.5**	**40**	**5**	**12**	**18**	**24**
						TOTAL	110.5

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	3	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved approach on Pacific Dr. • High speed approach on Aokautere Dr. • Narrow sealed shoulders. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • No footpath on southern side of Aokautere Dr. • Type of pedesrians - elderly home nearbySchool kids (young **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing • Type of pedesrians - elderly **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	1.5	2.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. The survivable impact speed is 40km/h. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. The survivable impact speed is 50km/h for a T-Bone crash. • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection (banks, drop-offs, streetlight poles). • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**14**	**9**	**40**	**10**	**18**	**24**	**24**
						TOTAL	139

Safe System Assessment - Urban Roundabout, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to roundabout intersection environment, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • 1 Circulating lane in roundabout. • Curve approach on Pacific Dr. • High speed approach on SH57 Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • No median seperation. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a roundabout	**Factors that increase the likelihood include:** • High volume of traffic. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses and intersections in the close vicinity. **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. • Type of pedesrians - elderly home nearbySchool kids (young **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2	1.5	2	2	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed is 40km/h. • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr (130km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. The survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 44 Km/h on Pacific Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	2.25	3	8	1.5	10	15	20
						TOTAL	59.75

Safe System Assessment - Urban Roundabout, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Curve approach on Pacific Dr. • High speed approach on SH57 Aokautere Dr. • Narrow sealed shoulder on **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • No median seperation. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a roundabout	**Factors that increase the likelihood include:** • High volume of traffic. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses and intersections in the close vicinity. **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. • No footpath on Southern side of Aokautere Dr. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2	1.5	2	2	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr (130km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr and survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 40 Km/h on Pacific Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	**4.5**	**6**	**8**	**3**	**20**	**20**	**20**
						TOTAL	**81.5**

4 Johnston Dr/SH57 Intersection

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median. The exposure is low due to no direct of residential dwellings on to SH57.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Johnston Dr. • Multiple auxiliary lanes • High speed approaches to intersection. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite unlikely given that there is no direct access of residential dwellings on to Aokautere Dr on South. • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • No footpath on southern side of Aokautere Dr. • Narrow footpath **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • No cycling infrastructure **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • No median separation within the project extents • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	1.5	1.5	4	2	3	3	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**5.25**	**4.5**	**64**	**5**	**24**	**36**	**40**
						TOTAL	**178.75**

Safe System Assessment - Status Quo, Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 20000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 20000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 20000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Johnston Dr. • Multiple auxiliary lanes • High speed approaches to intersection. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite unlikely given that there is no direct access of residential dwellings on to Aokautere Dr on South. • • • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • No footpath on southern side of Aokautere Dr. • Narrow footpath **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • No cycling infrastructure **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • No median separation within the project extents • High speeds and Curve approach on Aokautere Dr. • Curved approach on Johnstone Dr • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	3	3	3.5	1.5	3	3	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	3.5	2.5	4	4	4
Product (multiply scores above for crash type)	**21**	**18**	**49**	**7.5**	**48**	**48**	**40**
						TOTAL	**231.5**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved approach on Aokautere Dr and Johnstone Dr. • High speed approach on Aokautere Dr. • Narrow sealed shoulders. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are only a few accesses close to the intersection **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • No footpath on southern side of Aokautere Dr. • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	2	3	1.5	1.5	2	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**7**	**6**	**48**	**3.75**	**12**	**24**	**32**
						TOTAL	132.75

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 20000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 20000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 20000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Curved approach on Aokautere Dr and Johnstone Dr. • High speed approach on Aokautere Dr. • Narrow sealed shoulders. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are only a few accesses close to the intersection **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • No footpath on southern side of Aokautere Dr. • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	1.5	2.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**14**	**9**	**40**	**10**	**24**	**24**	**24**
						TOTAL	145

Safe System Assessment - Urban Roundabout, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and curve approach, the exposure is moderate.	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Curve approach on Johnstone Dr and Aokautere Dr. • High speed approach on SH57 Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • No median seperation. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and only a few accesses and intersections in the close vicinity. **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. • No footpath on Southern side of Aokautere Dr. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2	1.5	2	2	2.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	2.25	3	8	1.5	10	15	25
						TOTAL	64.75

Safe System Assessment - Urban Roundabout, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	Total volume of vehicles (AADT) using the road: 20000 vpd. Due to intersection environment and low length of exposure, the exposure is low.	Total volume of vehicles (AADT) using the road: 20000 vpd . Due to intersection environment and low length of exposure, the exposure is low	Total volume of vehicles entering the intersection: 20000 vpd. The exposure is high due to intersection environment.	Total volume of vehicles (AADT) using the road: 20000 vpd Assumed crash type is vehicles using nearby access and intersections interacting in the	Number of pedestrians: 100+ per day	Number of cyclists: 150+ per day	Number of motorcyclists: Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	Factors that increase the likelihood include: • Circulating lanes in roundabout. • Curve approach on Johnstone Dr and Aokautere Dr. • High speed approach on SH57 Aokautere Dr. Factors that decrease the likelihood include: • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	Factors that increase the likelihood include: • No median seperation. • • Factors that decrease the likelihood include: • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	Factors that increase the likelihood include: • High volume of traffic. • • • Factors that decrease the likelihood include: • Adequate sight visibility. • Reduced conflict points. • • •	Factors that increase the likelihood include: • Considering rear ends , they are quite likely given it is an intersection and only a few accesses and intersections in the close vicinity. Factors that decrease the likelihood include: • Continuous circulating traffic flow. • • •	Factors that increase the likelihood include: • High speed environment • Uncontrolled pedestrian crossing. • No footpath on Southern side of Aokautere Dr. Factors that decrease the likelihood include: • Median refuge for pedestrian crossing. • • •	Factors that increase the likelihood include: • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing Factors that decrease the likelihood include: • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	Factors that increase the likelihood include: • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • Factors that decrease the likelihood include: • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2	1.5	2	2	2.5
Severity Comments:	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 40km/h • Roadside hazards are present at intersection such as utility poles. • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed is 50km/h • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivability speed for a T-Bone crash is 50km/h. • Roadside hazards are present at intersection such as utility poles. • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. • • • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • • • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •	Factors that increase the severity include: • Operating Speed is 72 Km/h on Aokautere Dr and 32Km/h on Johnstone Dr. The survivable impact speed 30km/h • Roadside hazards are present at intersection such as utility poles. • • • • Factors that decrease the severity include: • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	4.5	6	8	3	20	20	25
						TOTAL	86.5

5 Ruapehu Dr/SH57 Intersection

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Pacific Dr. • Multiple auxiliary lanes • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • Shoulder car parking on Ruapehu Dr. • Staggered intersection (Pacific Dr.) • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • Conflict with slip lane at pedestrian median refuge crossing on Aokautere Dr. • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Ruapehu Drive and Aokautere Dr. •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	1.5	1.5	4	2	3	3	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr (144km/h max combined) and survivable impact speed is 50km/h • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivability speed for a T-Bone crash is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr . • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 72 Km/h on Aokautere Dr and, survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**5.25**	**4.5**	**64**	**5**	**24**	**36**	**32**
						TOTAL	170.75

Safe System Assessment - Status Quo Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to intersection is flat, good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Curved horizontal alignment increases risk • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • wide widths • Existing flush median • Speed limit and operating speed approx. 70km/h	**Factors that increase the likelihood include:** • Priority-controlled T intersection for Pacific Dr. • Multiple auxiliary lanes • • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • Shoulder car parking on Ruapehu Dr. • Staggered intersection (Pacific Dr.) • • • **Factors that decrease the likelihood include:** • Wide flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities present • Long crossing distances • Conflict with slip lane at pedestrian median refuge crossing on Aokautere Dr. • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Ruapehu Drive and Aokautere Dr. •	**Factors that increase the likelihood include:** • Narrow shoulder • High volume of high speed traffic with no separation • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Wide median
Likelihood Score:	1.5	1.5	4	2	3	3	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr (130km/h max combined) and survivable impact speed is 50km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivability speed for a T-Bone crash is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr . • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed is 65 Km/h on Aokautere Dr and, survivable impact speed 30km/h • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**10.5**	**9**	**64**	**10**	**48**	**48**	**32**
						TOTAL	**221.5**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speed approach on Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • Staggered intersections (Pacific **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	1.5	2.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 40km/h. • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr.The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • • • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product (multiply scores above for crash type)	**7**	**4.5**	**40**	**5**	**12**	**18**	**24**
						TOTAL	110.5

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speed approach on Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High volume of right turns. • More number of conflict points. • • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses close to the intersection • Staggered intersections (Pacific **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Slower entry/exit of vehicles alonside of cyclist at intersection. •	**Factors that increase the likelihood include:** • High speed traffic • • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	2	1.5	2.5	2	1.5	1.5	1.5
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 40km/h. • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 50km/h for a T-Bone crash. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. • • • • • **Factors that decrease the severity include:** • Drivers travelling slow when trying to merge/ manoeuvre. • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr.The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Vehicles are on red when pedestrians are crossing the intersection. • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	3	4	2.5	4	4	4
Product **(multiply scores above for crash type)**	**14**	**9**	**40**	**10**	**24**	**24**	**24**
						TOTAL	145

Safe System Assessment - Urban Roundabout, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to roundabout intersection environment, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Downhill approach on Ruapehu Dr. • High speed approach on SH57 Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • No median seperation. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • Downhill approach on Ruapehu Dr. • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses and intersections in the close vicinity. **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2.5	2	2	2	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 40km/h. • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 50km/h for a T-Bone crash. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr.The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 72 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	2.25	3	10	2	10	15	20
						TOTAL	62.25

Safe System Assessment - Urban Roundabout, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 21000 vpd.** Due to intersection environment and low length of exposure, the exposure is low.	**Total volume of vehicles (AADT) using the road: 21000 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 21000 vpd.** The exposure is high due to intersection environment.	**Total volume of vehicles (AADT) using the road: 21000 vpd** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100+ per day	**Number of cyclists:** 150+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Downhill approach on Ruapehu Dr. • High speed approach on SH57 Aokautere Dr. **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay • Few roadside hazards which	**Factors that increase the likelihood include:** • No median seperation. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • Downhill approach on Ruapehu Dr. • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses and intersections in the close vicinity. **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • one lane in each direction • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1.5	1	2.5	2	2	2	2
Severity Comments:	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 40km/h. • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr (144km/h max combined) and the survivable impact speed is 50km/h. • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed is 50km/h for a T-Bone crash. • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr.The survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h. • • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •	**Factors that increase the severity include:** • Operating Speed are 65 Km/h on Aokautere Dr and 37 Km/h on Ruapehu Dr. The survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • Entry/Circulating speed at roundabout is 30km/h. • • • • •
Severity Score:	1.5	3	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	4.5	6	10	4	20	20	20
						TOTAL	84.5

6 Ruapehu Dr/Summerhill Dr Intersection

Safe System Assessment - Status Quo Current.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles. Low exposure due to length of site for crash type**	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles. Low exposure due to length of site for crash type**	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles.**	**Total volume of vehicles (AADT) using the road: 12,754 and 6% Heavy Vehicles.** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is low due to length of the site	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Summerhill Dr. • Vertical alignment on Summerhill Dr and Mountain View Rd. • No Shoulder **Factors that decrease the likelihood include:** • Approach to intersection has good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Vertical alignment on crest of Summerhill Dr increases the risk of wrong way movement. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • Existing flush median	**Factors that increase the likelihood include:** • Priority-controlled staggered intersection. • Short flush median at intersection. • **Factors that decrease the likelihood include:** • Adequate sight visibility. • Turning movements from/to flush median • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection on the vertical gradient of Summerhill Dr. • Difficulty in controlling speed for downhill traffic. **Factors that decrease the likelihood include:** • Flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities • Long crossing distances • Conflict with Flush median and pedestrian median refuge on Summerhill Dr at intersection. • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Summerhill Dr.	**Factors that increase the likelihood include:** • No shoulder • High volume of high speed traffic with no separation • Vertical gradients allowing for high speeds. • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • Cycle lane markings. •	**Factors that increase the likelihood include:** • High speeds on Summerhill Dr. • Vertical alignment on Summerhill Dr and Mountain View Rd. • No Shoulder **Factors that decrease the likelihood include:** • Good pavement condition • Flush median
Likelihood Score:	1.5	2	4	2.5	3	3	2.5
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h (120km/h combined) and survivable impact speed is 70km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • • **Factors that decrease the severity include:** • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	4	3	2.5	4	4	4
Product (multiply scores above for crash type)	**5.25**	**8**	**48**	**6.25**	**24**	**36**	**40**
						TOTAL	**167.5**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles.**	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles. .**	**Total volume of vehicles (AADT) using the road: 12,754 vpd and 6% Heavy Vehicles.**	**Total volume of vehicles (AADT) using the road: 12,754 and 6% Heavy Vehicles.** Assumed crash type is vehicles using nearby access and	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speed approach on Summerhill Dr. • Downhill gradient. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • Flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High speed approach on Summerhill Dr northbound. • Heavy vehicles may have difficulty in negotiating with **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection. • Staggered intersection. • **Factors that decrease the likelihood include:** • • • • •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • • •	**Factors that increase the likelihood include:** • High speed environment. • Change in gradient on Summerhill Dr. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1	1	1.5	1	1	1	1
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/hand survivable impact speed is 50km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • • **Factors that decrease the severity include:** • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Signalised intersection reduces approaching speeds to intersection, especially when the signals are in Red for stop. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Signalised intersection reduces approaching speeds to intersection, especially when the signals are in Red for stop. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	4	3	2.5	4	4	4
Product (multiply scores above for crash type)	**3.5**	**4**	**18**	**2.5**	**8**	**12**	**16**
						TOTAL	**64**

Safe System Assessment - Urban Roundabout, Current

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 12,700 vpd.** Due to roundabout intersection environment, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700 vpd** . Due to intersection environment and low length of exposure, the exposure is low	**Total volume of vehicles entering the intersection: 12,700.** Due to intersection environment and low length of exposure, the exposure is high.	**Total volume of vehicles (AADT) using the road: 12,700** Assumed crash type is rear end. Due to shorter length of site, the exposure is less.	**Number of pedestrians:** 30 per day	**Number of cyclists:** 50-100 per day	**Number of motorcyclists:** Popular for Motorcyclists > 100
Exposure Score:	1	1	4	1	2	3	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Downhill approach on Summerhill Dr with difficult roundabout geometry on a gradient **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay	**Factors that increase the likelihood include:** • No median seperation. • • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • Downhill approach on Summerhill Dr. • High speed approach on Summerhill Dr. **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses at the approaches of Ruapehu Dr and intersections in **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing • Cyclists merged with traffic. **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • Approach to a roundabout intersection, reduces speed.
Likelihood Score:	3	1	3.5	2.5	1.5	1.5	2
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/hand survivable impact speed is 70km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •
Severity Score:	1.5	1	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	4.5	1	14	2.5	7.5	11.25	20
						TOTAL	60.75

Safe System Assessment - Status Quo Future.

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Assumed crash type is vehicles using nearby access and intersections interacting in the flush median, the exposure is high.	**Number of pedestrians:** 100 per day	**Number of cyclists:** 100+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 150 We referred to the Road safety Risk website and it is ranked 8th most popular Motorbiking routes of 125
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speeds on Summerhill Dr. • Vertical alignment on Summerhill Dr and Mountain View Rd. • No Shoulder **Factors that decrease the likelihood include:** • Approach to intersection has good visibility. • Pavement condition looked okay.	**Factors that increase the likelihood include:** • No median separation within the project extents • Vertical alignment on crest of Summerhill Dr increases the risk of wrong way movement. • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • Existing flush median	**Factors that increase the likelihood include:** • Priority-controlled staggered X-intersection. • Short flush median at intersection. • Unusual Y-shaped geometry **Factors that decrease the likelihood include:** • Turning movements from/to flush median • • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection on the vertical gradient of Summerhill Dr. • Difficulty in controlling speed for downhill traffic. **Factors that decrease the likelihood include:** • Flush median • • • • •	**Factors that increase the likelihood include:** • No controlled pedestrian crossing facilities • Long crossing distances • Conflict with Flush median and pedestrian median refuge on Summerhill Dr at intersection. • **Factors that decrease the likelihood include:** • Only confident pedestrains will be present • Median refuge on Summerhill Dr.	**Factors that increase the likelihood include:** • No shoulder • High volume of high speed traffic with no separation • Vertical gradients allowing for high speeds. • **Factors that decrease the likelihood include:** • Only confident cyclists will be present - commuters and recreational • Cycle lane markings. •	**Factors that increase the likelihood include:** • High speeds on Summerhill Dr. • Vertical alignment on Summerhill Dr and Mountain View Rd. • No Shoulder **Factors that decrease the likelihood include:** • Good pavement condition • Flush median
Likelihood Score:	1.5	2	4	2.5	3	3	2.5
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/hand survivable impact speed is 50km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • • **Factors that decrease the severity include:** • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	4	3	2.5	4	4	4
Product (multiply scores above for crash type)	**10.5**	**16**	**48**	**12.5**	**48**	**48**	**40**
						TOTAL	**223**

Safe System Assessment - Traffic Signals with Pedestrian and Cycle Facilities, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100 per day	**Number of cyclists:** 100+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 150
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • High speed approach on Summerhill Dr. • Downhill gradient. **Factors that decrease the likelihood include:** • Approach to a signalised intersection, reduces speed. • Pavement condition looked okay	**Factors that increase the likelihood include:** • High speed environment on Aokautere Dr. • No physical median separation **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • Flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • Signalised intersection. • High speed approach on Summerhill Dr northbound. • Heavy vehicles may have difficulty in negotiating with **Factors that decrease the likelihood include:** • Adequate sight visibility. • Protected right turn phase. •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection. • Staggered intersection. • **Factors that decrease the likelihood include:** •	**Factors that increase the likelihood include:** • High speed environment • • **Factors that decrease the likelihood include:** • Controlled pedestrian crossing. • Median refuge on each approach. • Fully separate or late start pedestrian crossing phases.	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • No separate cyclist phasing **Factors that decrease the likelihood include:** • Cycle lane and associated markings. •	**Factors that increase the likelihood include:** • High speed environment. • Change in gradient on Summerhill Dr. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • Approach to a signalised intersection, reduces speed.
Likelihood Score:	1	1	1.5	1	1	1	1
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/hand survivable impact speed is 50km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • **Factors that decrease the severity include:** • • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • **Factors that decrease the severity include:** • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Signalised intersection reduces approaching speeds to intersection, especially when the signals are in Red for stop. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Signalised intersection reduces approaching speeds to intersection, especially when the signals are in Red for stop. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • **Factors that decrease the severity include:** • • • • • •
Severity Score:	3.5	4	3	2.5	4	4	4
Product (multiply scores above for crash type)	**7**	**8**	**18**	**5**	**16**	**16**	**16**
						TOTAL	**86**

Safe System Assessment - Urban Roundabout, Future

	Run-off road	Head-on	Intersection	Other	Pedestrian	Cyclist	Motorcyclists
Exposure Comments:	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.**	**Total volume of vehicles (AADT) using the road: 20,000 vpd.** Assumed crash type is vehicles using nearby access and intersections interacting in the	**Number of pedestrians:** 100 per day	**Number of cyclists:** 100+ per day	**Number of motorcyclists:** Popular for Motorcyclists > 150
Exposure Score:	2	2	4	2	4	4	4
Likelihood Comments:	**Factors that increase the likelihood include:** • Circulating lanes in roundabout. • Downhill approach on Summerhill Dr. • High speed approach on Summerhill Dr. **Factors that decrease the likelihood include:** • Approach to a roundabout intersection, reduces speed. • Pavement condition looked okay	**Factors that increase the likelihood include:** • No median seperation. • • • **Factors that decrease the likelihood include:** • Low potential for wrong way movements • Pavement condition is ok • flat alignment • Approach to a signalised	**Factors that increase the likelihood include:** • High volume of traffic. • Downhill approach on Summerhill Dr. • High speed approach on Summerhill Dr. **Factors that decrease the likelihood include:** • Adequate sight visibility. • Reduced conflict points. • • •	**Factors that increase the likelihood include:** • Considering rear ends , they are quite likely given it is an intersection and there are a few accesses at the approaches of Ruapehu Dr and intersections in **Factors that decrease the likelihood include:** • Continuous circulating traffic flow. • • •	**Factors that increase the likelihood include:** • High speed environment • Uncontrolled pedestrian crossing. **Factors that decrease the likelihood include:** • Median refuge for pedestrian crossing. • • •	**Factors that increase the likelihood include:** • Narrow shoulder • High speed environment with no separation. • Uncontrolled cyclist crossing • Cyclists merged with traffic. **Factors that decrease the likelihood include:** • Cycle lane and associated markings. • Median refuge for cyclist crossing. •	**Factors that increase the likelihood include:** • High speed traffic • Conflict among heavy vehicle turning paths and motorcyclists. • **Factors that decrease the likelihood include:** • Flat alignments, good pavement condition • Approach to a roundabout intersection, reduces speed.
Likelihood Score:	3	1	3.5	2.5	1.5	1.5	2
Severity Comments:	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed is 40km/h • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/hand survivable impact speed is 50km/h • Heavy Vehicle Volume. • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivability speed for a T-Bone crash is 50km/h. • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and survivable impact speed 30km/h • • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • •	**Factors that increase the severity include:** • Posted speed limit on Summerhill Dr is 60km/h and, survivable impact speed 30km/h • • • • • **Factors that decrease the severity include:** • Roundabout catered for an operating speed of 30km/h. • • • • •
Severity Score:	1.5	1	1	1	2.5	2.5	2.5
Product (multiply scores above for crash type)	9	2	14	5	15	15	20
						TOTAL	80

wsp

wsp.com/ns'

Attachment 3

Rule 7A.5.2.2 Performance Standards for Restricted Discretionary Activity as notified

(i) Transport Network Requirements for Aokautere Structure Plan

As part of any subdivision within the Aokautere Residential Area the following infrastructure requirements must be completed and certified by Council before development, or in the case of (iii), (iv) and (v) below, completion and certification of the infrastructure requirements at the identified level of service thresholds must be provided for as part of the staging of the subdivision and development:

(iii) Implementation of improvements at the following locations before any development:

- Improvements to facilitate safe right turns at SH57 Old West Road/Aokautere Drive/Summerhill Drive.
- Improvements to facilitate pedestrians and cyclists (signalization) at SH57 Aokautere Drive/Pacific Drive.
- Improvements to facilitate a left in/left out at Ruapehu Drive/Summerhill Drive, with the right turn continuing out of Mountain View Road, and an opportunity for u-turns to be created further to the south along Summerhill Drive.
- An option for safely accommodating cyclists travelling between the northern end of Ruapehu Drive and the City.

(ii) Implementation of safety improvements at Turitea Road/Valley Views, as scheduled under the 10-Year Plan 2021-2031.

(iii) Improvements at the existing Abby Road and Johnstone Drive intersections with Pacific Drive when the Level of Service for side road traffic declines to a level of service of E at peak times, with either a charge of control to roundabouts or traffic signals.

(iv) Two future intersections with the existing section of Pacific Drive, either constructed as roundabouts or signals once the level of service for side road traffic declines to a Level of Service of E at peak times of when needed to support safe pedestrian access across Pacific Drive to the Aokautere Neighbourhood Centre.

(v) Safety improvements for active modes through a shared path along the southern side of SH57 Aokautere Drive to connect Johnstone Drive and Pacific Drive and to provide access to Adderstone Reserve from both directions, prior to the traffic

associated with the northeast area of the Structure Plan being loaded onto the network.

(vi) The restrictions on development set out in (iii), (iv) and (v) must be secured through consent notices imposed on titles at the time of subdivision.

(vii) Any subdivision that does not comply with this performance standard will be a non-complying activity.