URBAN CONNECTION
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Waipawa Street for People

Preliminary Design Stage Safe System Audit Report

Prepared for Central Hawke's Bay District Council

REVISION 0 – APRIL 2023

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1 Safe System Auditing for Transport Projects

This report for a Preliminary Design Stage Safe System Audit for Waipawa Streets for People project on the Central Hawke's Bay Region has been prepared for Central Hawke's Bay District Council.

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 which identifies and documents 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 follows:

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 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 is to 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's 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 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 the 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 is to disseminate this to team members.

1.2 The Safe System

A Safe System is a forgiving road system that takes into account human fallibility and vulnerability. Under a Safe System, the whole transport system is designed to protect people from exposure to high crash forces that lead to death and serious injury (DSI).

It is recognised that people are vulnerable, and the key crash types and associated crash forces that people can be exposed to lead to death or serious injuries. A Safe System manages crash forces within these limits to protect people.

The audit team is required to understand the human tolerance to force and identify where these boundary conditions are likely to be exceeded when reviewing the transport project.

1.3 Report Format

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

- The expected crash probability 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 impact speeds, type of collision, angle of collision and type of vehicle involved.

The key crash types and respective impact speed thresholds are shown below in Figure 1.3-1.

Key crash type	Impact speed threshold
Car/pedestrian/cyclist 	20-30 km/h
Car/motorcyclist 	20-30 km/h
Car/tree or pole (non-frangible objects) 	30-40 km/h
Car/car (side-impact, intersections) 	50 km/h
Car/car (head-on, rear-end) 	70 km/h

Figure 1.3-1 - Key crash types and impact speed thresholds

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.	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	Minor	Moderate	Serious	Serious
	Likely	Minor	Moderate	Serious	Serious
	Unlikely	Minor	Minor	Significant	Serious
	Very unlikely	Minor	Minor	Significant	Significant

Safe System injury threshold

Figure 1.3-2 - Safety Concern Risk Rating Matrix

1.4 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the SSA 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 report's accuracy, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

2 Safe System Audit Details

2.1 Type of Audit

This is a Preliminary Design Stage Safe System Audit (SSA) for the Waipawa Street for People Project.

The Auditors are not aware of any previous Road Safety Audits.

A key driver of the SSA is the identification of hazards or deficiencies that can potentially result in serious and fatal crashes.

2.2 The Safety Audit Team

The safe system audit was carried out in accordance with the Waka Kotahi NZ Transport Agency Safe System Audit Guidelines, Road to Zero Edition – August 2022 by:

- Tony Harrison, Urban Connection Limited, Hawke's Bay – Team leader
- Jonno Fletcher, Urban Connection Limited, Christchurch – Team member

2.3 Meetings and Site Inspections

The Safety Audit Team (SAT) reviewed the drawings on 12 April 2023. A briefing meeting was held with the Design Team on 17 April 2023 where initial SSA feedback comments were discussed.

3 Project Description

3.1 Project Background and Objective

The project proposes pedestrian and cycle facilities, including the installation of Raised Safety Platforms (RSP's) at an existing and proposed pedestrian crossings, installation of a shared path and cycle lane, and installation of a mini roundabout on SH2 in the township of Waipawa.

The project aims to improve vulnerable road user safety, connectivity, encourage active mode users and level of service through positive speed management via the installation of the RSP's and the installation of cycle facilities.

As part of the 'Streets for People' programme the current proposal is for temporary installation utilising bolt on rubber islands, kerbs and other tactical urbanism techniques.

3.2 Existing Conditions and Context

The existing conditions and context of the sections subject of this assessment are as follows:

- SH2 has a recorded annual average daily traffic (AADT) of 10,129 (MobileRoad 2021), with 8% of heavy vehicles;
- SH2 provides a connection between Hawke's Bay and Central Hawke's Bay, and further south, passing through the township of Waipawa;
- Waipawa has various retail and service businesses. The State Highway divides the majority of the population from the retail and service area; and
- The posted speed limit is 50 km/h throughout the site.

3.3 Proposed Works

The project proposes the following improvements.

- Installation of new temporary roundabout, temporary RSP's, upgrading an existing crossing to a permanent RSP, installation of on and off road cycle facilities;
- The works include:
    - Installation of a mini bolt on roundabout and associated intersection changes;
    - Construction of permanent and temporary RSP's;
    - Installation of planter boxes, rubber kerbs and other forms of lane separation; and
    - Road markings and signs.

The SSA team has been provided with the following documents for this audit:

- Drawing Set 310205048-01-100 Sheets 1 – 11 Rev A
- Memo dated 14 April 2023 outlining proposed changes to the drawing set as part of the evolution of the design. Note that the desktop review of the design drawings had been completed by this stage. Several of these proposed changes address concerns of the SAT. A meeting was held 17 April 2023 to discuss the initial findings.

The proposed changes to the design discussed and agreed at the meeting are documented in the table below to provide an audit trail to ensure that these are adopted in the final design.

Location	Proposed Change
SH2 / Ruataniwha Intersection	Installation of more physical delineation via rubber kerbs or delineators to reduce areas which are no longer to be used by traffic. This addresses the SAT's concerns that the design created some confusion with spaces which were not clearly delineated or could be driven over by vehicles. To be confirmed with vehicle tracking.
Northbound on road cycle lane on Western side of SH2 (Ruataniwha St – Waverly Street)	Removal of the northbound on road cycle lane with the space to remain available to cyclist but not to be marked as a cycle lane. This was going to be a recommendation of the SAT due to inconsistency in width of the proposed cycle lane and it being well below minimum width in some locations.
Permanent RSP locations	There are some pinch points for the on and off road cycle lanes / paths where they approach the proposed RSP's and existing kerb build outs. It is proposed to adjust lane markings to remove there pinch points. The SAT had noted this and agrees these changes are required.
Mid-block Temporary pedestrian crossing	Review the pinch point for cycleway on southern side of crossing and adjust centrelines of cycleway. Limit lines for cyclists and vehicles will be adjusted to comply with TCD manual requirements. The proposed build outs will also require some form of fill. The SAT had noted this and agrees these changes are required.
Victoria Street – transition from bi-direction path to on road uni-directional path	Establish shared ped/ cyclist zones where crossing meets footpath. Deflect cyclists toward footpath by means of physical devices such as flexi bollards. Establish a new shared path from crossing to Victoria St intersection to ensure two-way cycle movement ends in a logical location. Shared path should ideally be 3m (ie. remove berm) but could be 2.5m minimum. The SAT had noted this and agrees that this is required.
BP Accessway	Mark cycle way across the BP access. Cycleway to start just north of the BP driveway. The SAT had noted this and agrees that this is required.
Kerb build outs	These require some form of temporary fill if they are to be used by pedestrians. This will need to take into account drainage. The SAT had noted this and agrees that this is required.

4 Assessment of Safe System Alignment

4.1 Safe System Assessment Summary

The Safe System Assessment Matrix scores for the existing conditions and the proposed design options are shown in Table 4.1-1. The scores for each crash type are shown in Figure 4.1-1. The detailed assessments are presented in Appendix A.

Table 4.1-1 - Safe System Assessment Score Summary

Option	Score – Existing	Score – Proposed
Streets for People	203 / 512	163 / 512

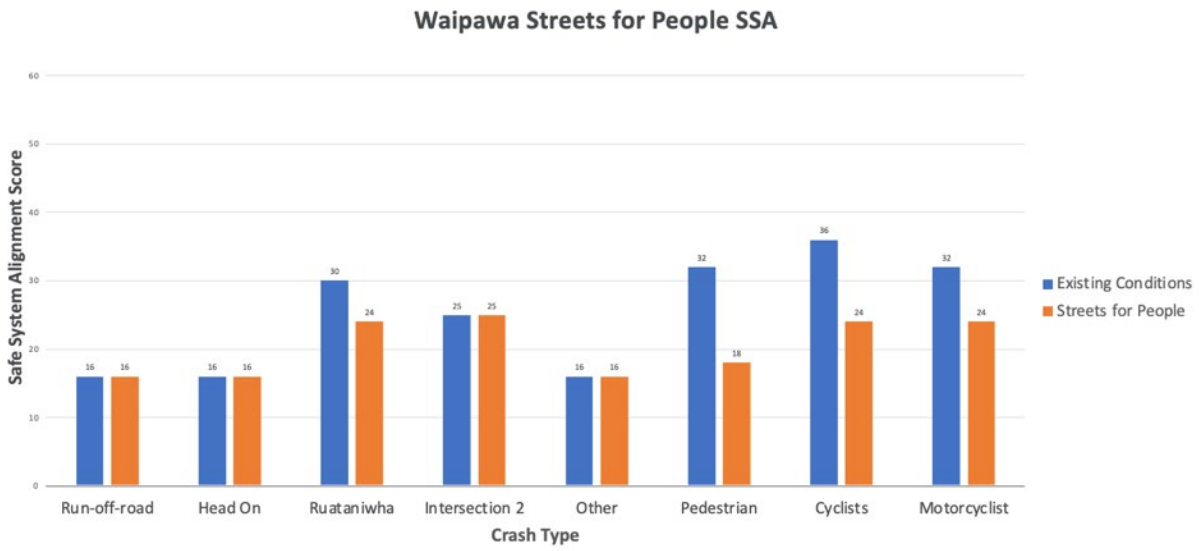


Figure 4.1-1 - Safe System Assessment Score Summary

The Safe System Assessment (SSA) shows positive benefits for pedestrian safety, predominately due to reduction in speed with the raised platforms and mini roundabout. There are also positive benefits for cyclist safety due to the separated cycle path, defined on road cycle lane, speed reduction with the raised platforms and roundabout.

5 Safety Concerns

5.1 Crash History

The crash history of the site was assessed to assist the SSA team in understanding the safety performance of the site and its immediate surroundings. A 5-year CAS assessment was undertaken from 2018 through 2022, 2023 to date, extending the length of the project. The crash location maps are shown in Figure 5.1-1, and the summary of the crashes is presented in Table 5.1-1.

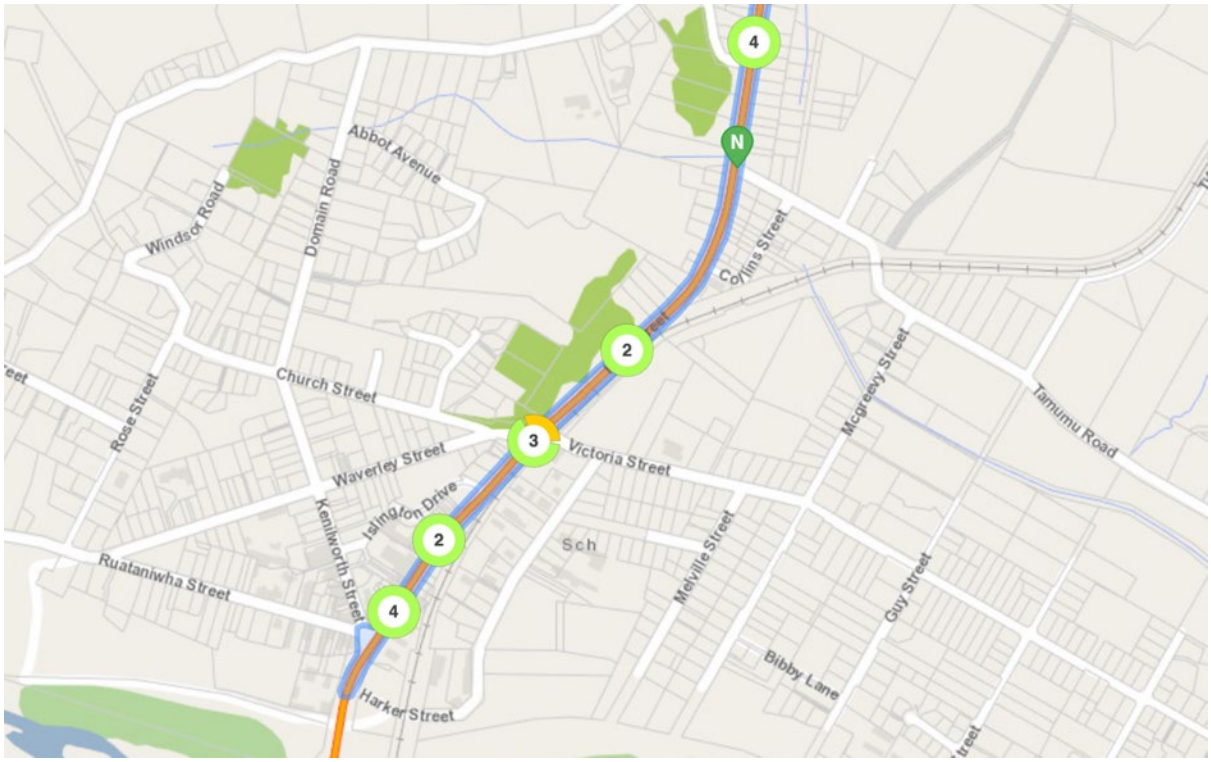


Figure 5.1-1 – Extent of safety assessment and crash locations

Table 5.1-1: Crash Summary 2018 – 2023 (to date)

Crash Severity	High Street Street (SH2)	
	Frequency	Casualties
Fatal	0	0
Serious	0	0
Minor Injury	1	1
Non-injury	15	0
Total	**16**	**1**

Crash Type		Environment		
Overtaking crashes	0%	Natural light conditions	Light/overcast	63%
Straight road lost control/head-on	38%		Dark/twilight	31%
Bend lost control/head-on	6%	Road conditions	Dry	88%
Rear end/obstruction	50%		Wet	6%
Crossing/turning	6%		Ice or Snow	0%
Others	0%	**Intersection/midblock**		
Involved motorcyclists	0%	Intersection		25%
Involved pedestrians/cyclists	0%	Midblock		75%

There have been sixteen crashes on High Street (SH2) within the project length. There have been no recorded pedestrian or cyclists crashes. Three of the crashes involve vehicles rear-ending other vehicles stopped or slowing for pedestrians using the pedestrian crossing.

5.2 Summary of findings

The frequency of risk rankings associated with this Safe System Audit is provided below, with the detailed findings to follow. This summary illustrates the degree of consideration that should be given when working through the findings.

Table 5.2-1: Summary of Findings

Serious	Significant	Moderate	Minor	Comment	Total
6	4	1	1	6	18

5.3 General Safety Concerns

5.3.1 Connectivity to the Waipukurau to Waipawa Shared Path — Comment

While outside the scope of this project the SAT believe that the wider connectivity of the cycle facilities needs to be addressed in the future. The Waipawa River bridge is immediately to the south of the proposed project. There is a very narrow footpath on the eastern side of this bridge which does not provide safe travel across the bridge for vulnerable users. This results in a 'severed connection' between the Waipukurau to Waipawa shared path and this project. The existing Waipukurau to Waipawa shared path currently provides and high level of service to vulnerable users, as will this proposed project. However, the level of service is severely impacted on by this narrow path on the bridge. Both the existing and proposed facilities are likely to encourage more cyclists to travel between the two townships and as such there is likely to be an increased exposure to this risk.

Recommendation:

1. *Promote an additional project to provide appropriate facilities for pedestrians and cyclists across the Waipawa River.*

Probability Rating: ***The probability of a crash is*** **N/A**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **N/A**
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 Northern extent of on road cycle lane — Comment

The design proposes the northern extent of the on road cycle lanes to stop at Tamumu Road. It is unclear to the SAT why the facility would stop here given residential properties continue further to the north.

While the proposed hatched shoulder still provides space for cyclists, it does not provide clear guidance as to what this area can be utilised for and could result in poor parking or use of this area as a deceleration lane on approach to the intersections.

It is recommended that consideration is given to extending the proposed cycle lanes further north, potentially to Racecourse Road, to provide improved connectivity for the urban residential sections of SH2.

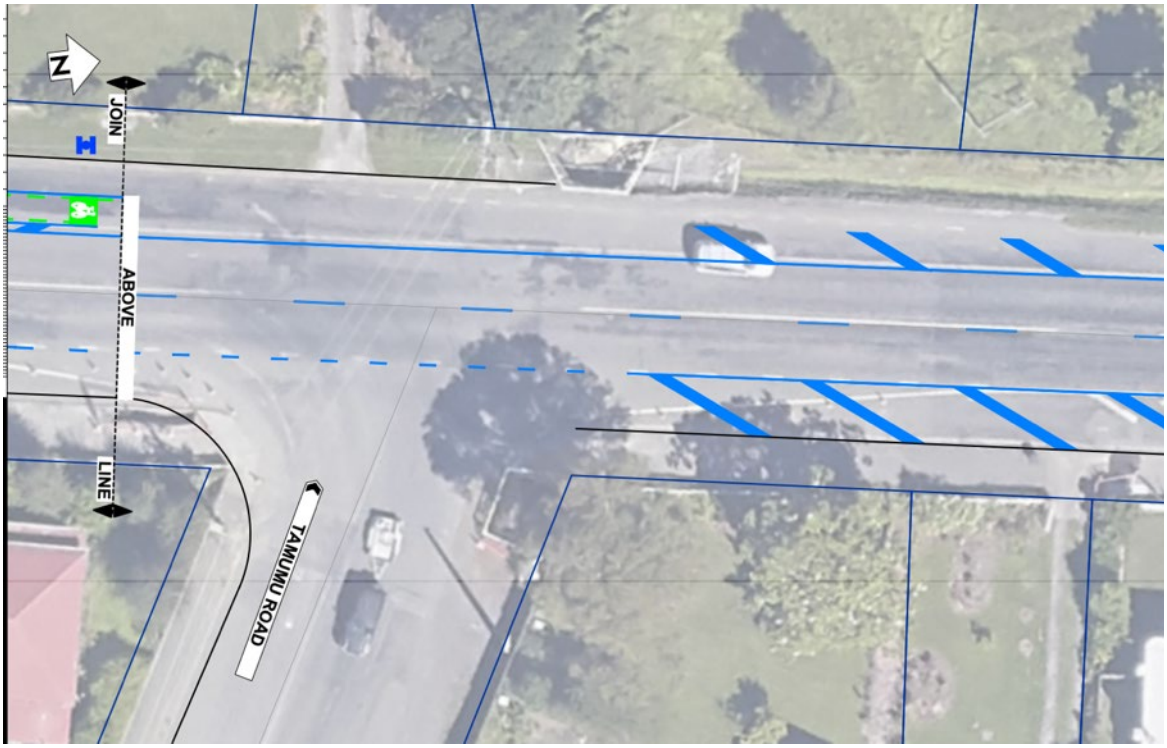


Figure 5.3-1 – Change from cycle lane to hatched shoulder

Recommendation:

1. *Consider extending the on road cycle lanes to Racecourse Road.*

Probability Rating:	***Severity Outcome Rating:***
The probability of a crash is **N/A**	***Crashes are likely to be*** **N/A**
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 Speed Limit Comment

The RSP's will reduce speeds in the township compared to the existing situation. However for a full safe systems solution the SAT believes that a reduction of the speed limit to 30km/h from Waverley Street to Harker Street is appropriate given one of the key objectives of the project is to improve the connection from either side of the state highway.

Crashes involving vulnerable road users with vehicle speeds greater than 30km/h will very likely result in serious injuries or death.

Recommendation:

1. *Consider reducing the speed limit to 30km/h for this section of road.*

Probability Rating:	***Severity Outcome Rating:***
The probability of a crash is **N/A**	***Crashes are likely to be*** **N/A**
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 Planter boxes Moderate

It is proposed to separate the bi-directional cycle lane from the traffic lane with planter boxes. Planter boxes, especially those with spacing between pose a risk of pedal snagging to users immediately adjacent to them. This can result in cyclists falling and receiving serious injuries.

Planter boxes can also have sharp corners which can result in serious injuries if struck. They can also be nudged / bumped out of place by vehicles resulting in them more likely to be struck with them intruding into the cycle lane.

The SAT appreciate there may be an aesthetic value to the planter boxes but they are very narrow and will also potentially create a safety in design issue from a maintenance aspect.

The SAT believe other forms of separation which address the issues above are more appropriate.

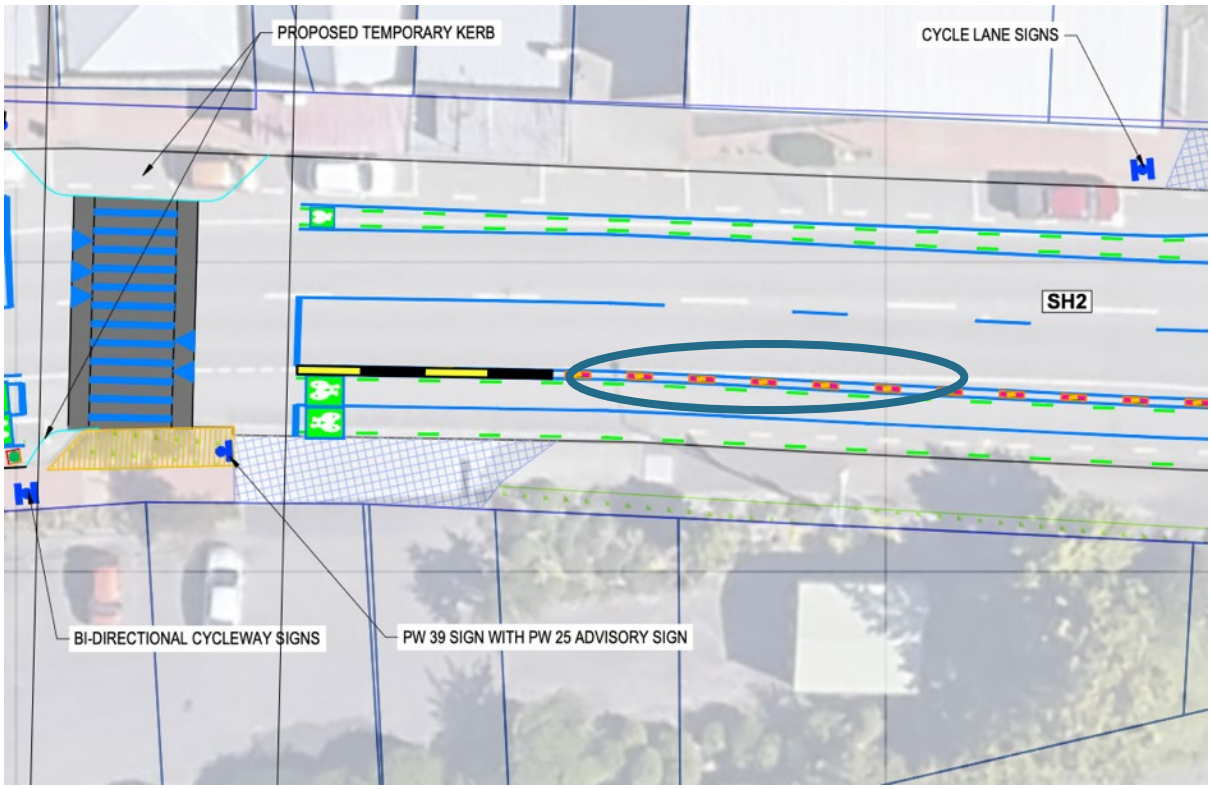


Figure 5.3-2 – Proposed planter boxes

Recommendation:

1. *Consider other forms of physical separation.*

Probability Rating:	***Severity Outcome Rating:***
The probability of a crash is **Likely**	***Crashes are likely to be*** **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.

5.3.5 Side road limit lines Serious

The drawings do not detail changes to limit lines on the side roads. They are currently shown hard up against the cycle lane. These will need to be relocated further back as per MOTSAM. Any changes to the position will require an assessment of the change in sight distance as a result of this. Some intersections may no longer meet the sight distance requirements for a Give Way and may need to be changed to Stop controlled or have additional parking removed to maintain sight distance.

If the limit lines are left hard up against the cycle lane there is a risk of vehicles intruding into the cycle lane and striking cyclists or making them swerve closer to the traffic lane to avoid the vehicle. Either of these could result in serious injuries to the cyclist.

Relocating the limit lines without assessing sight distance and making the appropriate changes could result in side impact vehicle crashes, once again resulting in serious injuries.

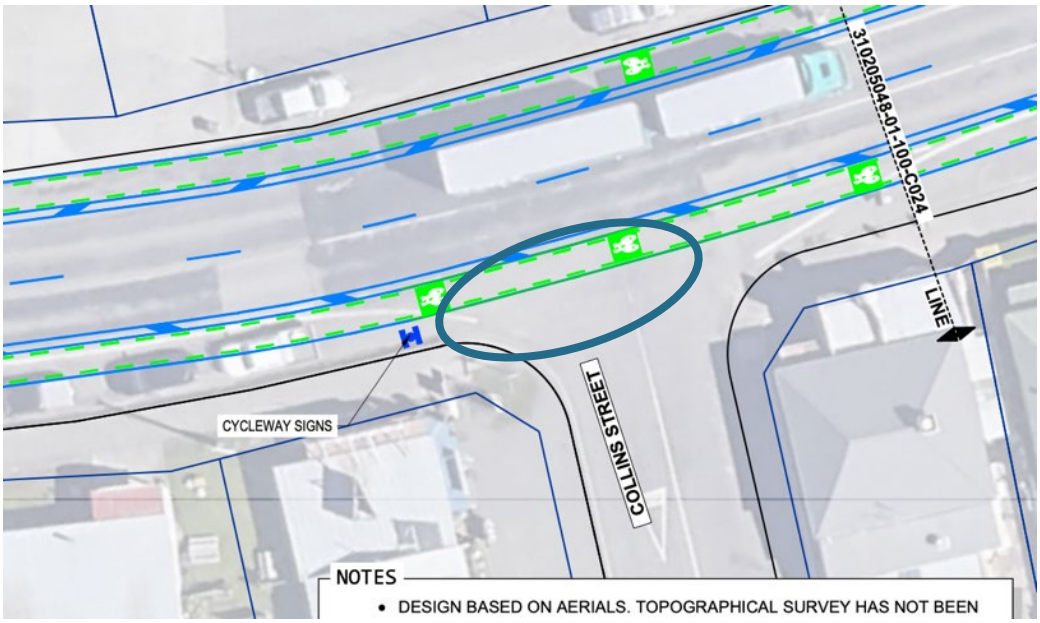


Figure 5.3-3 – Side road limit lines

Recommendation:

1. *Relocate the limit lines as per MOTSAM; and*
2. *Review the sight distance and address any deficiencies appropriately.*

Probability Rating: ***The probability of a crash is*** **Likely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.	

5.3.6 Victoria Street stacking distance – Kiwi Rail — Serious

As per Section 5.3.5 the limit lines on side roads will have to be relocated to allow for the cycle lane. At the Victoria Street intersection this will reduce the stacking distance for vehicles between the limit line and the rail corridor. There is currently approximately 8m from the limit line to the hatched area, this will be reduced when the recommendation in Section 5.3.5 is implemented. This should be checked to ensured that vehicles can safely stop in this area. The designers should be aware that Kiwi Rail will require a level crossing safety impact assessment (LCSIA) as a result of any changes to the intersection.

Any crashes which involve rail vs vehicle will result in serious injuries or death.

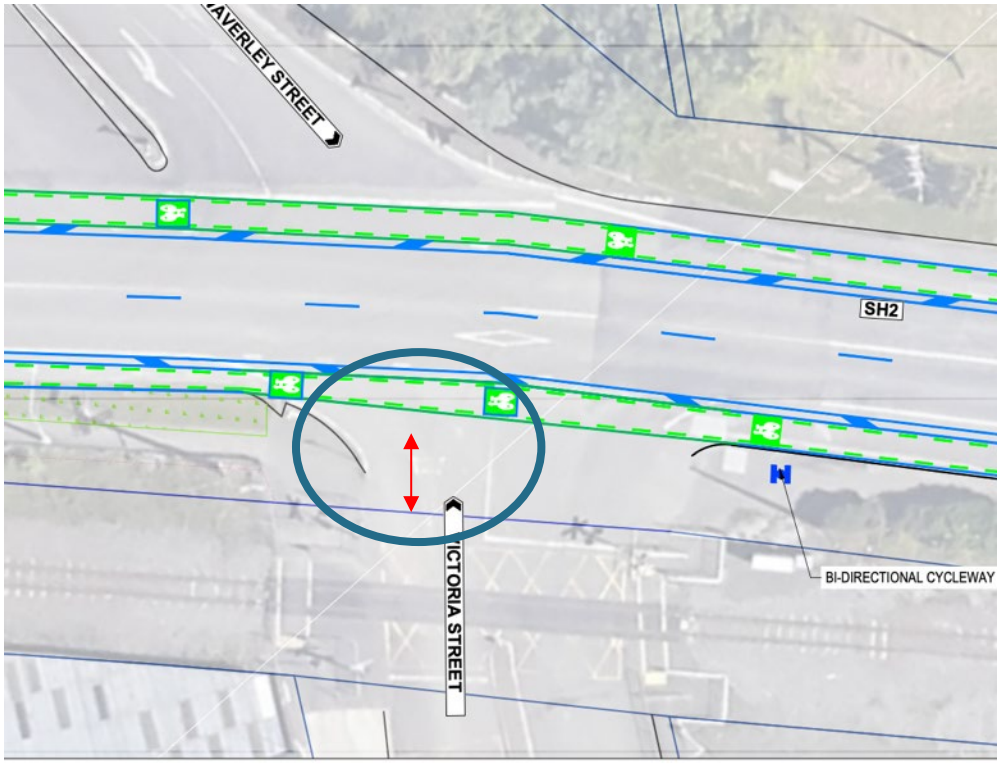


Figure 5.3-4 – Distance to rail corridor

Recommendation

1. *Establish if a safe stacking distance can be provided with the cycle lane in the proposed position; and*
2. *Ensure that any Kiwi Rail liaison is completed and LCSIA completed if required by them (highly likely it will be).*

Probability Rating:	***Severity Outcome Rating:***
The probability of a crash is **Very Unlikely**	***Crashes are likely to be*** **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.

5.3.7 Parking near Collins Street Serious

SH2 adjacent to Collins Street has several business (diary, café, bakery) which generate high demand for short term parking. The proposal removes all the parking on the western side (northbound) and possibly removes some on the eastern side. There is a high risk that motorists will park in the cycle lane on the western side while they make short visits to these businesses and with the parking bays not defined on the eastern side they may park poorly and intrude into the cycle lane. Both of these issues could result in a cyclists having to swerve into the traffic lane to avoid parked vehicles which could result on serious injury or death. A survey to understand short term parking demand would be beneficial to inform the project.

Consideration should be given ensuring that some parking is retained on the western side, possibly through recessed parking, and the on street parking is maximised and defined with markings on the eastern side. Note there is also a sign in the parking lane, circled in red, Refer Figure 5.3.5.

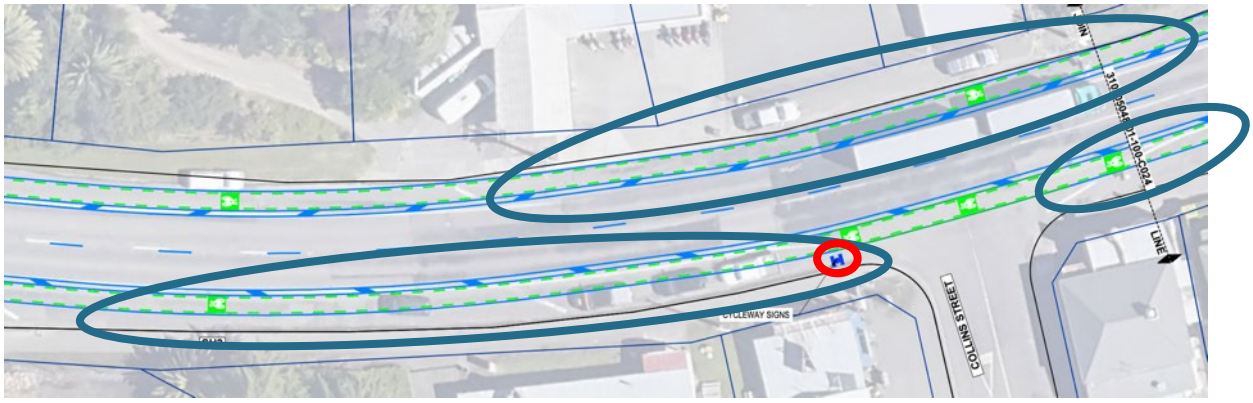


Figure 5.3-5 – Areas of high parking demand – areas of concern

Recommendation:

1. *Consider undertaking a parking survey;*
2. *Provide appropriate levels of parking and ensure it is defined with marking; and*
3. *Relocated the proposed sign to the footpath.*

Probability Rating: ***The probability of a crash is*** **Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.

5.3.8 Threshold Design Comment

The proposed threshold only details markings and coloured surfacing. This is likely to be ineffective in terms of speed reduction. Consideration should be given to providing more physical channelisation and signage for this threshold to be effective.

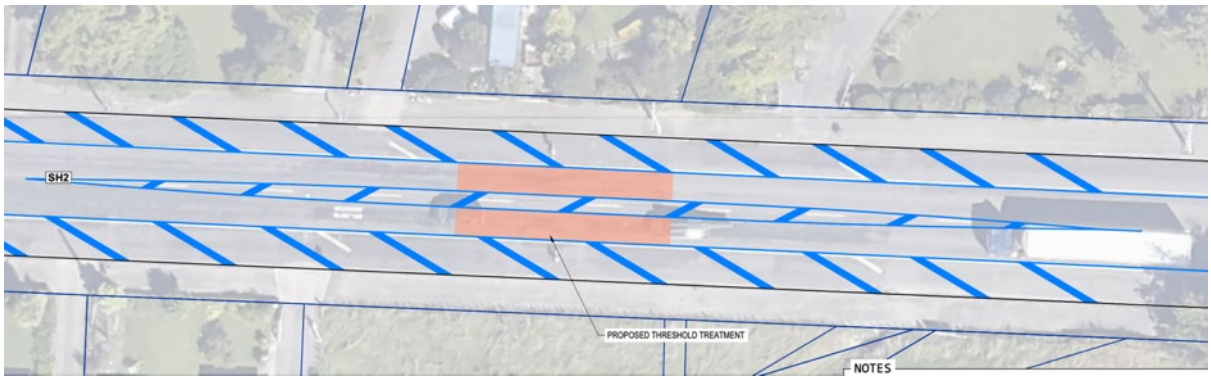


Figure 5.3-6 – Proposed Threshold

Recommendation:

1. *Consider providing physical channelisation and signage to make the threshold more effective.*

Probability Rating: ***The probability of a crash is*** **N/A**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **N/A**
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.	

5.3.9 Waverley Street – Angle of exit Significant

The left turn movement existing Waverley Street is very flat in angle which can result in high speed exits and makes it difficult for motorists to look over their shoulder to check for other road users. This is an existing issue, however with the cycle lane proposed this is a high risk to cyclists who are not as conspicuous to motorists. Any crash involving a vehicle and a cyclists is likely to result in a serious or fatal injury.

Squaring up the intersection would reduce the exit speed and this risk.

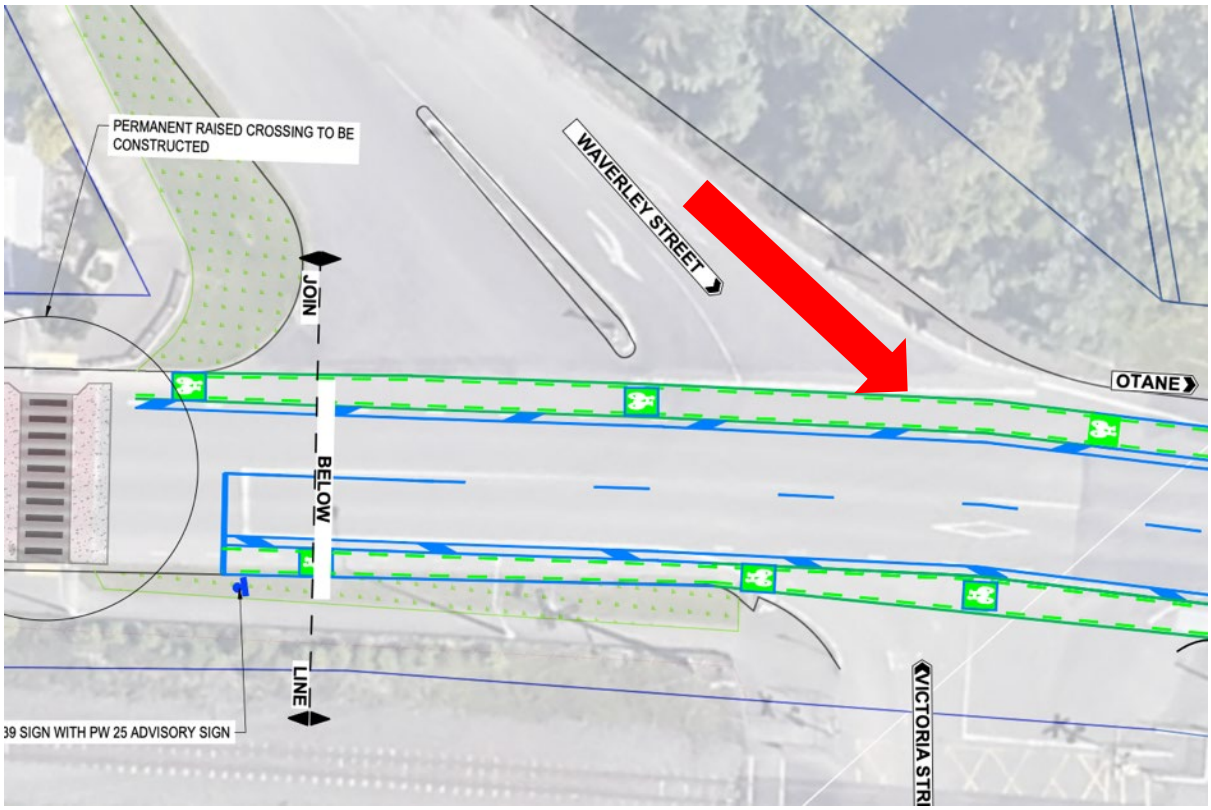


Figure 5.3-7 – Waverley Street, angle of left turn out

Recommendation:

1. *Consider squaring up the intersection to reduce exit speeds.*

Probability Rating: ***The probability of a crash is*** **Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.	

5.3.10 High volume accessway treatment — Serious

It is important to manage traffic exiting busy accessways where they conflict with cycle ways and shared paths. There are several accessways (BP, Super Liqour, and the public carpark) which are considered high volume.

Motorists exiting such businesses often do not slow down or notice cyclists when exiting across cycle ways or shared paths. These conflicts between vulnerable road users and vehicles are likely to result in serious injuries.

Consideration should be given to treatments which will slow exiting vehicles and also highlight the presence of cyclists and pedestrians. This could be in the form of speed bumps, splitter islands, signage and additional markings.

Recommendation:

1. *Consider applying treatments to address exit speeds and highlight the presence of cyclists and pedestrians at vehicle accessways.*

Probability Rating: ***The probability of a crash is*** **Likely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.	

5.3.11 Harker Street Intersection - Connectivity

Comment

The project finishes immediately prior to the Harker Street intersection. To the south of this is the Waipawa River Bridge which as discussed in Section 5.3.1 leads to the Waipawa to Waipukurau shared path. The SAT believe changes to the Harker Street intersection should be included as part of the Streets for People project.

The natural desire line is across the throat of the intersection. Users are likely to cross here whether there are facilities or not. The installation of a splitter island with a refuge would provide benefits for users to provide protection and a two part crossing. It is understood that there are potential changes to the use of Harker Street which may allow this crossing point to be designed differently. It is recommended that this be taken into consideration as part of this project to improve connectivity.

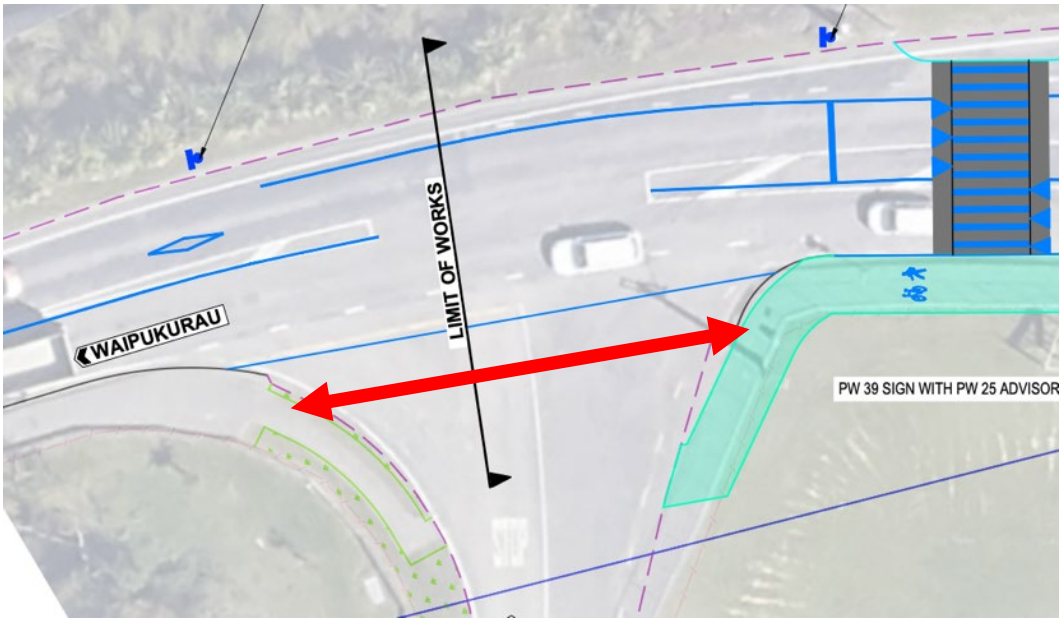


Figure 5.3-8 – Harker Street, Desire line

Recommendation:

1. *Include this intersection within the project scope and introduce facilities to improve the safety and level of service for pedestrians and cyclists.*

Probability Rating: ***The probability of a crash is*** **N/A**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **N/A**
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.	

5.3.12 Location of southern RSP Significant

The southern RSP is some distance from the desire line for pedestrians, and also further back than the RSP's on the other approaches to the roundabout. This will likely result in pedestrians crossing closer to the desire line where there are no facilities for them (Refer the double headed arrow in Figure 5.3.9) and also approach speeds to the roundabout on this leg being higher than the other legs.

The combination of higher approach speeds and pedestrians crossing without any form of pedestrian facilities could result in pedestrian injuries. The uneven entry speeds at a small diameter roundabout could also result in an increase in intersection related crashes and the associated severity of them. Having a formal pedestrian crossing at a location where there is low demand can also lead to complacency with motorists.

The SAT understand that the location of the full width RSP is dictated by the existing vehicle crossings. Given the proposed crossing point is likely to have the lowest demand for pedestrians other options of speed management for the approach combined with other pedestrian facilities closer to the desire line could provide a better level of service for pedestrians and safety.

The PW 39 sign (Refer Figure 5.3.9) is positioned in the middle of the shared path. This is a hazard to cyclists and could result in injuries. Care should be taken to position all signage in the shared path so as to avoid creating hazards to the path users.

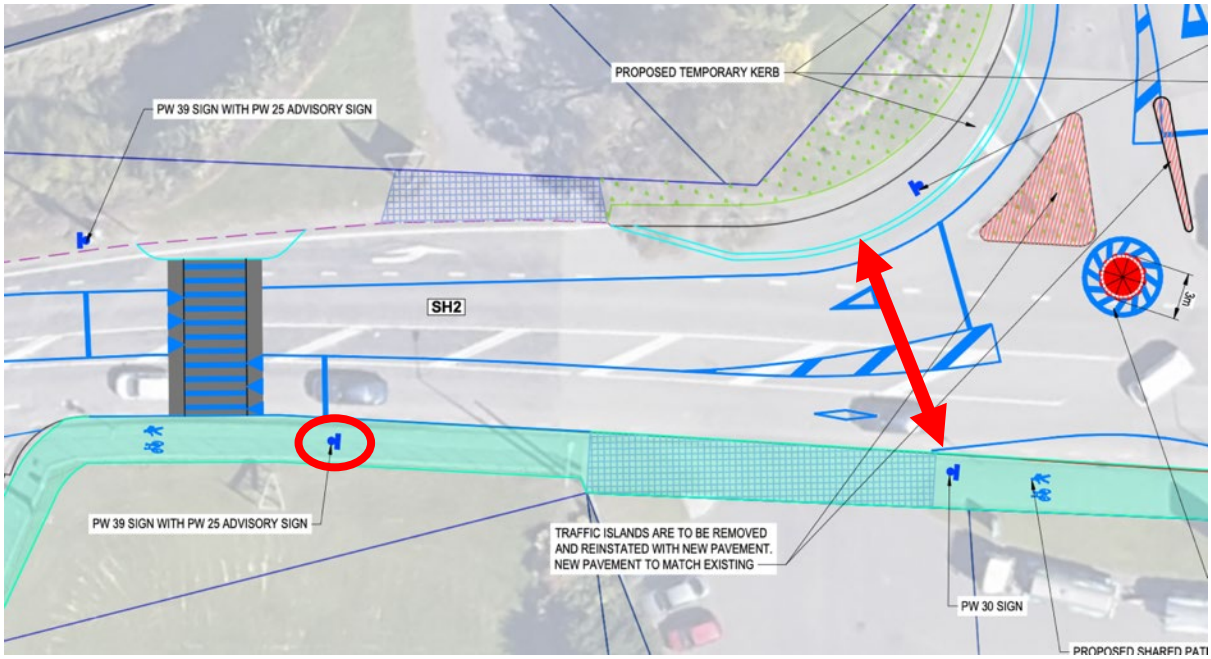


Figure 5.3-9 – Location of the proposed southern RSP vs desire line

Recommendation:

1. *Consider alternative forms / location of speed management on the approach;*
2. *Consider providing alternative forms of pedestrian facilities closer to the desire line; and*
3. *Ensure that signs are placed so as not present a risk to path users.*

Probability Rating: ***The probability of a crash is*** **Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.

5.3.13 Roundabout Signage Minor

The proposed roundabout has no supplementary Give Way (RG 6R) signs, and being a small diameter mountable roundabout has no chevrons on the central island. Vehicles approaching on the southern approach are unlikely to see the RG 6R as they approach, as indicated by the red dashed arrow in Figure 5.3.10. This could result in poor compliance for giving way at the roundabout and resultant injury crashes.

Consideration should be given to installing supplementary Give Ways on the splitter 'islands' to provide better warning to approaching vehicles.

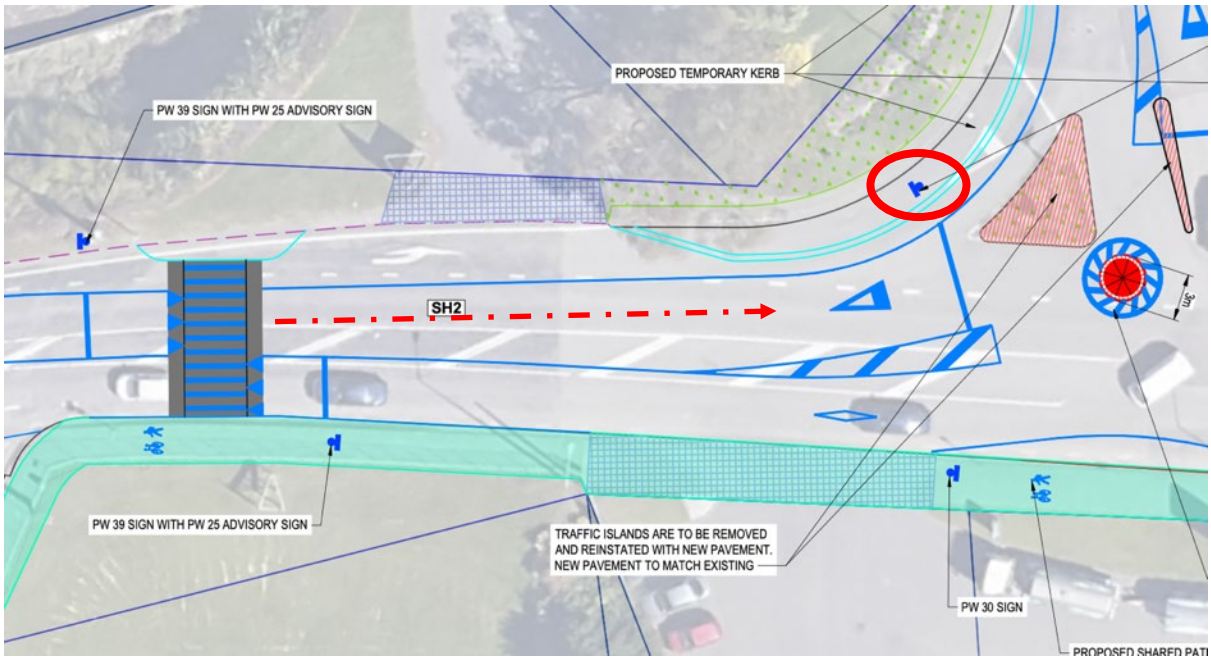


Figure 5.3-10 – Signage for approaching vehicles

Recommendation:

1. *Consider installing supplementary signage on the splitter 'islands'.*

Probability Rating: ***The probability of a crash is*** **Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.	

5.3.14 Roundabout Splitter Islands Significant

The splitter islands on all approaches to the roundabout are only hatched road marking. These will not manage approach angles to the roundabout. There is a risk in off peak periods that a small number of motorists may decide to straight line the roundabout rather than circulate around the island resulting in high speeds and risk of crashes with other road users not expecting this behaviour.

Consideration should be given to forming the islands with some form of physical product such as temporary rubber islands or delineators. This would also provide locations for signs to be installed as per Section 5.3.13.

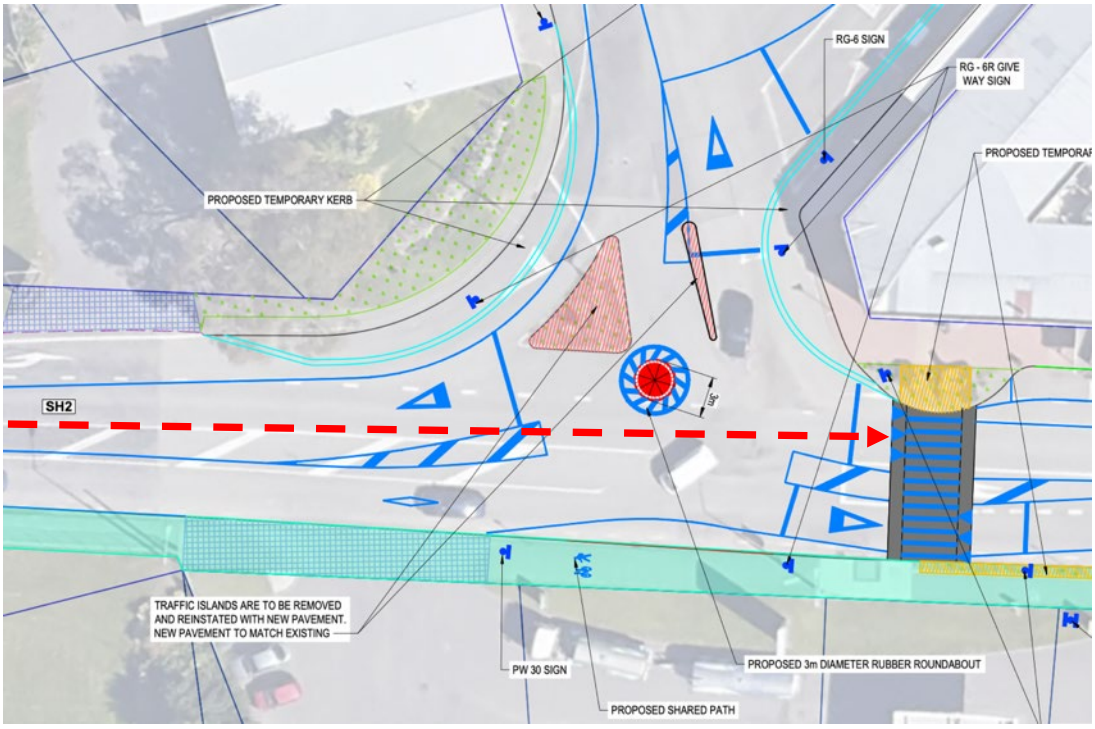


Figure 5.3-11 – Risk of straight lining the roundabout

Recommendation:

1. *Consider forming physical splitter islands.*

Probability Rating: ***The probability of a crash is* Very Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be* 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.	

5.3.15 Kenilworth Street pedestrian facilities — Serious

The design does not include any pedestrian facilities across Kenilworth Street. The SAT is aware of there being reasonable pedestrian demand across this intersection. The angle of entry of Kenilworth Street makes this a wide intersection for pedestrians to cross. There is a risk in particular to older, disabled and young vulnerable users trying to cross this wider section of road. Due the nature of the users any injuries will be serious.

Consideration should be given to providing improved pedestrian facilities across this intersection.

There is a non-standard line, circled in Figure 5.3.12, which is assumed to be a draughting error.

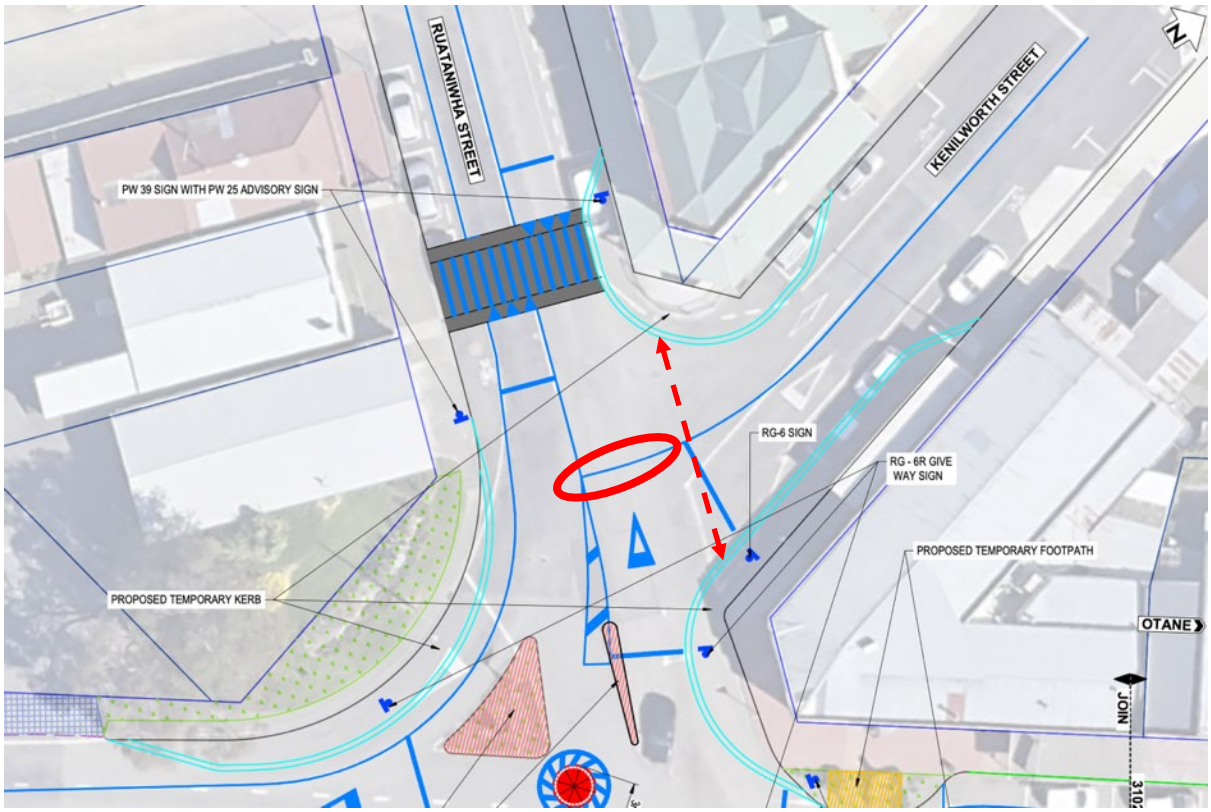


Figure 5.3-12 – Pedestrian demand across Kenilworth Street

Recommendation:

1. *Consider improved pedestrian facilities across Kenilworth Street; and*
2. *Ensure road marking is as per standards.*

Probability Rating:	***Severity Outcome Rating:***
The probability of a crash is **Likely**	***Crashes are likely to be*** **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.

5.3.16 Street Lighting Comment

The changes to the intersection layout and installation of RSP's at several locations may require changes to the street lighting. The street lighting should be checked to ensure meets the appropriate standards and design changes incorporated at the next design stage.

Recommendation:

1. *Ensure street lighting is reviewed and upgraded if required.*

Probability Rating: ***The probability of a crash is*** **N/A**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **N/A**
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.	

5.3.17 Roundabout markings Serious

The design includes an edge line adjacent to the south-west corner of the roundabout. This is offset from the proposed kerb by a distance that may make cyclists have a false sense of security and utilise this space as a pseudo cycle lane. There is a high risk of cyclists being struck in this pinch point by heavy vehicles negotiating the roundabout. This is likely to result in death or serious injuries.

Consideration should be given to removing this line and/or extending the kerb out further if this is space not required for vehicle tracking.

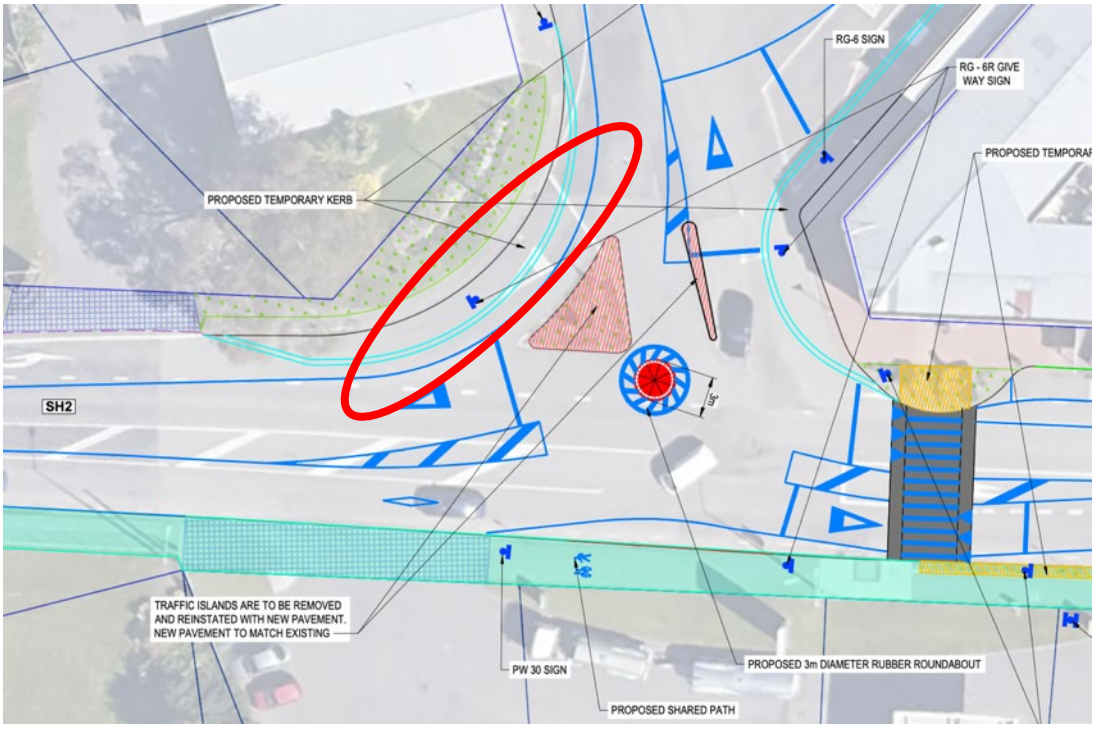


Figure 5.3-13 – Line marking adjacent to the kerb

Recommendation:

1. *Consider extending the kerb line or removing marking.*

Probability Rating: ***The probability of a crash is*** **Likely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **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.	

5.3.18 Roundabout diameter Significant

The proposed roundabout diameter is 3m with a painted apron. The SAT feel that a slightly larger diameter mountable roundabout could be accommodated at the intersection to increase deflection and reduce speed throughout the roundabout. This could also be achieved by a less conventional shaped roundabout i.e. not symmetrical. Higher speeds through the roundabout will increase the severity of any crashes.

It is recommended that consideration be given to a larger diameter mini roundabout or changes in shape to achieve increased deflection on some movements.

Recommendation:

1. *Consider increasing the size or changing the shape of the roundabout.*

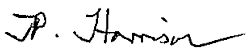
Probability Rating: ***The probability of a crash is*** **Unlikely**	***Severity Outcome Rating:*** ***Crashes are likely to be*** **Serious**
Design Team Response: Click here to enter text.	
Safety Engineer: Click here to enter text.	
Client Decision: Click here to enter text.	
Action Taken: Click here to enter text.	

6 Safe System Audit Statement

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed, or modified in order to improve safety. The problems identified have been noted in this report.

Signed:  Date: 28 April 2023

Jonno Fletcher BE Civil (Hons), MEngNZ
Principal Safety Engineer, Urban Connection Limited

Signed:  Date: 28 April 2023

Tony Harrison, Dip Hway Eng
Technical Director, Urban Connection Limited

Designer:	*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 the designer, Safety Audit Team Leader, Safety Engineer, and project file.

Date: ……

Appendix A – Safe System Assessment Matrix

Table 5.3-1 – Safe System Assessment Matrix – *Existing*

Safe System Assessment - SSA Matrix : Existing conditions								
	Run-off-road	**Head-on**	**Intersection-1 (SH1/Ruataniwha St)**	**Intersection-Other**	**Other**	**Pedestrian**	**Cyclist**	**Motorcyclists**
Exposure comments:	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV Combined AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV Combined AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	No data available, however, urban environment with main street shopping etc. Assume >100 units per day	No data available, however, urban environment with main street shopping etc. Assume 50-100 units per day	Assumed 1% of AADT as data is not available. Motorcyclists volumes of more than 100 units per day, given that AADT >10,000 vpd.
Exposure score:	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4	3 / 4	4 / 4
Likelihood comments:	Factors that increase the likelihood include: - Curved road alignment; Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Moderate shoulders with kerbside parking; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit	Factors that increase the likelihood include: - No median separation (only standard centreline); - Curve road alignment; Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit	Factors that increase the likelihood include: - Moderate/high traffic volumes on through road; - Priority control T-intersection: - Left-turn slip lane (masking issues); - High percentage of HCVs; - Intersection in close proximity; Factors that decrease the likelihood include: - 50km/h speed environment - Right-turn bay; - Lighting;	Factors that increase the likelihood include: - Priority control T-intersection type; - Waverley Street: low angle high speed left turn; - Victoria Street: Railway immediately to the east; Short stacking distance; - Kerbside parking in close proximity, restricting sightlines; Factors that decrease the likelihood include: - 50km/h speed environment - Flag Lighting;	Factors that increase the likelihood include: - Kerbside parking (side-swipe or rear-end); - Impact with vehicles entering / exiting numerous driveways; Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Moderate shoulders with kerbside parking; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit	Factors that increase the likelihood include: - High number of accessways and intersections; - Visibility restrictions at driveways; - High traffic volumes; - High operating speeds for vulnerable users (>30 km/h); Factors that decrease the likelihood include: - Footpaths on both sides of SH1; - Formal pedestrian (zebra) crossings - not raised; - Lighting; - Generally straight and flat alignment;	Factors that increase the likelihood include: - High number of accessways and intersections; - Visibility restrictions at driveways; - High traffic volumes; - High mix of HCV's v cyclists; - High operating speeds for vulnerable users (>30 km/h); - no formal on-road cycle lanes or separated facilities Factors that decrease the likelihood include: - Footpaths on both sides of SH1; - Formal pedestrian (zebra) crossings - not raised; - Lighting; - Generally straight and flat alignment;	Factors that increase the likelihood include: - No median separation (only standard centreline); - Curve road alignment; Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit
Likelihood score:	2 / 4	2 / 4	3 / 4	2.5 / 4	2 / 4	2 / 4	3 / 4	2 / 4
Severity comments:	Factors that increase the severity include: - No physical protection (barriers); - Numerous roadside hazards (e.g. Utility Poles); Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 30-40 km/h for impact to roadside hazard);	Factors that increase the severity include: - No physical protection (e.g. median island); Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 70 km/h for head-on);	Factors that increase the severity include: - High-impact angles; - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact);	Factors that increase the severity include: - High-impact angles; - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact);	Factors that increase the severity include: - High-impact angles; - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact);	Factors that increase the severity include: - Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h; Factors that decrease the severity include: - None identified;	Factors that increase the severity include: - Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h; Factors that decrease the severity include: - None identified;	Factors that increase the severity include: - Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h; Factors that decrease the severity include: - None identified;
Severity score:	2 / 4	2 / 4	2.5 / 4	2.5 / 4	2 / 4	4 / 4	4 / 4	4 / 4
Product:	16 / 64	16 / 64	30 / 64	25 / 64	16 / 64	32 / 64	36 / 64	32 / 64
							TOTAL	203 / 512

Table 5.3-2 - Safe System Assessment Matrix – *Proposed*

Safe System Assessment - SSA Matrix : Option - Streets for People

	Run-off-road	Head-on	Intersection-1 (SH1/Ruataniwha St) (SH1/Ruataniwha St)	Intersection-Other	Other	Pedestrian	Cyclist	Motorcyclists
Exposure comments:	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV Combined AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV Combined AADT > 10,000 vpd.	AADT from MobileRoad 2021 estimate: - SH1: 10,129 vpd; 8% HCV AADT > 10,000 vpd.	No data available, however, urban environment with main street shopping etc. Assume >100 units per day	No data available, however, urban environment with main street shopping etc. Expect an increase in cycle volumes with the improved facilities. Assume >100 units per day	Assumed 1% of AADT as data is not available. Motorcyclists volumes of more than 100 units per day, given that AADT >10,000 vpd.
Exposure score:	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4	4 / 4
Likelihood comments:	Factors that increase the likelihood include: - Curved road alignment; - additional roadside objects (planter boxes) and clutter, potentially increasing distraction Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Moderate shoulders with kerbside parking; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit; - Lanes narrowed to 3.4 m; - Additional delineation; - Raised platforms and other measures helping to reduce mean speeds	Factors that increase the likelihood include: - No median separation (only standard centreline); - Curve road alignment; - slightly narrower lanes, leading to more head-on impacts Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit - Additional delineation; - Raised platforms and other measures helping to reduce mean speeds	Factors that increase the likelihood include: - Moderate/high traffic volumes on through road; ~~- Priority control T-intersection;~~ ~~- Left-turn slip lane (masking issues);~~ - High percentage of HCVs; - Intersection in close proximity; - Proposed roundabout (can see an increase in crashes, although at lower speed and inmpact angle) Factors that decrease the likelihood include: - 50km/h speed environment - Right-turn bay; - Lighting; - Proposed temporary roundabout - less confusing layout; - Raised platforms, reducing speed on approach	Factors that increase the likelihood include: - Priority control T-intersection type; - Waverley Street: low angle high speed left turn; - Victoria Street: Railway immediately to the east; Short stacking distance; - Kerbside parking in close proximity, restricting sightlines; Factors that decrease the likelihood include: - 50km/h speed environment - Flag Lighting;	Factors that increase the likelihood include: - Kerbside parking (side-swipe or rear-end); - Impact with vehicles entering / exiting numerous driveways; Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Moderate shoulders with kerbside parking; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit	Factors that increase the likelihood include: - High number of accessways and intersections; - Visibility restrictions at driveways; - High traffic volumes; - High operating speeds for vulnerable users (>30 km/h); Factors that decrease the likelihood include: - Footpaths on both sides of SH1; - Formal pedestrian (zebra) crossings - not raised; - Lighting; - Generally straight and flat alignment; - Raised pedestrain crossings, reducing approach and impact speeds; - Separated cycleway removes cyclists from footpath	Factors that increase the likelihood include: - High number of accessways and intersections; - Visibility restrictions at driveways; - High traffic volumes; - High mix of HCV's v cyclists; - High operating speeds for vulnerable users (>30 km/h); ~~- no formal on-road cycle lanes or separated facilities~~ Factors that decrease the likelihood include: - Footpaths on both sides of SH1; - Formal pedestrian (zebra) crossings - not raised; - Lighting; - Generally straight and flat alignment; - Raised pedestrain crossings, reducing approach and impact speeds; - Separated cycleway removes cyclists from footpath; - Improved cycle facilities and delineation (signs and lines);	Factors that increase the likelihood include: - No median separation (only standard centreline); - Curve road alignment; - slightly narrower lanes, leading to more head-on impacts Factors that decrease the likelihood include: - Pavement appears to be mostly in good condition; - Generally flat alignment; - Good delineation; - 50 km/h posted speed limit - Additional delineation; - Raised platforms and other measures helping to reduce mean speeds
Likelihood score:	2 / 4	2 / 4	3 / 4	2.5 / 4	2 / 4	1.5 / 4	2 / 4	2 / 4
Severity comments:	Factors that increase the severity include: - No physical protection (barriers); - Numerous roadside hazards (e.g. Utility Poles); Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 30-40 km/h for impact to roadside hazard); - slight decrease in speed environment possible	Factors that increase the severity include: - No physical protection (e.g. median island); Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 70 km/h for head-on); - slight decrease in speed environment possible	Factors that increase the severity include: ~~- High-impact angles;~~ - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact); - lower speed and impact angle	Factors that increase the severity include: - High-impact angles; - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact);	Factors that increase the severity include: - High-impact angles; - High HCV volumes; Factors that decrease the severity include: - Impact speeds likely to be less than Safe System boundary conditions (i.e. < 50 km/h for side impact);	Factors that increase the severity include: ~~- Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h;~~ Factors that decrease the severity include: - None identified; - Impact speeds likely to be approaching Safe System boundaries (≥ 20-30 km/h), likely about 30 km/h;	Factors that increase the severity include: ~~- Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h;~~ Factors that decrease the severity include: - None identified; - Impact speeds likely to be approaching Safe System boundaries (≥ 20-30 km/h), likely about 30 km/h;	Factors that increase the severity include: ~~- Impact speeds exceed Safe System boundaries (≥ 20-30 km/h), likely ≥ 40 km/h;~~ Factors that decrease the severity include: - None identified; - Impact speeds likely to be approaching Safe System boundaries (≥ 20-30 km/h), likely about 30 km/h;
Severity score:	2 / 4	2 / 4	2 / 4	2.5 / 4	2 / 4	3 / 4	3 / 4	3 / 4
Product:	16 / 64	16 / 64	24 / 64	25 / 64	16 / 64	18 / 64	24 / 64	24 / 64
							TOTAL	163 / 512

Waipawa Streets for People Prelim Design Stage SSA Rev 0.docx

Document Status FINAL

Revision	Prepared by:	Reviewed by:		Approved by:		
		Name	Signature	Name	Signature	Date
0	Tony Harrison	Jonno Fletcher		Aaron Campion		28/04/2023