



Streets for People – Grey Street, Gisborne
Concept Stage Safe System Audit Report
Prepared for Gisborne District Council

REVISION 0- OCTOBER 2023

Table of Contents

1	Safe System Auditing for Transport Projects	3
1.1	Safe System Audit Procedure	3
1.2	The Safe System	4
1.3	Report Format	4
1.4	Disclaimer	6
2	Safe System Audit Details	7
2.1	Type of Audit	7
2.2	The Safety Audit Team	7
2.3	Meetings and Site Inspections	7
3	Project Description	8
3.1	Project Background and Objective	8
3.2	Existing Conditions and Context	8
3.3	Proposed Works	9
4	Assessment of Safe System Alignment	10
4.1	Safe System Assessment Summary	10
5	Safety Concerns	12
5.1	Crash History	12
5.2	Summary of findings	13
5.3	General Safety Concerns	14
5.3.1	<i>Tree Planters</i>	14
5.3.2	<i>Cycleway Crossfall and Vehicle Crossings</i>	17
5.3.3	<i>Courtesy Crossings</i>	20
5.3.4	<i>Existing Raised Pedestrian Crossing</i>	22
5.3.5	<i>Crossings at the Grey Street/Kahutia Street Intersection</i>	25
5.3.6	<i>Tactile Pavers</i>	28
5.3.7	<i>Vegetation over the Cycleways</i>	31
5.3.8	<i>Cycleway Connection to Existing Crossing</i>	33
5.3.9	<i>Northern Tie-in – Cycleway and Courtesy Crossing Conflict</i>	35
5.3.10	<i>Pedestrian Refuges</i>	38
5.3.11	<i>Proposed Parking Spaces</i>	41
5.3.12	<i>Tripping Hazards on Footpaths</i>	43
5.3.13	<i>Plate on the Drain – Tripping Hazard</i>	46
5.3.14	<i>Visibility Restriction – Childers Road Crossing</i>	48
5.3.15	<i>Cars Encroaching Footpath</i>	50
5.3.16	<i>Speed Management Measures (Speed Humps)</i>	53
5.3.17	<i>Connectivity to Side Roads</i>	55
5.3.18	<i>Missing Information</i>	56
6	Safe System Audit Statement	57

1 Safe System Auditing for Transport Projects

This report has been prepared in response to a request from the Gisborne District Council to carry out a Concept Stage Safe System Audit for the Grey Street – Streets for People Gisborne project.

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

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 report has been prepared in response to a request from Gisborne District Council to carry out a Concept Stage Safe System Audit (SSA) for Streets for People – Grey Street, Gisborne Project.

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:

- Matheus Boaretto, Urban Connection Limited, Hawke's Bay – Team leader
- Ashu Kedia, Urban Connection Limited, Christchurch – Team member

2.3 Meetings and Site Inspections

The Safety Audit Team (SAT) reviewed the drawings on 11 September 2023. This was followed by a full site inspection during the daytime on 13 September 2023.

3 Project Description

3.1 Project Background and Objective

The Streets for People project seeks to primarily enhance cyclist safety on Grey Street in Gisborne by implementing protected cycling facilities. Safety improvements for pedestrians are also proposed through additional pedestrian crossings. Associated traffic calming measures on Grey Street and at vehicle accesses, along with the associated road markings and traffic signs, are also introduced. The extent of the works is from Grey Street/0.530 (i.e., Grey Street/Childers Road intersection) to Grey Street/0.880 (i.e., 130 m west of Grey Street/Kahutia Street intersection), as shown in Figure 3.1-1.

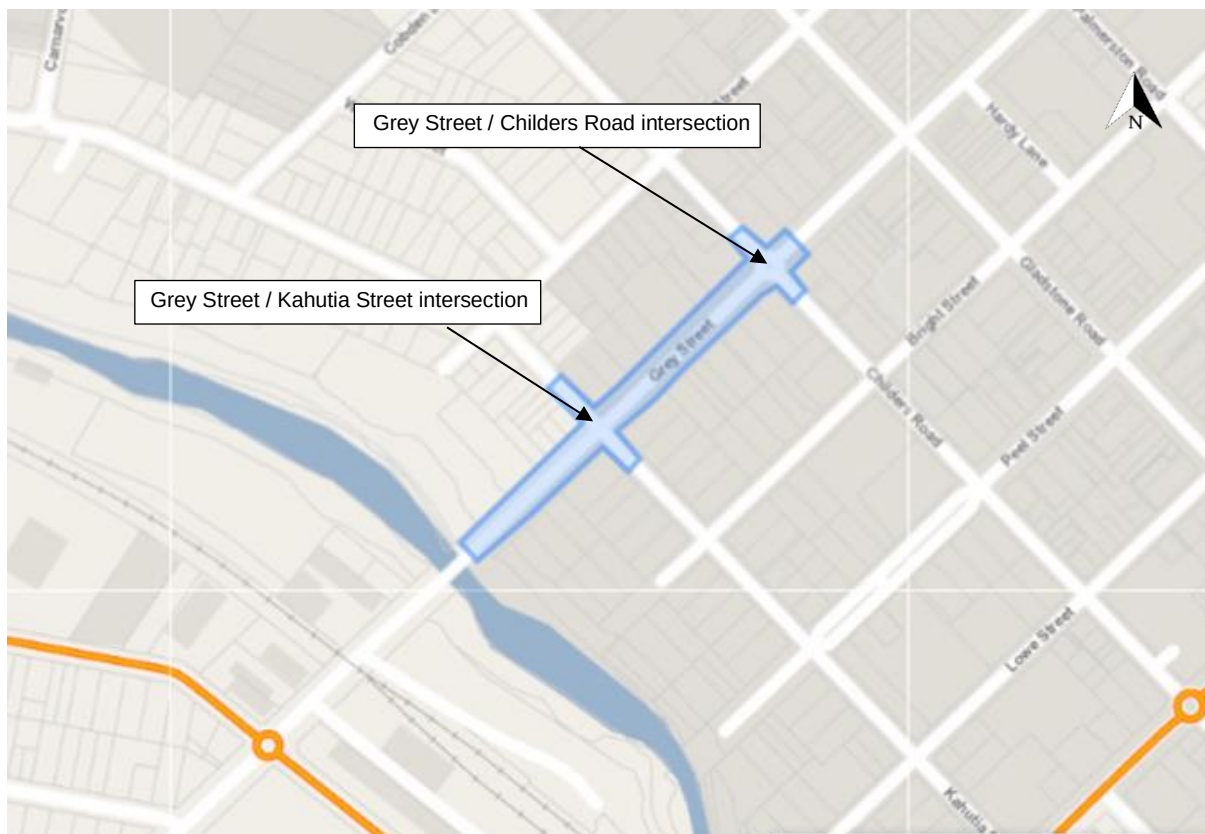


Figure 3.1-1 Locality plan

3.2 Existing Conditions and Context

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

- Grey Street, from approximately Grey Street/0.530 to Grey Street/0.880 in the Gisborne region.
 - Grey Street has a recorded annual average daily traffic (AADT) from 2,899 to 6,000 (Mobile Road 2022), with 3% of heavy vehicles;
 - Grey Street provides the connection between Waikanae to the south and Gisborne CBD to the north. Typical road users consist of residents of Gisborne travelling to and from the CBD. The adjoining roads are Arterial, Primary Collectors, or Secondary Collectors;

- The posted speed limit is 50 km/h throughout the site;
- The section throughout the site is urban commercial. The alignment is flat and straight on both ends of the site;
- A high presence of pedestrians and cyclists is expected due to the link to the CBD, the adjacent commercial area and stake and bike parks and tracks; and
- The typical cross-section throughout Grey Street is two-lane two-way, with wide sealed shoulders.

3.3 Proposed Works

The project proposes the following improvements.

- Pedestrian and cycling improvements on Grey Street:
- The works include:
 - Installing a new 3 m wide protected bi-directional cycleway with 0.6 m wide concrete separators between the cycle lane and parking along Grey Street;
 - Installing new courtesy crossings on Grey Street East and Kahutia Street South;
 - Installing a modal filter at Kahutia Street South, which bans the right turn movements at the Grey Street/Kahutia Street intersection, to make the courtesy crossings safer;
 - Introducing a new public space and a pick-up/drop-off area near the skate park along Grey Street;
 - Installing a new flush pedestrian crossing at mid-block on Grey Street between Kahutia Street and Childers Road using concrete traffic islands, rubber speed humps, and markings;
 - Installing a new raised pedestrian crossing across Childers Road to the south of the Grey Street/Childers Road intersection using a concrete or asphalt raised table, concrete buildouts, and markings;
 - Public space opportunity along the existing carriageway. Elements could include planting, seating, and/or interactive elements; and
 - Road markings and signs.

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

- Streets for People Gisborne – Grey Street Linear Park Trial: Concept Layout - Drawing No. NZ3334-101 to 102, Revision 3, Dated 15/08/2023).

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.

The intersections throughout this section have been analysed separately due to their different characteristics (either existing or proposed), as follows:

- Intersection 1: Grey Street/Kahutia Street intersection;
- Intersection 2: Grey Street/Childers Road intersection.

Table 4.1-1 - Safe System Assessment Score Summary

Option	Score
Existing	174.5 / 512
Proposed (Pedestrian and Cycling Improvements)	108.75 / 512

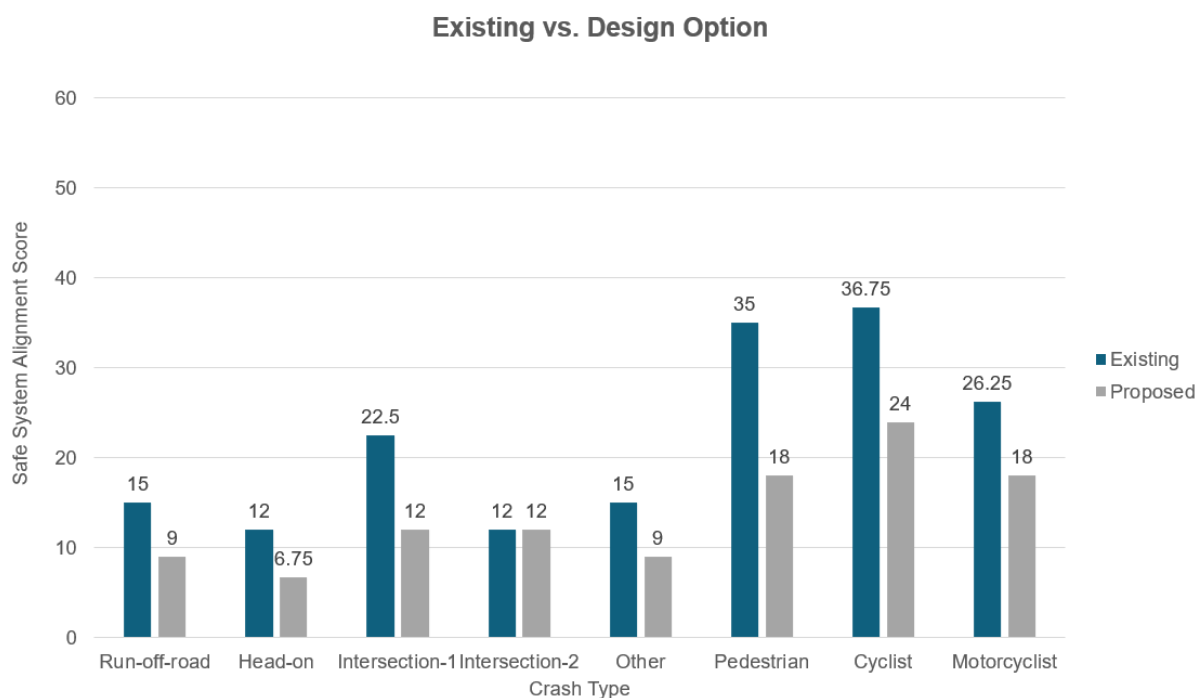


Figure 4.1-1 - Safe System Assessment Score Summary

The safe system assessment for the Grey Street Streets for People Project shows that the proposed design is more aligned with Safe System principles and is a significant improvement on the existing conditions across all crash types.

Pedestrian and cyclist crashes are expected to be positively impacted by the proposal. The likelihood of crashes involving pedestrians is reduced compared to the existing situation primarily due to the proposed crossing points, which are expected to raise drivers' awareness of the potential conflict with these vulnerable road users. Cyclist crashes are also expected to have a reduced likelihood due to the dedicated cycling facilities. Note that an increase in cyclist exposure is predictable, given the upgraded facilities. Nevertheless, even with a higher user exposure, the score still aligns more with Safe System principles, indicating high safety benefits for this user category. However, for both pedestrian and cyclist crashes, there is a residual risk associated with insufficient speed management at some of the crossing points, reducing the severity score only marginally compared to the existing condition.

Typically, all other crash types are expected to benefit from the proposed interventions. For instance, run-off-road, head-on, motorcyclist and other-type (rear-end) crashes are expected to have a reduced likelihood compared to the existing situation due to a more controlled speed environment expected to be generated by the proposed speed calming measures (i.e., curved alignment, speed humps). The reduced speed environment is also expected to reduce crash severity.

Furthermore, a high benefit is also observed at the Grey Street/Kahutia Street intersection. This is driven by the right-turn ban (left-in left-out) treatment at the intersection. This treatment, associated with traffic calming measures, is expected to significantly reduce the crash likelihood, creating a safer road environment.

The recommendations for improvement and alignment with the Safe System are outlined in the subsequent sections. As described, consideration should be given to the primary treatments that have the potential to eliminate or come close to eliminating the risk of death and serious injury crashes.

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, including 2023 to date, from RP Grey Street/0.500 to RP Grey Street/0.880. The crash location map is 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	Grey Street (0.530 to 0.880)			
	Frequency		Casualties	
Fatal	0		0	
Serious	0		0	
Minor Injury	7		8	
Non-injury	20		-	
Total	27		8	
Crash Type		Environment		
Overtaking crashes	0%	Natural light conditions	Light/overcast	74% (20)
Straight road lost control/head-on	4% (1)		Dark/twilight	26% (7)
Bend lost control/head-on	0%	Road conditions	Dry	89% (24)
Rear end/obstruction	22% (6)		Wet	11% (3)
Crossing/turning	74% (20)		Ice or Snow	0%
Others	0%	Intersection/midblock		
Involved motorcyclists	7% (2)	Intersection		85% (23)
Involved pedestrians/cyclists	7% (2)	Midblock		15% (4)

There have been a total of 27 crashes, including seven minor-injury crashes and 20 non-injury crashes, along this section of Grey Street in the last 5 years. None of the crashes were serious injury crashes or fatal crashes. 85% of crashes occurred at intersections. The most common type of crash was crossing or turning at intersections, followed by rear-end crashes.

5.2 Summary of findings

The frequency of risk rankings associated with this Safe System Audit is provided below, with 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
2	5	3	6	2	18

5.3 General Safety Concerns

5.3.1 Tree Planters

Serious

Tree planters are proposed to be installed at the designed central medians in front of the skate park and at the Grey Street/Kahutia Street intersection. Visibility restrictions are expected to be generated by the proposed planters, likely generating the following issues:

- As observed during the site visit, pedestrians cross the road east to west (and vice-versa) in front of the skate park to access the public toilets and bus stop. The raised zebra crossing is provided south of this point; however, pedestrians are inclined to use the shortest path (i.e., desire line), which explains the observed crossing behaviour. The tree planters illustrated on the plans are relatively high. When pedestrians are crossing the road on the north side of the proposed planters, the intervisibility between these users and northbound vehicles is expected to be restricted. When crossing the road on the south side of the planters, conflicts between pedestrians and southbound vehicles could arise. Note that the conflict risk is higher if the pedestrians are children due to their low height, and a high children presence is noted at this location;
- Similarly, at the proposed courtesy crossing through Grey Street, pedestrians crossing the road east to west could not be visible to northbound vehicles, establishing the risk of conflicts between them.

Given the reduced visibility, relatively high traffic volumes and number of pedestrians crossing the road (note that the i-Site is also located on the west side of Grey Street), the probability of a crash against pedestrians is assessed to be 'Likely'. The severity of a crash against a pedestrian could potentially be 'Serious', as vehicle speeds could exceed 30 km/h, especially at the courtesy crossing, on which no speed management measures are proposed.

Table 5.3-1: Risk analysis – Against a pedestrian

Prominent crash type		▪ Vehicle versus pedestrian
Probability	Likely	▪ Reduced intervisibility; ▪ Relatively high traffic volumes; ▪ Relatively high number of pedestrians crossing the road
Severity	Serious	▪ Impact speed could be above the threshold speed of 30km/h

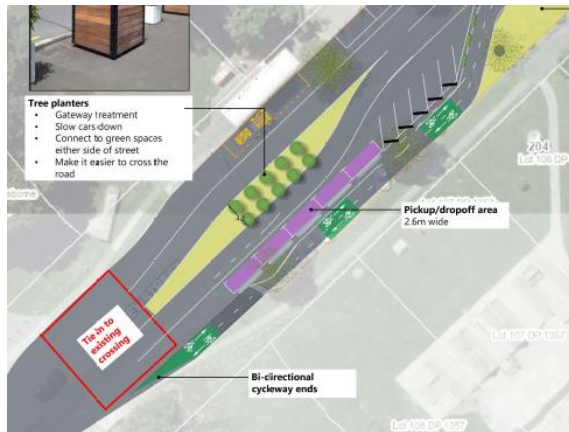


Figure 5.3-1 – Proposed tree planters in front of the skate park



Figure 5.3-2 – Proposed tree planters at the Grey Street/Kahutia Street intersection



Figure 5.3-3 – Pedestrians crossing Grey Street between the public toilet and the skate park

Recommendation:

1. Consider an alternative treatment on the central median that does not create visibility issues (for instance, low-height vegetation); and
2. Consider providing a formal pedestrian crossing between the public toilet/bus stop/i-Site and the skate park.

Probability Rating:

The probability of a crash is Likely

Severity Outcome Rating:

Crashes are likely to be Serious

Design Team Response: (1) We've amended the median planting design, now proposing low-level planters in both medians. The taller planters will be 600mm high, while the shorter planters will be 400mm high and be prioritised next to the proposed crossing island and where pedestrians may walk past them to cross casually. 600mm high planters will be 'boxed in' by shorter planters such that there will be distance between those and pedestrians to increase sightlines (2) Unfortunately an additional crossing is considered out of scope of this trial project, but this recommendation will be passed on for the design of any permanent solution to follow the trial. In the interim, casual crossing will be made safer by reduced vehicle movements, speeds, crossing distances and hopefully reduced vehicle volumes too.

Safety Engineer: I agree that suitable sightlines need to be provided appropriate to vehicle speeds. Ideally, vehicle speeds should be moderated and below 30 kph.. The width and shape of the island could also be designed to help provide suitable sightlines. Landscaping should be designed to suit sightlines also. Landscaping will also need to be managed, installed and maintained, to avoid impeding sight lines. It is noted that further consideration will be given to formal crossing facilities after the trial. Pedestrians should be encouraged to cross where it is safe to do so which could be through the provision of formal facilities but also through other measures such as breaks in the parking, access points and coloured surfacing.

Client Decision: Plants will be maintained by our contractor throughout the trial to ensure they cause no sight issues.

Action Taken: Low planter boxes to be installed with low growing plants that will not cause sight issues. Contractor has been engaged to maintain the planter boxes for the duration of the trial.

5.3.2 Cycleway Crossfall and Vehicle Crossings

Serious

The designed 3 m wide cycleway is proposed to run adjacent to the existing kerb and footpath on the northern end of the site, between the Grey Street/Childers Road roundabout and the proposed zebra crossing. This space is currently used for angle parking.

During the site visit, it was observed that the crossfall through the area where the cycleway is proposed is steeper than the road, appearing to exceed 3 percent. The maximum crossfall for cycle lanes is similar to the requirements for traffic lanes of 2.5 to 3 percent. If the crossfall is steeper than this, cyclists are likely to lose their balance while riding. In this case, cyclists would be expected to be pushed east towards the existing kerb. This would result in northbound cyclists likely being pushed towards the opposing cycle lane, potentially generating conflicts with southbound cyclists. Southbound cyclists, being pushed towards the kerb, would be susceptible to hitting the kerb and falling off their bicycles.

Furthermore, several vehicle crossings are located throughout this section of Grey Street. Due to the steep crossfall, vehicle crossings are raised on the road to enable appropriate vehicle access. As is, the vehicle crossings would both reduce the effective width of the southbound cycle lane and be a hazard for cyclists due to the level difference. Once again, this establishes a potential risk for cyclists to lose their balance and fall, especially in dark conditions. Note that the design does not provide details of how the existing carriageway is to be treated to accommodate the cycleway, which is expected for the concept stage of the project.

Some catch pits are also located throughout the section. In this case, it is important to confirm that these are cycle-friendly to remove the risk of unseating/catching a cyclist's wheel, which could result in issues for cyclists.

The probability of conflicts due to the above issues is assessed as 'Likely', as the substandard crossfall and reduced width and obstacle (level difference) created by the existing vehicle crossings. The severity in the event of a cyclist falling and hitting the kerb could be 'Serious' if a head collision occurs.

Table 5.3-2: Risk analysis – Cyclist falling off bikes

Prominent crash type		▪ Cyclist falling off and hitting kerb ▪ Cyclist versus cyclist
Probability	Likely	▪ Substandard crossfall ▪ Reduced cycle lane width ▪ Obstacle/level difference at vehicle crossings
Severity	Serious	▪ Impact with the kerb could generate serious injuries if a head collision occurs

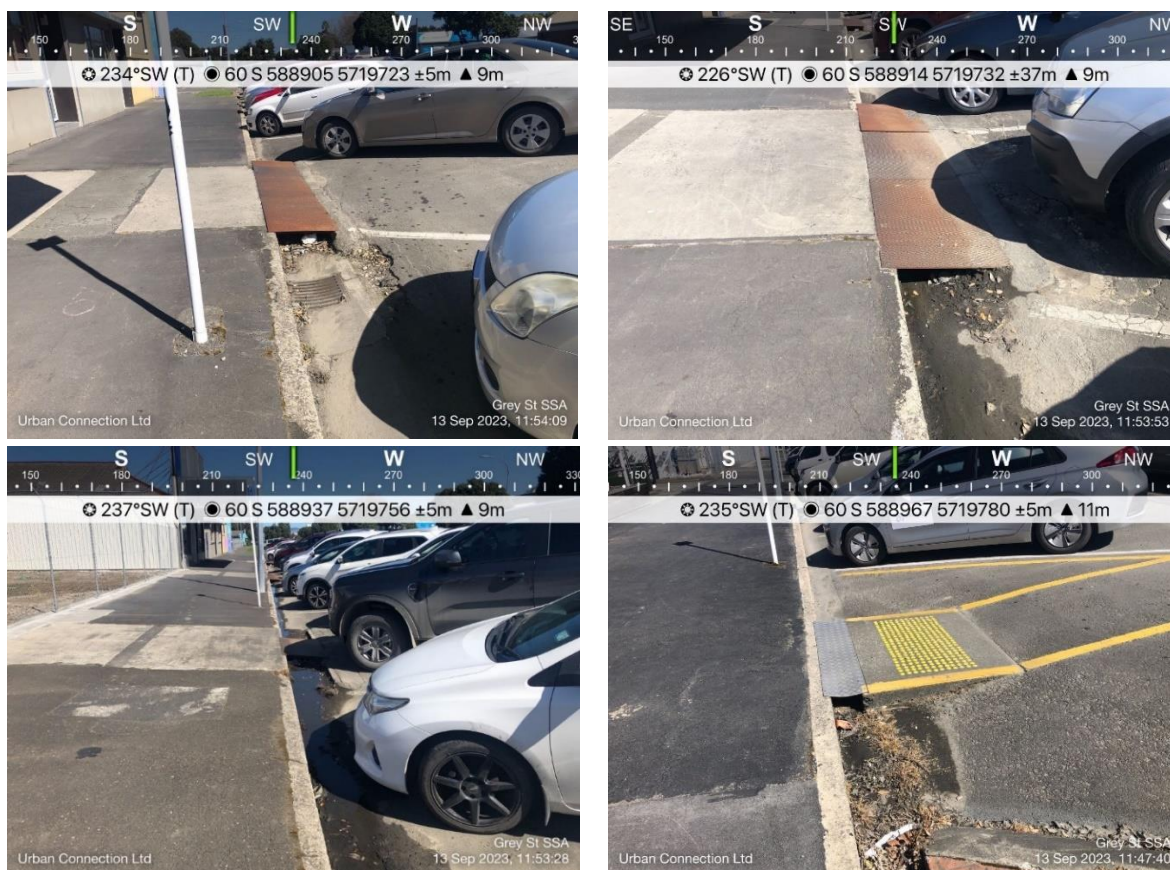


Figure 5.3-4 – Raised vehicle crossings along Grey Street



Figure 5.3-5 – Steep crossfall along Grey Street

Recommendation:

1. *Provide details of how the existing carriageway and vehicle crossings are to be treated to accommodate the proposed cycleway;*
2. *Provide a maximum crossfall of 3% throughout the cycleway;*
3. *Remove the on-road level difference generated by the vehicle crossings or offset the cycleway from the vehicle crossings; and*
4. *Provide cycle-friendly catchpit grates.*

Probability Rating:	Severity Outcome Rating:
<i>The probability of a crash is Likely</i>	<i>Crashes are likely to be Serious</i>
<i>Design Team Response:</i> Crossfalls have now been measured throughout the project extents. It has been confirmed that some sections are above desirable grades for a cycleway. Although remediation of carriageway grading is generally considered beyond the scope of a project of this nature, we have been investigating an option to remediate the steepest sections, and are awaiting pricing information to confirm our options	
<i>Safety Engineer:</i> Two wheeled cyclist are less susceptible to transverse grades. However, the facility should cater for trikes and mobility users which require modest transverse grades as suggested. Suitable transitions over or around vehicle crossings should be provided. Cycle friendly sump grates should be provided.	
<i>Client Decision:</i> After further pricing information has been received, the decision to not level the cross fall was made due to funding. Users will be monitored, and this is something we will look to remediate if there is a permanent stage.	
<i>Action Taken:</i> Monitoring schedule in line with the s-tech traffic cameras.	

5.3.3 Courtesy Crossings

Significant

Five crossing points are proposed to be provided by the project, three crossings through Grey Street, one crossing through Childers Road and one crossing through Kahutia Street. The crossing treatment differs from one location to another, as follows:

- A raised shared zebra crossing through Childers Road on the eastern quadrant of the roundabout with Grey Street;
- One courtesy crossing through Grey Street on the southern quadrant of the roundabout with Childers Road;
- One zebra crossing through Grey Street halfway between Childers Road and Kahutia Street;
- One courtesy crossing through Grey Street on the northern side of the intersection with Kahutia Street; and
- One courtesy crossing through Kahutia Street on the eastern side of the intersection with Grey Street.

Although it is recognised that courtesy crossings are a common treatment in Gisborne, the treatment does not prioritise pedestrians (i.e., legally, vehicles still have priority). Conversely, at the proposed zebra crossings, pedestrians are prioritised. Due to the inconsistent and interchangeable layout of the crossings proposed by the project, both vulnerable road users and vehicles could be confused as to who has the priority, potentially leading to conflicts between them.

As a Streets for People project, the auditors consider prioritising vulnerable road users at all crossing points essential to provide a safer environment for these users. A consistent/standard treatment at all crossings (i.e., zebra) is also expected to result in road users quickly understanding the layout and is likely to reduce the likelihood of conflicts.

The probability of conflicts is considered 'Unlikely' due to the typically good visibility provided at courtesy crossings and the fact that the red surfacing might increase vehicles' awareness in regards to the crossing point. However, impact speeds could likely exceed 30 km/h as speed management is not provided at all crossings, potentially resulting in 'Serious' injuries.

Table 5.3-3: Risk analysis – Against pedestrians

Prominent crash type		▪ Vehicle against pedestrians
Probability	Unlikely	▪ Good visibility at crossing points; ▪ Red surfacing is expected to raise motorists' awareness
Severity	Serious	▪ Impact speed could be above the threshold speed of 30km/h



Figure 5.3-6 – Proposed courtesy crossings (extracted from the design)

Recommendation:

1. Consider providing priority zebra crossings instead of courtesy crossings.

Probability Rating:

The probability of a crash is Unlikely

Severity Outcome Rating:

Crashes are likely to be Serious

Design Team Response: In addition to the previously proposed crossings, we are now proposing a pedestrian and cycle priority dual crossing across Kahutia Street. This will improve consistency for cycling, as all cycle crossings will have priority. The crossing over Grey Street at CH90 is also proposed to be priority given it ties-in well with existing infrastructure. Unfortunately the two other crossings are proposed to be courtesy crossings, due to the costs of upgrading them to priority being likely prohibitively high for this project. Red markings are proposed such that they are consistent with other local courtesy crossings. Any future permanent project for Grey Street should consider this recommendation

Safety Engineer: There is some merit in providing consistency however the facilities should also be appropriate for the environment and use. The use of zebra crossings will also be a broader consideration, with consideration of all users and impacts on traffic.

Client Decision: Courtesy Crossing on Kahutia Streets has been changed to a pedestrian crossing.

Action Taken: To be monitored with S-Tech traffic cameras under monitoring and evaluation.

5.3.4 Existing Raised Pedestrian Crossing

Significant

An existing raised zebra crossing is located south of the Kahutia Street intersection, connecting the Alfred Cox Stake Park on the east side of Grey Street and the Cycleway and Walkway on the west side of the road. The following safety concerns have been identified during the site visit:

- The approach ramps are long and smooth, which could result in vehicles travelling at higher than desirable speeds that exceed the Safe System boundary conditions for vulnerable road users (i.e., less than 30 km/h). A 100 mm high raised crossing would typically have approach and departure ramps of 1:20 (5%), which would result in a 2 m long ramp;
- The length of the raised platform is too short to provide for shared use (raised crossings are usually required to be 6 m long);
- The limit line prior to the crossing is faded;
- The zebra markings at the crossing are faded;
- The median refuge width is 1.6 m, which is insufficient for waiting pedestrians and cyclists and their belongings (i.e., bicycles, prams, mobility scooters) not protruding into adjacent traffic lanes;
- The fluorescent reflectorised orange disc is missing on the pole placed near the crossing adjacent to the westbound traffic lane;
- No advance warning diamond symbol is marked on the road surface (as shown in Figure 5.3-9);
- The kerb ramps have gradients that appear to exceed 10%. This gradient can be steep for mobility-impaired and wheelchair users to negotiate;
- The kerb ramps are narrower than the crossing path, effectively creating a lip which could result in pedestrians tripping and falling; and
- The directional tactiles do not extend through the whole footpath width on the east side of the road.

Despite the several issues noted above, the probability of crashes is assessed as 'Unlikely', given the good forward visibility provided by the straight alignment on Grey Street and raised nature of the crossing. However, the outcome of a crash could be 'Serious' given the likely deficient speed management resulting from the long and smooth approach ramps.

Table 5.3-4: Risk analysis – Against vulnerable road users

Prominent crash type		▪ Vehicle versus pedestrian/cyclist
Probability	Unlikely	▪ Good forward visibility ▪ Raised crossing
Severity	Serious	▪ Impact speeds could exceed 30 km/h due to deficient speed management



Figure 5.3-7 – Narrow crossing and refuge, long ramps and faded zebra markings



Figure 5.3-8 – Directional tactile not covering the whole footpath width



Figure 5.3-9 – Missing advance warning diamond symbol marking



Figure 5.3-10 – Missing reflectorised orange disc

Recommendation:

Consider the following:

1. *Investigate the design parameters of the raised crossing to understand the compliance with the applicable standards;*
2. *Provide a longer crossing path to enable shared use;*
3. *Provide steeper ramps to achieve the desired speed management;*
4. *Reinstate the limit lines and zebra markings and orange disc;*
5. *Widen the median refuge;*
6. *Install advance warning diamond symbol markings;*
7. *Check if the gradient of the kerb ramps are accessible and provide suitable kerb ramps if necessary;*
8. *Ensure that the kerb ramps match the crossing width; and*
9. *Extend the directional tactiles through the whole footpath width.*

Probability Rating:

The probability of a crash is Unlikely

Severity Outcome Rating:

Crashes are likely to be Serious

Design Team Response: Remediation of limit line and zebra markings will be included as part of this project, along with adding diamond markings to both approaches, and a second belisha sign as recommended. Unfortunately the existing crossing sits just outside the southern boundary of this project, and budget is considered insufficient to extend physical works into this area, especially changes to pavements and islands which are likely prohibitively expensive for a trial project. We recommend more extensive remediation of this existing crossing be considered for any permanent project on Grey St

Safety Engineer: It is agreed that the operating speed should be moderated. The ramp design may need to be reviewed if this is critical to achieving target operating speeds. The signs and markings should be installed and maintained to meet legal requirements and good practice, as part of the project or via routine operations / maintenance. All facilities should be designed to be accessible, allowing access to those with mobility issues. It is agreed trip hazards should be avoided and tactile guidance should also comply with good practice. Any matters outside scope could be brought to Council's attention.

Client Decision: This pedestrian crossing is outside the Streets for People project scope and feedback has been passed onto the appropriate team to review the existing pedestrian crossing design.

Action Taken: The line marking of the pedestrian crossing has been repainted under streets for people. Further remedial work will need to be discussed and reviewed through the appropriate team.

5.3.5 Crossings at the Grey Street/Kahutia Street Intersection

Significant

Two courtesy crossings are proposed to be provided at the Grey Street/Kahutia Street intersection (as shown in Figure 5.3-11). One of the crossings is proposed to be located on Grey Street on the north side intersection. The other crossing is to be located on Kahutia Street on the east side of the intersection. The cycleway also crosses Kahutia Street on the eastern side of the intersection. Speed humps are proposed to be used as a speed management measure at the crossing through Kahutia Street. However, no speed management is proposed on the crossing through Grey Street. The following safety issues have been identified in regard to the proposed layout:

- The lack of speed management measures on Grey Street may result in vehicles exceeding the 30 km/h threshold through the crossing, which can result in more severe injuries for pedestrians crossing the road in the event of a crash;
- The position of the speed humps for eastbound vehicles (i.e., turning from Grey Street onto Kahutia Street) is expected to result in vehicles stopping over the proposed cycleway. This can potentially result in conflicts between vehicles and cyclists. A speed hump is also provided on the departure, past the courtesy crossing, which appears to be redundant and can result in vehicles slowing down over the courtesy crossing, potentially resulting in conflicts between vehicles and pedestrians;
- The lack of speed management on Grey Street can also result in relatively high turning speeds for left turn movements onto Kahutia Street through the cycleway crossing, which can lead to conflicts between vehicles and cyclists. Due to the lack of speed management for northbound vehicles, an increased likelihood and severity of crashes involving pedestrians could be expected;
- A wide offset is provided between the courtesy crossing on Kahutia Street and the cycleway crossing. This configuration is expected to result in vehicles being confined between the two crossings. The configuration also results in a reduced stacking space between the intersection's limit line and the cycleway crossing. This is expected to increase the likelihood of conflicts between vehicles and pedestrians/cyclists.

Vehicle versus pedestrian/cyclist crashes are considered the prominent risk resulting from the above deficiencies. The good visibility, combined with some awareness offered by the red surfacing through the crossing (or green surfacing through the cycleway), is assessed to result in an 'Unlikely' probability for crashes. However, the lack of speed management on Grey Street could result in 'Serious' injury crashes.

Table 5.3-5: Risk analysis – Vehicle versus pedestrian/cyclist

Prominent crash type		▪ Vehicle versus pedestrian/cyclist
Probability	Unlikely	▪ Good visibility ▪ Red/green surfacing is expected to raise awareness
Severity	Serious	▪ Impact speeds could exceed 30 km/h due to deficient speed management

A safer layout would provide speed management measures on the crossing through Grey Street. This would provide a safer environment for pedestrians to cross the road while managing vehicle turning speeds for left turn movements onto Kahutia Street. Consequently, this would result in relatively low left turning speeds through the cycleway and courtesy crossing, reducing the probability and severity of conflicts. Furthermore, a reduced offset between the two crossings (cycleway and courtesy crossings) would also be expected to prevent vehicles from stopping over the crossings and increase the stacking space between the limit line and the cycle crossing.

As the Streets For People nature of the project, the safety of pedestrians and cyclists must be the priority. This includes effective speed management at all proposed crossing points and prevention/mitigation of any conflicts involving these vulnerable road users. Note that increased pedestrian and cyclist activity, and associated crossing demand, can be expected to occur throughout the site, given the upgraded facilities and removal of parking spaces throughout the section.



Figure 5.3-11 – Proposed layout at the Grey Street/Kahutia Street intersection (extracted from the design)

Recommendation:

Consider the following:

1. Provide speed management measures on the crossing through Grey Street (both southbound and northbound lanes);
2. Remove the speed humps on Kahutia Street's eastbound lane; and

3. Reduce the offset between the cycleway and courtesy crossing on Kahutia Street.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is Unlikely	Crashes are likely to be Serious
Design Team Response: (1)75mm high rubber speed humps have been added to both approaches to the crossing of Grey Street near Kahutia Street (2)One of the speed humps has been removed from the threshold into Kahutia St, however given the 15m distance from the Grey St hump to the cycle crossing and the effect which vertical deflection at a crossing has on conveying right of way, it is suggested that we keep one of the humps. This design is reflected in v1.3 of the plans. (3)We have amended the design, and are now proposing a standard dual crossing at this location, with a standard arrangement of cycle and pedestrian crossings, as recommended.	
Safety Engineer: Speed control on Grey St in some form is likely to be needed to provide safe operating speeds. The designers suggested changes appear to achieve this and address the auditors' recommendations.	
Client Decision: Speed bumps to be installed as per the design recommendations.	
Action Taken: Speed bumps to be installed as per the design.	

5.3.6 Tactile Pavers

Significant

There are flush pedestrian crossings, courtesy crossings, and a raised table dual crossing proposed across Grey Street, Kahutia Street, and Childers Road. As shown in Figure 5.3-12 to Figure 5.3-15, Tactile Ground Surface Indicators (TGSIs), both directional and warning tactiles, are missing at several crossing points on Grey Street and side roads throughout the section. It is noted that the proposed designs do not have tactile pavers shown on them.

The absence of these pavers creates an inconsistent crossing environment for pedestrians and can potentially cause confusion for visually impaired pedestrians crossing the road, increasing the likelihood of conflicts with vehicles.

The probability of crashes due to the above deficiency is assessed to be 'Very Unlikely' given the difference in level and surface texture generally present on the footpaths and ramps and the low number of visually impaired pedestrians. Good visibility is also provided at crossing points. However, speed management is not proposed at all crossing points throughout the site, and impact speeds could still be above the threshold speed of 30 km/h, which may result in 'Serious' injuries to vulnerable road users should a crash occur.

Table 5.3-6: Risk analysis – Against pedestrians

Prominent crash type		Vehicle against pedestrians
Probability	Very Unlikely	- Ramps level/texture difference; - Low number of visually impaired users; - Good visibility at crossing points.
Severity	Serious	Impact speed could be above the threshold speed of 30km/h



Figure 5.3-12 – Missing tactile pavers at crossing points across Childers Rd (west of Grey St)

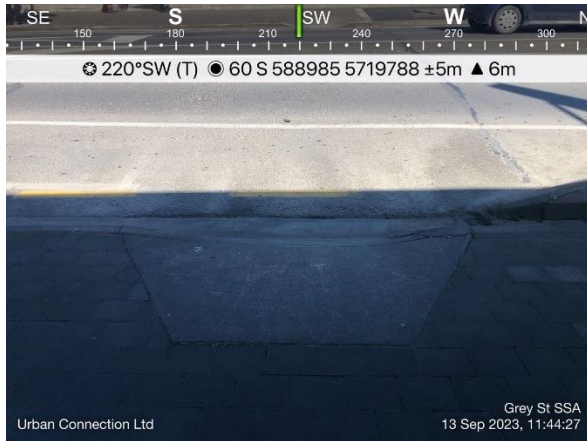


Figure 5.3-13 – Missing tactile pavers at crossing points across Childers Rd (east of Grey St)



Figure 5.3-14 – Missing tactile pavers at crossing point across Kahutia Street (west of Grey St)

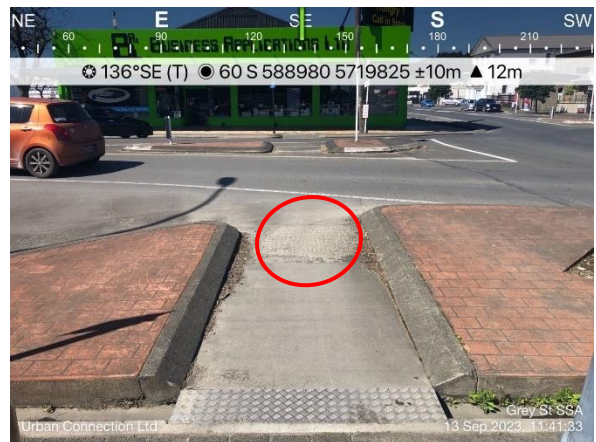


Figure 5.3-15 – Missing tactile pavers at crossing point across Grey St (north of Childers Rd)

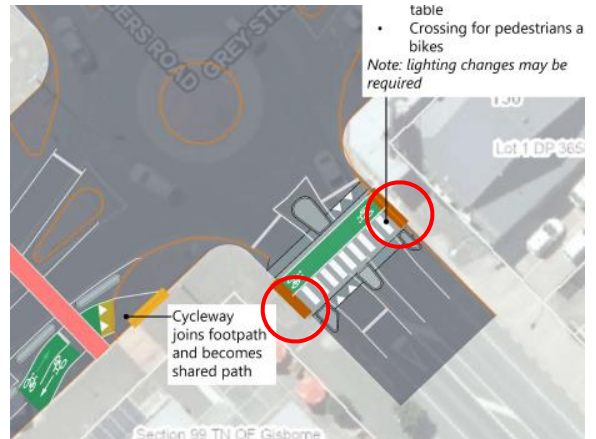
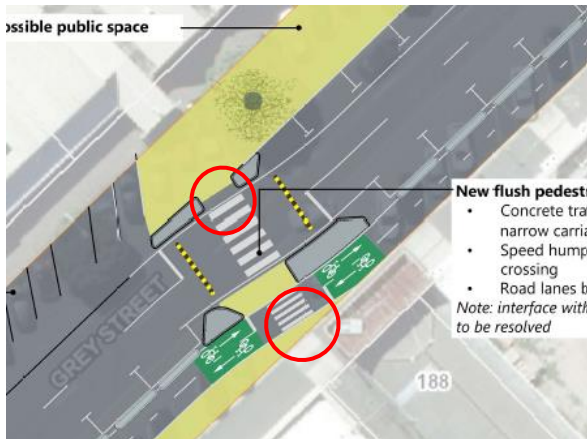


Figure 5.3-16 – Missing tactile pavers at crossing points (extracted from the design)

Recommendation:

1. Identify kerb ramps where TGSIs are missing; and
2. Consider providing TGSIs at all crossing points throughout the section as per RTS 14 guidelines.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is Very Unlikely	Crashes are likely to be Serious
Design Team Response: Warning tactiles will be added to all crossings affected by, or proposed by this project . These are proposed to be adhesive, given the trial nature of this project. These are included in v1.3 of the plans. Unfortunately crossings which are not affected by this project are considered to be out of scope for addition of tactiles, given cost constraints.	
Safety Engineer: The designer advises that TGSIs are to be provided for crossings within / affected by the project. I support the suggestion of reviewing other related crossings / facilities to provide connected and cohesive guidance for visually impaired users, albeit this may occur outside the project.	
Client Decision: Tactiles to be installed as per the design recommendation.	
Action Taken: Tactiles to be installed as per the design recommendation.	

5.3.7 Vegetation over the Cycleways

Significant

Existing trees are proposed to be retained throughout the development of the bi-directional cycleway. Some trees have been observed to have relatively low-height branches, which could result in issues for cyclists. While deviating from the low branches, cyclists could move towards the opposing cycle lane, potentially generating conflicts with incoming cyclists. Furthermore, the deviation manoeuvre or unexpected low-height object ahead could result in cyclists losing their balance and falling.

The risk is assessed as 'Very Unlikely' due to the good forward visibility and relatively low cyclist travelling speeds. However, 'Serious' outcomes could be generated if a cyclist falls down and hits the head against the kerb.

Table 5.3-7: Risk analysis – Cyclist falling down

Prominent crash type		Cyclist falling down
Probability	Very unlikely	- Good forward visibility - Relatively low travelling speeds
Severity	Serious	Impact against the kerb could result in serious injury



Figure 5.3-17 – Low-hanging branches on the future cycleway location

Recommendation:

1. Consider trimming low-hanging branches that could result in issues to cyclists; and
2. Provide regular maintenance to trees and bushes adjacent to the cycleway.

Probability Rating:	Severity Outcome Rating:
<i>The probability of a crash is Very Unlikely</i>	<i>Crashes are likely to be Serious</i>
Design Team Response: We are allowing for assessment and if required trimming of any branches overhanging the cycleway at a height of less than 2m -notes have been added to the 5 potentially affected trees plan set v1.3	
Safety Engineer: It is agreed that tree branches should be managed to avoid them being a hazard. It is expected that trees and any other such features will be maintained to avoid them being a hazard, as a routine matter beyond the trial project.	
Client Decision: Tree branches to be trimmed during the installation and maintained throughout the duration of the trial.	
Action Taken: Tree branches to be trimmed and maintained.	

5.3.8 Cycleway Connection to Existing Crossing

Moderate

The bi-directional cycleway is proposed to be tied into the existing pedestrian crossing located to the west of the skate park on Grey Street. The design plans do not provide the details of this connection between the proposed cycleway and the pedestrian crossing (as shown in Figure 5.3-18). The issues identified in relation to the tie-in are presented below:

- The length of the existing raised crossing is insufficient to enable safe shared use, potentially resulting in conflicts between pedestrians and cyclists;
- No details are shown in regard to which side of the crossing to be used by cyclists or pedestrians. The proposed cycleway is to be located north of the existing crossing, and preferably, cyclists use the northern side to cross the road;
- No details are shown in regard to the tie-in to the Cycleway and Walkway on the west side of Grey Street and how the users, especially cyclists, would safely turn between the existing crossing and the Cycleway. Note that a sharp turn would be required to provide the connection between them, which could result in issues considering the relatively narrow footpath width on the west side of the road;

The probability of conflicts between cyclists and pedestrians is assessed as 'Likely' due to the combination of factors above. However, due to their low travelling speeds, the associated impact speeds are expected to be low, expected to result in 'Minor' injuries.

Table 5.3-8: Risk analysis – Against vulnerable road users

Prominent crash type		▪ Between vulnerable road users (pedestrians and cyclists)
Probability	Likely	▪ Narrow crossing path; ▪ No separation between different users; ▪ Difficult corner negotiation on the west side of Grey Street;
Severity	Minor	▪ Low impact speeds of less than 30 km/h



Figure 5.3-18 – Missing tie-in details



Figure 5.3-19 – Path on the west side of Grey Street

Recommendation:

Consider the following:

1. Provide the details of the proposed connection between the cycleway and the existing crossing;
2. Widen the existing crossing to enable shared use;
3. Separate different users through the crossing; and
4. Provide a safe connection between the Cycleway on the west side of Grey Street and the crossing;

Probability Rating:

The probability of a crash is Likely

Severity Outcome Rating:

Crashes are likely to be Minor

Design Team Response: Unfortunately, the existing crossing is generally considered outside of the scope of this trial project due to the significant works which would be required to re-build this recently installed crossing. However several low-cost modifications are proposed to the crossing to make it safer for pedestrians and legally usable by cyclists:

- Re-marking limit lines and zebra markings.
- Additional traffic calming elements on Grey Street including just north of the crossing.
- Addition of diamond markings on both approaches.
- Addition of a second belisha disk and pole

Safety Engineer: The project may see increased use of the area. The crossing/s need to safely cater for the current and future use. This should be considered as part of the trial as much as practical and once the trial is complete.

Client Decision: As this is a preexisting crossing and outside the project scope it has been raised the appropriate team to review.

Action Taken: Area to be monitored during the duration of the trial.

5.3.9 Northern Tie-in – Cycleway and Courtesy Crossing Conflict

Moderate

The proposed bi-directional cycleway merges onto the footpath south of the Grey Street/Childers Road roundabout. Essentially, the footpath becomes a shared path between the raised shared crossing through Childers Road and the start of the cycleway, with the starting point on Grey Street being north of the proposed courtesy crossing. The potential safety issues are observed in relation to the proposed layout:

- The layout creates a conflict point between pedestrians crossing the road and cyclists, as cyclists will be required to cross the courtesy crossing;
- A pedestrian crossing the road west to east could potentially slow down or stop over/close to the southbound traffic lane on Grey Street while observing an approaching cyclist. This could lead to conflicts between pedestrians and vehicles;
- There is no clear definition of which user (pedestrian or southbound cyclist) has priority, as no limit line is provided on the cycleway north of the courtesy crossing.

The probability of conflicts as a result of the above is assessed as 'Likely', given the high turning volumes at the intersection and relatively high crossing demand. However, any conflicts would be expected to be 'Minor' due to relatively low impact speeds that are not expected to exceed 30 km/h.

Table 5.3-9: Risk analysis – Collision between cyclists/vehicles and pedestrians

Prominent crash type		▪ Collision between cyclists/vehicles and pedestrians
Probability	Likely	▪ High turning volumes ▪ Relatively high crossing demand
Severity	Minor	▪ Impact speed less than 30km/h threshold speed

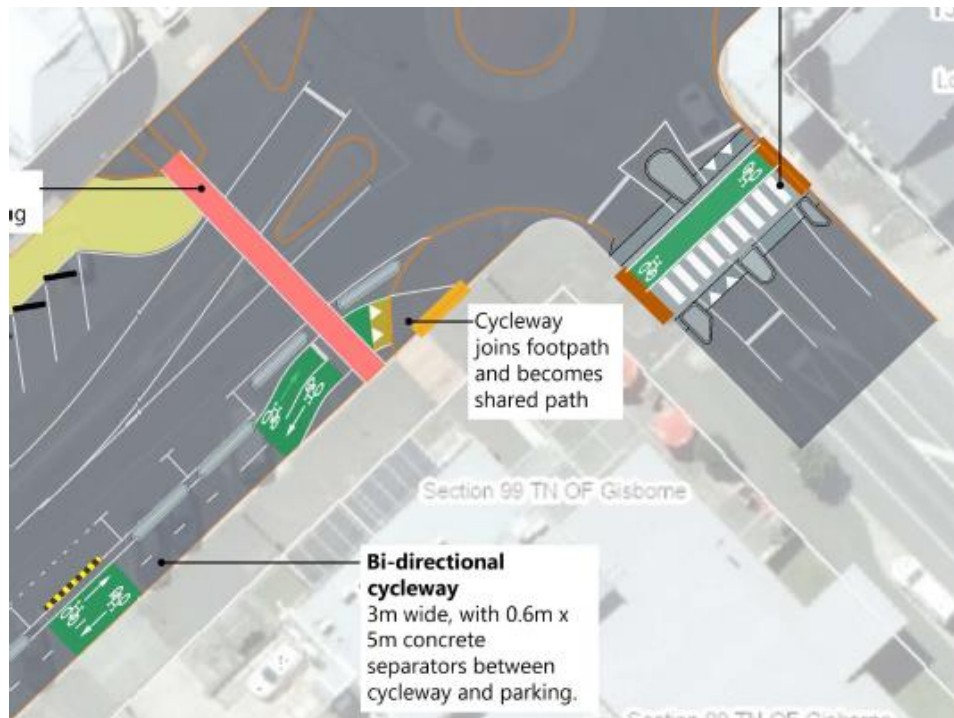


Figure 5.3-20 – Merger of the cycleway and the footpath (extracted from the design)

Recommendation:

1. Consider moving the start of the cycleway past (south) the courtesy crossing.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is Likely	Crashes are likely to be Minor
Design Team Response: Various modifications are included in plan set version 1.3 to address these concerns . We consider that beginning a shared path south of the Grey Street courtesy crossing would lead to further hazard, as cyclists and crossing pedestrians would still cross each others paths, however within a smaller space, plus with a greater distance of shared path, which increases danger and conflict for all users. We now propose to extend the separated, dedicated cycleway and dedicated footpath to extend as far as the dual crossing over Childers Road, such that conflict between users is reduced. To increase legibility and consistency of RoW, we have removed the limit lines from the cycleway at this crossing, such that the pedestrian courtesy crossing legally gives way to the cycleway just as it gives way to the carriageway.	
Safety Engineer: The designer has indicated the matter has been addressed as much as practical. Conflict points between all users need to be managed, including safe and appropriate waiting areas.	
Client Decision: To be installed as per the design recommendation.	
Action Taken: Risk has been mitigated through design reviews	

5.3.10 Pedestrian Refuges

Moderate

During the site visit, the auditors identified that pedestrian refuges at intersections are either missing or substandard, as follows:

- At the Kahutia Street intersection, the refuges are too narrow to accommodate pedestrians and their belongings (i.e., pram, mobility scooter or bicycle). This could result in conflicts with approaching vehicles;
- At the Childers Road intersection, only one pedestrian refuge is provided on the northern quadrant of the roundabout. No pedestrian refuges are provided on the eastern, western and southern quadrants. This puts pedestrians at risk of being struck by vehicles.

As a Streets for People project, it is essential that pedestrians are safeguarded when crossing the road.

The probability of issues due to the missing or deficient infrastructure is assessed as 'Likely' due to the relatively high traffic volumes and pedestrian crossing demand, especially at the Childers Road roundabout. Crash severity is expected to be 'Minor' due to the relatively low vehicle approaching and departure speeds, with impact speeds expected not to exceed 30 km/h.

Table 5.3-10: Risk analysis – Vehicle against pedestrian

Prominent crash type		Vehicle against pedestrian
Probability	Likely	High traffic volumes and pedestrian crossing demand
Severity	Minor	Impact speeds are likely to be less than 30 km/h



Figure 5.3-21 – Substandard pedestrian refuge on Kahutia Street West



Figure 5.3-22 – Substandard pedestrian refuge on Kahutia Street East



Figure 5.3-23 – Pedestrian refuge missing on Childers Road West



Figure 5.3-24 – Pedestrian refuge missing on Childers Road East

Recommendation:

1. Provide pedestrian refuges at all quadrants of the Childers Road roundabout; and
2. Widen the existing pedestrian refuges at the Kahutia Street intersection.

Probability Rating:**The probability of a crash is Likely****Severity Outcome Rating:****Crashes are likely to be Minor****Design Team Response:**

Response to (1):

Unfortunately the northwestern and northeastern legs of the Childers/Grey Roundabout are considered out of scope for this trial project, given the significant works required to modify these. We're significantly improving the southwestern crossing, by:

- narrowing the carriageway on both sides which will reduce traffic speeds
- reducing the crossing distance from approximately 17.5m to approximately 11.5m
- installing speed humps on both approaches to the courtesy crossing
- marking the courtesy crossing red, such that it is more visually prevalent like the existing crossings along Gladstone Road

Unfortunately, we can't install a full median refuge at this location due to the requirement for vehicles to be able to turn right out of the property on the south eastern corner of the intersection. And the southeastern crossing: A full raised table priority treatment, lighting upgrade, re-alignment to better meet desire lines, and centre median islands will significantly improve safety.

Response to (2):

The northwestern arm of this intersection is considered out of scope unfortunately due to budgetary constraints. It will be made safer however by removing straight through and right turning traffic, as well as reduced speeds along Grey Street. On the southeastern arm of the intersection, we now propose to remove one of the two existing islands, which will make it clearer that the centre should not be considered by people crossing to be a median refuge they can safely wait within. This also needs to be removed to support both left in vehicle tracking as well as the proposed dual crossing across Grey Street at this intersection. A wider refuge would prevent the dual crossing over Grey Street from fitting without significant compromise to the current design. The priority markings reduce the need for a centre refuge.

Safety Engineer: It is accepted that some work may be out of scope for the trial. If infrastructure is being developed to promote walking and cycling, use could increase thus plans should be made to provide appropriate facilities within the project and surrounds. It is however acknowledged that this may be out of scope and need to be addressed at a later stage.

Client Decision: Such changes would need to be reviewed if there is a permanent stage and the project area will be monitored.

Action Taken: To be monitored under a monitoring schedule using s-tech traffic cameras.

5.3.11 Proposed Parking Spaces

Minor

Existing angle car parking spaces are proposed to be removed throughout the section, being converted to new angle or parallel car parking spaces (as shown in Figure 5.3-25). The dimensions of both the parallel and angle car parking spaces are missing from the proposed design plans; hence, the auditors are unable to assess whether the proposed parking spaces are able to safely serve their intended purpose.

The space between angle parking spaces and the through traffic lane primarily serves as a manoeuvring aisle. The manoeuvring aisle must be sufficient to accommodate reversing movements from angled parking spaces in order to prevent vehicles from using the live traffic lanes to do so. Note that the aisle width ranges from 3.9 to 4.2 m for 45-degree angle parking, depending on the width of the parking space.¹ If the aisle width is insufficient, a rear-end crash between a through vehicle and the vehicle exiting the car park can potentially occur.

Parallel parking is also proposed throughout the section, mostly immediately adjacent to the traffic lane. The dimensions of the parking spaces are typically not provided on the plans. It is important to ensure that suitable space length and width are provided in accordance with AS/NZS 2890.1:2004, depending on the width of the adjacent traffic lanes. This is deemed required for easing of manoeuvring into the parking spaces. A difficult parking manoeuvre could generate queueing that could lead to rear-end crashes. Additionally, it could generate damage-related crashes with parked vehicles.

The probability of a rear-end crash has been assessed to be 'Unlikely' given the good visibility generated by the straight alignment and low manoeuvring speeds. The severity of a crash is likely to be 'Minor' should one occur, as the impact speeds are likely to be less than 50 km/h.

Table 5.3-11: Risk analysis – Rear-end

Prominent crash type		▪ Rear-end
Probability	Unlikely	▪ Good forward visibility; ▪ Low manoeuvring speeds.
Severity	Minor	▪ Impact speeds < 50 km/h

¹ AS/NZS 2890.1:2004

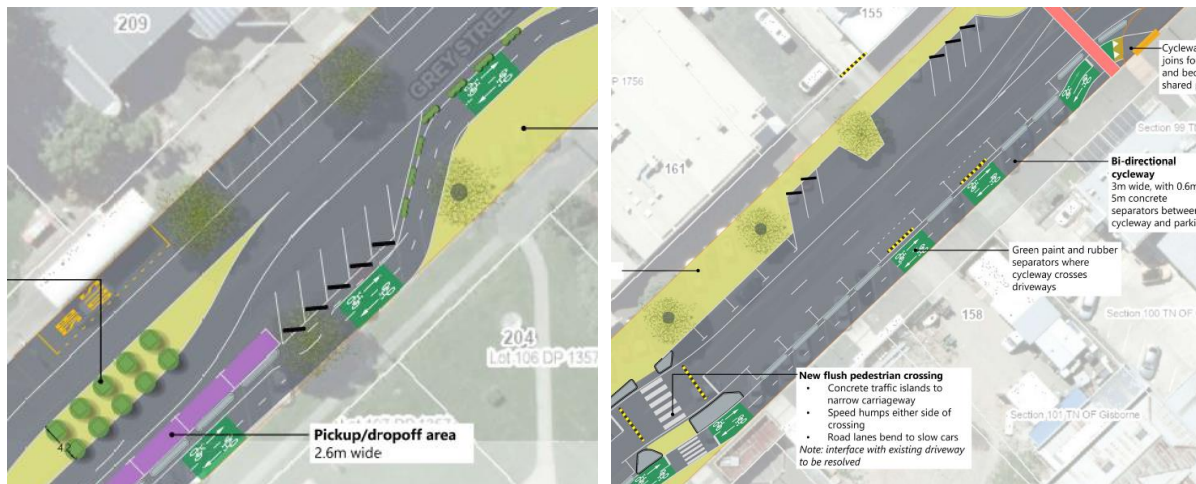


Figure 5.3-25 – Proposed parking spaces (extracted from the design)

Recommendation:

1. Provide dimensions of the proposed car parking spaces, including the reversing aisle; and
2. Ensure parking spaces are designed in accordance with ASNZS 2890.1-2004.

Probability Rating:

The probability of a crash is Unlikely

Severity Outcome Rating:

Crashes are likely to be Minor

Design Team Response: Dimensions have been added to planset version 1.3. Proposed angle parking is designed to meet the existing precedent on Grey Street, with manoeuvring aisles being the same as those for existing parks. Long sight lines have been maintained between angle parking and adjacent carriageway lanes, while the design also plans to reduce traffic speeds. Line-marking plans in version 1.3 include full dimensioning for the proposed angle car parks

Safety Engineer: Parking should be designed to a suitable standard. A key outcome could be to avoid the need to manoeuvre into or too close to the opposing traffic's space. AS2890.1 relates to Off Street Parking. It provides useful guidance for parking and manoeuvre space design but should be designed and put in context of the street environment. It is noted that parking may be similar to what has existed for quite some time, and similar to that which is provided elsewhere.

Client Decision: Parking to be as per the design, the parking will be monitored and evaluated in which we are able to make adaptations when required.

Action Taken: Cycle Lane symbols will not be installed in the cycleway from the Childers Road roundabout to the first pedestrian crossing on Grey Street. This will allow for easy design changes if we are required to reclaim space to move the parking further away from the live lane if seen as required from monitoring and evaluating.

5.3.12 Tripping Hazards on Footpaths

Minor

There are several tripping hazards on footpaths along both the east and west sides of Grey Street, including the lifted base of the high voltage box at the southwestern corner of the Grey Street/Kahutia Street intersection, the lip in the ramp onto Kahutia Street (North), and the level difference due to unformed section of path on the east side along Grey Street (as shown in Figure 5.3-26 to Figure 5.3-28). These all create a potential tripping hazard for footpath users, especially for mobility- and vision-impaired users.

Note that a rise in the height of 14 mm typically represents a tripping hazard for 50 percent of people tested on a paved footpaths study and that a 6 mm difference (rise) is commonly used as the intervention standard.² High-quality walking facilities are considered essential for this project, which aims to increase the level of service for pedestrians (i.e., Streets for People). Note that with the proposed parking removal, pedestrian activity is likely to increase in this area.

Furthermore, some sections of the footpath are obstructed by vegetation, effectively reducing the footpath width (as shown in Figure 5.3-29). This increases the risk of conflicts between pedestrians walking in opposite directions or walking too close to the kerb, which could also establish the tripping risk. A reduced footpath width could also result in accessibility issues, as this could prevent wheelchair users from using the footpaths.

The probability of issues related to the above-mentioned deficiencies is assessed to be 'Unlikely' given the predominant use during the day, when the footpath (and defects) is clearly visible, and the low volumes of visually impaired users. In the event of a pedestrian tripping and falling, 'Minor' injuries are most likely to occur.

Table 5.3-12: Risk analysis – Pedestrians tripping and falling

Prominent crash type		▪ Pedestrians tripping and falling
Probability	Unlikely	▪ Pedestrian volumes are higher during the day when the footpath is visible; ▪ Low volumes of visually impaired users
Severity	Minor	▪ Single-user issue at low walking speeds

² NZ Transport Agency Pedestrian Planning and Design Guide



Figure 5.3-26 – Tripping hazard – lifted base of the high voltage box



Figure 5.3-27 – Tripping hazard – lip in the ramp on Kahutia Street



Figure 5.3-28 – Tripping hazard – level difference on the westbound footpath



Figure 5.3-29 – Vegetation reducing the footpath width

Recommendation:

1. Investigate the quality of the existing footpaths, aiming to identify defects that could lead to pedestrians tripping and, potentially, falling;
2. Consider providing vertical delineation around the power box to highlight the tripping hazard; and
3. Treat the locations where defects are found on the existing footpaths.

Probability Rating:	Severity Outcome Rating:
<i>The probability of a crash is Unlikely</i>	<i>Crashes are likely to be Minor</i>
Design Team Response: Unfortunately footpath renewals, and concrete works generally, are considered beyond the scope of this trial project, however it is recommended that any permanent future Grey Street project consider footpath renewals and this item	
Safety Engineer: It would be ideal to have these addressed, especially with the goal of the project to increase the amount of pedestrian activity. It is accepted that this may be beyond the scope of the project, in which case the matters should be referred to Council as a maintenance item.	
Client Decision: Budget for footpath renewals has not be finalise at the time of this report.	
Action Taken: To be monitored through a monitoring schedule using s-tech traffic cameras.	

5.3.13 Plate on the Drain – Tripping Hazard

Minor

There are metal plates being used over the drain at several pedestrian crossings on the side roads throughout the site (as shown in Figure 5.3-30). These plates fit precisely the crossing width; therefore, they do not extend through the small areas to the side where pedestrians could be stepping while turning their bodies to access the crossing path. This is a potential tripping hazard for pedestrians, especially vision- and mobility-impaired pedestrians, who can mistakenly step on the corner of the plate (or drain) and lose their balance while transitioning from the footpath to the crossing.

The probability is assessed to be 'Very Unlikely' considering predominant use during the day, where light levels are good, and the relatively low presence of visually impaired users. The severity would be expected to be 'Minor' should it occur, given that the risk is expected to be limited to single-user sprained ankle or similar.

Table 5.3-13: Risk analysis – Pedestrians tripping and falling

Prominent crash type		Pedestrians tripping and falling
Probability	Very Unlikely	- Pedestrian volumes are higher during the day when the footpath is visible; - Low volumes of visually impaired users
Severity	Minor	Single-user issue at low walking speeds, limited to sprained ankle or similar



Figure 5.3-30 – Plate on the drain at crossings – tripping hazard

Recommendation:

1. Consider extending the steel plate bridge over the drain at the pedestrian crossing.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is Very Unlikely	Crashes are likely to be Minor
Design Team Response: Unfortunately footpath renewals fall outside of the scope of this trial project. Its recommended that any future permanent project for Grey Street include remediation for these items.	
Safety Engineer: It would be ideal to have these trip hazards addressed but it is understood these may be out of scope for the trial / project. They should thus be addressed to Council for maintenance or potentially at a subsequent stage of the project.	
Client Decision: Footpath renewal budget is not finalised at the time of this report.	
Action Taken: To be monitored.	

5.3.14 Visibility Restriction – Childers Road Crossing

Minor

A raised pedestrian and cycle crossing is proposed across Childers Road's eastern approach at the intersection with Grey Street. A give-way sign is installed immediately east of the crossing, creating a visibility obstruction for pedestrians toward approaching traffic depending on their height. A tree located further east on the footpath also limits the intervisibility between pedestrians and vehicles (as shown in Figure 5.3-31).

The probability of conflicts between vulnerable road users and approaching vehicles is assessed to be 'Very Unlikely' due to the relatively low vehicle approaching speeds. Due to this same factor, crash severity would be expected to be 'Minor' should it occur.

Table 5.3-14: Risk analysis – Vehicle against a vulnerable road user

Prominent crash type		Vehicle against a vulnerable road user
Probability	Very Unlikely	Relatively low vehicle approaching speeds
Severity	Minor	Impact speeds likely to be less than the 30 km/h threshold



Figure 5.3-31 –Sign and tree obscuring visibility on Childers Road (east)

Recommendation:

1. Consider moving the give-way sign to the west of the crossing; and
2. Consider getting trimming the tree regularly.

Probability Rating:

The probability of a crash is Very Unlikely

Severity Outcome Rating:

Crashes are likely to be Minor

Design Team Response: This sign will be moved as part of this project, right up to on the radius and it shouldn't block pedestrian sightlines. Design is outlined in v1.3 plan 301

Safety Engineer: Agree that sightlines should not be impeded and note the designers comment that the sign is to be moved. Controlling driver speeds will be important for the project and safety. Vegetation and landscaping will be an integral part of promoting low speeds. The need to manage vegetation for safety in context with the environment and speed should be brought to the attention of the Council.

Client Decision: Sign has been moved per the design; existing trees are under a maintenance schedule.

Action Taken: To be monitored using S-Tech traffic cameras as part of monitoring and evaluation.

5.3.15 Cars Encroaching Footpath

Minor

It was observed during the site visit that several vehicles, which were visiting the tyre shop located on the southwestern corner of the Grey Street/Childers Road intersection, had encroached over the footpath while queueing to be serviced. Effectively, motorists servicing their vehicles use the footpath as a waiting area.

The following issues result from this behaviour:

- Pedestrians have a narrow walking width available, being required to negotiate between queued cars. This puts pedestrians at risk of being struck by manoeuvring vehicles;
- The obstructed path results in accessibility issues, as wheelchair users are unable to negotiate this section of the footpath due to the narrow width; and
- The vehicles parked on the footpath adversely affect visibility at the intersection. The intervisibility between vehicles approaching from the west (Childers Road) and from the south (Grey Street) is reduced as a result of this behaviour.

Note that this behaviour seems to be common practice at this location, given that cars blocking the footpath can also be observed in Google Streetview.

The probability of conflicts being generated as a result of the above-mentioned behaviour is assessed as 'Unlikely' due to the low speeds of either vehicles manoeuvring or approaching the roundabout. For this same reason, the severity of a crash is likely to be 'Minor' as the impact speeds are likely to be less than 30 km/h.

Table 5.3-15: Risk analysis – Vehicle against pedestrian / side-impact at the roundabout

Prominent crash type		▪ Vehicle against pedestrian ▪ Side-impact crash at the roundabout
Probability	Unlikely	▪ Low manoeuvring and approaching speeds
Severity	Minor	▪ Impact speeds are likely to be less than 30 km/h



Figure 5.3-32 – Vehicles encroaching footpath along Childers Road

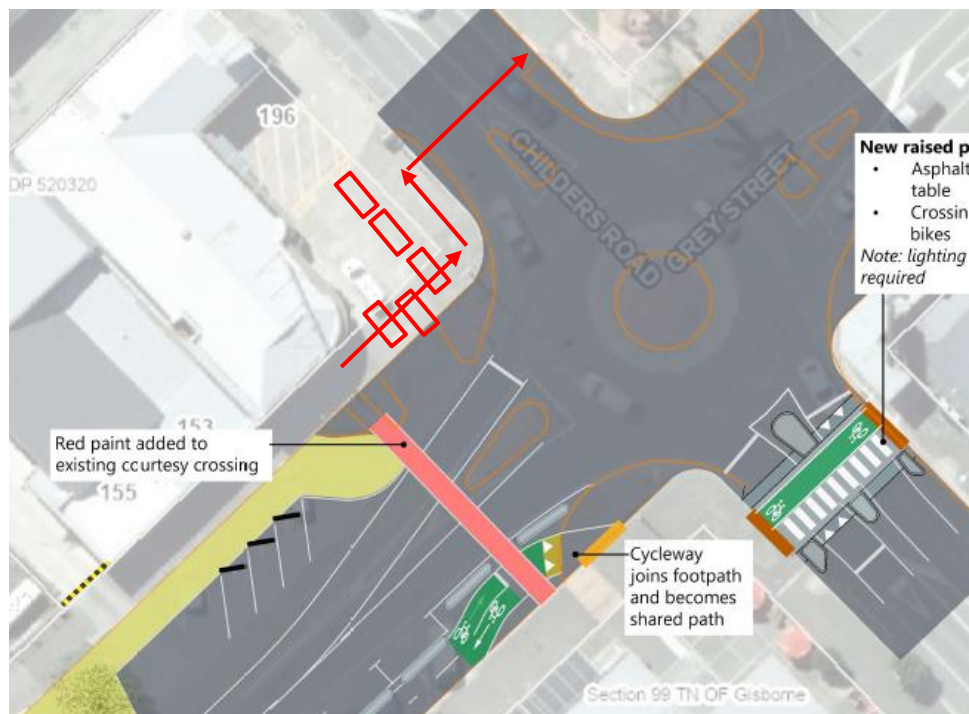


Figure 5.3-33 – Entrance to tyre shop across the footpath

Recommendation:

1. Engage with the shop to ensure parking over the footpath is prevented; and
2. Install 'keep clear' road markings and signs.

Probability Rating:	Severity Outcome Rating:
<i>The probability of a crash is Unlikely</i>	<i>Crashes are likely to be Minor</i>
Design Team Response: We suggest that GDC discuss this with the adjacent business owner as recommended. We don't support signage and markings at this stage, because: 1) Footpath parking is always illegal. adding additional signage and markings to this location may imply to others that such parking is acceptable at other locations on footpaths, so should be carefully considered 2) Currently any changes to this footpath are out of our scope for this trial project due to budget limitations	
Safety Engineer: It is agreed that it is undesirable to have traffic queued on the footpath. It is also agreed that this is best managed by the Council, via consenting and / or enforcement, and that additional signs and / or markings are best avoided within the road corridor. The infrastructure should be built and provided to encourage appropriate behaviour, albeit this may need to be addressed at a later stage. The footpath for example should appear continuous, rather than 'ceasing' either side of the vehicle crossing, as this would suggest and reinforce pedestrian use and rights to the footpath space. The 'entry' word painted on the footpath could imply legitimate use of the footpath by drivers thus could be removed. Providing alternative short stay parking or a loading zone in the vicinity may also help. A barrier should also be installed around the property to limit the risk of vehicles manoeuvring on or over the footpath and colliding with pedestrians. This would also help define the entry and exit points.	
Client Decision:	<i>Separators have been installed to prevent this from occurring.</i>
Action Taken:	To be monitored using S-Tech traffic cameras as part of monitoring and evaluation.

5.3.16 Speed Management Measures (Speed Humps)

Minor

Speed humps are proposed to be provided as a speed management measure at some of the proposed crossings. For instance, speed humps are provided at the zebra crossing through Grey Street and at the Kahutia Street intersection. Although they are expected to be effective in achieving the objective of slowing down vehicles, speed humps result in a more abrupt speed reduction compared to raised platforms (i.e., raised platforms, including the approach ramps, are longer and, therefore, provide a smoother surface for vehicles).

Motorists are required to typically slow down considerably to cross over speed humps even if no pedestrians are crossing the road. This is expected to result in an increase in rear-end-type crashes in the vicinity of the crossings.

The probability of rear-end crashes as a result of the speed humps is assessed as 'Unlikely' due to the good forward visibility provided on this section of the road. Crash severity is expected to be 'Minor' due to the relatively low impact speeds of less than 70 km/h.

Table 5.3-16: Risk analysis – Rear-end near crossings

Prominent crash type		▪ Rear-end near crossings
Probability	Unlikely	▪ Good forward visibility
Severity	Minor	▪ Impact speeds are likely to be less than 70 km/h

Recommendation:

1. Consider providing raised safety platforms at all crossing points.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is Unlikely	Crashes are likely to be Minor
Design Team Response: We've amended and refined our design, such that instead of vanguard speed humps, Vanguard 75mm high 'speed cushions' are now proposed across carriageway traffic calming locations. This much wider product is consistent with a roughly 30km/h design speed, similar to a raised table, rather than the lower design speed the previously shown humps would be. Such humps are now only proposed for vehicle crossings, under equivalent circumstances to how they are commonly used around the country. Although further speed tables may be an ideal outcome, especially for pedestrian benefits, these are a more permanent and costly treatment, considered out of scope for this trial project.	
Safety Engineer: Accept both auditor and designer comments. Speeds should be regulated especially at pedestrian crossing points. The design has been amended to included speed control. More permanent features can be considered at the end of the trial. Consideration may need to be given to maintaining the less permanent features being installed or the trial, if the long term solutions are delayed.	
Client Decision: Speed has been managed with vertical deflection devices as per the design. Monitoring and evaluation will be continued throughout the duration of the trial.	
Action Taken: To be monitored using S-tech traffic cameras as part of monitoring and evaluation.	

5.3.17 Connectivity to Side Roads

Comment

The design presents no details in regard to how cyclists travelling from side roads are to connect to the proposed cycleway, including:

- No safe shared crossing is provided for cyclists travelling eastbound (i.e., from the west) on Childers Road and Kahutia Street who wish to connect to the cycleway;
- There are no tie-in details on side roads for westbound cyclists (i.e., from the east) wishing to travel along the cycleway and if ramps or shared paths are to be provided in the vicinity of the intersections with Kahutia Street and Childers Road. There are also no details of how cyclists coming from the north or south are to connect to the cycleway.

It is acknowledged, however, that the project is in the concept design stage, and, potentially, the details are still to be developed. Note that safe connections to the cycleway are essential to provide a safe environment for cyclists.

Recommendation:

1. *Provide further details of the connectivity to the side roads; and*
2. *Consider providing shared crossings for eastbound cyclists to connect to the cycleway.*

Probability Rating:

The probability of a crash is **N/A**

Severity Outcome Rating:

Crashes are likely to be **N/A**

Design Team Response: Unfortunately budget and scope for this trial project is insufficient to address more than one leg of the complex Childers/Grey Intersection, as significant physical works is considered to be required to improve this for pedestrians and cycle users. Any permanent project for Grey Street following this trial is recommended to include a raised table priority crossings at each leg of the roundabout, close to desire lines. We have however been able to improve the Kahutia Street intersection, such that there is a clear space for cycles to travel through the modal filter for through trips on Kahutia as well as to access the Cycleway from the west there. These changes are in v1.3.

Safety Engineer: Note the desire for improved connectivity to side roads from the auditor, and that the designer suggests some improvements have been made. It is however accepted that this may be out of scope and would need to be considered at a later stage, along with other similar out of scope matters previously raised.

Client Decision: Such changes are to be investigated if there is a permanent stage of the project as these infrastructure improvements are currently out of scope.

Action Taken: To be monitored using S-Tech traffic cameras as part of monitoring and evaluation.

5.3.18 Missing Information

Comment

The following information was not provided in the design drawing set.

- Signage & road marking plan – it cannot be assessed if the proposed signage and road marking is adequate and sufficient;
- Drainage design – including whether changes are proposed to existing catch pit covers, and whether any new drainage devices are required to be provided next to the proposed raised platform or as a result of the new concrete kerb separators;
- Lighting design – including whether luminosity levels are adequate at proposed crossing points;
- Cross-sections – including the proposed cycleway crossfall; and
- The details/type of concrete kerb separators.

It is acknowledged that the project is in the concept/preliminary stage, and the missing information is not typically provided at this phase.

Recommendation:

1. Ensure the above information is provided in the detailed design stage.

Probability Rating:	Severity Outcome Rating:
The probability of a crash is N/A	Crashes are likely to be N/A
Design Team Response: Detailed design has now been undertaken, updates below: - Line marking is Included in v1.3 plans 211 to 215 - Signage is included in v1.3 plans 301 and 302 - There are no changes to drainage, aside from 3 temporary ramps with pipes embedded for channel flow. - Lighting design has been undertaken for proposed priority crossings and is being finalised now. - Cycleway crossfalls have been measured, and potential for mitigations for a few sections with steep crossfalls is being considered currently. - Full specifications for concrete separators is included as an attachment to design v1.3	
Safety Engineer:	This is a comment only but note the designer has indicated that design and plans have been updated.
Client Decision:	These details have been provided in the 'For Construction' drawings.
Action Taken:	Construction drawings issued providing missing information.

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: (Signed on pdf)

Date: 25 October 2023

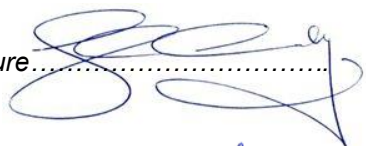
Matheus Boaretto, BEng (Civil), GradDipEng (Highways)
Senior Transport Engineer, Urban Connection Limited

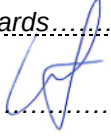
Signed: (Signed on pdf)

Date: 25 October 2023

Ashu Kedia, B.Tech. (Civil), M.Tech. (Transport)
Transport Engineer, Urban Connection Limited

Designer: Name: Sam Hood Position: Transport Engineer
Signature:  Date: 12 February 2024

Safety Engineer: Name: Glenn Connelly Position: Senior Safety Engineer
Signature:  Date: 13 February 2024

Project Manager: Name: Lauriel Edwards Position: Road Safety Coordinator
Signature:  Date: 1 May 2024

Action Completed: Name: Dave Hadfield Position: Acting Director
Community Lifelines

Signature:  Date: 1 May 2024

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

	Run-off-road	Head-on	Intersection 1 Grey Street/Kahutia Street	Intersection 2 Grey Street/Childers Road	Other	Pedestrian	Cyclist	Motorcyclists
Exposure comments:	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; - Kahutia Street: 3,000 vpd; Combined AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; - Childers Road: 13,000 vpd; Combined AADT is > 10,000 vpd.	AADTs from MobileRoad 2021 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	Data is not available. Assumed more than 100 pedestrians per day given the site is located on an urban residential and commercial area adjacent to the CBD.	Data is not available. Assumed 50-100 cyclists per day given the site is located on an urban residential and commercial area adjacent to the CBD where no dedicated cycling facilities are provided.	Assumed 1% of AADT as data is not available. 50 - 100 motorcyclists per day, given that AADT is between 5,000 and 10,000 vpd.
Exposure score:	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0	4.0 / 4.0	3.0 / 4.0	4.0 / 4.0	3.0 / 4.0	3.0 / 4.0
Likelihood comments:	Factors that increase the likelihood include: - Hazards within clear zone (power poles, light poles, trees); - Several accessways (conflicts with vehicles entering/exiting); - High accessway frequency; - On-street parking; - Straight alignment encourages higher speeds; Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Wide sealed shoulders (reversing aisle); - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision;	Factors that increase the likelihood include: - High opposing traffic volumes; - No median separation between opposite lanes; - No median barrier; - High number of accessways (conflicts with vehicles entering/exiting); - On-street parking; - Straight alignment encourages higher speeds; Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Straight alignment; - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision;	Factors that increase the likelihood include: - Priority controlled (stop) cross roads; - Several conflict points; - No right-turn bays; - Moderate/high volumes on side roads; - Visibility restricted by adjacent buildings; - Angle parking adjacent to intersection; - Straight alignment encourages higher speeds on main road; Factors that decrease the likelihood include: - Lighting provision;	Factors that increase the likelihood include: - High volumes on side roads; - Several conflict points; - Priority controlled; - Accessways in close proximity to intersection; - Visibility restricted by adjacent buildings; - Angle parking adjacent to intersection; Factors that decrease the likelihood include: - Roundabout layout; - Relatively low operating speeds due to roundabout layout; - Lighting provision;	Factors that increase the likelihood include: - Several accessways (conflicts with vehicles entering/exiting); - Parking adjacent to the road; - Angle parking; - Straight alignment encourages higher speeds; - Insufficient safe mid-block crossing points; - TGSIs missing at several kerb ramps; - No mid-block safe crossing points; - Straight alignment encourages higher speeds; Factors that decrease the likelihood include: - Good visibility - straight and flat road; - Lighting provision;	Factors that increase the likelihood include: - A large number of vehicle accesses/driveways increasing pedestrian conflicts with vehicles entering/exiting; - No marked pedestrian crossings at intersections; - Insufficient safe mid-block crossing points; - TGSIs missing at several kerb ramps; - No mid-block safe crossing points; - Straight alignment encourages higher speeds; Factors that decrease the likelihood include: - Footpaths appears mostly in good condition; - Straight and flat road typically provides drivers with good visibility of pedestrians crossing the road; - Lighting provision.	Factors that increase the likelihood include: - No dedicated cycle facilities; - A large number of vehicle accesses/driveways increasing cyclists' conflicts with vehicles entering/exiting; - On-street parking, including angle parking (reversing); - Straight alignment encourages higher speeds; - Relatively high traffic volumes; Factors that decrease the likelihood include: - Good visibility generated by straight and flat road alignment. - Lighting provision.	Factors that increase the likelihood include: - Hazards within clear zone (power poles, light poles, trees); - High accessway frequency; - On-street parking; - No median separation; - No median barrier; - Straight alignment encourages higher speeds; Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision; - Wide traffic lanes (3.5m or more).
Likelihood score:	2.0 / 4.0	2.0 / 4.0	3.0 / 4.0	2.0 / 4.0	2.5 / 4.0	2.5 / 4.0	3.5 / 4.0	2.5 / 4.0
Severity comments:	Factors that increase the severity include: - No protection against non frangible roadside hazards within clear zone; - Impact speeds likely exceed safe system speed threshold of 30-40 km/h. Factors that decrease the severity include: - None identified.	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely not exceed safe system threshold speed of 70 km/h for this crash type.	Factors that increase the severity include: - Impact speeds could exceed threshold speed of 50 km/h for this crash type; - High impact angles. Factors that decrease the severity include: - None identified.	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely to be less than threshold speed of 50 km/h for this crash type; - Low impact angles.	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely not exceed safe system threshold speed of 70 km/h for this crash type.	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users); Factors that decrease the severity include: - None identified	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users); Factors that decrease the severity include: - None identified	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users); Factors that decrease the severity include: - None identified.
Severity score:	2.5 / 4.0	2.0 / 4.0	2.5 / 4.0	1.5 / 4.0	2.0 / 4.0	3.5 / 4.0	3.5 / 4.0	3.5 / 4.0
Product:	15 / 64	12 / 64	22.5 / 64	12 / 64	15.0 / 64	35 / 64	36.75 / 64	26.25 / 64
TOTAL								174.5 / 512

Table 5.3-2 - Safe System Assessment Matrix – Proposed

	Run-off-road	Head-on	Intersection 1 Grey Street/Kahutia Street	Intersection 2 Grey Street/Childers Road	Other	Pedestrian	Cyclist	Motorcyclists
Exposure comments:	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; - Kahutia Street: 3,000 vpd; Combined AADT is between 5,000 and 10,000 vpd.	AADTs from MobileRoad 2022 estimate: - Grey Street: 6,000 vpd; - Childers Road: 13,000 vpd; Combined AADT is > 10,000 vpd.	AADTs from MobileRoad 2021 estimate: - Grey Street: 6,000 vpd; AADT is between 5,000 and 10,000 vpd.	Data is not available. Assumed more than 100 pedestrians per day given the site is located on an urban residential and commercial area adjacent to the CBD.	Data is not available. Assumed more than 100 cyclists per day given the site is located on an urban residential and commercial area adjacent to the CBD where dedicated cycling facilities are to be provided.	Assumed 1% of AADT as data is not available. 50 - 100 motorcyclists per day, given that AADT is between 5,000 and 10,000 vpd.
Exposure score:	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0	4.0 / 4.0	3.0 / 4.0	4.0 / 4.0	4.0 / 4.0	3.0 / 4.0
Likelihood comments:	Factors that increase the likelihood include: - Hazards within clear zone (power poles, light poles, trees); - Several accessways (conflicts with vehicles entering/exiting); - High accessway frequency; - On-street parking; ~~-Straight alignment encourages higher speeds;~~ - Curved alignment increases chances for RoR. Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Wide sealed shoulders (reversing aisle); - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision; - Fewer angle parking spaces; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds;	Factors that increase the likelihood include: - High opposing traffic volumes; - No median separation between opposite lanes; - No median barrier; - High number of accessways (conflicts with vehicles entering/exiting); - On-street parking; ~~-Straight alignment encourages higher speeds;~~ - Curved alignment increases chances for head-on. Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Straight alignment; - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision; - Fewer angle parking spaces; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds;	Factors that increase the likelihood include: - Priority controlled (stop) cross roads; ~~-Several conflict points;~~ ~~-No right-turn bays;~~ - Moderate/high volumes on side roads; - Visibility restricted by adjacent buildings; - Angle parking adjacent to intersection; ~~-Straight alignment encourages higher speeds on main road;~~ Factors that decrease the likelihood include: - Roundabout layout; - Relatively low operating speeds due to roundabout layout; - Lighting provision; - Left-in left-out (right-turn ban); - Central island likely to reduce vehicle speeds; - Lower approach speeds from the east due to speed humps;	Factors that increase the likelihood include: - High volumes on side roads; - Several conflict points; - Priority controlled; - Accessways in close proximity to intersection; - Visibility restricted by adjacent buildings; - Angle parking adjacent to intersection; Factors that decrease the likelihood include: - Relatively low operating speeds due to roundabout layout; - Lighting provision; - Lower approach speeds from the east due to raised platform;	Factors that increase the likelihood include: - Several accessways (conflicts with vehicles entering/exiting); - Parking adjacent to the road; - Angle parking; ~~-Straight alignment encourages higher speeds;~~ - Steeper gradient parking spaces (requires more acceleration); - Curved alignment increases chances for head-on. Factors that decrease the likelihood include: - Good visibility - straight and flat road; - Lighting provision; - Fewer angle parking spaces; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds;	Factors that increase the likelihood include: - A large number of vehicle accesses/driveways increasing pedestrian conflicts with vehicles entering/exiting; ~~-No marked pedestrian crossings at intersections;~~ ~~-Insufficient safe mid-block crossing points;~~ - TGSIs missing at several kerb ramps; ~~-No mid-block safe crossing points;~~ ~~-Straight alignment encourages higher speeds;~~ Factors that decrease the likelihood include: - Footpaths appears mostly in good condition; - Straight and flat road typically provides drivers with good visibility of pedestrians crossing the road; - Lighting provision; - One shared raised crossing; - One zebra crossing; - Three courtesy crossings; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds; - Speed humps at driveways;	Factors that increase the likelihood include: ~~-No dedicated cycle facilities;~~ - A large number of vehicle accesses/driveways increasing cyclists' conflicts with vehicles entering/exiting; ~~-On-street parking, including angle parking (reversing);~~ ~~-Straight alignment encourages higher speeds;~~ - Relatively high traffic volumes; - Poor connectivity to side roads; Factors that decrease the likelihood include: - Good visibility generated by straight and flat road alignment. - Lighting provision; - Dedicated cycling facility; - One shared raised crossing; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds; - Speed humps at driveways;	Factors that increase the likelihood include: - Hazards within clear zone (power poles, light poles, trees); - High accessway frequency; - On-street parking; - No median separation; - No median barrier; ~~-Straight alignment encourages higher speeds;~~ Factors that decrease the likelihood include: - Wide traffic lanes (3.5m or more); - Good visibility - straight and flat road; - Pavement appears mostly in good condition; - Pavement markings generally in good condition (delineation); - Lighting provision; - Wide traffic lanes (3.5m or more). - Fewer angle parking spaces; - Curved alignment likely to reduce vehicle speeds; - Road narrowing due roadside islands and cycleway likely to reduce vehicle speeds;
Likelihood score:	1.5 / 4.0	1.5 / 4.0	2.0 / 4.0	2.0 / 4.0	2.0 / 4.0	1.5 / 4.0	2.0 / 4.0	2.0 / 4.0
Severity comments:	Factors that increase the severity include: - No protection against non frangible roadside hazards within clear zone; - Impact speeds likely exceed safe system speed threshold of 30-40 km/h. Factors that decrease the severity include: - Some speed reduction due to interventions.	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely not exceed safe system threshold speed of 70 km/h for this crash type. - Some speed reduction due to interventions.	Factors that increase the severity include: ~~-Impact speeds could exceed threshold speed of 50 km/h for this crash type;~~ - High impact angles. Factors that decrease the severity include: - Impact speeds are unlikely to exceed threshold speed of 50 km/h for this crash type due to proposed treatments;	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely to be less than threshold speed of 50 km/h for this crash type; - Low impact angles.	Factors that increase the severity include: - None identified. Factors that decrease the severity include: - Impact speeds likely not exceed safe system threshold speed of 70 km/h for this crash type. - Some speed reduction due to interventions.	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users). - Residual risk of lack of speed management at some crossings; Factors that decrease the severity include: - None identified	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users). - Residual risk of lack of speed management at some crossings; Factors that decrease the severity include: - None identified	Factors that increase the severity include: - Impact speeds likely exceed 30 km/h (threshold for vulnerable road users); Factors that decrease the severity include: - Some speed reduction due to interventions.
Severity score:	2.0 / 4.0	1.5 / 4.0	2.0 / 4.0	1.5 / 4.0	1.5 / 4.0	3.0 / 4.0	3.0 / 4.0	3.0 / 4.0
Product:	9 / 64	6.75 / 64	12 / 64	12 / 64	9.0 / 64	18 / 64	24 / 64	18 / 64
							TOTAL	108.75 / 512



© Urban Connection Limited 2023

This document is and shall remain the property of Urban Connection Limited. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. The unauthorised use of this document in any form whatsoever is prohibited.

Streets for People Gisborne Grey Street Concept Stage SSA_Rev0

Document Status FINAL

Revision	Prepared by:	Reviewed by:		Approved by:		
		Name	Signature	Name	Signature	Date
0	Ashu Kedia & Matheus Boaretto	Matheus Boaretto	(Signed on pdf)	Tony Harrison	(Signed on pdf)	25/10/2023