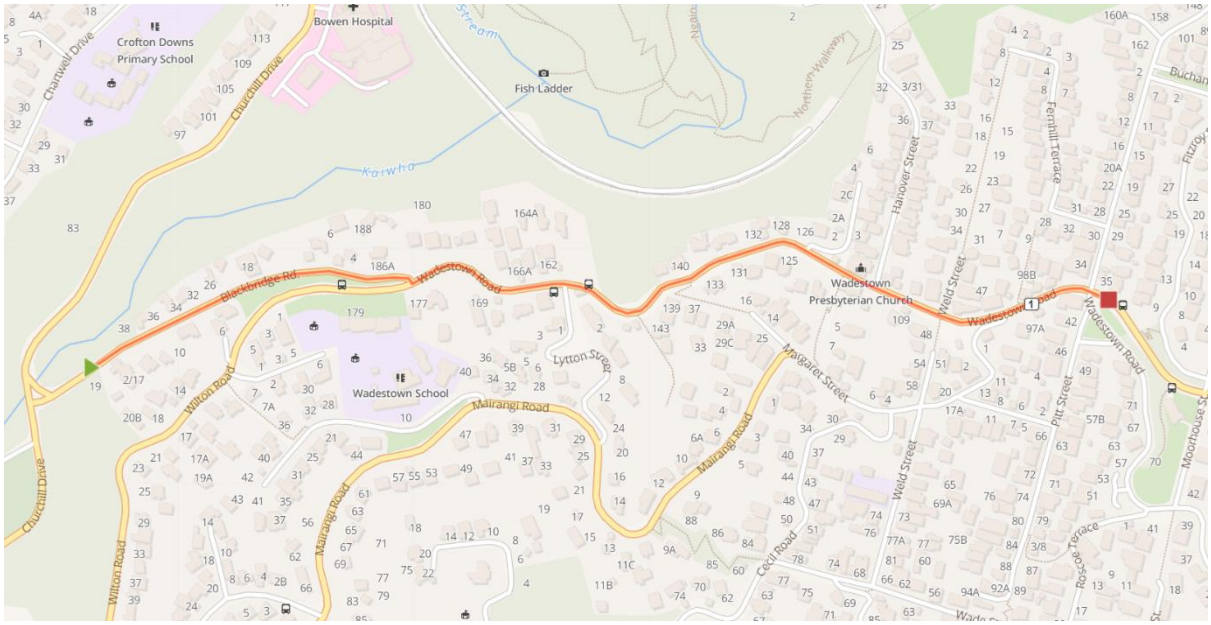
Transport Planning and Design
Level 1, 284 Kilmore Street
www.viastrada.nz

Wadestown Shops cycleway audit – safety and accessibility

90% design audit



Report prepared for

Paneke Pōneke
Bike network plan

Absolutely Positively Wellington City Council
Me Heke Ki Pōneke

July 2023

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<table>
<tr><th colspan="3">Quality Assurance Statement</th></tr>
<tr><td rowspan="3">ViaStrada Ltd
Level 1,
284 Kilmore Street
PO Box 22 458
Christchurch 8140
New Zealand
Phone: (03) 366-7605
www.viastrada.nz
info@viastrada.nz</td><td>Project manager:</td><td>Axel Downard-Wilke, ME (Civil), BE (Civil)
Director – Senior Transportation Engineer & Transportation Planner
027 292 9810
axel@viastrada.nz</td></tr>
<tr><td>Prepared by:</td><td>Luca Ware
Warren Lloyd</td></tr>
<tr><td>Reviewed by:</td><td>Axel Wilke</td></tr>
<tr><td>Project number:
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Disclaimer

The findings and recommendations in this report are based on the site visit undertaken by the cycleway audit team (CAT), an examination of available relevant plans, the specified road and environs, and the CAT's professional knowledge and experience. However, it must be recognised that no audit can guarantee the elimination of all possible safety concerns as all traffic environments consist of a multitude of elements that are never completely within the control of engineering design.

Safety and accessibility audits, by nature, focus on aspects relating to safety and accessibility and therefore do not constitute a complete review of design or assessment of standards with respect to engineering or planning documents. Similarly, the safety audit focuses on the plans provided and the relevant design stage.

This audit applies to the stated project. Whilst some issues covered are general and might be applicable to other locations, the CAT does not take any responsibility for transferral of concepts to other projects or locations.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the CAT or their organisation(s).

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1 Introduction

1.1 Brief and project description

ViaStrada (the cycleway audit team, a.k.a. CAT) have been commissioned by the client to audit for Paneke Pōneke – Wellington's transitional cycle network. The audit is to be a combination of road safety and accessibility audits and is henceforth referred to as a CASA – i.e. "Cycleway audit – safety and accessibility". Several CASAs will be undertaken on the various routes / packages at various design stages. The CASA process complies with Waka Kotahi NZ Transport Agency *Safe System audit guidelines* (2022).

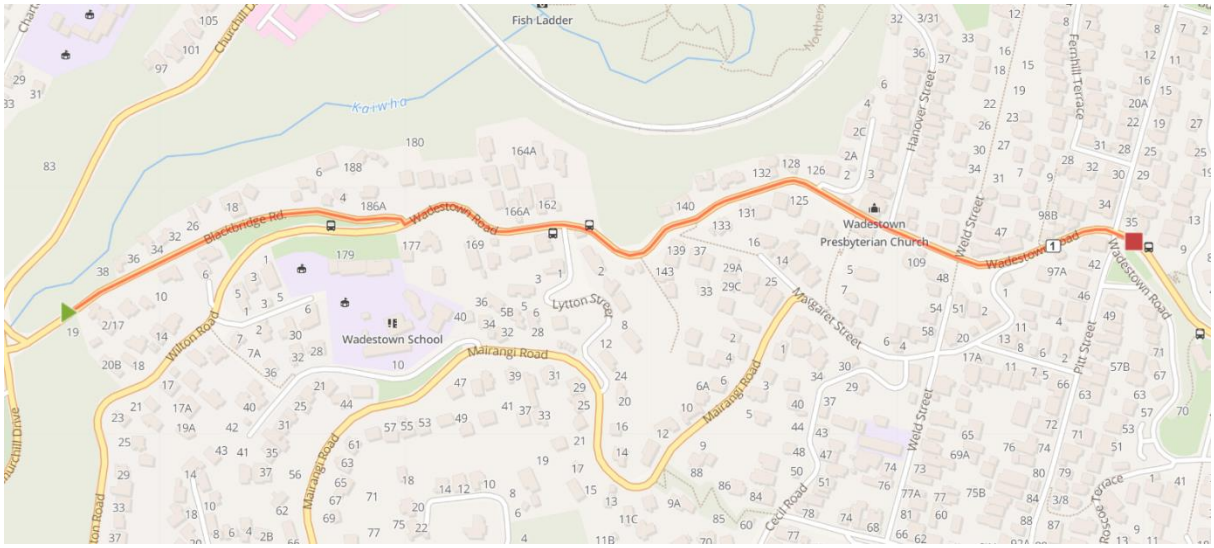


Figure 1: Extent of audit (source: mapometer)

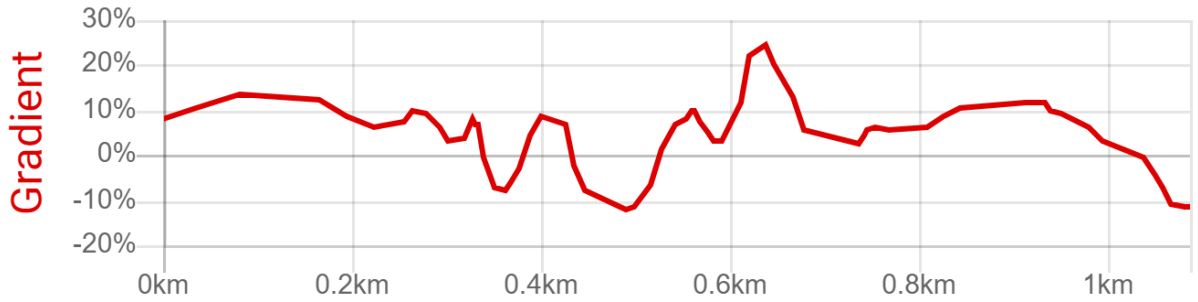


Figure 2: Gradient of audit route (from green triangle to red square, source: mapometer)

This CASA is for the 90% stage of the Wadestown Village sections of Wadestown connections project, as shown in Figure 1.

1.2 The cycleway audit team

This CASA was carried out by:

- Warren Lloyd, the CASA team leader, of ViaStrada Ltd
- Axel Downard-Wilke and Luca Ware are CASA team members, of ViaStrada Ltd

1.3 Meetings and site visits

During the Wadestown 10% design audit stage a project briefing was conducted on Tuesday morning, 18 April 2023, prior to the site visit. The briefing meeting included a client representative and the CAT.

A daytime site visit of the Wadestown route was undertaken immediately after the site meeting between 9:00 am and 4:00 pm.

This 90% design stage audit is desktop based and relies on the CASA's knowledge of the area from our previous Wadestown route audit site visit plus our safety and design knowledge.

1.4 Project information provided

The CAT has received the following plans and information on the roads and traffic within the audit area:

Table 1-1: plans reviewed

Document	Date	Description
90% Wadestown Village Combined Optimized.pdf	23/06/2023	Plans of route the Wadestown shops area
DRAFT-Transitional Cycleways Wadestown Connections Design Decisions Report.pdf	23/06/2023	Report issued to accompany the 90% design plans

1.5 Design vehicles

For intersections, Austroads *Guide to Road Design Part 4: Intersections and Crossings: General* (AGRD4, 2017) describes a design vehicle as the largest vehicle that can perform any particular turning movement from the appropriate approach lane to the appropriate departure lane with adequate clearances to features such as kerbs and roadside furniture.

The CAT has assumed the following design vehicles for this project:

- 19 m semi-trailer is the maximum design vehicle expected.
- 11.5 m rigid truck or urban bus on the main road network.
- People on bikes are anticipated to be confident riders with at least cycling competency of Grade 2 intermediate skills.

Audit procedure and report format

This audit follows the Waka Kotahi NZ Transport Agency *Safe System Audit Guidelines* (2022). 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 following section(s) of this report detail the issues identified in the audit.

1.6 Crash probability

The probability of a crash is qualitatively assessed based on expected exposure (how many road users will be exposed to the site) and the likelihood of a crash resulting from the presence of the particular safety issue. Probability ranges from "very likely" to "very unlikely" and have been based on the categories in the Austroads *Guide to Road Safety part 6: Road Safety Audit* (2022) but adapted for the 4-tier probability structure used in the NZ guide (Waka Kotahi, 2022).

Table 0-1: Relationship between crash probability and frequency

Probability of a crash occurring	**Frequency of crashes expected**
Very likely	One crash every 3 months (4+ crashes / year)
Likely	One crash every 3-12 months (1-4 crashes / year)
Unlikely	One crash every 1-7 years (0.1-1 crashes / year)
Very unlikely	One crash every 7+ years (<0.1 crashes / year)

1.7 Crash severity

The expected severity outcome of a crash is qualitatively assessed based on factors such as expected speeds, type of collision, and type of user/vehicle/object involved; Figure 3, which is based on Austroads *Guide to Road Safety part 6: Road Safety Audit* (2022) but in colour instead of greyscale, gives an indication of the expected crash severity based on these factors. Table 0-2 describes the four crash severities used.

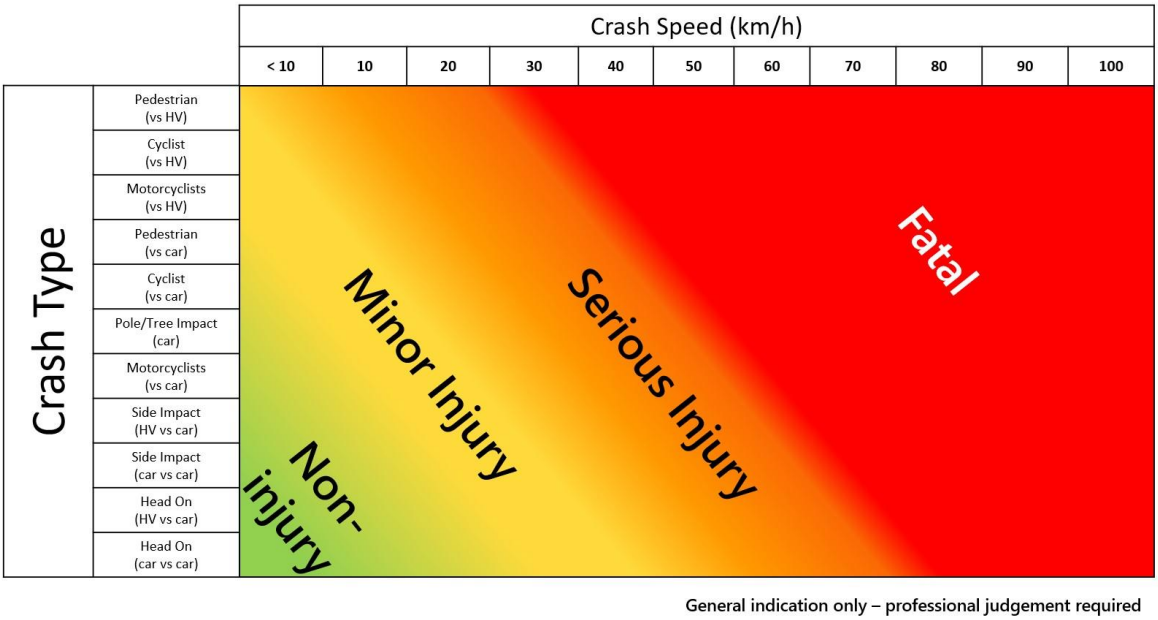


Figure 3: Expected crash severity by crash type and crash speed (adapted from Austroads GRS6, 2002)

Table 0-2: Crash severity descriptions (adapted from Waka Kotahi Safe Systems Audit Guidelines, 2022)

Severity outcome	Description
Fatal	Where Safe System boundary conditions are exceeded. A death occurring as the result of injuries sustained in a road crash within 30 days of the crash.
Serious	Where Safe System boundary conditions are exceeded. Injury (fracture, concussion, severe cuts or other injury) requiring medical treatment or removal to and retention in hospital.
Minor	Where Safe System boundary conditions are met. Injury that is not 'serious' but requires first aid, or that causes discomfort or pain to the person injured.
Non-injury	Where Safe System boundary conditions are met. Property damage crashes.

Reference to historic crash data 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, probability and severity that may result from a particular concern.

1.8 Crash risk rating

The probability and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the Waka Kotahi Safety Concern Risk Rating Matrix shown in Table 0-3. The qualitative assessment requires professional judgement and experience from a wide range of projects of varying sizes and locations.

Table 0-3: Safety concern risk rating matrix (from Waka Kotahi Safe Systems Audit Guidelines, 2022)

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

Safe System injury threshold

While all safety concerns should be considered for action, the client will make the decision as to what action will be adopted. This report gives safety ranking guidance, and it is acknowledged the client must consider factors other than safety alone. The suggested action for each concern category is given in Table 0-4.

Table 0-4: Concern categories

Risk	Suggested Action
Serious	Safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate concern that should be addressed to improve safety
Minor	Minor concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the CAT to provide additional comments about items that may have a safety implication but lie outside the scope of the CASA. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project; items outside the scope of the audit such as existing issues not impacted by the project; an opportunity for improved safety that is not necessarily linked to the project itself, or drawing/signage

issues that should be addressed but are not necessarily safety related. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the CAT.

1.9 Recommendations

Each issue is accompanied by a list of recommendations to address the issue. As per the safe systems framework, these are classified as relating to either:

- Primary treatments – i.e. those capable of virtually eliminating death or serious injury resulting from the particular safety issue; or
- Supporting treatments – reduce the overall harm caused by the safety issue.

1.10 Affected user groups

For ease of interpretation, each issue heading in this CASA report includes the severity rating, as well as include letters to denote the main user groups affected. The first row in the table also includes icons to denote possible sub-groups. The user letters and icons are presented in Table 0-5:

Table 0-5: User groups included

Main user group	Heading letter	Possible sub-groups
Pedestrians	P	Vision impaired pedestrians 
		Mobility impaired pedestrians 
		Wheelchair users 
		Bus patrons (waiting / alighting) 
		All other pedestrians 
Cyclists	C	Enthused & confident cyclists 
		Interested but concerned cyclists 
		Cyclists using electric bikes 
		All other cyclists 

E-scooter / device users	E	E-scooter users; other electric small-wheeled device users	
Motorists	M	Drivers	
		Buses	
		Motorcyclists / moped users	

Section 4 presents a summary of the issues identified and the audit statement to be signed by the designer, responding auditor, safety engineer, project manager and project sponsor.

1.11 Project team response process

In accordance with the procedures set down in the Waka Kotahi NZ Transport Agency *Safe System Audit Guidelines* (2022) the audit report will be submitted to the client who will instruct the wider project team to respond.

No changes, however small they may appear, may be made to any of our writings in the main audit section of our report without our express review and consent. This restriction includes our CAT responses.

> We do not consent to any changes … to be made to the main audit section of our report.

The safety issues raised in this audit will require responses from the designer and, after the CAT has had a chance to clarify issues further, the project safety engineer. Finally, the client decision and action taken against the safety issues will also be recorded.

The following people have been identified by the client for these roles (Table 0-6).

Table 0-6: project team members relevant to this audit (to be completed by the client)

Role	Name	Organisation
Designer response	Billy Rodenburg	StepChange
Safety engineer	Dennis Davis	WCC
Client decision	Jonathan Kennett	WCC
Action taken by	Claire Pascoe	WCC

2 Crash history

See previous 10% design stage audit report dated 3 May 2023 for crash information.

3 CASA findings

Project wide

Design

3.1 Cycle route target audience – C E

Comment

The plans indicate a combination of standard cycle lanes, buffered cycle lanes and separated cycle lanes with physical separator devices and a vertical element.

People using the route are likely to cycle in both directions over the course of the day (although, they could feasibly take the bus into the city if they wanted to avoid the mixed traffic direction).

The proposed treatment for this route, whilst being an improvement on the existing situation, is only expected to attract cyclists of the "strong and fearless" or "enthused and confident" categories, according to the Geller classification. That is considered acceptable given the difficulty of providing a temporary treatment on a route with challenging space availability and topography, but a permanent solution in the future should aim to provide more separation from motor traffic, to attract a wider cycling audience.

Probability of crash occurring	N/A
Expected crash severity	N/A
Primary treatment recommendations:	
3.1.1	N/A
Supporting treatment recommendations:	
3.1.2	Look for opportunities to maximise the length of separated and buffered cycle lanes to increase the uptake of riding by 'interested but concerned' cyclists.

Responses:	
Designer	We agree with the CAT finding. The cycle facility type for each section of the route was considered at concept design stage which specifically considered this objective; however the corridor width and other road users (particularly bus tracking) has limited the extent of separation that can be achieved within the transitional cycleway approach of working between the existing kerb widths. We will continue to test this through the detailed design stage maximise the separation that is provided for cyclists within this transitional phase and recommend that additional separation that cannot be achieved in the transitional approach is considered by WCC as part of future transformational cycleways programme.

Safety Engineer	Agree with Designer's response.
Client decision	Agree
Action taken	Advise future Transformational design.

3.2 Raised crossings – M

To be an effective and safe system-compliant speed-calming device, a raised crossing should be at least 100 mm high, in which case it should also have a 6 m wide tabletop so that long vehicles (e.g., buses) always have at least one set of wheels on the crossing; otherwise, they may bottom out. This may result in unnecessary damage to the road, trucks, and public transport vehicles.

If the crossing platform is less than 100 mm high, the width requirement stated above is less important, but also unlikely to result in a meaningful reduction in traffic speed.

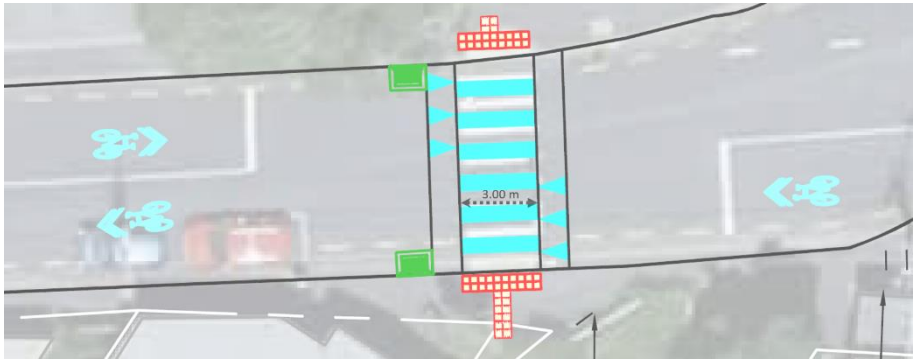


Figure 4: example of a raised platform width on the route.

Comment

Probability of crash occurring	N/A
Expected crash severity	N/A
Primary treatment recommendations:	
3.2.1	N/A
Supporting treatment recommendations:	
3.2.2	Make platforms 6 m wide on bus routes.
3.2.3	Design crossings to be 75 mm high on bus routes and 100 mm in other areas (as discussed in Kilbirnie audit)

Responses:	
Designer	We agree with CAT recommendation 3.2.2 and will update the designs accordingly. This also reflects feedback from the bus reviewers for the Berhampore to Newtown transitional cycleway. Both of these crossings are on a bus route so will be designed 75mm high in alignment with CAT recommendation 3.2.3

	We note that in addition to the consideration for buses, a 75mm high platform is also designed to ensure that the stormwater secondary flow path continues along the road rather than spreading cross the footpath and into adjacent properties.
Safety Engineer	Agree with Designer's response.
Proposed action	Agree with Designer's response.
Client decision	Due to overhead constraints and footpath width constraints, the eastern most raised crossing is to be kept to 3.5 m wide.

3.3 Lack of physical separation – C E M Significant

The safety issue is the risk of drivers driving onto the cycle lane and hitting cyclists (Figure 5 and Figure 6). This risk is increased by the narrow width of traffic lanes and lack of centreline in some places.

The crash type expected are side swipe and rear end crashes between motor vehicles and riders.

The risk factors include medium traffic volume exposure (4,000 to 6,000 vpd) and the operating speed of vehicles (35-39 km/h) which is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooter riders.

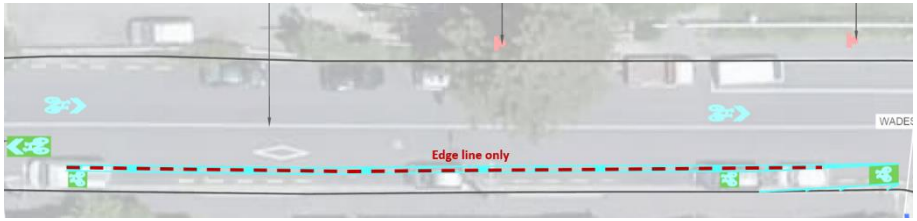


Figure 5: Area without physical separations and only buffered edge line

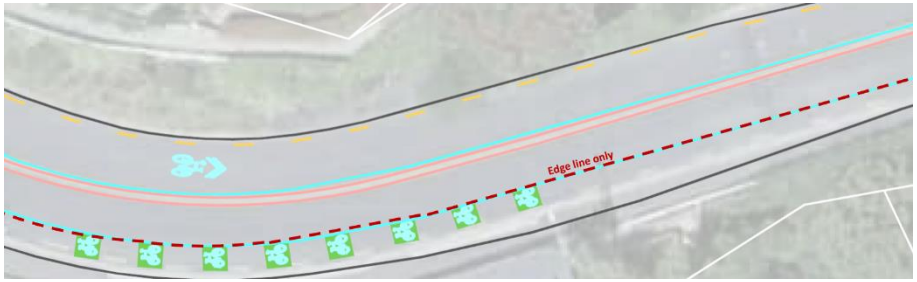


Figure 6: Area without physical separations and only edge line

Probability of crash occurring	Unlikely
Expected crash severity	Serious injury
Primary treatment recommendations:	
3.3.1	Provide vertical separation along cycle lanes.
Supporting treatment recommendations:	
3.3.2	Provide buffered cycle lanes.
3.3.3	Designer to consider an advisory shoulder, also known as a 2-1 'two minus one' lane layout. This is a single lane with shoulders on either side for cyclists and e-scooter riders in urban areas. This would require considerable consultation with all road users to improve its acceptance and operation.

Responses:	
Designer	Vertical separation and/or buffers were considered for this section but unable to fit between the kerb to kerb width for the full length considering other constraints and requirements (including retaining parking in the Wadestown Town centre as instructed by WCC). Whilst we accept the problem as described, we do not agree with CAT recommendation 3.3.3. With volumes up to 6,000 vehicles per day and a winding alignment that restricts forward visibility, we would assess that a 2 minus 1 alignment would increase the risk of drivers swerving into the shoulder area / cycle lane without checking for cyclists to avoid oncoming vehicles. We also note that where this option was proposed on the Ngaio transitional project it did not proceed due to technical advice from WCC and Waka Kotahi and public opposition. No change is proposed unless directed otherwise by the client decision
Safety Engineer	Agree with Designer's response. Also noting, 2 minus 1 configuration is not appropriate with the traffic volumes.
Client decision	Agree with designer and safety engineer.
Action taken	No change.

3.4 Traffic lane widths – C E M

Moderate

The safety issue is larger cars, emergency vehicles and buses will not be able to pass each other (opposing direction) for some distance without encroaching on the cycle lane (which has vertical

Probability of crash occurring	Likely
Expected crash severity	Minor injury
Primary treatment recommendations:	
3.4.1	Where legal and absolute minimum lane widths cannot be achieved on a cross-section, provide traffic calming.
Supporting treatment recommendations:	

separation) or the centre line. The presence of cyclists sharing the lane will be an added complexity adding to the situation.

The crash types expected include head on, rear end and side swipe crashes between vehicles and possibly cyclists.

The risk factors include medium traffic volume exposure (3,000 vpd) and the operating speed of vehicles (40-44 km/h) which is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooter riders or vehicles and other vehicles.

The relevant standards include Waka Kotahi's CNG (Mixed traffic lanes).

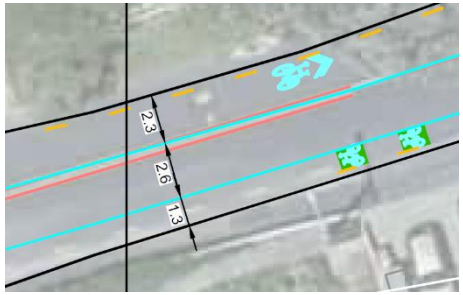


Figure 7: #134 – narrow lanes – no yellow centreline

3.4.2	Designer to provide the suitable lane widths. The absolute (legal) minimum traffic lane width is 2.5 m.
3.4.3	Designer to consider an advisory shoulder, also known as a 2-1 'two minus one' lane layout. This is a single lane with shoulders on either side for cyclists and e-scooter riders in urban areas.

Responses:	
Designer	Vertical separation is only provided where the traffic and cycle lanes exceed minimum widths (1.5m cycle lane, 0.4m bollards, 2.9m traffic lanes in each direction). Refer to the response to Finding 3.3 above regarding the 2-1 'two minus one' lane layout response. We will further review the design and reallocate space to achieve a minimum 2.5m lane width in each direction.
Safety Engineer	Agree with Designer's response.
Client decision	Agree with designer and safety engineer.
Action taken	Not to implement two minus one. But to achieve minimum 2.5m traffic lane width.

3.5 Lane widths for mixed traffic – C E M

Significant

The safety issue is lane widths for a mixed traffic lane, that change with kerbside parking, an example is shown in Figure 8. When cars are parked along here, this width could result in motorists overtaking cyclists where there is not sufficient space. This width also creates a situation where a rider may feel pressured to ride close to the kerb which further accommodates being overtaken.

There are several locations along the route where mixed traffic lanes are provided that fall in the "in-between" width range (3.3 m – 4.1 m) that should be avoided. There are some locations (mostly for the city-bound lane) where the lane widths are not shown plus other locations where the width from kerb to centreline is shown but this covers parking plus the live traffic lane; each of these situations could also fall in the in-between width range.

The crash type expected is a side swipe crashes between a motor vehicle and a rider.

The risk factors include medium traffic volume exposure (5,000 to 8,000 vpd) and the operating speed of vehicles (35-39 km/h), which is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooter riders. The risk is increased by the distance motorists may be stuck behind a cyclist without a passing opportunity (i.e., the length of mixed traffic sections), and the presence of oncoming traffic (i.e., lack of opportunity for a motorist to cross the centreline).

Given the reasonably low volume of cyclists on the route, the probability of a crash resulting from this issue is expected to be unlikely.

The CASA has used the MegaMap operating speed, showing motor vehicles travelling in the vicinity of 50 km/h in some sections, crashes that do occur would be expected to result in serious injury to cyclists. The design does propose some traffic calming, but it is unlikely that the proposed spacing will

Probability of crash occurring	Unlikely
Expected crash severity	Serious injury
Primary treatment recommendations:	
3.5.1	N/A
Supporting treatment recommendations:	
3.5.2	That all car parking spaces are marked to narrow the mixed traffic lane.
3.5.3	Ensure mixed traffic widths are less than 3.2 m or more than 4.2 m to avoid drivers overtaking riders.
3.5.4	Remove parking spaces where there is insufficient space.
3.5.5	Mark parking lanes / spaces only where parking is permissible.

achieve the target safe speed of 30 km/h. As described in section 3.13, the risk is greater in the uphill direction where the speed differential between riders and motorised vehicles in greater.

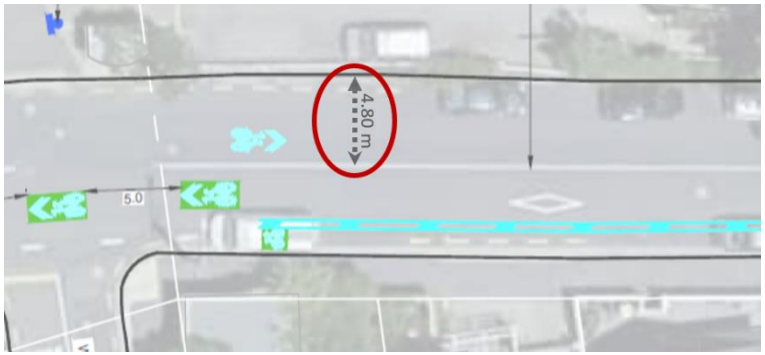


Figure 8: #107 example of wide mixed lane.

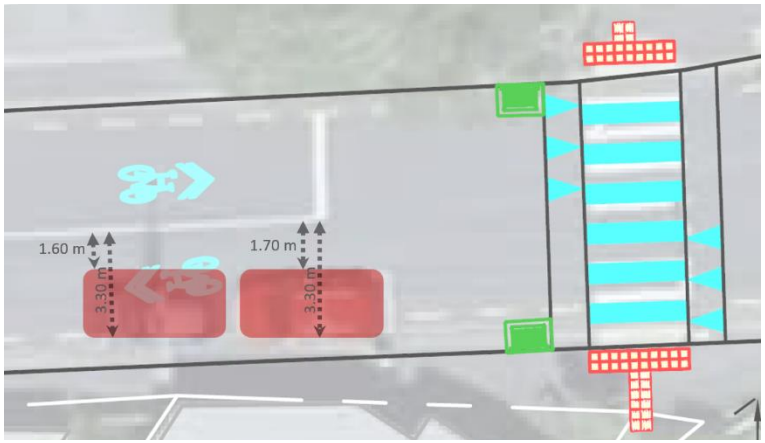


Figure 9: #98 example of narrow mixed lane.

The TCD manual part 5 gives guidance for shared lanes. In general, they should be 4.2 m or greater (for side-by-side cyclists and motor vehicles) or no wider than 3.0 m (for single-file cyclists and motor vehicles, where buses are not present).

The CNG section on mixed traffic provides guidance.

Responses:

Designer	We agree with the CAT recommendations 3.5.2, 3.5.4 and 3.5.5 and will mark the parking spaces accordingly We also agree with CAT recommendation 3.5.3 and will review the lane width as part of the next design iteration.
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree with all four recommendations.
Action taken	Amend designs to marking parking and traffic lanes as advised.

Road markings

3.6 Alignment of sharrow transition markings – C E M

Comment

Primary treatment recommendations:	
3.6.1	N/A
Supporting treatment recommendations:	

The safety issue is riders following the sharrow alignment and suddenly appearing in the live traffic lane. Drivers may not anticipate this movement of riders into the traffic lane even though the sharrows indicate this is the expectation. The crash type/s expected are side swipe and rear end crashes between vehicles and riders. The risk factors include medium to high traffic volume exposure (5,000 to 8,000 vpd) and the operating speed of vehicles (35-39 km/h) is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooters. There is currently no guidance for transitioning sharrows from the kerbside to the live lane, however, the markings should be intuitive for all road users.  ***Figure 10: sharrow markings don't guide riders to take the lane***	3.6.2	Align the sharrow marking to guide riders from the kerbside cycleway into the traffic lane.

Responses:	
Designer	The design of cycle merge markings is in accordance with Waka Kotahi guidance which states that the merge sharrows should be central within the carriageway, refer https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-standards-and-guidance/cycling-network-guidance/designing-a-cycle-facility/intersections-and-crossings/roundabouts/. A design in accordance with national guidance is important to provide consistent messaging to roads users across the road

	network to reduce confusion and increase awareness. The central sharrow immediately at the end of the cycle lane is intended to indicate to drivers to expect cyclists to be merging into the lane. No change is proposed unless directed otherwise by the client decision
Safety Engineer	Agree with Designer's response.
Client decision	Agree with designer and safety engineers.
Action taken	No change.

3.7 Advanced stop boxes – C E

There is no facility for cyclists to wait ahead of traffic at the zebra crossing at Fancourt Street. This creates a potential safety issue where drivers may not be aware of riders alongside as they move off across the zebra crossing.

Relevant standards are Waka Kotahi's CNG (wait facilities at intersection) and Buffered Advanced Stop Box guidance note.

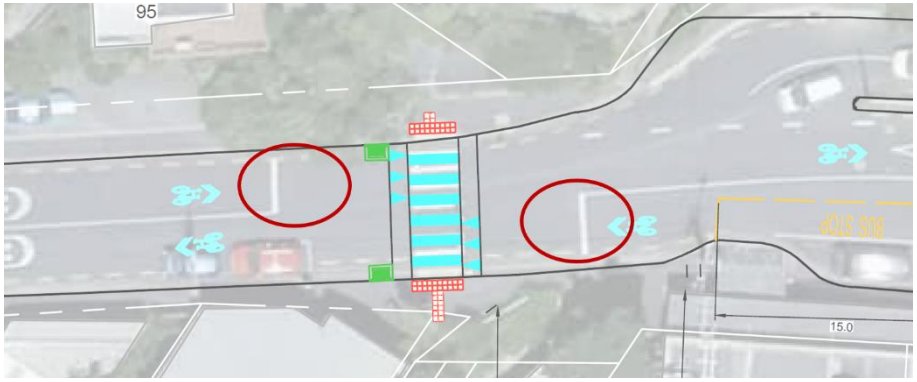


Figure 11: example where no ASBs are provided

Comment

Probability of crash occurring	N/A
Expected crash severity	N/A
Primary treatment recommendations:	
3.7.1	N/A
Supporting treatment recommendations:	
3.7.2	Provide Advanced Stop Boxes at limit lines for cyclists in mixed traffic lanes. Note that this issue recurs throughout the design.

Responses:	
Designer	This Waka Kotahi guidance relates to signalised intersections rather than zebra crossings. The intersection waiting time is typically higher and more frequent at signalised intersections providing incentive and time for cyclists to move to the front of the queue, whereas waiting at a pedestrian crossing is typically more momentary (at 1.5m/s it will take a pedestrian

	approximately 8 seconds to cross the 10m crossing). We consider it safer for cyclists to stay within the shared traffic lane rather than trying to advance between vehicles and the kerb to the front of the queue and this is expected to have limited impact on cyclists convenience.
Safety Engineer	Agree with Designer's response. Consistency of markings throughout the network is of key importance.
Client decision	Agree. Do not mark ASBs at pedestrian crossings.
Action taken	No change.

3.8 Sharrow placement – C E M

The issue is cyclists not taking the lane correctly locating themselves in the lane as indicated by the sharrows placement.

The relevant standards are Waka Kotahi's sharrow marking best practice guidance note and the CNG (mixed traffic lanes).

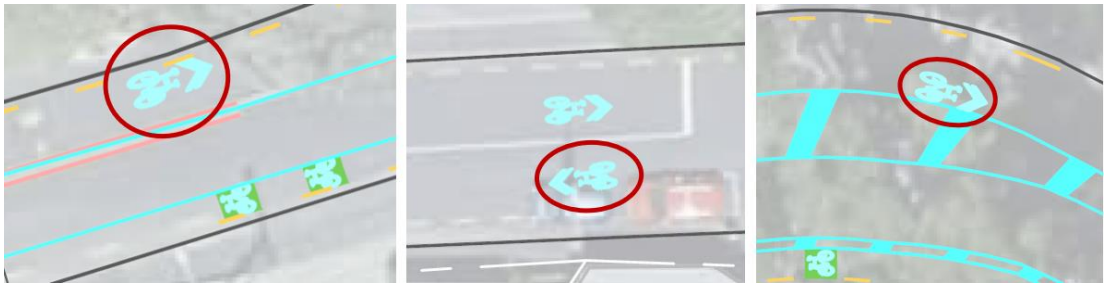


Figure 12: Examples of poor sharrow placement.

Comment

Probability of crash occurring	N/A
Expected crash severity	N/A
Primary treatment recommendations:	
3.8.1	N/A.
Supporting treatment recommendations:	
3.8.2	Ensure sharrows are placed correctly to encourage cyclists to take the centre of the lane.

Responses:	
Designer	We agree with the CAT recommendation, and the sharrow locations will be updated prior to the next drawing issue
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree with everyone.
Action taken	Sharrows to be updated in next drawing set.

Design

3.9 Cycle lanes on inside of curves – C E

Significant

The safety issue is several sections along Wadestown Road where there is a cycle lane without separators is located on the inside of a curve, see Figure 13. In such locations, motorists are more likely to track into the cycle lane while cornering and could hit a cyclist.

Motorists cutting the corner into the cycle lane will be a frequent occurrence, but the low volumes of cyclists and fact that most motorists will adjust their course if a cyclist is present, means crashes are unlikely. The CAT assume that overtaking drivers can utilise the flush median when negotiating this curve.

The risk factors include medium traffic volume exposure (4,200 VPD) and the operating speed of vehicles (35-39 km/h) which is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooter riders. The greatest risk would be long heavy vehicles, and especially those with trailers, tracking close to the kerb with their rear wheels.

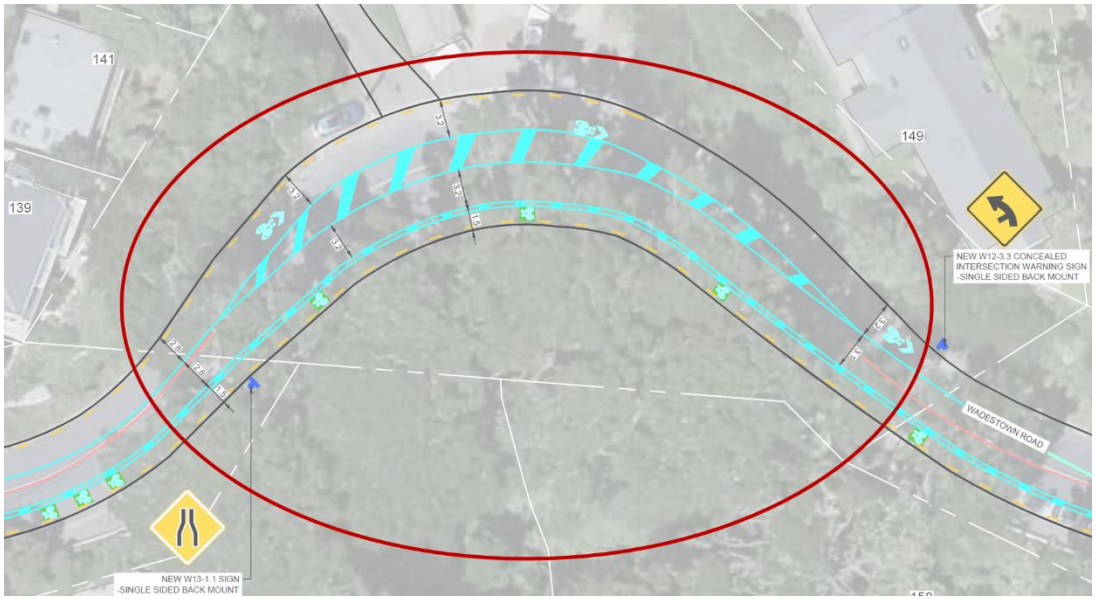


Figure 13: #142-158 example of cycle Lane on inside of curve

Probability of crash occurring	Unlikely
Expected crash severity	Serious injury
Primary treatment recommendations:	
3.9.1	Provide vertical separation within the buffer on the inside of curves.
Supporting treatment recommendations:	
3.9.2	N/A

Responses:	
Designer	We agree with the CAT recommendation, and this will be reviewed, and the design updated subject to vehicle tracking requirements prior to the next drawing issue
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree with all of the above.
Action taken	Review and add separators on the corner, subject to bus tracking.

3.10 Parking outside 98 and 94 Wadestown Road – C E M — Serious

3.11 Bus stop in lane adjacent parking – P C E M — Minor

The safety issue is the back exit of the bus could be obstructed by parked vehicles. Car passengers and drivers of the parked vehicle will also be prevented from opening doors while a bus is present at the stop as indicated in Figure 14. The bus driver may have to pull forward to locate the centre doors at the kerb build out or ask the passengers to

Probability of crash occurring	Unlikely
Expected crash severity	Non-injury
Primary treatment recommendations:	
3.11.1	Remove the kerbside parking.
Supporting treatment recommendations:	
3.11.2	Consider extending the kerb buildout towards the RSP to provide a bus border and retain the kerbside parking.
3.11.3	Consider relocation of the bus stop.

walk forward to the front door. This will delay the bus at the stop and could result in frustration for following riders and drivers.

The crash type/s expected include side swipes between buses and vehicles and collisions between pedestrians dismounting the bus and parked vehicles.

The risk factors include medium to high traffic volume exposure (6,000 VPD) but the operating speed of vehicles will be reduced with the RSP, to the tolerable impact speed for a crash between vehicles and vulnerable road users.

The relevant standards include the Public transport design guidance.

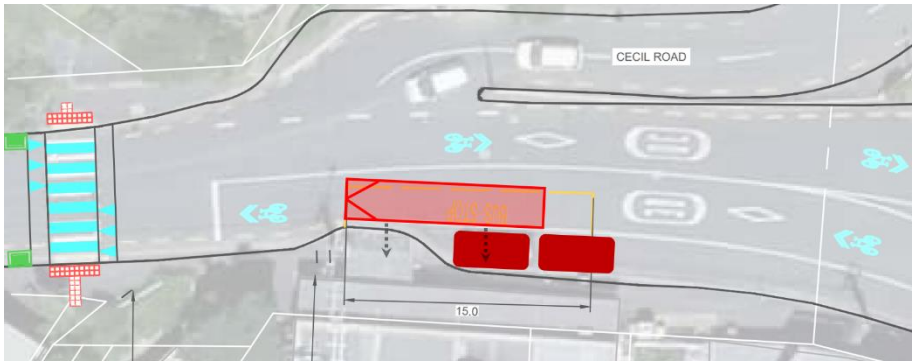


Figure 14: #100 Bus stop outside adjacent kerbside parking.

Responses:

Designer	Relocating the bus stop offline to within the intended parking bay or extending the kerb line within the parking bay to provide a full platform were considered, but do not meet the WCC instructed concept design approach of retaining this car parking. Whilst the bus stop layout is not in line with Waka Kotahi guidance, this project is not changing the existing situation and is maintaining the current bus user experience, and therefore, is not anticipated to have additional adverse impacts on bus users. No change is proposed unless directed otherwise by the client decision

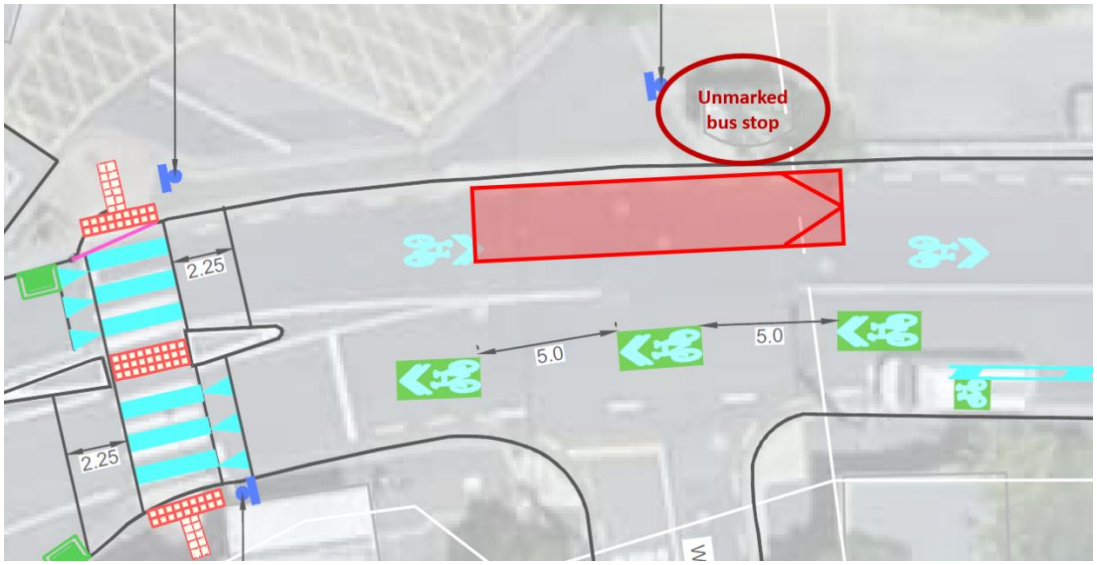
Safety Engineer	If the issue can be managed by passengers getting on and off from the front door, this should be workable.
Client decision	Agree with designer and safety engineer. The bus stop has been there for 20+ years with no known issues and is an ideal location in the middle of the village. Carparking is in very high demand at the shops.
Action taken	No change.

Road markings

3.12 Unmarked in-lane bus stop – P C E M

Minor

Probability of crash occurring	Likely
Expected crash severity	Non-injury
Primary treatment recommendations:	
3.12.1	N/A
Supporting treatment recommendations:	

The safety issue is unfamiliar motorists and riders not anticipating buses stopping at an unmarked bus stop. This could also cause passing attempts by drivers and or riders when it may be unsafe. The crash types expected include rear end or side swipe crashes between buses and vehicles or riders. The risk factors include medium traffic volume exposure (5,000 VPD) but the operating speed of vehicles will be reduced with the RSP, to the tolerable impact speed for a crash between vehicles and vulnerable road users. The relevant standards include the Public transport design guidance.  ***Figure 15: #100 unmarked bus stop***	3.12.2	Mark the bus stop as per guidance.

Responses:	
Designer	We agree with the CAT recommendation, and this will be implemented as part of the next drawing issue
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree.
Action taken	Mark on the bus stop in the next set of drawings.

3.13 Sharrows on an uphill gradient – C E M

Moderate

The safety issue is the higher speed differential between riders and vehicles on an uphill gradient where riders are encouraged to 'take the lane'.

The crash types expected are rear ends and possibly side swipe crashes between motorists and riders.

The risk factors include medium to high traffic volume exposure (5,000 to 8,000 VPD) but the operating speed of vehicles will be reduced with the RSP, to the tolerable impact speed for a crash between vehicles and vulnerable road users. The risk is compounded in some locations by the mixed lane widths as discussed in safety issue 3.5.

The relevant standards include Waka Kotahi's CNG (mixed traffic lanes) and Sharrow markings.

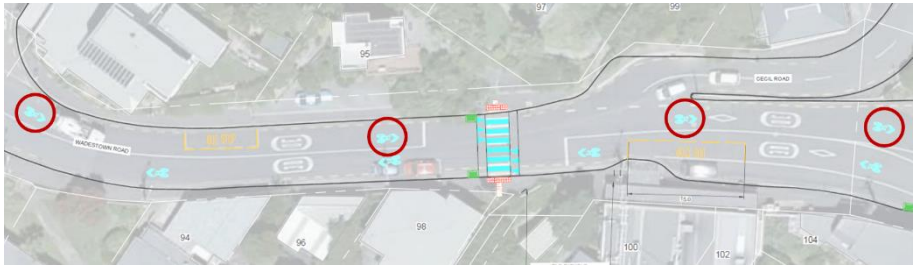


Figure 16: sharrows on uphill gradients near shops

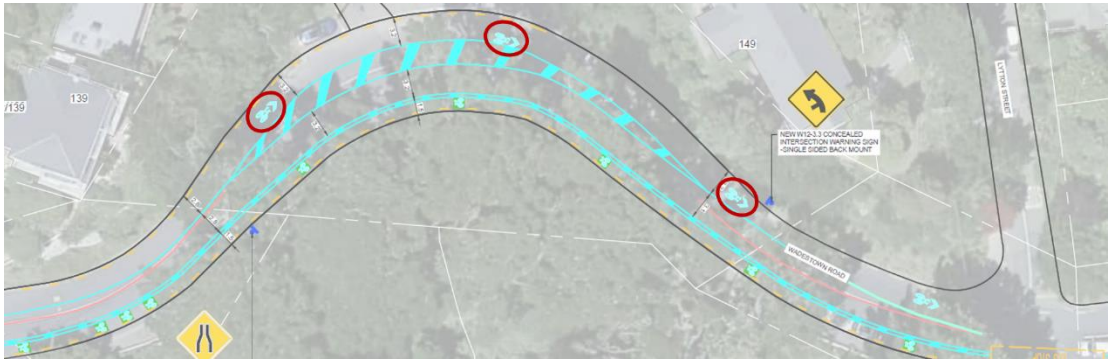


Figure 17: Sharrows on uphill gradients near Lytton Street

Probability of crash occurring	Unlikely
Expected crash severity	Minor injury
Primary treatment recommendations:	
3.13.1	Provide separation for cyclists on uphill gradients.
Supporting treatment recommendations:	
3.13.2	That motorist and rider speeds are measured along the route where sharrows are provided on uphill grades to determine if more traffic calming is required.

Responses:

Designer	We note that the sharrows circled are in the downhill direction but acknowledge that the finding equally applies for the sharrows on the other side of the road in Figure 19. We agree with the CAT finding. Separation through Wadestown Village was considered at concept design. That option received the highest score from the MCA assessment of options. However, WCC chose to progress design for Option 2 (sharrows) as it retained high value parking. This shared lane approach is consistent with the treatment through village shopping areas on other transitional projects (e.g. Aro Valley). Direction is required by the client decision
Safety Engineer	Agree with CAT. Traffic and cyclist speeds should be monitored. If the speed differential is excessive, additional traffic calming measures should be considered.
Client decision	Monitor speed differential after installation and add traffic calming if required. Note that WCC speed management programme may result in a speed reduction on Wadestown Road around the same time this section of Wadestown Connections is installed.
Action taken	Add speed monitoring to post installation report.

3.14 Line marking alignment – C E M

Moderate

The safety issue is road users traveling along Wadestown Road being guided towards the opposing lane by new line markings (Figure 18 shows where a driver could end up if they followed the centre line markings).

The crash types expected include head on and side swipe crashes between vehicles or riders and buses or other vehicles.

The risk factors include high traffic volume exposure (4,000 VPD) and the operating speed of vehicles (35-44 km/h) which is above the tolerable impact speed for a crash between vehicles and cyclists/ electric scooter riders or vehicles and other vehicles.

Probability of crash occurring	Unlikely
Expected crash severity	Minor injury
Primary treatment recommendations:	
3.14.1	N/A
Supporting treatment recommendations:	
3.14.2	Ensure the new centreline road markings direct traffic around the curve in the correct direction.

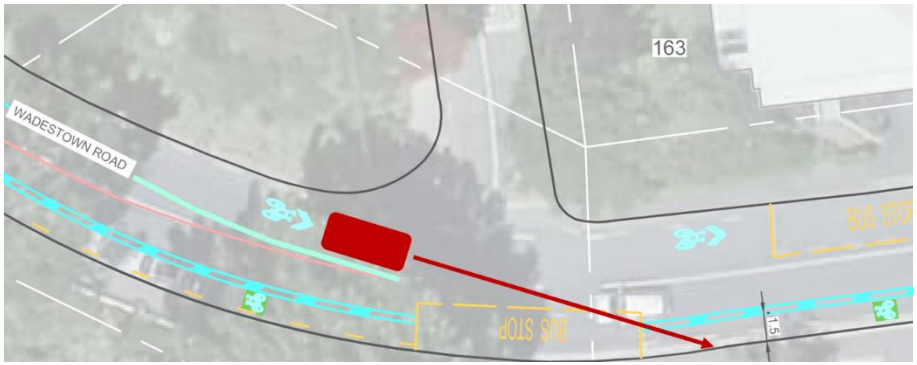


Figure 18: possible direction of vehicles following the new line markings.

Responses:	
Designer	We agree with the CAT recommendation, and this will be implemented as part of the next drawing issue
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree with the above.
Action taken	Centreline to be adjusted in the next set of drawings.

3.15 Narrowing lane past bus stop – C E M

Minor

The safety issue is the unexpected lack of space between the bus stop and centreline for riders. Also see issues 3.10 and 3.11.

The crash type expected is a side swipe crash between riders, buses, and other vehicles.

The risk factors include medium to high traffic volume exposure (6,000 VPD) but the operating speed of vehicles will be reduced with the RSP, to the tolerable impact speed for a crash between vehicles and vulnerable road users.

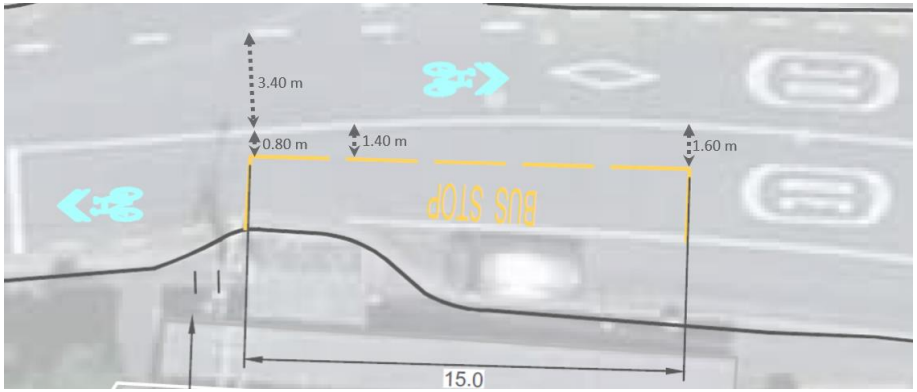


Figure 19: Lane width past in lane bus stop

Probability of crash occurring	Unlikely
Expected crash severity	Non-injury
Primary treatment recommendations:	
3.15.1	N/A
Supporting treatment recommendations:	
3.15.2	See 3.11.2 and 3.11.3.
3.15.3	Ensure the eventual narrow width is clear to uphill riders when a bus is present.

Responses:	
Designer	We agree with the CAT recommendation, and this will be reviewed prior to the next drawing issue to provide a consistent width between the bus stop and centre line
Safety Engineer	Agree with CAT and Designer's response.
Client decision	Agree with the above.
Action taken	Centreline to be adjusted in the next set of drawings.

4 Audit statement

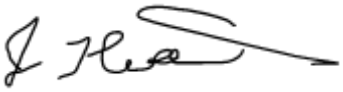
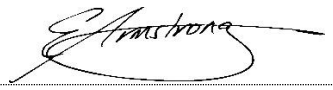
We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed, or modified to improve safety.

The safety issues identified and noted in this report are summarised in Table 4-1.

Table 4-1: Summary of Issues

Serious	*Significant*	*Moderate*	*Minor*	*Comments*	*Total*
1	*3*	*3*	*3*	*5*	*15*

Issue		***Ranking***
	Project wide	
	Design	
3.1	Cycle route target audience.	Comment
3.2	Raised crossings.	Comment
3.3	Lack of physical separation.	Significant
3.4	Traffic lane widths.	Moderate
3.5	Lane widths for mixed traffic.	Significant
	Road markings	
3.6	Alignment of sharrow transition markings.	Comment
3.7	Advanced stop boxes.	Comment
3.8	Sharrow placement.	Comment
	Design	
3.9	Cycle lanes on inside of curves	Significant
3.10	Parking outside 98 and 94 Wadestown Road.	Serious
3.11	Bus stop in lane with adjacent parking.	Minor
	Road markings	
3.12	Unmarked in lane bus stop.	Minor
3.13	Sharrows on an uphill gradient.	Moderate
3.14	Line marking alignment.	Moderate
3.15	Narrowing lane past bus stop.	Minor

Designer:	Billy Rodenburg	Position	Step Change Project Manager
Signature		Date	14/08/2023
Safety Engineer:	Dennis Davis	Position	Principal Transport Engineer, WCC
Signature		Date	15/08/23
Client:	Jonathan Kennett	Position	Project Lead, WCC
Signature		Date	19/08/23
Project Manager - action completed:	Elyse Armstrong	Position	Project Lead
Signature		Date	26/02/2024
Audit report distributed on:		Date	