WAITEMATA GREENWAYS PRE-OPENING ROAD SAFETY AUDIT

PREPARED FOR AUCKLAND TRANSPORT

20 December 2017

Stantec

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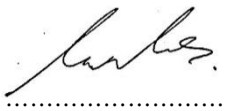
Micheal Xiong		20/12/2017
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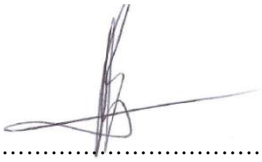
Brian Yip		20/12/2017
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Auckland Transport

Waitemata Greenways Pre-Opening Road Safety Audit

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1. Introduction

1.1 Safety audit definition and purpose

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

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

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

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, which is a safe road system increasingly free of death and serious injury. The road safety 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 so 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 road safety audit is summarised as:

'to deliver completed projects that contribute towards a safe road system that is increasingly free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.'

A road safety audit should desirably be undertaken at project milestones such as:

- concept stage (part of business case);
- scheme or preliminary design stage (part of pre-implementation);
- detail design stage (pre-implementation or implementation); or
- pre-opening or post-construction stage (implementation or post-implementation).

A road safety audit is not intended to be a technical or financial audit and does not substitute for a design check of standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the NZTA Road Safety Audit Procedures for Projects Guidelines - Interim release May 2013 the audit report should be submitted to the client who will instruct the designer to respond. The designer should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

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

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations. It is to be completed by the designer, safety engineer, and client for each issue, and should record the designer's response, client's decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

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

1.2 Project

This report documents a pre-opening road safety audit of two sections of Route C in the Waitemata Safe Routes project. It should be noted that construction of the Waitemata Safe Routes project was only partially complete at the time of the audit. Line marking, surfacing, signage and parking reconfiguration was still to outstanding. The audit was undertaken in two sections as shown in Figure 1 below.

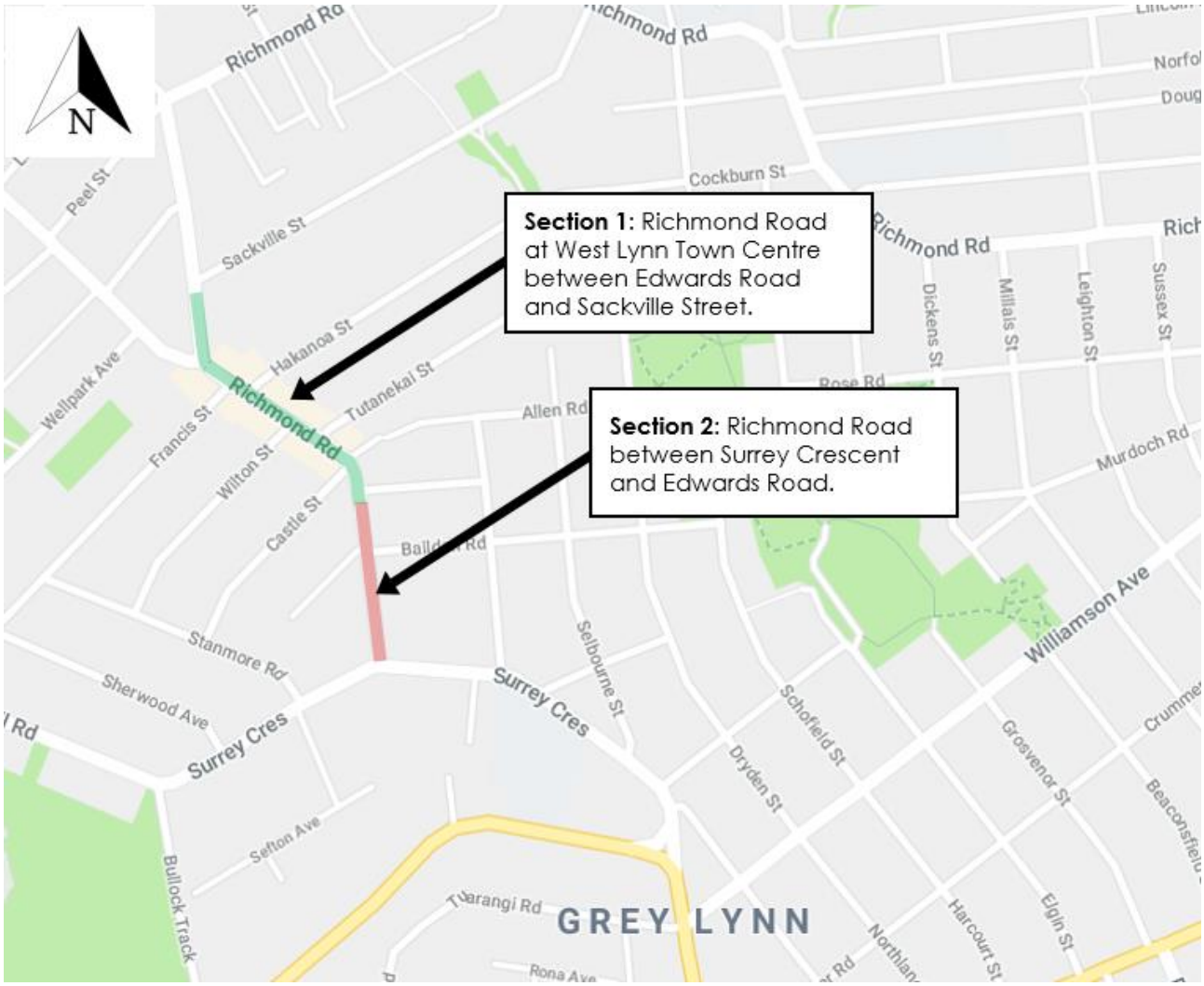


Figure 1- Location Plan: Section 1 and Section 2

1.3 The road safety audit team

This road safety audit has been carried out in accordance with the NZTA Road Safety Audit Procedure for Projects Guidelines – Interim release May 2013, by:

- Nick Gluyas, Principal Transportation Engineer and Audit Team Leader.
- Brian Yip, Senior Transportation Engineer and Transportation Team Lead
- Micheal Xiong, Transportation Engineer

1.4 Previous road safety audits

Two previous Road Safety Audits have been carried out for the Waitemata Greenways routes.

- Detail Design Road Safety Audit Waitemata Safe Routes – Routes A and C (February 2017)
- Waitemata Safe Routes – Route A, Addendum Report (September 2017)

The Stantec audit team were not involved in the production of the detailed design or scheme design of these routes.

1.5 Scope of this road safety audit

This road safety audit is an audit of the construction work completed as at 14 December 2017. A site visit as undertaken by the safety audit team on 14 December 2017 between 10:00 am to 12:00 pm (Section 1 and 2). A night time audit was not undertaken. No entry or exit meetings were held.

1.6 Report format

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

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

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

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the concern assessment rating matrix in Table 1-1. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1-1: Concern Assessment Rating Matrix

Severity (likelihood of death or serious injury)	**Frequency** (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 1-2.

Table 1-2: Concern Categories

Concern	Suggested action
Serious	Major safety concern that must be addressed and requires changes to avoid serious safety consequences.
Significant	Significant safety concern that should be addressed and requires changes to avoid serious safety consequences.
Moderate	Moderate safety concern that should be addressed to improve safety.
Minor	Minor safety concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. 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 or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

1.7 Documents provided

No documents were required for this audit

1.8 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 SAT. 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. Safety audits do not constitute a design review nor are they an assessment of standards with respect to engineering or planning documents.

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

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

2. Safety Concerns

2.1 Safety concerns pertaining both section 1 and section 2

2.1.1 Bus shelters on floating bus stops

Moderate

Floating bus stops are proposed at a number of locations on each route. Some of these stops have *Adshel* bus shelters located on the island, but not all. The safety concern is that the shelters block inter-visibility between cyclists travelling behind the shelter and a bus patron walking around the end of the shelter. This could lead to collisions between cyclists and pedestrians.

Figure 1 - Bus stop at 554 Richmond Road

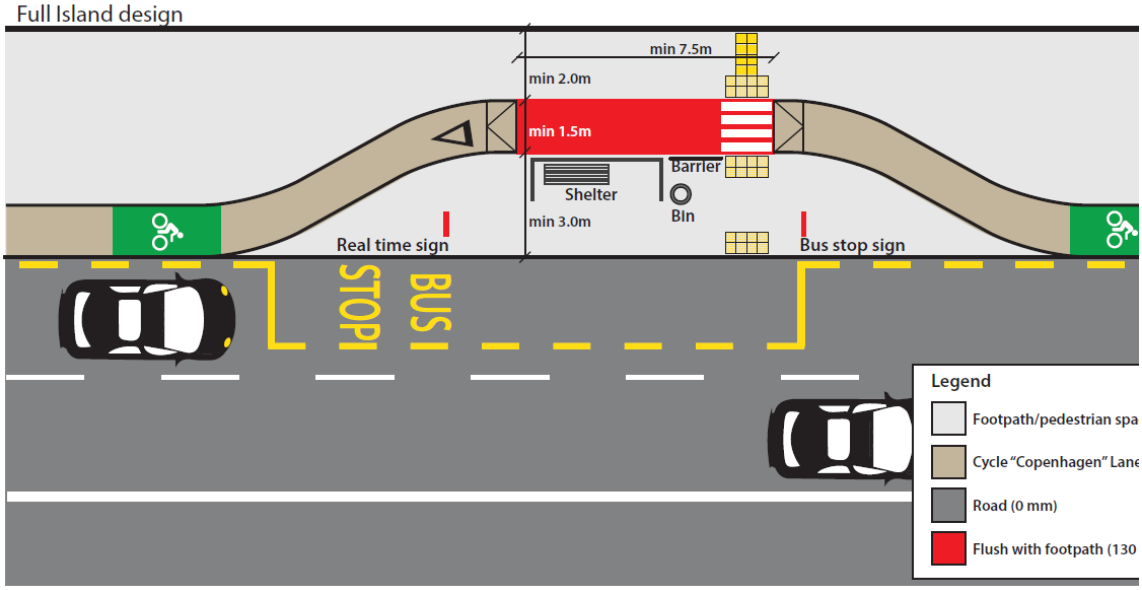
Figure 2 - Bus stop at 470 Richmond Road

Recommendations

1. Reconsider the style of shelter used at the floating bus stop islands to ensure they are as transparent as possible.
2. If an Adshel is used consider placing street furniture or railings downstream from the closed end to improve the intervisibility to cyclists and redirect pedestrian movements away from the closed end
3. As per the detailed design drawings, provide a colour contrasted surface on the cycle path behind the shelter with markings and zebra bars indicating where pedestrians should cross.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Designer (AECOM) Response: - Disagree with SAT recommendation 1, Adshell shelters are required to remain along the route as per AT instruction. - Agree with SAT recommendation 2, the detailed design drawings detail (drawing C3412 sheets1 and 2) an AT fence type E to be installed on the upstream side of the bus shelter to discourage pedestrians from crossing behind the shelter. - Agree with recommendation 3, install the cycle lane paint markings as per the latest detailed design drawings	

Recommendations

Safety Engineer comment	Agree with SAT comments. Floating bus stop should be consistent and the following design should be adopted. Full Island design 
Client decision	We agree with the installation of coloured surfacing and fencing as per SAT Comments 2 and 3. The floating bus stop design provided by the safety engineer does not provide further detail on the type of shelter. We note that the shelter at 474 Richmond Road is the most transparent shelter available with Adshell, AT's shelter provider. With the coloured surfacing and barrier, we do not believe a fully transparent shelter is required. This suggestion will be considered as the shelters reach the end of their life cycle and require replacement. We note that there have been floating bus stops installed where the cycling facility is not considered open for use. Coloured surfacing and barrier installation will not be implemented in these locations until the route is considered open.
Action taken	Complete coloured surfacing and Barrier installation where the dedicated cycling facility is considered complete. Bus stop locations now being reviewed by MR Cagney.

2.1.2 Intervisibility

Moderate

On both routes there are sections where parking is permitted between the kerbside cycle lane and the general traffic lane. In some locations this parking is immediately adjacent to a vehicle crossing. Figure 3 shows an example of one such location.

The safety concern is that the parked vehicles will hide a cyclist using the cycle lane from a driver intending to turn into the vehicle crossing, resulting in a collision when a vehicle is turned across the path of a cyclist. This is of special concern for child cyclists who are more easily hidden behind parked vehicles, or when vans and other high sided vehicles are parked.

There is also a concern that people alighting from parked vehicles may not see approaching cyclists as they cross the cycle lane to the footpath.

Where the number of parking spaces adjacent to the cycle lane is limited to only one or two consecutive spaces drivers and alighting passengers have an opportunity to see behind the parked vehicles and see cyclists as they approach the vehicle crossing. A crash is most likely to occur when there are three or more parked vehicles without a gap.

Figure 3 – Vehicle Access at 466 Richmond Road

Recommendations

1. Provide a colour contrasted surface on the cycle path across vehicle crossings and in front of parked vehicles (between the kerb and the parked vehicles) adjacent to locations where more than two consecutive vehicles can park.
2. Where vehicle crossings exist between angled parking spaces consider installing a speed bump along the outside of the cycle lane to warn drivers of potential cyclists and slow their movement across the cycle lane.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agree with both SAT recommendations - Install cycle greening as per latest detailed design drawings - Install 50mm vanguard or similar speed hump as proposed at other high turnover vehicle accesses across the route	
Safety Engineer comment	Agree with the installation of a coloured surface where there is angled parking to highlight the presence of the cycle lane. Vertical deflections at entrances should only be used where there is a high number of turning movements and the drivers are not regular users. If the entrance is to a private property with space for a few vehicles, then a vertical deflection is not considered necessary.	
Client decision	Agree with the recommendation for coloured surfacing. Safety Engineer comment is noted regarding the frequency of vehicles typically using a private driveway. However, the town centre is subject to numerous vehicles illegally parking in front of the entrances, with the nose of their vehicles impeding on the cycleway. Given the context, a vertical deflection is recommended	
Action taken	Complete coloured surfacing and installation of vertical separation. Boffas are now undertaking a technical review of the cycle routes.	

2.1.3 Delineation

Serious

There is currently a lack of delineation markings such as edge lines and cycle lanes lines along Richmond Road due to the construction being incomplete. The double white lines as shown in Figure 4 below is ultimately intended to be a buffer zone providing clearance between vehicle passenger doors and passing cyclists. The cycle lane is intended to be kerbside and the parking mostly removed or relocated to the other side of the buffer zone. Because the line marking has not been fully implemented vehicles are effectively parking in the cycle lane and cyclists appear confused as to where they should ride. For example, during the safety audit the SAT observed cyclists riding between the buffer zone markings using it as a cycle lane. This included riding between the side islands and the parked vehicles. This places cyclists in a very risky 'door' zone.

There are multiple areas along the route where there is currently no clear distinction between the cycle way, the footpath, the buffer zone and the traffic lane which creates significant confusion for road users and may lead to collisions.

Figure 4 – Double line acting as a narrow cycle lane

Recommendations

1. Complete the road markings as per the construction plans and implement the proposed coloured surface treatments to clearly define the cycling, pedestrian and traffic areas; or
2. Remove the line marking currently undertaken and return the site to its pre-construction configuration

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation 1, install paint markings as per latest detailed design drawings - The cycle lane is proposed to be closed just south of the community centre, if line markings and greening are not proposed to be installed outside of this, then measures (i.e flexi posts) should be installed to deter parking and discourage cyclists from using cycle lane around pinch points such as traffic islands - Disagree with SAT recommendation 2, removal of the road markings will cause confusion and significant "ghost" markings (on new surfacing in some areas) which could create an unsafe environment	
Safety Engineer comment	As the scheme is not completed it is causing confusion for road users. On a site visit vehicles were observed parking in the cycle lane and the side islands protruded into the carriageway creating a road safety concern. The cycle lane markings need to be installed as designed and road markings are required to guide vehicles past the side island. If parking is to be provided between the cycle lane and traffic lane then this needs to be marked accordingly.	
Client decision	This portion of the cycling facility is currently under review with the community. Full implementation of the cycle lane without further consultation is not supported. The buffer line closest to the kerb will be removed along with any associated cycling symbols to reduce confusion with road users.	

Action taken	Remove the cycle buffer line closest to the kerb from Edwards Road to Surrey Crescent. Cyclists to share road with vehicles in the interim. Boffas are now undertaking a review of the scheme.

2.1.4 Cycling in door zones — Significant

In more than one location along the route, there appears to be little to no separation between the cycle lane and the parallel car parking spaces. The width marked (parking plus cycle lane) appears to be narrower than the widths specified on the drawings that were reviewed for the detailed design road safety audit. If a narrower than intended/endorsed facility has been installed this could create safety issues.

In addition to the potential misperception of the road markings, cyclists are currently riding along the door zone of the parking spaces which is a hazard if vehicle occupants open a door without seeing the cyclist. This applies when a driver pulls out of a parking space as well. The lack of separation and delineation also increases the likelihood of vehicles parking further out from the kerb and intruding into the cycle lane.

Figure 5 - Parking bay at 436 Richmond Road

Recommendations

Complete the cycle lane edge line markings, flush markings and delineation measures to ensure that there is separation between parallel parked vehicles and cycle lane users. Review the widths provided on site against the design intent (drawings) to confirm that the installed facility is as intended/endorsed and consistent with what operates safely elsewhere.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation – install all markings as per latest design drawings prior to opening the facility	
Safety Engineer comment	Agree with SAT recommendations.	
Client decision	Agree with SAT recommendations	
Action taken	Complete town centre paint and coloured surfacing per current design.	

2.1.5 Refuse collection — Minor

Residents are placing their refuse bins in the cycle lane creating not only pinch points, but also collision hazards for cyclists.

Figure 6 – Bins in cycle lane at West Lynn shops

Figure 7 – Bins in lane outside 552 Richmond Rd

Recommendation

Undertake consultation with residents to educate them on where to place their bins.

Frequency **Crashes are likely to be occasional**	**Severity** **Death or serious injury is unlikely**	**Rating** **The safety concern is minor**
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation. Recommend AT liaise with Auckland Council Waste Management team as well.	
Safety Engineer comment	Agree with Designers response.	
Client decision	Agree. Consideration of bins will be a key part of future facility design.	
Action taken	Liaise with AC Waste management to determine go forward strategy for bin placement. Boffas are now undertaking a review of the project.	

2.2 Safety concerns pertaining to section 1

2.2.1 Richmond Road and Castle Street Intersection

Moderate

Figure 8 shows vehicles cutting into the cycle lane at the bend near the intersection of Richmond Road and Castle Street.

No physical separation measures are in place at the bend. The cycle lane is not fully marked and there is no clear distinction to whether the area outside of the edge line is a cycle lane or a road shoulder.

The safety concern is that the lack of delineation allows drivers to maintain a high speed by cutting the corner into the cycle lane. The risk of a collision with cyclists and/or vehicles exiting parking spaces is increased by the tree and streetlight at the apex of the bend, partially obstructing driver visibility.

Figure 8 - Bend near the intersection of Castle Street and Richmond Road

Recommendations

1. Complete the road marking, green surfacing and cycle lane symbols as per design plans.
2. Install the proposed delineation measures (such as flexi posts) to separate cycling and vehicle traffic)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agree with SAT recommendations, install all proposed road markings and separation measures as per the latest detailed design drawings	
Safety Engineer comment	Installing the green surfacing and flexi-posts will assist cyclists, however vehicles are still likely to drive over the hatching as this is the driving line. Suggest that this intersection be reviewed to protect cyclists and guide traffic round the bend in a smooth alignment.	
Client decision	Agree with SAT recommendations. Flexi post have been installed and paint to be implemented shortly.	

Recommendations

	The alignment of the cycle lane will be reviewed as part of the greater town centre review.
Action taken	Flexipost installed. Complete coloured surfacing. Review alignment of cyclelane.

2.2.2 Parallel parking bay at 481 Richmond Road **Significant**

Figure 9 shows the location of the parking bay and the cycle lane around the bend. The red strip illustrates an indicative linear line of sight between a parallel parked vehicle and the cycle way.

The safety concern is that downhill cyclists may be travelling at reasonable speed and will round a blind corner and be presented with a vehicles moving slowly across the cycle lane – or drivers slowly reversing into a parking space. There would be little room (or time) for cyclists to take evasive action.

The tree and street light post contributes to the obstruction of visibility significantly, refer to Figure 10

The parking restriction at this location is assumed to be P60, therefore a higher vehicle turnover is expected which increases the risk for cyclists. In addition, cyclists will be riding in the door zone where there are no separation measures in place between the cycle lane and the parallel car parks.

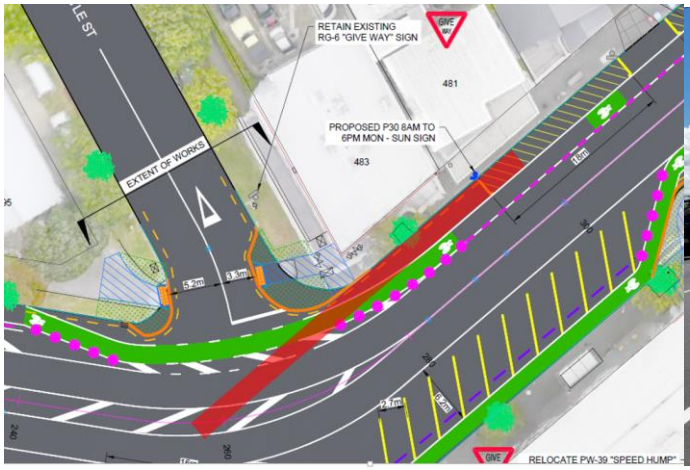


Figure 9 - Plan showing visibility to/from parked vehicles

Figure 10 - Visibility from parked vehicles towards the bend

Recommendations

1. Complete the road markings including green coloured surfacing and cyclist symbols as per design plans to assist drivers in recognising the adjacent cycle lane.
2. Consider implementing supplementary warning signs and road markings to encourage cyclists to slow down at the bend and encourage drivers to actively check for cyclists.

Frequency **Crashes are likely to be common**	**Severity** **Death or serious injury is likely**	**Rating** **The safety concern is significant**
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation 1, install all road markings as per the latest detailed design drawings – These have been revised to provide a 400mm buffer zone both on the inside of the cycle lane and on the outside of the cycle lane. This provides a greater refuge for cyclists - Agree with SAT recommendation 2, additional signage is a good idea.	
Safety Engineer comment	See comments in 2.2.1.	
Client decision	Agree with implementation of green coloured surfacing. Signage to be reviewed as part of the greater town centre design process.	
Action taken	Complete coloured surfacing and review signage requirements	

2.2.3 Parking over cycle lane adjacent to angled parking

Moderate

Figure 11 and Figure 12 depict instances of vehicles illegally parking over the cycle way, barricading the cyclist path.

The safety concern is that this will force cyclists to divert behind the angled car parks into an area that has less than desirable separation between parked vehicles and passing traffic. The SAT expects that, in this situation, confident cyclists would likely cycle along the edge line of the traffic lane whereas inexperienced cyclists would tend to ride further away from the moving traffic and closer to the parking spaces. This would expose inexperienced cyclists a potential collision with a reversing vehicle.

It was observed that this issue is primarily due to a lack of clarity of whether parking is permitted.

Figure 11 - Vehicle parked over cycle lane at 452 Richmond Road

Figure 12 - Vehicle parked over cycle lane at the start of angled parking section

Recommendations

1. Complete the proposed road marking, green coloured surfacing and cyclist symbols as per the design plans to provide better delineation and distinction between the cycle lane and the parking spaces.
2. Implement the designed separation measures (e.g. flexi posts) at the ends of the angle parking sections, refer to Figure 12.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agree with both SAT recommendations, install all road markings, greening and separation measures as per the latest detailed design drawings. - Additional recommendation for both accesses close to 452 Richmond Road (figure 11) would be to install NSAAT lines across vehicle accesses and 50mm speed humps along the edge of the cycle lane as per section 2.1.2 of this report	
Safety Engineer comment	Agree with SAT recommendation 1. SAT recommendation 2 of installing flexi-posts have been installed, as shown below.	

	
Client decision	Comment has been addressed with installation of Flexipost. A permanent concrete separator may be considered as part of the greater village centre design process.
Action taken	Action addressed. Boffas are now undertaking a review of the project.

2.2.4 Zebra crossing at 474 Richmond Road

Moderate

Figure 13 shows the zebra crossing and a vehicle parked directly in front of the bus stop outside 474 Richmond Road. The safety concern is that the parked vehicle is blocking the visibility between the crossing pedestrians and on coming vehicles. Drivers may not have sufficient time to stop, causing a collision. Currently there are no parking restrictions at this location indicating permitted on street parking.

It should also be noted that the there is no limit line on the cycle lane requiring cyclists to give way and because the cycle lane crosses the speed table between the zebra bars and the tactile pavers it is ambiguous as to who gives way. Cyclists may consider that they are in a priority lane and ride across the path of pedestrians using the zebra crossing, risking a collision.

Figure 13 - Vehicle parked in front of the bus stop at 474 Richmond Road

Recommendations

1. Consider implementing a section of NSAAT road marking between the speed table and the head of the bus stop marking to ban parking.
2. Complete the road markings as per the construction plans and implement the proposed coloured surface treatments to clearly define the cycling, pedestrian and traffic areas.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation 1, latest detailed design drawings include NSAAT and "BUS STOP" road markings and these are proposed to be installed prior to opening - Agree with SAT recommendation 2, install all proposed road markings and surface colouring as per latest detailed design drawings	
Safety Engineer comment	Agree with SAT comments and Designers response. Extending the limit line across the cycle lane was raised during the detailed design process.	
Client decision	Agree with SAT recommendations	
Action taken	Complete paint as per current design drawings. Bus stop location being reviewed by MR Cagney.	

2.2.5 Cross fall at 436 Richmond Road

Significant

Figure 14 shows a steep grade from the kerb to the footpath at the parallel parking bay outside 436 Richmond Road.

The safety concern is people with mobility challenges such as wheel chair users, the elderly, or parents with prams may have difficulty accessing parked vehicles and could fall/topple. This can lead to serious injuries, especially for the elderly (e.g. broken hips).

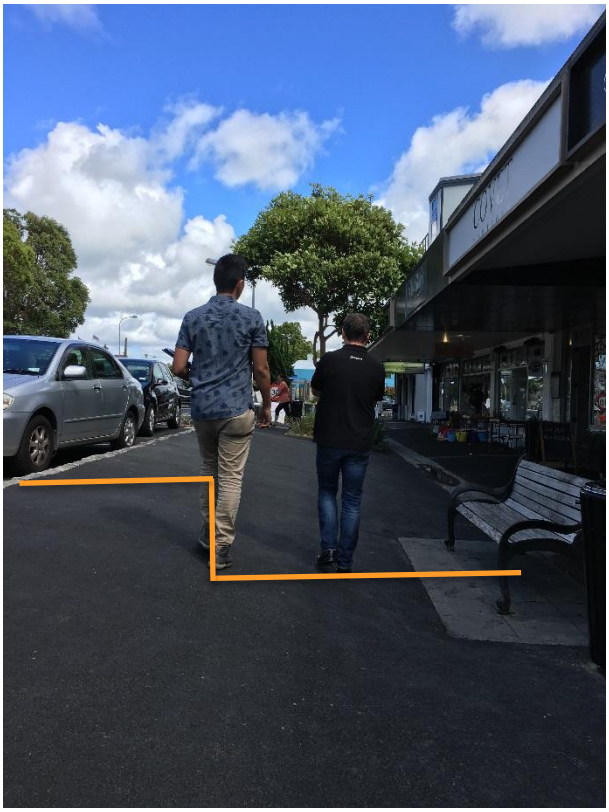


Figure 14 - Cross fall between the kerb and the footpath outside 436 Richmond Road

Recommendation

Provide a flat area (e.g. 1.5m wide footpath) adjacent to the parking spaces.

This would necessarily require the installation of a low retaining wall, however the area between the low wall and the footpath under the shop verandas could be landscaped (e.g. parklet) or turned into a useable streetscape (e.g. a café seating area).

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation, this has already been identified as a high priority action and is being worked though by AT with the community liaison group at present.	
Safety Engineer comment	Agree that the gradient adjacent to the parking area is too steep and needs to be reviewed to reduce the gradient to current standards.	
Client decision	Addressing the gradient in this location is a key component of the greater town centre design review.	
Action taken	Boffas are now undertaking a review.	

2.2.6 Kerb pointing trip hazard

Moderate

Figure 15 shows the cycle lane and footpath separated by a line of flush kerb stones outside 474 Richmond Road.

The safety concern is the excessive height of the pointing between the kerb blocks which creates a tripping hazard for passing pedestrians and bus patrons, especially given the cycle lane is not visually

distinct from the bus waiting area. Pedestrians may not perceive the area set aside for cyclists to be a cycle lane.

Figure 15 - High kerb pointers outside 474 Richmond Road

Recommendations

Reduce the height of the pointing to reduce the tripping hazard. Visually demarcate the cycle way by applying a contrasting material (colour or finish) to the cycleway to raise awareness of its presence.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agree with SAT recommendation, grind the pointing where considered a significant trip hazard and install all proposed coloured surfacing and line marking as per latest detailed design drawings. The kerbs should be retained as they provide good delineation between the footpath and cycle path.	
Safety Engineer comment	Agree with SAT comments.	
Client decision	Agree with SAT comments	
Action taken	Contractor to be instructed to correct.	

2.3 Safety concerns pertaining to section 2

2.3.1 Richmond Road / Surrey Crescent Intersection **Serious**

The eastbound cycle lane on Surrey Crescent is proposed to transition from the road into the berm area, around the back of a bus shelter on the corner of Surrey Crescent and Richmond Road, and back into the road space. Eastbound cyclists will be re-joining the carriageway immediately in front of the bus box at a point approximately 10 m before the Richmond Road intersection. This issue has been raised in two previous audits and the SAT remain concerned that the late transitioning of cyclists into the road space is a significant conflict with traffic turning left into Richmond Road, especially when there is a stopped bus, but also when there is no bus is present.

Significantly exacerbating the concern at this location is the fact that the 020 bus route that uses Surrey Crescent makes a left turn into Richmond Road at this location. Bus drivers leaving this stop will almost certainly drive straight ahead and over the cycle lane area. Furthermore, as they set off they will most likely be looking in their right hand mirror for vehicles approaching from behind. Bus drivers will not be checking for cyclists popping out in front of them on their left hand side. Cyclists may be attempting to re-join the carriageway, in their dedicated cycle lane immediately in front of a departing bus, or just as a bus has set off, leaving the cyclist in the situation of an unavoidable collision.

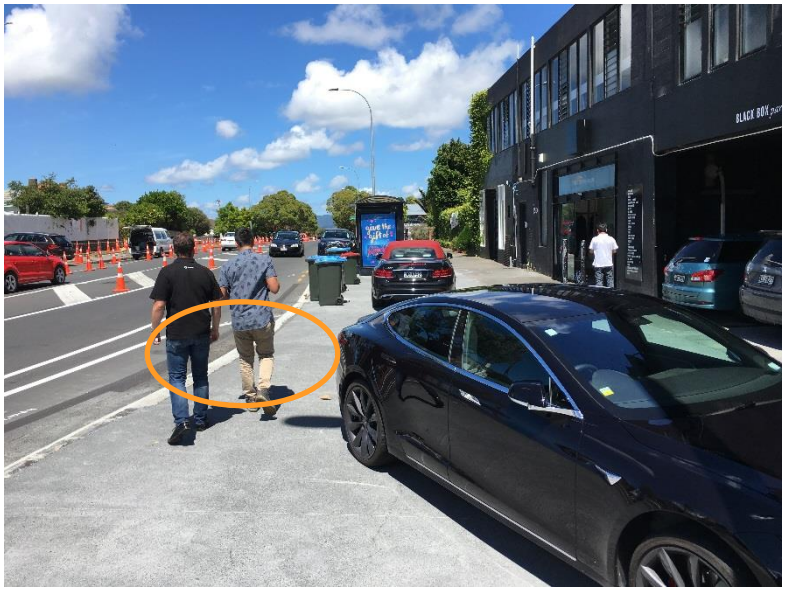


Figure 16 – Cycle path dropped crossing immediately in front of bus stop

Recommendations

1. Remove or relocate the bus stop.
2. If this is not possible, keep the cycle path in the berm area and cross require cyclists to cross the end of Richmond Road with pedestrians.

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	Designer (AECOM) Response: - Agree with SAT that this requires further attention. This was a design decision made and dictated by the previous AT project manager. The SAT recommendation and AT safety engineer were over-ruled in the Detailed Design RSA. AECOM considered the SAT recommendation and provided AT an option for this, however, it was considered unacceptable by AT W&C to cross cyclists at the pedestrian refuges from a LOS stand point	

	- AECOM recommend that the AT Decision be reconsidered to improve the safety of this location - Flexi posts have been installed in the interim to close cyclist access to the bus stop area
Safety Engineer comment	This location can be reviewed so that cyclists can access the cycle facility on Richmond Road without having to pass the bus shelter. The issue of visibility and cycle / vehicle conflicts at this location were also raised during the detailed design process. The photo below shows that during the site visit on 26th February 2018 that the cycle ramp was closed with the use of flexi-posts.  It was also noticed that the tactile paving was not installed on the central island and eastern side of the intersection, as shown below. 

Client decision	The cycling facility at this intersection has been closed. A greater review of the entire Richmond Surrey intersection is underway and addressing this component is a key consideration.
Action taken	Cycling facility closed. Boffas are now undertaking a review.

2.3.2 Cycle ramp at bus stop at 552 Richmond Road

Moderate

Figure 17 below shows the cycle ramp at the bus stop outside 552 Richmond Road. As mentioned above, the buffer zone is currently functioning as an informal cycle lane and the buffer zone ends at the point of a kerb. The safety concern is that cyclists riding in this area may make a late decision to use the ramp or swerve into the traffic lane despite potential adjacent obstructions (e.g. refuse bins, vehicles, buses pulling into the bus stop, etc). This could result in the cyclist losing control and/or a collision.

Figure 17 - Parking bay at 436 Richmond Road

Recommendations

1. Complete the road markings (including the bus box markings) as per the design to ensure clear delineation between cycle lane, footpath, buffer zone, bus stop and vehicle lane. Ensure clear and visible distinction between the cycle lane and footpath between the two cycle ramps.
2. If the construction of the cycle lane is not to proceed, consider closing the cycle ramps at this location to prevent cyclists from accessing the footpath.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Designer (AECOM) Response: - Agreed with SAT recommendation to install bus box markings as per latest detailed design drawings as this is to remain a functioning bus stop - As the cycle lane at this location is likely to be closed until further consultation is completed, we recommend temporarily closing the cycle ramps to deter use of the facility. A formal closure of the cycle lane and merge into general traffic is to be provided just south of the community centre	
Safety Engineer comment	Agree with SAT recommendations. Also see 2.1.1.	
Client decision	The cycle lane buffer line closest to the kerb will be removed, reducing confusion for road users. This will effectively close the cycling facility and promote Kerb side parking.	

Figure 17 - Parking bay at 436 Richmond Road

Recommendations

Action taken	Contractor to be instructed to action.

2.3.3 Traffic Island at 522 Richmond Road

Minor

Figure 18 shows the partially marked out refuge crossing with constructed islands and temporary signage at 522 Richmond Road.

The safety concern is:

- The lack of delineation lines increases risk of vehicles hitting the traffic islands, especially during periods of low congestion and/or low visibility (e.g. night time, rain, fog, etc.)
- The incomplete markings mislead cyclists into using the buffer zone as a cycle way which creates a significant pinch point at the crossing. In addition, riding in the buffer zone places cyclists in the door zone of the on street car parks, exposing them to a hazard.
- The regulatory signs placed on temporary road cones may be accidentally (e.g. wind) or deliberately moved resulting in poor conspicuousness of the islands and subsequent collisions.

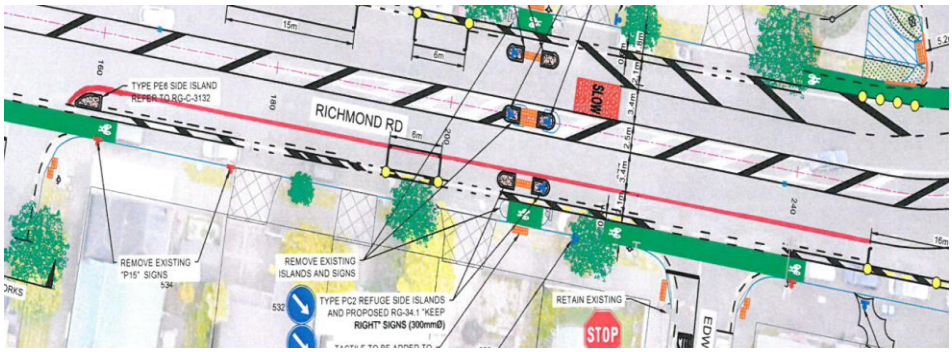
Figure 18 - Refuge crossing and side island outside 522 Richmond Road

Recommendations

1. Complete the proposed road markings to ensure clear delineation between cycle lane, footpath, buffer zone, parking areas and vehicle lane (including the edge line that directs passing traffic away from the refuge side islands).
2. Install the proposed permanent regulatory signs on the refuge central island and side islands.

The rating for this concern has been based on an errant vehicle striking the island

Frequency Crashes are likely to be occasional	Severity Death or serious injury is unlikely	Rating The safety concern is minor
Designer response	Designer (AECOM) Response: - As this portion of the cycle lane is going to be a closed facility until further consultation is undertaken. We would recommend installing the edge line detailed below (in Red) in addition to the installation of the permanent regulatory RG-34 signs on the traffic island. This will ensure the traffic lane is clearly delineated through this section. - We disagree that the remainder of the proposed markings be installed as they are ineffective unless the entire design is implemented – recommend that flexi	

	posts are installed on kerb side of island to prevent parked cars creating a pinch point 
Safety Engineer comment	See section 2.1.3.
Client decision	The cycle lane buffer line closest to the kerb will be removed, reducing confusion for road users. This will effectively close the cycling facility and promote Kerb side parking.
Action taken	Contractor to be instructed.

2.3.4 Traffic Island immediately north of Baildon Road on Richardson Road

Minor

Figure 19 shows an in-lane traffic island with a flat edge facing perpendicular to approaching traffic.

The safety concern is:

- The lack of delineation lines and regulatory signage increases risk of vehicles hitting the traffic islands, islands, especially during periods of low congestion and/or low visibility (e.g. night time, rain, fog, etc.)
- The incomplete markings misleads cyclists into using the buffer zone as a cycle way which creates a significant pinch point. In addition, riding in the buffer zone places cyclists in the door zone of the on street car parks, exposing them to a hazard.

Figure 19 - Island at the intersection of Baildon Road and Richmond Road

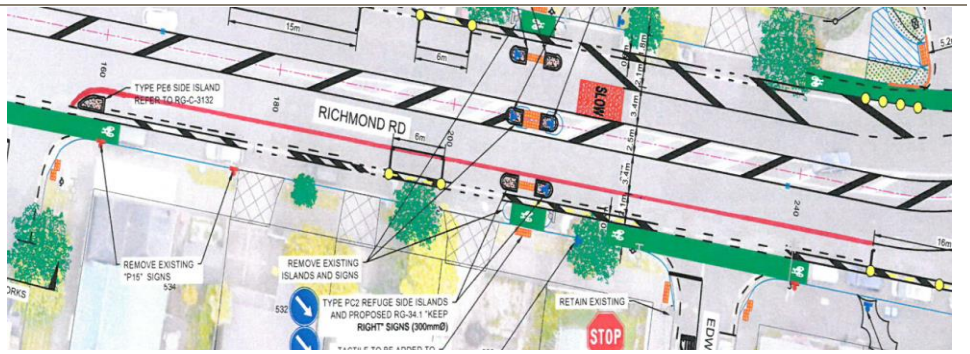
Recommendations

1. Complete the proposed road markings to ensure clear delineation between cycle lane, footpath, buffer zone, parking areas and vehicle lanes (including the edge line that directs passing traffic away from this side islands).
2. Install a regulatory sign (an RG-34) on the traffic island.

The rating for this concern has been based on an errant vehicle striking the island

Frequency Crashes are likely to be occasional	Severity Death or serious injury is unlikely	Rating The safety concern is minor
Designer response	Designer (AECOM) Response: - As this portion of the cycle lane is going to be a closed facility until further consultation is undertaken. We would recommend installing the edge line detailed below (in Red) in addition to the installation of the permanent regulatory RG-34 signs on the traffic island. This will ensure the traffic lane is clearly delineated through this section. - We disagree that the remainder of the proposed markings be installed as they are ineffective unless the entire design is implemented – recommend that flexi posts are installed on kerb side of island to prevent parked cars creating a pinch point	

Recommendations

	
Safety Engineer comment	All traffic island within the carriageway need the correct signing. Also see 2.1.3. and 2.3.3.
Client decision	The cycle lane buffer line closest to the kerb will be removed, reducing confusion for road users. This will effectively close the cycling facility and promote Kerb side parking. Permanent signage on the island will be installed.
Action taken	Contractor to be instructed.

3. Comments

The following comments are either:

- of a general nature; or
- cannot be related to any specific safety concern; or
- relate to previous safety concerns that may have been misinterpreted; or
- relate to subsequent design developments that could become safety concerns in a future safety audit; or
- relate to safety concerns that the designers are already aware of; or
- relate to design elements where the safety implications are not yet clear due to insufficient detail for the stage of the project.

These comments are included for the consideration of the designers and the client. Decision tracking tables are included to record responses, as attention paid to the comments may contribute to improving overall road safety.

3.1 Drainage

The catch pit at the cycle ramp outside 398 Richmond Road appears to not be at the low point of the channel. There is also an apparent drainage issue between 422 and 436 Richmond Road.

Figure 20 - Ponding between 422 and 436 Richmond Road

Designer response	Designer (AECOM) Response: - Observation noted, this is an action being addressed as part of the urban design/landscape re-scope of the project. This is being worked through with the community liaison group
Safety Engineer comment	Agree with SAT and note designers response.
Client decision	Drainage considerations are a key component of the town centre design review.
Action taken	Becas are now undertaking a design change to be implemented shortly.

3.2 Tactile pavers

The tactile paving at the zebra crossings should intersect the footpath in order to direct visually impaired pedestrians to the crossing location. Refer to Figure 21.

Figure 21 – Tactile paving at the speed table outside 428 Richmond Road

Designer response	Designer (AECOM) Response: - Observation noted. This is an action being addressed as part of the urban design/landscape re-scope of the project. This is being worked through with the community liaison group
Safety Engineer comment	All tactile paving should comply with RTS 14.
Client decision	Tactile paving will be a consideration of the town centre design review
Action taken	To be addressed by Boffas in the review.

3.3 Markings and surfacing

The give way diamond marking is missing for the Richmond Road and Tutanekai Street zebra crossing.

The section of No Stopping At All Times (NSAAT) road marking between the driveways of #400 and #398 Richmond Road should be implemented to avoid vehicles obstructing the cycle lane.

The surface condition on the east side of Richmond Road between Warnock Street and Sackville Street is in poor.

Bus box markings have yet to be installed in some locations.

The lack of markings and greening in the cycle lane is resulting in a lack of compliance (e.g. drivers parking in the cycle lane and cyclists not knowing where the cycle lane goes.

Designer response	Designer (AECOM) Response: - Agree with SAT observation 1, diamond marking to be installed as per latest detailed design drawings - Agree with SAT observation 2, NSAAT markings between driveway 398 & 400 Richmond Road should be installed, these are not included in the detailed design drawings - SAT observation 3, condition to be assessed by AT engineer to the contract and the contractor - Agree with SAT observation 4, all bus boxes should be installed as per the latest detailed design drawings - Agree with SAT observation 5, all cycle greening and markings to be installed as per the latest detailed design drawings – ONLY for the

	sections of the facility that are proposed to be formally opened to the public.
Safety Engineer comment	Agree with SAT comments and designers response.
Client decision	Agree with above. Proposed paint and coloured surface parking underway
Action taken	Contractor to implement

3.4 Speed table

The speed table at the Richmond Road and Francis Street Intersection (eastbound) appears to be ineffective at slowing vehicles down.

Designer response	Designer (AECOM) Response: - Observation noted. Speed table is to ATCoP standards for bus route LATM. When all road markings, greening, signage and separation are installed as per design, speeds should be visibly lower. Recommend speed survey is undertaken once design is finalised and compared to any before speed survey undertaken by AT or as part of the scheme stage investigations and design by the AT Design office.
Safety Engineer comment	Agree with designers response.
Client decision	Speeds in the town centre will be a key consideration of the town centre design review.
Action taken	Boffas are now undertaking a review.

3.5 Obstructions in the cycle lane

The SAT noted informal use of driveways by vehicles stopping to pick up or drop off passengers. These vehicles often obstructed the cycle lane. Vehicles were also observed parking in the cycle lane.

Designer response	Designer (AECOM) Response: - Observation noted. All cycle greening, road markings and separators should be installed as per the latest detailed design drawings to provide the visual ques to deter vehicles from parking across the cycle lane. - Refer item 2.2.3 for further mitigation options proposed at similar locations
Safety Engineer comment	Due to the scheme being incomplete it causing confusion for drivers as to where they are entitled to park. The photo below show car parked in the cycle lane, and the signs indicate that vehicles can park for an hour. The cycle scheme need to be completed or removed to avoid any confusion.

	
Client decision	Agree. Proposed paint and coloured surfacing will address this issue.
Action taken	Boffas are now undertaking a review.

3.6 Landscaping

The planting proposed outside #422 Richmond Road needs to be a low growth variety to ensure adequate visibility between cyclists, pedestrians and delivery vehicles using the delivery driveway at #422 Richmond Road.

Designer response	Designer (AECOM) Response: - Agree with SAT observation, all planting proposed at intersections has been low level planting – this is the intention at the above location too
Safety Engineer comment	Agree that all planting needs to be low level so not to obstruct visibility.
Client decision	Agree with above. We believe that all planting meets these requirements.
Action taken	Boffas are now undertaking a review

4. Audit Statement

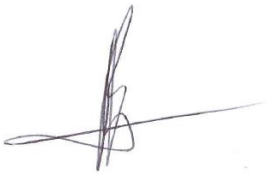
We declare that we remain independent of the design team, and have not been influenced in any way by any party during this road safety audit.

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.

We have noted the safety concerns that have been evident in this audit, and have made recommendations that may be used to assist in improving safety.

Signed  Date 20 December 2017

Nick Gluyas, BE(Civil)(Hons), CPEng CMEngNZ, Principal Transportation Engineer, Stantec

Signed  Date 20 December 2017

Brian Yip, BE(Civil), MEngSt, Senior Transportation Engineer, Stantec

Signed  Date 20 December 2017

Micheal Xiong, BE(Civil), MEng, Transportation Engineer, Stantec

5. Response and Decision Statements

System designers and the people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury.

5.1 Designer's Responses

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report and I have responded accordingly to each safety concern with the most appropriate and practical solutions and actions, which are to be considered further by the safety engineer (if applicable) and project manager. In signing this declaration I also note that a technical review process is underway lead by Boffa Miskell and a number of project changes may result. Once this process is completed a design process will follow at which stage a further safety audit may be done and Boffa Miskell will be responsible for responding to this as designer.

Signed  Date 2/3/2018

[Simeon De'ath, Associate Director Transport, AECOM

5.2 Safety Engineer's Comments (if applicable)

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report together with the designer's responses. Where appropriate, I have added comments to be taken into consideration by the project manager when deciding on the action to be taken.

Signed  Date 26th February 2018

Andrew Garratt, Principal Road Safety Engineer

5.3 Project Manager's Decisions

I have studied and considered the auditors' safety concerns and recommendations for safety improvements set out in this road safety audit report, together with the designer's responses and the comments of the safety engineer (if applicable), and having been guided by the auditor's ranking of concerns have decided the most appropriate and practical action to be taken to address each of the safety concerns. In signing this declaration I also note that a technical review process is underway lead by Boffa Miskell and a number of project changes may result. Once this process is completed a design process will follow at which stage a further safety audit may be done.

Signed Date 2/3/2018

Chris Conner, Senior Project Manager, Auckland Transport

5.4 Safety Audit Close Out

The project manager is to distribute the audit report incorporating the decisions to the designer, safety audit team leader, safety engineer, and project file.

Date:……

(ClickHeretoAddReferenceInfo)

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