NEWTOWN TO CITY TRANSITIONAL CYCLEWAY
30% DESIGN ROAD SAFETY AUDIT

PREPARED FOR WELLINGTON CITY COUNCIL

13 December 2021

Stantec

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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
A	7/12/2021	Draft for SAT review	M Smith		J England	
B	13/12/21	Final for Client Comment	M Smith	J England	C De Kock	C De Kock

Abbreviations

RSA	Road Safety Audit
RS	Route Station
RP	Route Position
SID	Safety in Design

Wellington City Council

Newtown to City Transitional Cycle Route

30% Design 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 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 The Project

The WCC Transitional Cycleways proposes interim transitional cycleways to quickly roll out the WCC Cycleway network over months rather than years. These transitional cycleways will be formed with minimal physical works and temporary materials in an interim fashion.

Two projects are proposed as the initial tranche of work:

- Newtown to City, extending for 2.3km along Riddiford St, Adelaide Rd, Cambridge Terrace, and
- Botanic Gardens to City, extending for 1.3km along Tinakori Road, Bowen Street, Whitmore Street.

To enable the transitional cycleway approach, these projects are designed to fit within the existing physical road environment as far as possible to reduce the installation works required and demonstrate the temporary approach (i.e. Council are open to adjusting aspects of the cycleway following installation and are not investing heavily in physical works that may only be in place for a short length of time). Where possible kerbs and traffic signal poles are to be left in place and managed through design compromises.

Cycle facilities on these routes are expected to be upgraded to permanent as part of the Let's Get Wellington Moving (LGWM) programme of works (details below).

The 30% design road safety audits are intended to consider the wider implications for road users given this introduction of a new space within the road corridor and potential for conflicts between road users as a result of the changes to the road layout. Additional audits are proposed at 60% design and post construction, and details such as signage and markings are anticipated to be assessed at these later stages.

The Newtown to City Transitional Cycleway extends along Riddiford Street, Adelaide Road and Cambridge Terrace between Newtown (Mein Street) and the waterfront at Waitangi Park.

There is no current provision for cyclists between Newtown and the city; cyclists are currently required to share traffic lanes with vehicles. It is noted that there are peak period bus lanes on parts of the route (Adelaide Road and Cambridge Terrace) which are utilised by cyclists during peak periods. This suppresses cycling demand that could start to be unlocked with a suitable facility.

LGWM works on this corridor have not yet been confirmed and are not scheduled to occur for several years (maybe up to 10 years). WCC has an opportunity to implement some interim measures until these future works are completed.

This road corridor has limited width and a cycle facility would occupy space currently used for other modes of transport. For past projects this has meant that affected stakeholders are concerned with the impact of the changes and sceptical of the benefits. This interim project will record the outcomes to quantify the benefits and compromises of such a facility for consideration in the LGWM design, as well as providing improved cycling opportunities for people travelling between Newtown and the city.

The project scope includes:

- Connections to Mt Victoria Tunnel (path), Hospital, Memorial Park & Courtney Place
- Monitoring before and during implementation
- Evaluation
- Signalised intersection upgrades
- Integration with LGWM intersection changes along SH1
- Interim pedestrian facility upgrades
- Interim bus facility improvements
- Considering where the cycle facility is within the road cross-section
- Coordinate with other works on this corridor (e.g. scheduled maintenance)
- Keep a consistent team with Thorndon to City (Bowen Street) transitional cycleway

Newtown to City has been divided into two sub-projects 'south' and 'north' of the Basin respectively to reflect the significant difference in road layout and design between Adelaide Road and Cambridge Terrace.

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:

Table 1-1: Road Safety Audit Team Members

Name	Position	Organisation	Element
Mike Smith	Senior Principal Road Safety Engineer	Stantec Christchurch	Complete Streets; SANF; Multi-modal
Jon England	Principle Transportation Engineer	Stantec Wellington	SANF; Urban RSA; Multi-modal

1.4 Previous Road Safety Audits

The Auditors have not been advised of any previous road safety audits.

1.5 Scope of this Road Safety Audit

Wellington City Council has commissioned Stantec to undertake a Road Safety Audit (RSA) of the 30% design of the Newtown to City corridor transitional cycleway. The initial request was for a conventional RSA.

During the initiation and entry meetings for the Audit, it was discussed on the current stages of the design, then extent that the design has been developed, and the overall objectives of the RSA for the project team.

It is acknowledged that the 30% design has many high-level thoughts for the facility and will be greatly enhanced through the next phases of the design process. Discussions revealed that the project team would appreciate comments to guide the way forward, minimising the risk of the need for rework at a later stage.

It has been proposed, and accepted by the WCC project team, that while this RSA generally follows the process outlined in the Waka Kotahi Guidelines for Road Safety Auditing of Projects, additional direction that could be gained from this first review would assist the design team. IT has been presented that the application of the Safety Audit and Network Functionality (SANF) framework would provide the additional guidance required for the project team. This was accepted by the WCC project team.

Accordingly, the Safety Audit Team (SAT) have applied narrative around the issues and guidance going forward that applies the SANF framework and makes commentary that would not typically be expected in a conventional RSA.

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 1-3. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

In ranking specific concerns, the auditors have considered the objectives of the Safe System approach, i.e. to minimise fatal or serious injury crashes.

In undertaking this assessment, the Safety Audit Team have utilised the following descriptor tables to enable a fair and reasonable rating of the risks.

Table 1-2: Crash Frequency Descriptor

Crash Frequency	Indicative Description

Frequent	Multiple crashes (more than 1 per year)
Common	1 every 1-5 years
Occasional	1 every 5-10 years
Infrequent	Less than 1 every 10 years

Crash Severity is determined on the likelihood of a crash resulting in death or serious injury. The reader is advised that the severity of an injury is determined in part by the ability of a person to tolerate the crash forces. An able-bodied adult will have a greater ability to recover from higher trauma injuries, whereas a elderly person may have poor ability to recover from high trauma injuries. The auditors consider the likely user composition, and hence the likely severity of injury to that user.

Table 1-3: 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 1-4.

Table 1-4: 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

The SAT was provided with the following documents for this audit.

Table 1-5: Documents Provided to the SAT

Title	Project Number	Date	Revision	Number of Sheets
Wellington City Council Newtown to Waterfront Cycleway Proposed Cycleway Layout	5-C4326.00(1)	undated	A	C101; C102 C201; C202 C301 – C303 C401

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 General Issues

The following safety issues are of a general nature and have been noted as occurring generally along the entire route or have an influence on specific design elements presented in the other sections of this report.

2.1.1 Seal Edge – Wheel Entrapment

Moderate/Significant

This project relies on the formation of an on-road cycleway, with differing types of separation from the traffic lane, generally traversing along the existing kerb.

In undertaking the site inspection it was noted that while there is typically a good formation between the pavement surface and the kerb, there were a large number of locations where the top surfacing formed a rolled lip into the kerb, as indicated in Figure 2-1 and Figure 2-2 below.

Figure 2-1: Example of rolled lip to seal edge

Figure 2-2: Example of rolled lip to seal edge

This rolled lip forms a wheel entrapment issue for cyclists, with potential for the cyclist to lose control and fall into the adjacent traffic lane. This issue is magnified when it is in conjunction with higher speeds for the downhill movement.

A full assessment for rolled lip / defects that would cause loss of control if encountered must be undertaken to identify locations where remedial treatment should be undertaken to enable the safe movement of cyclists on the new facility.

Recommendation(s)

1. Undertake a full assessment for rolled lip / defects that would cause loss of control if encountered to identify locations where remedial treatment should be undertaken to enable the safe movement of cyclists on the new facility.

Frequency **Crashes are likely to be common**	**Severity** **Death or serious injury is unlikely**	**Rating** **The safety concern is moderate**
Should a cyclist fall in front of a faster moving downhill vehicle, the injury could be serious to fatal. In this scenario, the rating would be Significant		
Designer response	Agree that lip / defects present a hazard. However, given project is short term transitional project, suggest only focusing on areas where narrow cycle lanes proposed.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Assess lip/defects on narrow cycle lanes.	

Recommendation(s)

Action taken	Routes reviewed to identify the lip/defects and complete risk assessment

2.1.2 Driveway / Access Warning

Moderate

A large number of accesses on Riddiford Street / Adelaide Street have either drive-in / reverse out requirements, or if drive-out, then have their intervisibility obstructed by road alignment or other roadside features.

The 30% design drawings supplied indicate typical generic treatment options that do not consider the needs of each access. Best practice design would have a level of markings and signs that considers each access and will result in a suitable level of treatment based upon the site constraints.

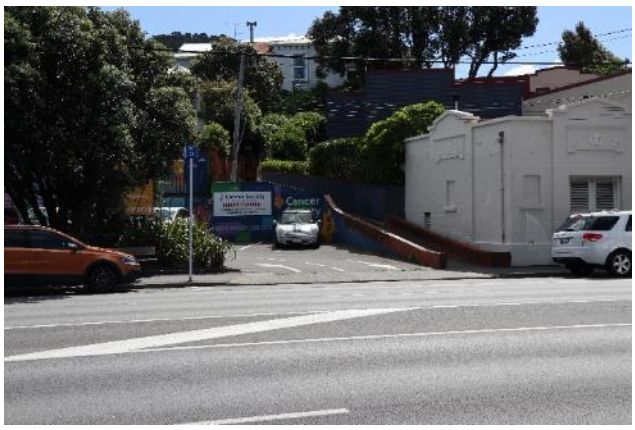

Figure 2-3: Typical large access for properties. Note adjacent buildings limiting intervisibility to road.

Figure 2-4: Typical view for reversing driver – intervisibility will be restricted by B Pillar of vehicle and utility poles.

The design should consider the individual needs of every access and have suitable design features incorporated to maximise the warning of approaching cyclists.

Recommendation(s)

1. The design should consider the individual needs of every access and have suitable design features incorporated to maximise the warning of approaching cyclists, maximising the safety of the cyclist.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree with SAT, high risk accesses should be identified and appropriate treatments for exiting vehicles should be implemented.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Address in next design revision	
Action taken	Included in 90% design	

2.1.3 Side Road Treatments

Significant

The current design details distinct green cycle boxes over the side road junctions. In reviewing the side roads, it is noted that these have various forms, and approach gradients.

As with the access to properties, the junction of Right of Ways and side roads onto the main through road currently has restrictions to the intervisibility at some intersections due to the built form of the adjacent buildings. During the site inspection it was noted that drivers pulled well forward of the limit line to check for vehicles. It is acknowledged that this movement is in part due to the need to see past the heavily parked road shoulder.

The new cycle facility will remove the obstructions created by parked vehicles, however the behaviour of a driver moving forward may still remain, as has been experienced elsewhere across other networks such as Hutt Road (Wellington) and Antigua Street (Christchurch).

The SAT consider that conventional white dashed lines across side roads and Right of Ways does not fully highlight the presence or operation of a kerbside cycle facility in this environment.

The design team should amend the design to include significant and highly visible markings and signs to ensure that the exiting driver is fully aware that they are crossing a cycle facility that has the permitted through movement. This could include, but not be limited to, full green surfacing and cycle symbols in the cycle lane, or cycle markings on green background (smaller property accesses).

The approach to be undertaken should be from a top-down assessment, with the best solution considered, and the pros and cons noted for the design. If this is found to be unacceptable for a site constraint or technical reason, then the next best solution should be assessed. This process is to continue until the best solution acceptable is found.

This approach should be undertaken for all side roads, ensuring that every junction has an appropriate and safe treatment applied.

Recommendation(s)

1. That the design be amended to include significant and highly visible markings and signs to ensure that the exiting driver is fully aware that they are crossing a cycle facility
2. That a top-down approach should eb applied to the selection of treatment styles

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Agree with SAT, more detail to be provided in 60% designs.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Address in next design revision.	
Action taken	Included in 90% design	

2.1.4 Facility Maintenance - Separators

Significant

The SAT were advised that upon construction, the intent is to install vertical separators where indicated, and that these will be reviewed with time. It is noted on the supplied plans that the intent of the design is: "Cycle barriers between and across driveways to be confirmed during detailed design"

The SAT note that the exact form of the separators may not be know at this stage of design. The following comments are presented to guide the designers in the future design.

To understand the approach, the SAT undertook a review of the recently formed cycle facility on Brooklyn Hill. This revealed that a large number of vertical separator posts had been replaced or were damaged, all within a short time frame since opening.

The SAT note that the provision of vertical separators along the proposed alignment will have an impact on the available road traffic lanes. While the lanes will be appropriate for general use, the narrowing of the road, and the inability to access the cycle lane for maintenance, would result in on-going maintenance safety issues.

These issues include (but are not limited to):

1. Maintenance teams being exposed to approaching traffic when undertaking repair / replacement of delineators,
2. Cyclists being exposed to hazards within the cycle facility (damaged separators, especially downhill movement)
3. Maintenance activities blocking the cycle lane requiring the cyclist to undertake a Pop-out movement into the traffic lane, drivers unaware of the movement as no indication given to the cycle change of position
4. Vertical separators subject to road grime and becoming ineffective. Regular cleaning required to maintain effectiveness.

The SAT consider that a specific safety in design (SID) assessment should be undertaken on the maintenance activities required to ensure that all furniture utilised in the design remains effective. This SID assessment should consider the level of Temporary Traffic Management to be applied to undertake the maintenance activity, and time restrictions to ensure that maintenance activities are not undertaken at peak cycle movement times.

Recommendation(s)

1. That a specific safety in design (SID) assessment is undertaken on the maintenance activities required to ensure that all furniture utilised in the design remains effective. This SID assessment should consider the level of Temporary Traffic Management to be applied to undertake the maintenance activity, and time restrictions to ensure that maintenance activities are not undertaken at peak cycle movement times.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Agree with suggestion for specific maintenance plan for all new infrastructure.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Agree with above.	
Action taken	Specific maintenance plan to be completed	

2.1.5 Emergency Vehicle Priority Route

Comment

During the site visit the SAT noted numerous times where emergency vehicles travelled along the proposed route. During the afternoon off peak traffic period, it was noted that with the current lane configuration the emergency services encountered times where their progress was briefly impeded due to traffic ahead.

The new design changes the extent of available lanes, reducing from two general lanes in each direction, to one general traffic lane and a bus priority lane. It is assumed that under the new configuration the emergency vehicle will utilise the bus lane.

In locations, the cyclist will share the bus lane. While it is acknowledged that all vehicles must give passage to emergency vehicles, it may be assumed by road users that the emergency vehicle would normally be within the lane or passing on the left of the traffic.

It is recommended that discussions be held with the Emergency Communication Centre to present what behaviours and approach should be undertaken by drivers of emergency vehicles when travelling under lights and sirens.

Designer response	Agree with SAT
Safety Engineer comment	Agree with Designer and SAT.
Client decision	Discussions are ongoing with Emergency services who generally expressed support for the proposed changes

Action taken	As described in client decision.

2.1.6 Pedestrian Crossing Facilities - TGSI

Moderate

In reviewing the supplied design, it was noted that there was a general absence of suitable Tactile Ground Surface Indicators (TGSI) for persons of low vision or blind users at crossing points.

The modification to the road layout for the new facility should ensure that all crossing locations have the correct TGSI arrangements installed as part of this project. The introduction of the new dedicated cycle facility will change the normal operation of the road and will result in blind / low vision users being exposed to high-speed cycle movements near kerb side.

The SAT noted that the design utilised the current kerb lines as much as possible, limiting potentially costly kerb changes. This approach combined the current road geometry and shoulder formations will result in non-complying installations of TGSI if the existing kerb is retained.

Recommendation(s)

1. The designers must incorporate the inclusion of TGSI at all crossings to provide clear warning to persons of low vision / blind users that they are entering into a near side lane.
2. Amend kerb lines to ensure that compliant TGSI's are installed at crossings.

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is very likely	Rating The safety concern is moderate
Designer response	Agree that vision impaired users should be accommodated at all locations. Do not think there that there is an increased risk with change in facilities at signalised crossings. Given project is short term transitional project, suggest new TGSI only provided where new drop kerbs provided.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Agree with designer	
Action taken	TGSI's for new drop kerbs to be included on the 90% drawings.	

2.1.7 Lighting

Moderate

During the night-time assessment, that SAT observed that while the lighting currently installed was considered generally suitable for normal vehicles, the level of lighting, and the obstruction to light fall was significantly impacted by adjacent buildings, or in the instance of Cambridge Terrace / Kent Terrace, the lighting was intermittent in the central median, with extensive tree canopies blocking the light fall onto the road section that will be the new facility.

When considering the new separated facility, and the style of facility proposed, the SAT are of the opinion that lighting levels would not clearly illuminate hazards to a cyclist, especially during the winter months.

It is recommended that a specific lighting design assessment be undertaken for the whole route, with the full consideration of vegetation trimming required to maximise light fall, and locations where additional suitable lighting will be required to meet the needs of the cyclists and other users.

Recommendation(s)

1. Undertake a full assessment of lighting, including the impact of existing vegetation and structures have on light fall onto the road surface. Undertake improvements to meet the required lighting standards.

Recommendation(s)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree appropriate lighting should be provided. However, given transitional nature of project, suggest project will provide opportunity to identify gaps in lighting to be addressed in permanent design.	
Safety Engineer comment	Agree with Designer and SAT. The lighting assessment should be done during the design phase to identify (and remediate before opening) any locations that have significant/serious lighting deficiencies. Any others can be addressed in permanent design.	
Client decision	Lighting is out of scope of the project and will be addressed in permanent design. We will pass on request for tree trimming to be undertaken around existing lighting.	
Action taken	As per client decision. This finding to be advised to LGWM panel for consideration in the business case and design for this route.	

2.1.8 Turn / Hook Turn Boxes & Permeability

Significant

The supplied design has consideration of the movement of cyclists along the Newtown to City cycleway as that it is assumed to be the dominate cycle movement.

However, in observing usage along the route, it is identified that there is significant redistribution of cyclists onto side roads, especially around John Street, Basin Reserve and residential side roads along Cambridge Terrace and Kent Terrace.

The current design does not provide suitable facilities for the turn movement into these side roads, and as such exposes cyclists to multiple lanes to cross to undertake the movement, at great risk to the cyclist.

When assessing the Cambridge Terrace / Kent Terrace segment, it is noted that the facility is in the central median of the road, and any right turn movement would occur in the middle of the intersection, a location where a right turn facility could not be installed. A cyclist undertaking the turn would be inside an active intersection without any protection or potentially signal control.

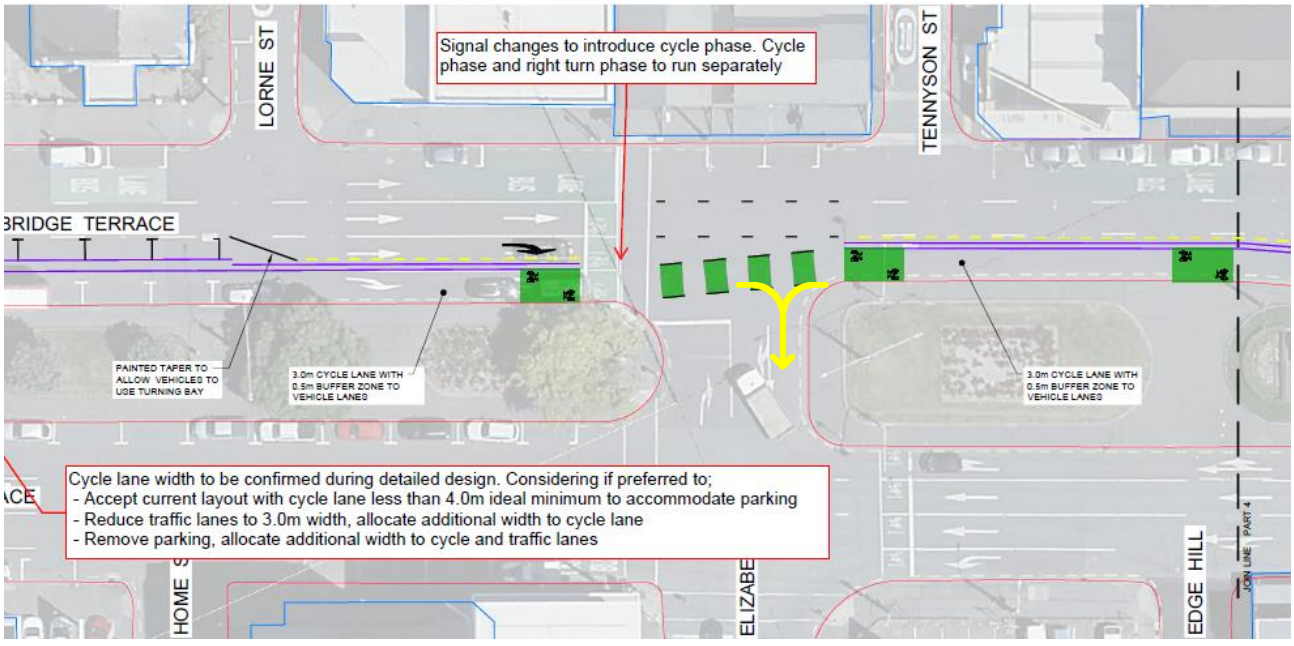

Figure 2-5: Right turn movement for side roads

The provision of a bi-directional facility down the central median enables good movement of users along the system, and it is considered that in general there is appropriate control for the through movement.

However, the style of design has a very poor level of service for the permeability movement of cyclists into the adjacent side roads, due in a large part to the lack of separated cycle turn movement controls or facilities.

As an example, a cyclist exiting from Vivian Street would need to be positioned to the far right of the approach to the Cambridge Terrace intersection. From this position they could access into the proposed facility. However, the current design fails to identify any treatment or guidance to be provided for the cyclists. Similarly, as presented in Figure 2-5 above, a cyclist turning right from the new facility into Elizabeth Street would be required to wait at a point clear of the through movement on Kent Terrace, and within the circulating path within the vehicle cut through. This nature of facility has not been demonstrated in the current design.

The design team should undertake an assessment of the interlinkage of this project with the needs to access side roads, especially for significant residential areas and main routes linking into, and out of the CBD area.

Recommendation(s)

1. Undertake an assessment of the interlink of this project with the needs to access side roads, especially for significant residential areas and main routes linking into, and out of the CBD area.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with recommendation, hook turn facilities may be appropriate in some locations	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Agree with above. In addition, designs to consider signs to help positioning and wayfinding in and out of the facility	
Action taken	As per client decision. Hook turn boxes to be considered for each intersection and provided where appropriate.	

2.1.9 In-Line Bus Stops

Significant

The proposed design incorporates in-line bus stops within the dedicated bus lane. The SAT consider that this is appropriate, however do note that should an express service and an all-stop service run along the same route at the same time, they may clash at peak times.

The current design provides indicative design details of the nature and style of the in-line stops, with only a low level of detail of the nature and treatment proposed for the cycle lane alongside.

Experience with similar installations elsewhere around New Zealand has revealed that some key elements need careful consideration when incorporating in-line bus stops. These include:

- The landing space required for bus patrons to safely emerge from the bus before crossing the adjacent cycle lane
- The size and location of the waiting space for the bus, and the impacts that movement would have on cycle movement
- The requirement to impose controls such as pedestrian crossings at bus entry / exit positions (when bus arrives)

The SAT strongly advise that site specific consideration of the in-line bus stops be undertaken, and that all aspects of movement to and from the bus, and along the cycle way be part of the development of a suitable design. An appropriate landing area for a bus may require significant impacts on the overall road lane widths etc.

Recommendation(s)

1. Undertake a highly detailed design for the proposed in-line bus stops that consider the items presented in Section 2.1.9
2. Review the design for the impacts to vulnerable road users and through movement traffic.

Recommendation(s)

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Agree with SAT, more detail to be provided at 60% design	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Agree with above.	
Action taken	Design for each bus stop location to be completed for 60% design	

2.1.10 Sump Grates

Moderate

The SAT acknowledge that at the 30% design stage, there will not have been a high level of clarity on the finer points of existing features that would affect the safe movement of cyclists along the kerbside.

During the site walk over, the SAT noted that the current sump grates were typically of a form and location that would result in wheel entrapment of bikes. A cyclist having their wheel entrapped is very likely to suffer serious injuries (one or more nights hospitalisation). Similar crashes have resulted in significant facial trauma.

At locations, the sumps appear to be of an old style, and it is unsure if modern cycle friendly sump grates can be retro-fitted into the sump.

The designers should undertake a full inspection of all kerbside features that would cause wheel entrapment.

Recommendation(s)

1. The designers should undertake a full inspection of all kerbside features that would cause wheel entrapment, with a clear indication on the design drawings on improvements / retrofits required to sumps etc.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is likely	Rating The safety concern is moderate
Designer response	Agree with SAT, WCC is proposing to replace all grates with cycle friendly alternatives	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Replace with Cycle friendly grates.	
Action taken	Site walkover recording sump condition completed, with sumps to be replaced identified as enabling works.	

2.2 Riddiford Street

The following section on Riddiford Street should be read with full consideration of the issues raised in Section 2.1.

Riddiford Street design incorporates a number of design options at specific locations. The SAT have considered each in turn and have made comments regarding the connection of that design option to the connecting network.

2.2.1 Riddiford Street / Mein Street / Hall Street Intersection **Significant**

The Riddiford Street / Mein Street / Hall Street intersection has two options presented. These are discussed below.

Both options include the development of a left turn facility for buses and vehicles into Mein Street. The cyclist is transferred from a kerb side separated facility, over the left turn development, positioning the cyclist between the left turn and the through lane, as indicated in Figure 2-6 below.

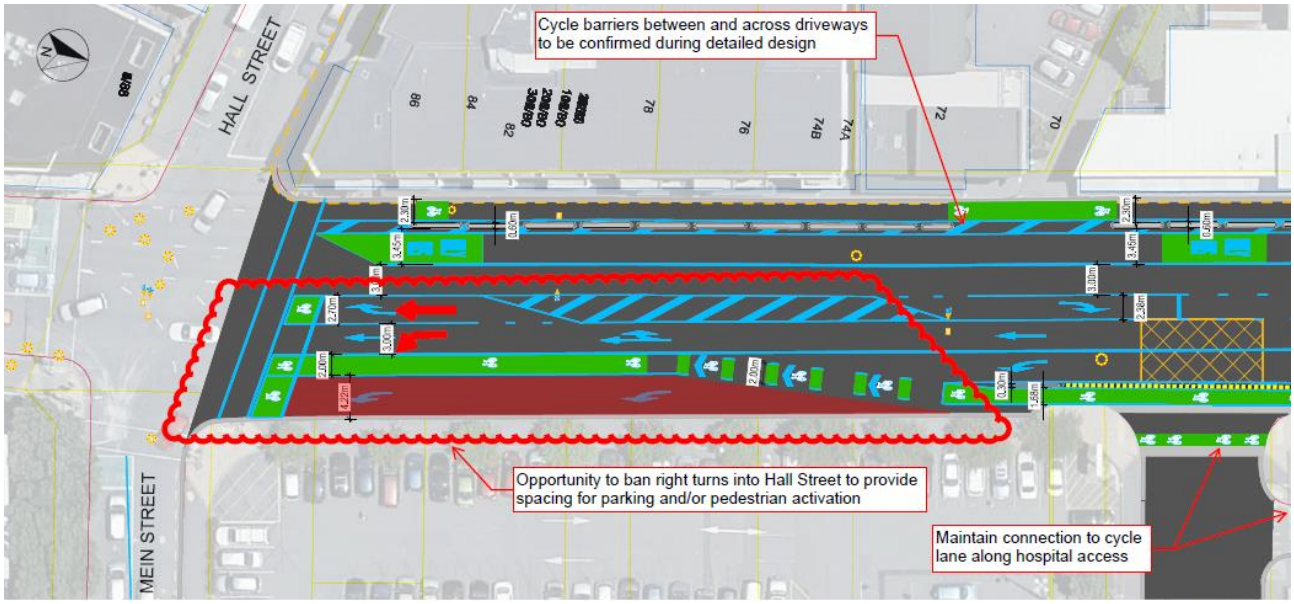

Figure 2-6: Riddiford Street / Mein Street / Hall Street – Proposed options

Dashed green boxes and cycle symbols are proposed for the cycle position transition. The nature of the symbols proposed (with sharrow arrows) would indicate that the cyclist has the dominant movement. The SAT consider that the proposed markings, while technically correct, may be unclear to the general motorist.

The current design for the cycle left turn would have a cyclist moving to the right, traversing alongside the left turn box, then dropping into the advance stop box (ASB) for the left turn in front of the bus. In reality, the cyclist undertaking the left turn would traverse directly to that position through the left turn box. Thus, this feature (the cycle lane to the ASB) would predominantly be used by cyclists travelling straight ahead.

The nature and style of any treatment over the Hospital access does not have a high level of clarity. From the drawings, it is assumed that there will be yellow / black access humps installed over the edge of the separated cycleway / through traffic lane.

Figure 2-7: Existing shoulder parking (to be removed)

Figure 2-8: Existing Hospital access treatment

A shallow tabletop is formed on the current alignment of the footpath and cycle facility. The inclusion of the new access humps would have the exiting vehicle stopping / slowing in a position where they straddle the new cycle facility. The use of solid green markings over this access is applauded, as it very clearly indicates the cycle facility, however a level of non-compliance could result as drivers advance forward looking for a gap in a heavy traffic stream.

The lead for the bus lane from Riddiford Street (South) into the new design has not been shown. A review of the aerial map for the area would indicate that there is a general misalignment of the lanes, that should be corrected with lead lane lines through the intersection to correctly align the through movement into the new lanes on the north side. The current design has the green cycle markings commencing north of the pedestrian crossing lines. The SAT consider that the green markings should extend back to the pedestrian crossing lines as indicated in green with red outline in Figure 2-9.

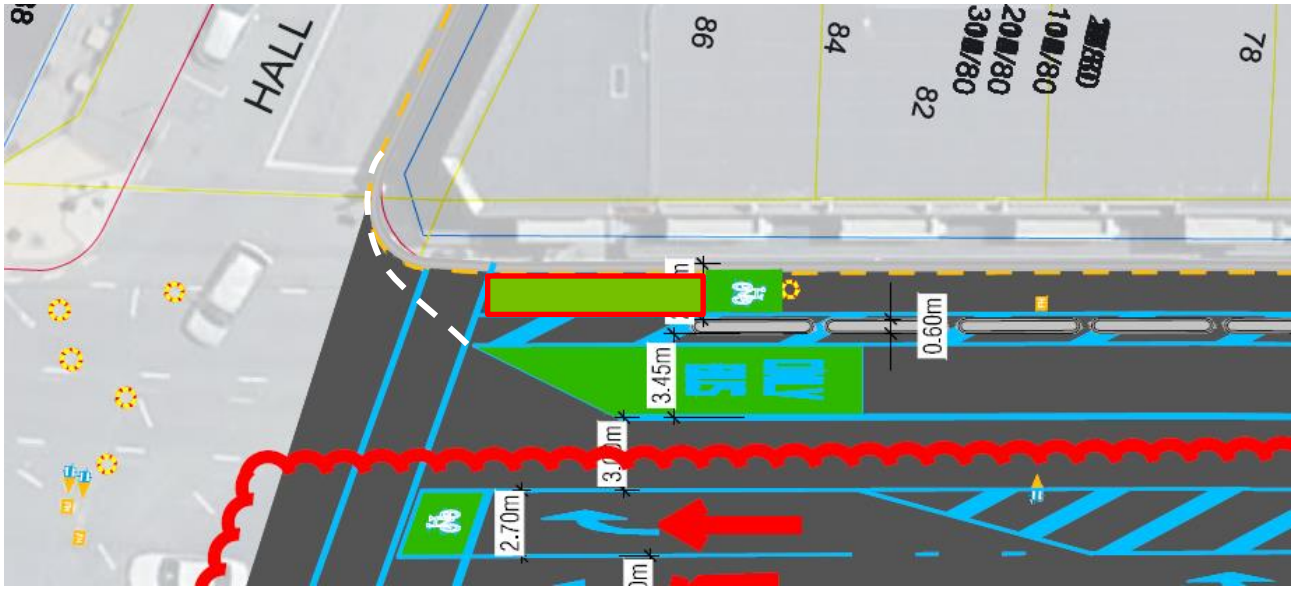

Figure 2-9: Proposed additional green markings (green with red outline)

The left turn from Hall Street into Riddiford Street (north) should be defined by the inclusion of a leading edge line to position the driver into the correct lane. This will guide the driver away from entry into the cycle and bus lane.

Option 1 – Retain Right Turn into Hall Street

This option generally retains the existing road layout for the right turns at the Hospital Access, with the new left turn bus lane and cycle lanes being gained through the removal of the on-street parking. Care needs to be taken in the subsequent design iterations to ensure that all lanes safely lead the driver into the correct opposing lane or turning lane.

At the time of undertaking the site inspection the SAT noted that there was a very heavy use of the on-street parking, with observable free parking spaces within the hospital parking area. The on-street parking

is generally P60. The SAT have been advised that the removal of parking is acknowledged, and that this is part of the consultation going forward. The SAT remain neutral on the removal of heavy on-street parking but do note that the displacement of the heavy parking demand may cause on-going issues on the surrounding road network as drivers circulate to find other P60 spaces.

Option 2 – Right Turn Ban into Hall Street

This option has the through movement lane being displaced to the right, into the right turn pocket formed under option 1. This would form a short stack distance for the through movement as the right turn pocket for the hospital access would need to be retained. The SAT are unclear on how this could be done safely, maximising efficiency for the required movements.

Option 2 enables a greater street activation area, with the retention of some kerb-side parking, as is currently enabled. Under this option the cyclist would require a safe movement space from the separated cycleway, through to the ASB for the through movement on Riddiford Street. This will present significant cycle safety concerns as the facility would potentially run alongside the short stack area for the displaced through movement lane / conflicting hospital access right turn.

This design has not progressed past a series of notes on the drawings and should be fully explored for the safe movement of all users.

The Option 2 design will present significant user safety elements that will need site specific / movement specific treatments. This should be developed to a preliminary design stage, and subject to a further RSA to ensure that all matters have been addressed prior to progressing into detailed design.

Recommendation(s)

1. Undertake further design refinements considering the SAT detail of issues for each proposed Option
2. Solidify an understanding of the risks, mitigations, and residual risks of the preferred option
3. Undertake additional RSA on the selected design option

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Option 1 has been chosen by the client. Risks identified by the SAT will be considered in the development of the option for 60% design. A second pre-construction RSA is expected to be undertaken. Consideration will be given to whether the weaving from bus lane and traffic lane to through lane and left lane can occur separately from the cycle lane crossing the traffic lane to minimise potential conflicts.	
Safety Engineer comment	Agree with Designer. A further RSA of the design is necessary.	
Client decision	Agree with above.	
Action taken	As per client decision, further detail to be provided for 90% design audit	

2.2.2 Mid-Block Signalised Crossing

Significant

A mid-block signalised crossing is currently located between the two hospital entrances. The SAT observed the operation of this crossing, and the movement of buses on the existing layout.

The SAT noted that there was a high number of occasions where multiple buses arrived at the stop immediately north of the current crossing. This often resulted in the rearward bus overhanging the crossing, even while the crossing movement was running (refer to Figure 2-10 & Figure 2-11). In almost every instance, the situation occurred when two double deck buses arrived.

Figure 2-10: Two double deck buses at bus stop. Rear bus overhanging signalised mid-block crossing

Figure 2-11: Two double deck buses at bus stop. Rear bus overhanging signalised mid-block crossing

The SAT direct the designers to ensure that two double deck buses can safely occupy the required bus stop without overhanging into the pedestrian movement zone for the crossing. A bus overhanging the pedestrian crossing will severely limit the pedestrian from good visibility of approaching traffic.

The proposed new design has a separated cycleway approaching and departing from the signalised crossing point. Immediately north of the signalised crossing, the separated cycle lane traverses onto the raised table for the bus stop. Refer to Section 2.1.9 for comments on bus stop formations.

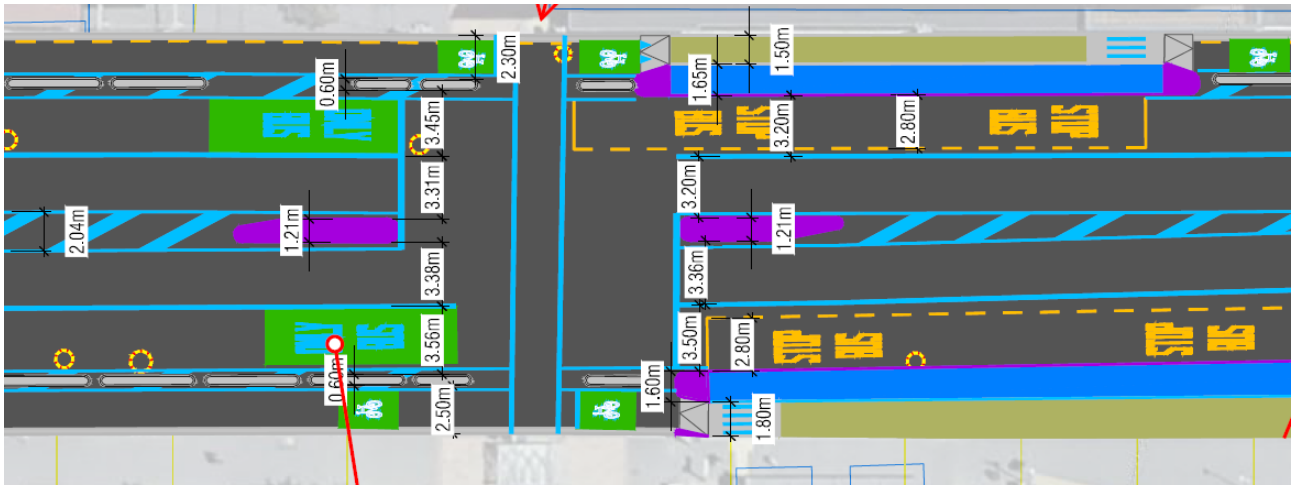

Figure 2-12: Proposed design alterations for mid-block crossing

The SAT raise the following elements with regard to the western (northbound) crossing point and cycle lane.

1. The proximity of the bus stop, and the presence of the raised table could encourage pedestrians to walk along the new cycle facility to access the pedestrian crossing, conflicting with cycle movements.
2. The SAT has experience that separated cycle ways such as this have a high instance of cyclists not stopping for the signals. The proposed markings etc would lead the cyclists through the crossing, even while the pedestrian phase is running.

The bus stop for the south bound movement on Riddiford Street is immediately prior to the signalised crossing. The proposed formation of a raised tabletop for the landing area of the bus stop will enable cyclists to traverse over the bus stop area, and directly onto the pedestrian crossing point. The cyclists will be focused on any passengers alighting from the bus and may completely miss the signal aspects. As for the north side, pedestrians may traverse along the cycle path to gain access to the signalised crossing. In this instance, they will generally be walking with the flow of the cyclist and be unaware of a cyclist approaching from behind.

The inclusion of a dedicated bus priority lane / bus stop will result in the forward most bus being within the intervisibility sight line for the pedestrian waiting at the crossing. The dedicated bus lane will enable pre-emption of the bus movement at the mid-block crossing. The incorporation of pre-emption could also

allow cyclists to advance in the same phase as the bus, given the separation of the facilities, but may result in a clash of movement as the cyclist emerges over the bus lane to enable the cyclist to access the through movement lane.

The design team should include mitigation measures to ensure that a high level of compliance by cyclists stopping for the pedestrian movement is achieved. This may include, but not be limited to:

- Large and easily visible cycle aspects (standard 200mm aspect / 5mm cut-out may be ineffective)
- In ground flashing studs, pedestrian crossing signal activated
- STOP ON RED signs

Cyclists failing to yield could impact with pedestrians crossing with the signal phase. An impact with vulnerable and elderly users could result in higher trauma injuries. It is well known that the elderly have reduced ability to recover from high trauma injuries.

The proposed bus stops have minimal details provided on the safe movement provisions for bus passengers over the adjacent cycle lane. A passenger alighting from the bus will require a suitably sized landing area, along with pedestrian crossing markings for each door of the bus. As the bus stops enable multiple buses to stop sequentially, all door accesses should have similar treatments.

Recommendation(s)

1. Undertake extensive redesign of the bus stop to ensure that two double deck buses can occupy the bus stop safely at any given time.
2. The design team should include mitigation measures to ensure that a high level of compliance by cyclists stopping for the pedestrian movement is achieved.
3. Undertake a comprehensive review of the proposed signal phasings, with careful consideration to downstream conflicts if both the bus and cyclist are released under a pre-emption phase.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Bus stop length is sufficient for two buses nose to tail. Photo 2-10 provided by SAT indicates issue is caused by rear bus leaving a gap to exit the stop prior to the front bus. Issue to be discussed with GWRC, if rear bus exiting is required then lengthening the stop will be considered, if not, it is a driver education issue for GWRC / Metlink. Agree additional compliance measures should be considered given the proximity of the crossing and bus stops. Risks around bus and cycle pre-emption noted and to be considered further.	
Safety Engineer comment	Agree with Designer.	
Client decision	Agree with above.	
Action taken	As per above. Changes to be noted on Drawings for 90% RSA	

2.2.3 Hospital Entrance - North

Significant

The northern entrance to the hospital is characterised by a wide-open intersection with dashed lane lines for the through movement lanes. Large landing and placemaking areas are currently formed either side of the current side road access junction.

Figure 2-13: Existing Hospital Access formation

Figure 2-14: Hospital Access: Note limited guidance to motorists of cycle movement over the access side road.

Cyclists traversing along Riddiford Street are traversing over the junction with little or no positional guidance, and a lack of warning to the turning / exiting motorist of cycle movement over the access.

The new design incorporates the provision of markings similar to that over the left turn development for the southbound approach to the Mein Street intersection, for the north bound movement at the hospital access signals. In the instance of the Riddle Street / Mein Street markings, the design infers a cyclist has dominance over the left turn drop.

In the situation presented at the hospital access, the cyclist would be required to yield to the signal controls for the pedestrian crossing movement, and side road movement. The proposed design would have a low level of compliance with cyclists yielding due to the apparent guidance that would suggest free movement northbound.

A cyclist undertaking this movement, especially if there is pre-emption for the bus movement in the adjacent lane, would result in a cycle / bus side impact type crash, with significant injuries. The cyclist would be on the off-side for the bus driver, who may be unaware that a cyclist would be coming up on their left.

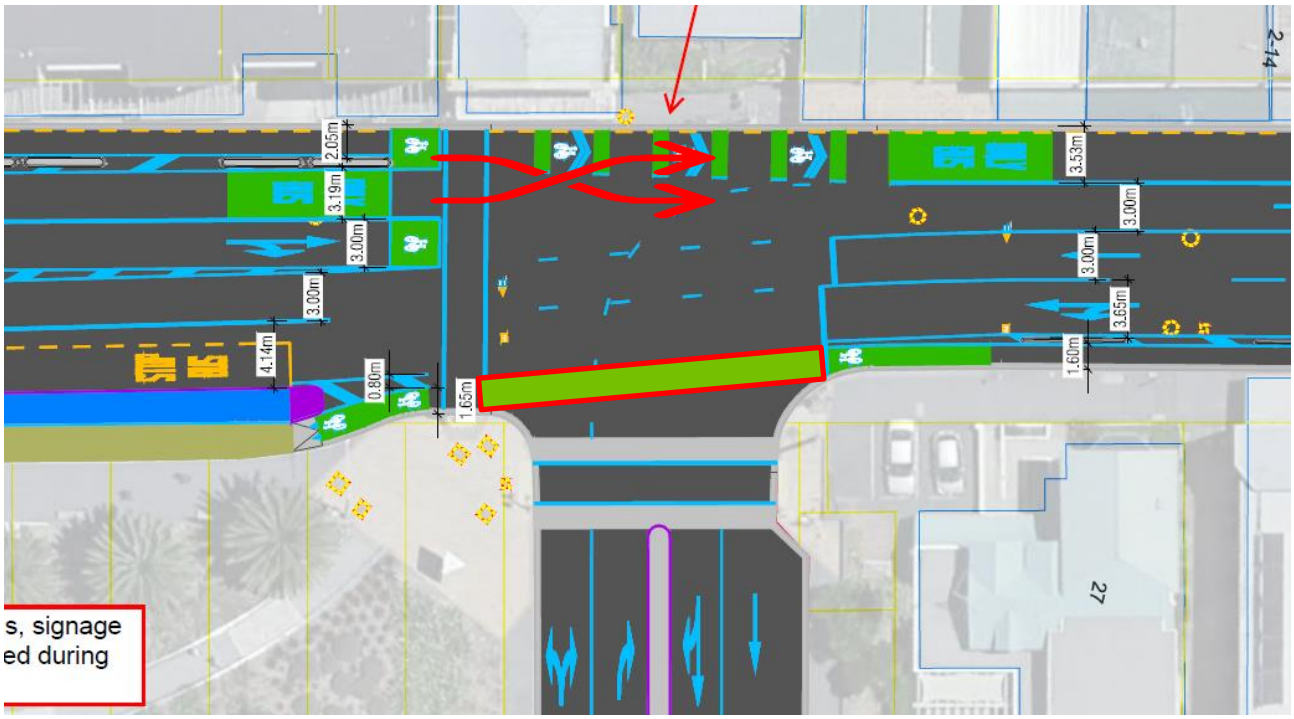

Figure 2-15: Proposed design - Hospital Access Side Road. Conflict zones indicated

Motorists entering into and exiting from the hospital access should have clear warning of cycle movements. This should include, but not be limited to:

- ⌘ Separation of the through movement and turn movements through separate signal phases, reducing any potential for conflict. This may be difficult as there is no central island for signal poles, and outreach arms may not extend sufficiently out over the lanes.
- ⌘ Inclusion of green markings for the southbound cycle movement
- ⌘ Inclusion of appropriate mitigation measures to reinforce the cyclist requirements to conform with the operational controls.

Drivers exiting from the hospital access and wishing to undertake a left turn into John Street, will need to utilise the left lane upon exit (marked as left turn / right turn), to turn right, into the bus lane and traverse along the bus lane until the left turn pocket at the Riddiford Street / Adelaide Road / John Street intersection. At the commencement of this entry movement into the kerbside lane (northbound), the turning driver will occupy the lane for a distance in excess of 90 metres. This distance is greater than the legally allowed 50 metres from the intersection. This would result in a technical breach of the Traffic Control Devices Rule. It is acknowledged that in the instance of a driver wishing to turn into Johns Street, there is no viable alternative to this. It is noted that in other locations in Wellington (e.g. Chaytor Street approach from Curtis St to Raroa Cres) where additional signage has been provided permitting motorists to utilise the bus lane in advance of a left turn movement into a side road.

The SAT note that there is no guidance given to the driver in the left lane (exiting the Hospital access) that directs the left lane; right turn movement that they can only turn into Johns Street from that position. This reduces the left turn out to generally a single lane, whereas a double lane is currently marked.

The SAT are of the opinion that specific guidance in the form of an Intersection Destination Sign should be installed for the hospital approach to Riddiford Street, clearly indicating the correct lane position for each specific movement.

Recommendation(s)

1. The SAT are of the opinion that specific guidance in the form of an Intersection Destination Sign should be installed for the hospital approach to Riddiford Street, clearly indicating the correct lane position for each specific movement.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with SAT that changes are required to ensure compliance with the TCD rule. A simpler approach would be to make the left lane left turn only and require traffic bound for John Street to turn into the right lane and change lanes to the left within 50m as legally permitted.	
Safety Engineer comment	Agree with Designer and SAT. Designer solution appears to be more intuitive. It decreases the likelihood of errant right turning through motorists entering the bus/cycle lane, and blocking it as they exit to the through lane.	
Client decision	Agree with above.	
Action taken	Design updated as per client decision	

2.2.4 Adelaide Road / John Street Intersection – Stack Length

Significant

While on site the SAT noted that the right through movement along Adelaide Road, and the right turn from Adelaide Road into John Street were running with long queue lengths forming for the southbound approach on Adelaide Road. This stack occurred with the right turn and right through movements separated.

The proposed design alters the intersection to provide a combined through right and right turn lane, as indicated in Figure 2-16 below. The new design greatly reduces the capacity of the turn movement stack, with a very high potential for the queue to form back into the through movement Adelaide Road into Riddiford Street. An extended stack will result in following drivers undertaking a "pop-out" manoeuvre into

the bus lane and concentrating all traffic towards the cycle lane. This movement would be undertaken with the driver having a reduced level of rearward visibility due to the B pillar, and the general direction of the left mirror that looks down the side of the vehicle, and not splayed sufficient to fully observe a near side cycle lane.

This could compromise the safety of the cyclist at the inside of the curve within the intersection. It was further noted that there was a perceived higher proportion of e-bike use, with associated higher travel speeds.

Figure 2-16: Proposed design – Riddiford St

The SAT recommend that the signal design be optimised to minimise queue length, with the possible inclusion of an auxiliary detector coil to hold the right lane open longer to clear, should a long queue form.

Figure 2-17: High traffic volumes – John Street

Figure 2-18: Long queue lengths form for the veer right / turn right pockets at the current intersection.

The traffic volume departing from the John Street signals was noted to be high at the time of the site inspection. This movement was formed as a dual veer right lane, with an adjacent right turn lane for the movement into Adelaide Road (south). A number of cyclists were observed to emerge from John Street, with the right veer movement into Riddiford Street (southbound).

While advance stop boxes were installed, the cyclist had to negotiate their way through multiple traffic lanes to occupy the ASB's. It is noted that the general southbound cycle movement occurred from the kerbside lane on John Street, as the central lane resulted in a cyclist being trapped in the middle lane entering into Riddiford Street. The far right ASB only served the tight right turn movement from John Street into Adelaide Road.

The SAT comment that the middle ASB is potentially mis-leading and could result in a cyclist being trapped between two traffic streams.

Cyclists wanting to undertake a movement from John Street into the new facility will require clear guidance, and a suitable width to enable a safe turn movement upon entry into the proposed new separated facility. The design fails to identify how this will be undertaken safely, considering the proximity of the new facility to veranda posts etc. Specific design of this movement should be included, ensuring a safe turn movement space.

The proposed formation of the southbound separated cycle facility would require compliance with the traffic signals by the cyclist. However, with the facility being separated, and the through movement not having any conflict with turning traffic, a cyclist would have a very high likelihood of traversing through in conflict with the red signal. This places a pedestrian crossing with the crossing phase at a very high risk of being struck. This is further complicated due to the presence of veranda posts on kerbside blocking intervisibility sight lines.

Recommendation(s)

1. The SAT recommend that the signal design be optimised to minimise queue length, with the possible inclusion of an auxiliary detector coil to hold the right lane open longer to clear, should a long queue form.
2. Undertake a review for the safety of a cyclist utilising the centre ASB for the departure from John Street.
3. Specific design and clear guidance, along with a suitable width to enable a safe turn movement from John Street entry into the proposed new separated facility. ensuring a safe turn movement space.
4. Implement a suite of mitigation measures to enforce a high level of compliance with the red signal for the southbound cycle movement Adelaide Road into Riddiford Street

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Revised lane layout being considered which retains separate through and right lanes on Adelaide Road approach. Suggest removal of central ASB on John Street approach. Gap in separators on curve provides a logical entry point into the separated cycleway for cyclists coming from John Street – no change proposed. Agree additional compliance measures should be considered given the perceived lack of conflicts for southbound cyclists.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Agree with above	
Action taken	As per designer response, changes implemented on 90% designs	

2.3 Adelaide Road

2.3.1 Separator Style

Significant

Refer also to comments presented in Section 2.1.2 and 2.1.4.

The proposed design for the separated cycle facility along Adelaide Road is characterised by the use of twin edge lines to define the separator. It is acknowledged that the frequency and spacing of the business access is such that it would be difficult to place an effective vertical separator of a typical form.

It is also understood that this proposed facility is transitional and enables the rapid deployment and adjustment of the design, without significant costs for the changes.

The SAT do have concerns that the use of conventional pavement markings on their own will fail to deter people from parking / pulling into the separated facilities. This places a high risk to cyclists using the facility.

While on site, the SAT observed drivers parking their cars in the active bus priority lane, and the bus drivers having to undertake a fast pop-out movement into the adjacent traffic lane.

A similar style of design has been implemented on the Island Bay facilities, with a high level of public resistance to the facility type etc.

Given the history of the low-profile separators style, or use of paint lines only, the SAT recommend that the design team undertake a comprehensive review of suitable treatments for separators, utilising a "top-down" approach, where the best solution is selected, analysed, and if discounted, fully documented prior to moving to the next best solution. This process should continue until an acceptable solution is found that maximises the safety of the cyclist within the facility.

Recommendation(s)

1. The SAT recommend that the design team undertake a comprehensive review of suitable treatments for separators, utilising a "top-down" approach, where the best solution is selected, analysed, and if discounted, fully documented prior to moving to the next best solution. This process should continue until an acceptable solution is found that maximises the safety of the cyclist within the facility.
2. That any treatment finally deployed is constantly monitored for adverse effects, and if any are encountered, the design is immediately modified to counter the safety issues identified.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree with SAT	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Insert comment	
Action taken	Separators are shown on the 90% designs, including vertical separators between accesses and mountable humps across accesses	

2.3.2 Cycle Movement to off road shared path - #156 Adelaide Road

Significant

An option has been presented whereby, due to available width, the proposed cycle movement in the vicinity of #156 Adelaide Road would transition from on-road to off-road shared path for a short section, then back to an on-road arrangement, as shown in Figure 2-19 below.

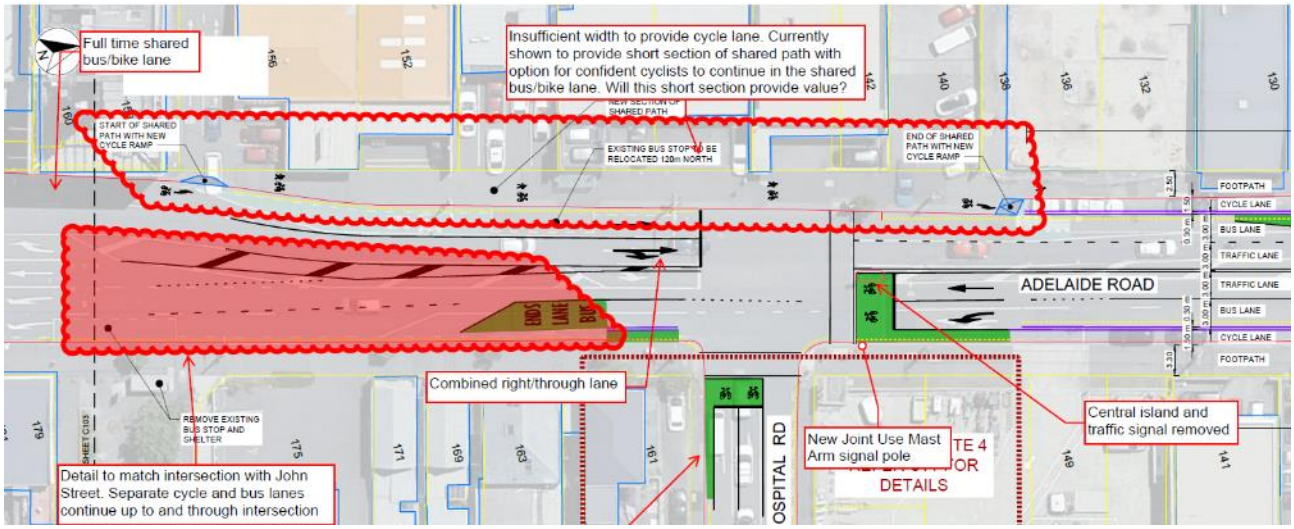

Figure 2-19: Proposed shared path design option - #156 Adelaide Road

With the presented design, the SAT note that the entry ramp to the facility is inadequate for the general through movement and corresponds to the location of a property access. It is considered that conflicts between the cycle through movement, and the entry / exit movement would occur.

It is further noted that the shared path crosses a large number of off-street parking accesses that would require drive-in / reverse out movements. This will cause significant conflicts with the through movement cyclists, in part due to the speed of the through movement, and the position of the driver, with a lower level of intervisibility due to the B-Pillar of the car and the need to look through the left rear window to gain visibility of movement on the shared path.

The SAT are of the opinion that significant design work would be required to identify all safety issues, and to implement suitable treatments to minimise the risk of vehicles impacting with through movement cyclists.

The shared path facility leads up to, and past a signalised intersection. The shared path facility would enable a through movement cyclist to drop out of lane, and traverse at speed past the signals before emerging onto the separated path system again. This movement, if at speed, would conflict with the safe movement of pedestrians utilising the crossing at the signals. This could result in high injury cycle / pedestrian type crashes. Should the crash result in a cyclist impacting with a vulnerable user such as blind / mobility impaired / elderly, then the likely injuries would be serious or high trauma type injuries.

The SAT recognise that the alternate presented would require cyclists to travel within the bus lane, in an area that has limited width and ability for the cyclists to pull left for a bus. Refer also to Section 2.2.2 for narrative on cyclists failing to stop at the signals for the direct through movement.

Recommendation(s)

1. The SAT are of the opinion that significant design work for the consideration of a shared path system in the general location of #156 Adelaide Road would be required to identify all safety issues, and to implement suitable treatments to minimise the risk of vehicle impacting with through movement cyclists, and cycle impacts with the vulnerable users at the signalised intersection.
2. Apply suitable mitigation measures to ensure a high level of compliance by cyclists on the through movement with the signalised crossing at Hospital Road junction

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Shared path no longer being considered, cyclist to shared bus lane until past the build-out.	
Safety Engineer comment	Agree with Designer.	
Client decision	Agree	
Action taken	As per designer response, drawings updated	

2.3.3 Mid-Block Pedestrian Crossing **Moderate**

A mid-block pedestrian crossing is currently located outside #1024 Adelaide Road (F45 Gym). The current form has a narrow central median island that offers some protection if a slower moving pedestrian is caught mid crossing at the signal change. The site is characterised by a tall building to the north, with shading occurring across part of the road at the time of inspection. Refer to Figure 2-21 below.

The proposed design has the central Islands to be removed, resulting in a single crossing phase over 4 traffic lanes and two cycle lanes. There is a risk that cyclists would fail to yield to the signalised crossing on the new cycle facility, as presented in previous sections of this report.

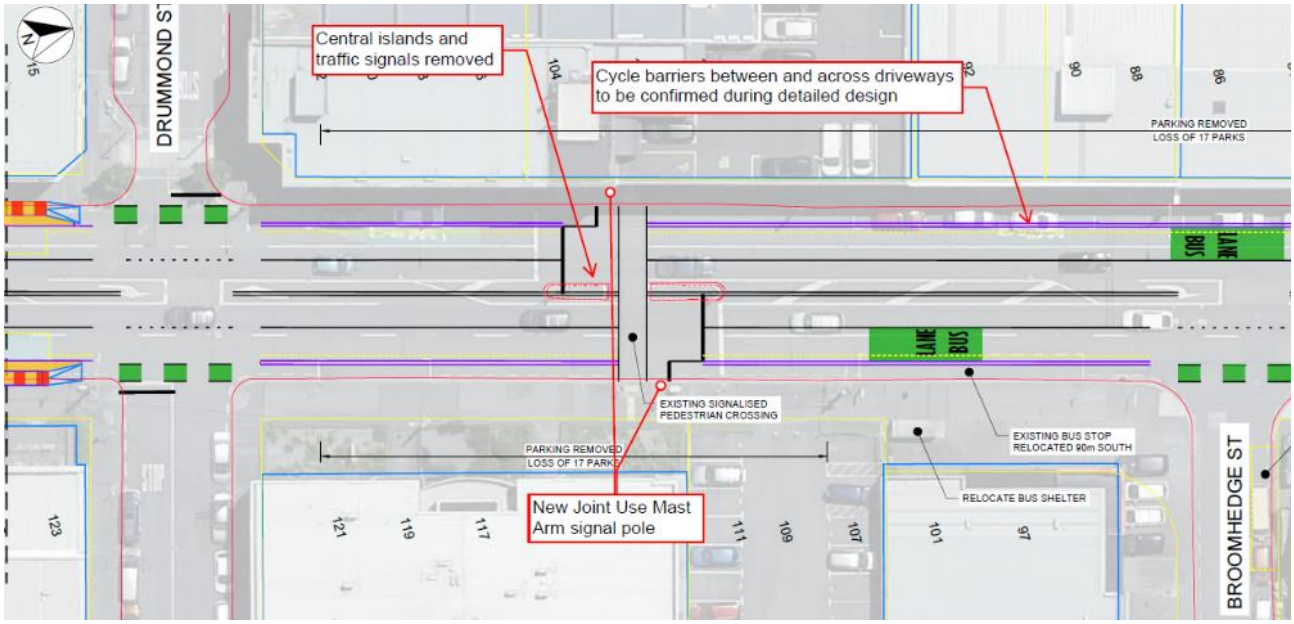

Figure 2-20: Proposed changes to the mid-block crossing - #104 Adelaide Road

The current central islands deter in part the right turn movement (southbound) into the road level car park in the adjacent building to the north. The removal of the central islands could result in drivers attempting to access the car park through a right turn movement over multiple lanes. The placement of double yellow lines on centreline on their own does not eliminate a permitted turn movement into a driveway or access.

A driver wishing to turn right is often enabled to undertake the turn in a busy traffic stream due to drivers in the through movement opening a turn gap in the traffic stream, especially in heavy traffic. This will result in a driver undertaking a right turn through movement not aware of the inside traffic lane, and any cyclists on the separated facility. This can result in moderate to serious injuries should a cyclist impact with the side of the vehicle and be thrown over the bonnet.

Figure 2-21: Existing mid-block pedestrian crossing. Note access under building.

Figure 2-22: Broomhedge Street Intersection in close proximity to mid-block crossing.

The designers should undertake a redesign of the proposed mid-block crossing to ensure that right turn through movements are eliminated, preventing right turn over type crashes.

It is identified that the new design, with the removal of the central islands, will result in the removal of the current right turn pocket for Broomhedge Street. This will result in a right turn driver waiting in the through lane, and any following drivers undertaking a "pop-out" movement into the adjacent bus lane. As this intersection is immediately downstream of the mid-block crossing, there is a risk that following drivers may result in rear-end type crashes as the vehicle in front pulls away on green, only to immediately stop in the lane for the turn.

Recommendation(s)

1. The designers should undertake a redesign of the proposed mid-block crossing to ensure that right turn through movements is eliminated, preventing right turn over type crashes.
2. Consider suitable treatments to either enable a safe right turn into Broomhedge Street, or if unsafe, ensure that suitable preventative measures are installed for the turn.

Frequency **Crashes are likely to be occasional**	**Severity** **Death or serious injury is likely**	**Rating** **The safety concern is moderate**
Designer response	Agree with risks identified by SAT. Not possible to address right turn safety within available cross-section. Client will need to accept risk.	
Safety Engineer comment	Agree with Designer and SAT. WCC to provide direction to either accept risk of right turns or ensure that suitable preventative measures are designed and installed for the turn.	
Client decision	Removal of the flush median and right turn pockets apply for all business entrances and side road on Adelaide Road. There is insufficient width within this corridor to maintain this in addition to the cycle lanes. Banning right turns along Adelaide Road has been assessed but not considered practical from a servicing and network perspective due to a lack of turn around facilities. This is to be specifically monitored following installation using CCTV cameras located at The Basin, John Street and the pedestrian crossing signals and included in the monitoring and evaluation of these projects with specific interventions if required.	
Action taken	As per client decision	

2.4 Basin Reserve

Also refer to comments presented in Section 2.1.8 regarding permeability and turn movements.

2.4.1 Safe Cycle Movement into / from Basin Reserve **Significant**

The proposed development of the kerbside lanes along Adelaide Road requires users to transition over the main through lanes, into a central island before moving over the main circulating lanes around the Basin Reserve.

The crossing movements will occur via signalised crossing facilities to the central island. The following comments relate to both the movement from Adelaide Road towards the Basin Reserve, and the movement away for the Basin Reserve, onto Adelaide Road.

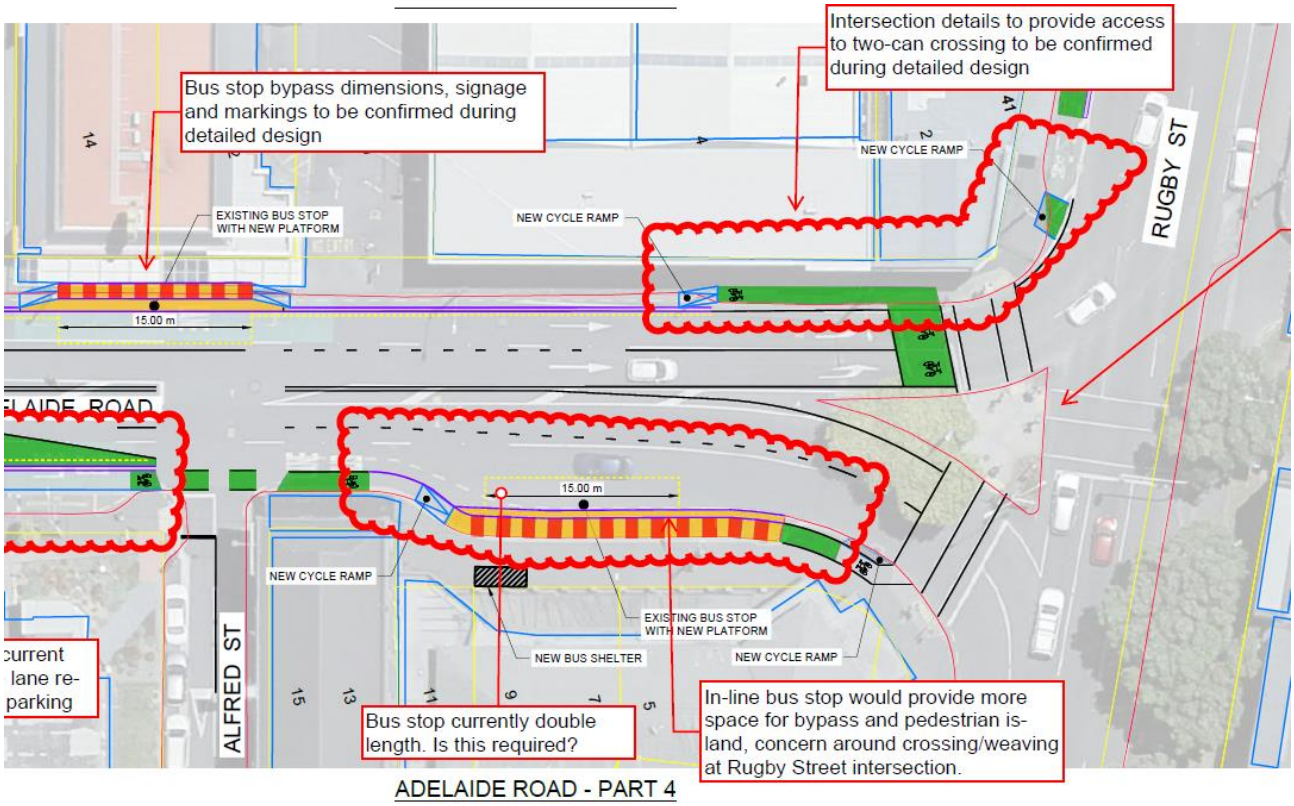

Figure 2-23: Proposed Design Adelaide Road to Basin Reserve

Figure 2-24: Current central island formation

Adelaide Road to Basin Reserve

The SAT generally agree with the intent of the design for the movement from Adelaide Road towards the Basin Reserve. It is noted that the proposed design requires the cyclist to transition up to footpath level at the location of the bus stop, then back to on-road, then back up to footpath level as they approach the signals. A safer and more effective treatment may be to retain the cyclist up at footpath level.

The SAT note that the landing / standing space for the cycle movement to access the central island is very narrow adjacent to the buildings (west side). The SAT consider that this area would be better suited as a shared space, with appropriate markings and signs etc to enable all users to operate within a larger zone. Intervisibility at the corner is obstructed by the building, resulting in users traversing from Rugby Street, along the footpath and into Adelaide Road not being able to identify any cycle user on the footpath. Shared path markings for the wider area may assist.

Dependant on the phasing of the crossing movements, there could be both inbound (towards Basin Reserve) and outbound cyclists and pedestrian need to occupy the central island. A design check should be made to ensure that the landing space in the central island is suitable for safe two-way movement.

Basin Reserve to Adelaide Road

Observing the movement of traffic at the left turn from Rugby Street into Adelaide Road, the SAT noted that while smaller vehicles generally occupied their correct lane, buses and other large vehicles occupied both the turning lanes to undertake the turn. Buses were observed to have the nose of the bus sweep out onto the central island edge before returning back to the kerbside lane. This would indicate that the swept paths for buses may not be able to be completed from within their own lane.

The wide sweep impacts on traffic in the right-hand turn lane into Adelaide Road, with drivers in that lane being squeezed by the bus movement. This conflict occurs adjacent to the central island where cyclists and vulnerable users will be waiting to complete the turn.

The proposed changes to the bus stop would require an assessment of the safe movement of buses to achieve a parallel movement that would have the bus stationary alongside the proposed bus stop. Drivers pulling out of the bus stop would not have suitable visibility behind to identify if a vehicle was traversing through the curve from Rugby Street into Adelaide Road due to the curved approach being from behind the bus.

The dedicated bus lane southbound commences after the Alfred Street / Adelaide Road intersection. Observing the movement, it is noted that all drivers will be required to be in the right hand most lane by this point. Movement in the left hand most lane at the Rugby Street junction would be very short, with an immediate merge at the location of the bus stop.

Consideration should be given to the formation of the dedicated bus lane in the left lane for the turn from Rugby Street into Adelaide Road, with general traffic only able to undertake the movement into Adelaide Road from the right-hand lane. This would enable the formation of the bus stop within the bus lane.

Cyclists were observed to transition from the central island into the left-hand lane on Adelaide Road to continue their movement to the south. Refer to Figure 2-25 below.

The proposed design for the facility (southbound – Adelaide Road) has cyclists traversing onto a cycle path that is in very close proximity to the bus set down area, traversing along the current kerb line. The plans indicate that the cycle facility will be at footpath level.

The SAT note that there are currently utility poles that would affect the safe movement of cyclists in this area. These poles also include street light outreach arms.

Figure 2-25: Typical cycle use observed (southbound movement)

Figure 2-26: Existing configuration including bus stop

The SAT are concerned that while the indicative design appears to be functional, the actual design, considering the physical constraints and vehicle movement requirements will result in a less than ideal formation.

The SAT recommend that extensive design of this area is required, with full consideration of turn movements, utility pole location, visibility needs for bus movement and signal phasing to enable safe movement.

Recommendation(s)

1. Consideration should be given to the formation of the dedicated bus lane in the left lane for the turn from Rugby Street into Adelaide Road, with general traffic only able to undertake the movement into Adelaide Road from the right-hand lane. This would enable the formation of the bus stop within the bus lane.
2. Consideration should be given to the formation of the dedicated bus lane in the left lane for the turn from Rugby Street into Adelaide Road, with general traffic only able to undertake the movement into Adelaide Road from the right-hand lane.
3. The SAT recommend that extensive design of this area is required, with full consideration of turn movements, utility pole location, visibility needs for bus movement and signal phasing to enable safe movement.

Frequency **Crashes are likely to be occasional**	**Severity** **Death or serious injury is very likely**	**Rating** **The safety concern is significant**
Designer response	Revised design for bus lane development from Rugby Street to Adelaide Road has been identified for discussion with Waka Kotahi. Agree that there are risks for active travel users with the current intersection layout. However, outside the current scope of the project.	
Safety Engineer comment	Agree with Designer and SAT. Disagree with Designer. A lower risk intersection layout design is within scope, to ensure that significant risks for active travel users can be understood and mitigated to best effect.	
Client decision	Recommendation for changes to the lane layout (1 and 2) approved by Waka Kotahi and to be included in design. Physical changes to pole and kerb locations out of scope. To be considered during monitoring and evaluation and findings relayed to LGWM for business case design Design to be further considered during 90% audit	
Action taken	As per client decision	

2.4.2 Basin Reserve to Cambridge Terrace

Significant

The current pedestrian crossing over Buckle Street is offline for proposed new facility. It is noted on site that a crushed gravel path has been installed on the alignment that better forms a direct link from the Basin Reserve, onto Cambridge Terrace.

Figure 2-27: - Aerial View of the northern side of the Basin Reserve and Kent (sbd) / Cambridge (nbd) Terraces

The SAT observed a number of cyclists exiting directly into existing gap formed by the crushed gravel path in the island, then moving to Cambridge Terrace for the northbound movement.

The SAT consider that the risk is currently that cyclists are crossing unprotected, albeit with a raised platform, and are emerging from the Basin Reserve at speed. At the same time, drivers are traversing around the Basin Reserve, and entering into Buckle Street at speed, and generally unobserved by the cyclist or pedestrian. Drivers can observe the formal pedestrian crossing some 40 metres into the lane.

Figure 2-28: Current gravel surface track (utilised by cyclists)

Figure 2-29: Current gravel track linkage to Basin Reserve

The new design raises an opportunity to have a formal shared path facility lead directly to a single crossing point (combined), on an alignment leading into the new shared path facility proposed, with this crossing developed to a very high standard. This will enable the design to articulate a placemaking destination for the Basin Reserve and be an enhancement to large events at the Basin.

The SAT see this as being an opportunity to use this typology to reinforce the place setting element of the area as a key hub along the route, combining with opportunity to celebrate elements of Basin Reserve etc.

A comprehensive change to this environment will reinforce the slow speed desired for the area, greatly reducing the conflict speeds between users. This could be achieved though the provision of speed tables, tabletops, increased levels of lighting at the crossing, coloured surfacing etc.

Recommendation(s)

The design is to reduce vehicle speeds entering Buckle Street, maximising safety for cyclists and pedestrians to cross Buckle Street. Enhancements for the safe transition between the Basin Reserve, and the new facilities is required that enhances user safety.

The SAT see this as being an opportunity to use this typology to reinforce the place setting element of the area as a key hub along the route, combining with opportunity to celebrate elements of Basin Reserve etc.

A comprehensive change to this environment will reinforce the slow speed desired for the area, greatly reducing the conflict speeds between users. This could be achieved though the provision of speed tables, tabletops, increased levels of lighting at the crossing, coloured surfacing etc.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Agree that additional guidance for conflicting users as to the safe travel routes and priorities should be provided.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	Signage and wayfinding plans to be included for 90% RSA. Further upgrades to this area are beyond the current scope of this project, however this will be considered during monitoring and evaluation as potential works to further improve this route.	
Action taken	As per client decision	

2.5 Cambridge Tce / Kent Tce

Also refer to comments presented in Section 2.1.8 regarding permeability and turn movements.

The proposed facility along the Cambridge Terrace / Kent Terrace alignment is generally formed on the northbound side (Cambridge Terrace side) of the raised central median. Elements identified within this section should consider the impacts that the design has on pedestrian movements on both sides of the central median, and permeability to the greater network.

The formation of the new facility greatly maximises the safety of the cyclist due to absence of mid-block access to business, and the ability to form to a high standard any crossing of central median crossroads.

The following elements are identified to enable safe movement along the route.

2.5.1 Trees - Impact on available space **Minor**

Several mature trees are currently located within the central median that would have an impact on the provision of a safe and effective cycle facility. The trees are considered a landmark for the route and offer significant visual character to the route.

The use of the current footpath is generally limited to persons accessing the car parks, with observed behaviour being the occupants walking across the central median to traverse over the traffic lanes. There was little observed longitudinal pedestrian movement due to inadequate and safe crossing facilities over the through road, so users choosing to cross immediately in the vicinity of their parked vehicle.

Issues identified with the current trees include:

1. Tree roots within the existing footpath (proposed shared space) at the southern mid-block pedestrian crossing. A modified design may be required to minimise the effect on tree roots.

2. Low overhanging branches that are within head strike zone.
3. Limited intervisibility at junctions due to low hanging foliage.

Figure 2-30: Significant mature trees add to the visual character of the route.

Figure 2-31: Existing footpath lifted by tree roots

Figure 2-32: Low overhanging branches on current footpath.

Figure 2-33: Low branches obstructing intervisibility and head strike risk

The proposed new design will result in design features that could encourage the vehicle occupants from the kerbside parking to traverse along the central median. Refer to Figure 2-30 to Figure 2-33

This may also result in pedestrian movement along the proposed separated cycle facility, as it may be deemed a safer option by users and be immediately adjacent to the parking spaces.

The SAT recommend that a full assessment of existing trees be undertaken, and appropriate remedial action be taken to eliminate all safety concerns.

Recommendation(s)

1. The SAT recommend that a full assessment of existing trees be undertaken, and appropriate remedial action be taken to eliminate all safety concerns.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is unlikely	Rating The safety concern is minor
Designer response	Agree with SAT	
Safety Engineer comment	Agree with Designer and SAT.	

Recommendation(s)

Client decision	Will refer to relevant Council team for attention
Action taken	As per client decision

2.5.2 Signalised Crossing Landing Space

Significant

The proposed design includes some changes to the current mid-block pedestrian crossing facility near the Basin Reserve, as indicated in Figure 2-34 below.

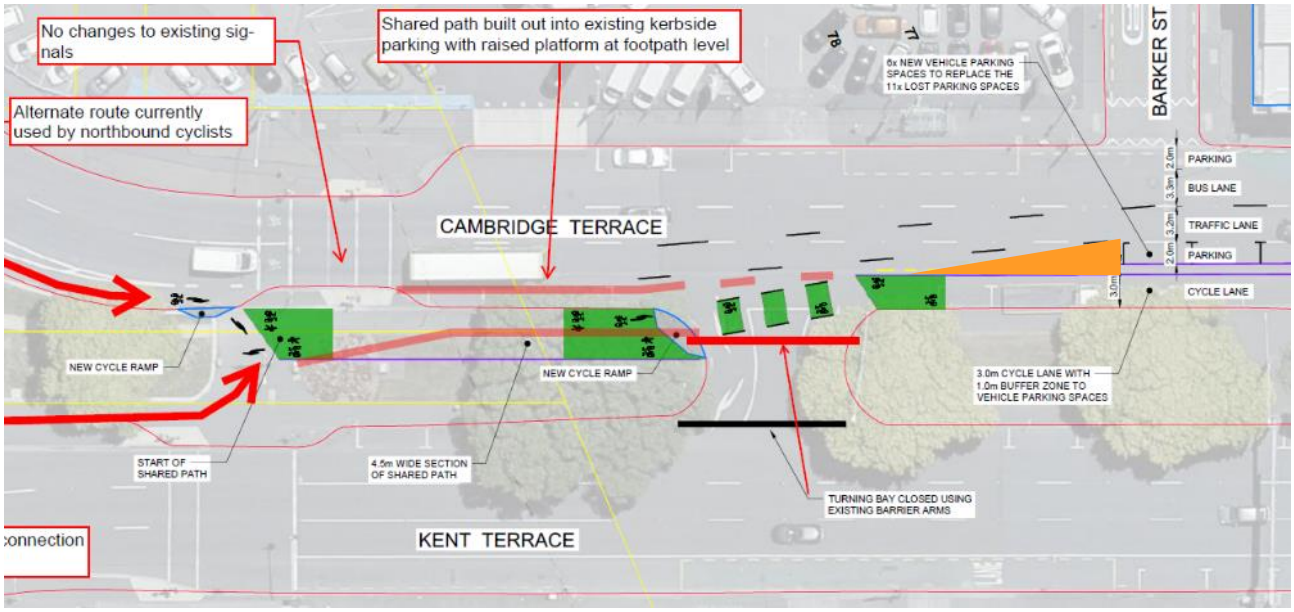

Figure 2-34: Proposed design options – Mid-block crossing

As mentioned above in Section 2.5.1, tree roots are currently affecting the footpath surface, and would impact with the intent of the design for the green marked cycle / shared space option in Figure 2-34.

The second option (defined by red edge lines and text) would reduce the impact of the tree roots on the facility, and better define the lane edge and lane shift movement. This would also increase the landing area on the central median and could be incorporated as part of the placemaking for the Basin Reserve area. The formation of a kerb buildout (shown in orange) on the city side of the median gap would assist in the direction of both through traffic, and right turn through traffic. This would also provide protection to the approach side of parked vehicles.

The current design does not identify with detail the proposed controls to be formed as part of the route. The SAT consider that this is a critical element as failure to yield at the turn through locations could result in serious injuries to vulnerable users. As detailed previously, the new formation may be considered more attractive to pedestrian and vulnerable users, and a lack of suitable controls, especially over wide turn lanes, could result in conflicts and impacts with vulnerable users.

The SAT note the presence of significant boom arms that are utilised to close the turn facility at times of major events in and around the Basin Reserve. The redesign of the general area would be required to include how the long arms will be incorporated minimising their protrusion into the adjacent pedestrian paths.

Figure 2-35: Existing mid-block crossing formation

Figure 2-36: Existing mid-block crossing formation

Figure 2-37: Existing boom arms will be within the proposed new facility

Figure 2-38: Existing boom arms will be within the proposed new facility

Any redesign of this area would need to fully consider all turn movements currently permitted through the central island, and the effect that these turn movements would have on the safe movement of cyclists along the facility.

The SAT recommend that the design team undertake a comprehensive design of this area early in the design phase, to ensure that all movements (all users) are fully considered, and that safety of pedestrians and cyclists is maximised through the application of appropriate controls and design form.

Recommendation(s)

1. The SAT recommend that the design team undertake a comprehensive design of this area early in the design phase, to ensure that all movements (all users) is fully considered, and that safety of pedestrians and cyclists is maximised through the application of appropriate controls and design form.

Frequency **Crashes are likely to be occasional**	**Severity** **Death or serious injury is very likely**	**Rating** **The safety concern is significant**
Designer response	Agree further work required to develop the path route through this area. Note that the turn-around facility is proposed to be permanently closed as part of this project.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	As per designer response, further detail to be included in 90% designs	
Action taken	As per client decision	

2.5.3 Unsafe Delivery Behaviour

Significant

While undertaking the site inspection the SAT observed instances of unsafe delivery behaviour that impacts on the safe operation of not only the current road, but the proposed design.

Figure 2-39: Observed unsafe delivery behaviour

Figure 2-40: Observed unsafe delivery behaviour

Vehicle delivery trucks were observed to park in the median side traffic lane and discharge vehicles to the adjacent car yards. Vehicles were observed to stationary, unattended and without suitable temporary warning for over 15 minutes. The driver was observed to reverse cars off the truck deck, back into the oncoming traffic lane before traversing around the truck to undertake the delivery. During the offload, the driver was standing on the traffic lane side of the truck, with their backs to approaching traffic in the lane immediately adjacent.

The SAT had significant safety concerns with this operation and undertook contact with WTOC and WCC staff on the practice observed. Despite expressing significant safety concerns to the truck driver and the general traffic, the SAT were advised that this was typical, and was not considered a significant concern.

The SAT discussed the issue with one dealership (Toyota), with the dealership advising that they would take immediate action with their provider to ensure that all loading / offloading was undertaken safely.

The SAT remain of the opinion that the practice was unsafe and exposed the traffic and driver to a very high level of impact risk. The late lane change movements, into an active adjacent lane resulted in hard braking of drivers in the adjacent traffic lane.

The proposed design reduces the through lane from two lanes to a single lane. The current right-hand lane will be converted to parking, with on-road pavement markings only. The separator between the parking and the proposed cycle lane is indicated to be paint markings only.

The SAT consider that in this location a painted separator would be inadequate to prevent drivers traversing into the proposed cycle lane, especially the densification of traffic volume in the adjacent lane.

Should the observed unsafe delivery practice continue, the SAT are of the opinion that this would impact greatly on the safe and efficient operation of the through movement lane and could result in drivers undertaking a pop-out movement into the bus lane to avoid the stationary trucks.

The SAT strongly advise that any proposed design along this section should include full consideration of safety improvements that minimise late lane change conflicts and eliminate the risk of delivery vehicles parking in the live traffic lane, especially with the new design layout.

Recommendation(s)

1. The SAT strongly advise that any proposed design along this section should include full consideration of safety improvement that minimise late lane change conflicts and eliminate the risk of delivery vehicles parking in the live traffic lane, especially with the new design layout.

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	Risks have also been identified by the project team. An appropriately sized loading zone is being considered for this section of Cambridge Terrace.	
Safety Engineer comment	Agree with SAT and Designer.	
Client decision	Parking allocation including loading zones to be shown on the 90% drawings. Our communications include engagement with these businesses and will communicate these concerns.	
Action taken	As per client decision	

The following sections are indicative of issues presented with connection of the side roads to the proposed new facilities. The SAT advise that the nature of these issues should be considered in progressing the design through the next phases, ensuring that vulnerable users have safe access to the new facilities.

2.5.4 Vivian Street / Cambridge Terrace

Significant

Vivian Street is a primary one-way system that is State Highway 1 (SH 1). Vivian Street connects to the primary route on Cambridge Terrace and Kent Terrace and has significant turning volumes.

The provided design layout indicates two options for the through movement along Cambridge Terrace yet fails to identify the required linkage for cycle users exiting from Vivian Street (or similar side roads) onto the new facilities.

Any pedestrian movement along the new central median facilities will be impacted by the crossing of the Vivian Street intersection, with the lack of suitable controls and movement space.

Observations on site would indicate that the shared crossing facility along the central median, over the Vivian Street exit lanes, could be undertaken central to the central median, with suitable landing and movement space for movement in all directions.

The SAT note that comment on the ban of the right turn from Cambridge Terrace, and through the central median to Pirie Street and onto Kent Terrace. The SAT acknowledge that the presented design is generally indicative of movement and will be developed further through the design process.

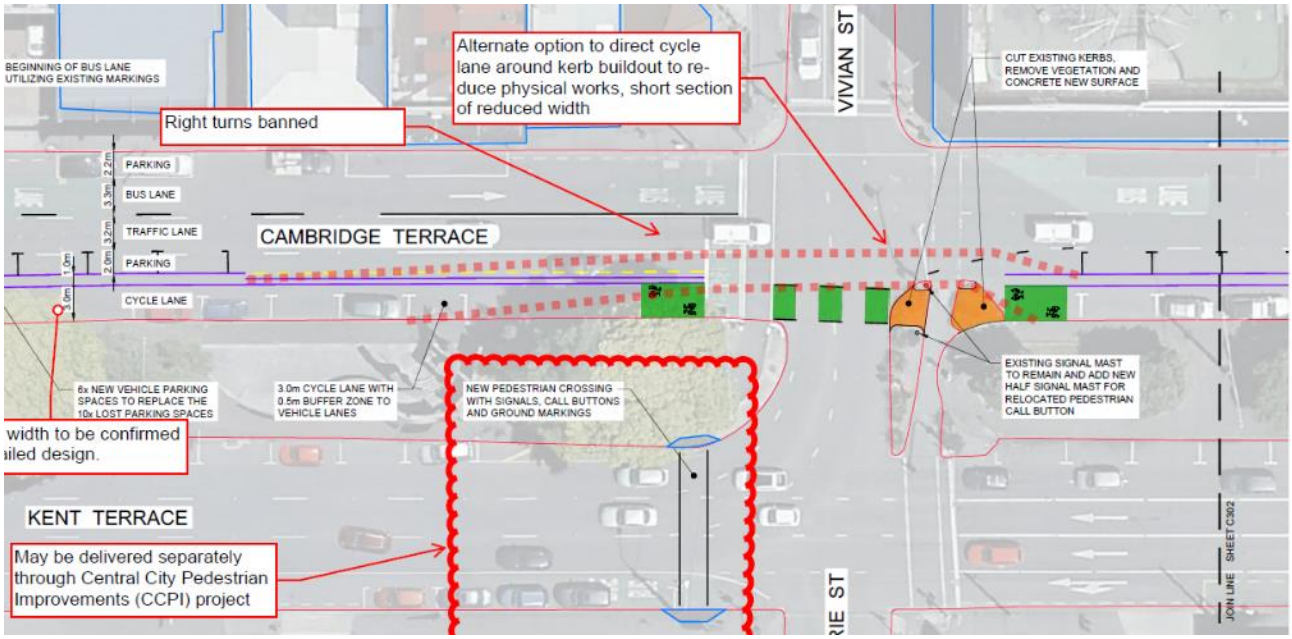

Figure 2-41: Proposed options for Vivian Street / Cambridge Terrace intersection

To assist the designers, we make the following comments:

1. The design should incorporate elements that physically restrict the right turn movement
2. That a combined cycle / pedestrian crossing phase be incorporated within the design for the through movement along the new facility
3. The SAT consider the option to direct the cyclist around the traffic lane side of the existing signals is unsafe, and exposes the cyclist to impact from the adjacent traffic movement
4. All landing spaces within the central median should be marked as shared space, as both pedestrian and cyclists will occupy the area.
5. Full details should be provided for the safe movement of cyclists from Vivian Street into the new facility, minimising any conflicts with turning vehicles.

The SAT consider that the supplied design details are insufficient to fully identify all safety concerns, and the impact of the design on the safe operation of the intersection. It is recommended that additional safety reviews be undertaken in the preliminary design phases to ensure that safety issues are identified early, and mitigations developed. The SAT consider that elements presented at this intersection are typical for a number of intersections and will have a significant impact on the provision of a safe facility along Cambridge Terrace. Failure to address the safe movement over the intersections could compromise the provision of a safe facility.

The SAT recommend that the intersection of Vivian Street and Cambridge Terrace / Kent Terrace be subject to a comprehensive redesign, to provide greater clarity of safe movement for all users.

Recommendation(s)

1. The SAT consider that the supplied design details is insufficient to fully identify all safety concerns, and the impact of the design on the safe operation of the intersection. It is recommended that additional safety reviews be undertaken in the preliminary design phases to ensure that safety issues are identified early, and mitigations developed. The SAT consider that elements presented at this intersection are typical for a number of intersections and will have a significant impact on the provision of a safe facility along Cambridge Terrace. Failure to address the safe movement over the intersections could compromise the provision of a safe facility.
2. The SAT recommend that the intersection of Vivian Street and Cambridge Terrace / Kent Terrace be subject to a comprehensive redesign, to provide greater clarity of safe movement for all users.

Frequency	Severity	Rating
Crashes are likely to be common	Death or serious injury is likely	The safety concern is significant

Recommendation(s)

Designer response	Further detail to be provided at 60% design. A separate pedestrian crossing facility is to be constructed by the Let's Get Wellington Moving programme in conjunction with the transitional cycleway programme.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Updated in 90% design

2.5.5 Bus Layover Area – Opposite Alpha Street

Significant

A bus layover area currently exists opposite Alpha Street. The proposed design retains the bus layover area, with the proposed design having the layover occupy one of the current northbound traffic lanes. This layover area then terminates and develops into a right turn facility through the central median (U-Turn) and the right turn at the Courtenay Place intersection.

It is noted that the U-Turn pocket, and the right turn bay at the intersection are in close proximity to each other and will result in ambiguity by the cycle facility user as a turning vehicle could use either of the turn facilities. The movement of buses through the U-turn facility presents a high risk to cyclists as any impact would result in significant injuries.

The proposed cycle facility along the central median will allow bi-directional cycle movements along the facility. This will require a high level of control on the nature and style of the facility over the U-Turn pocket as cyclists could not identify which channel the turning vehicle would use.

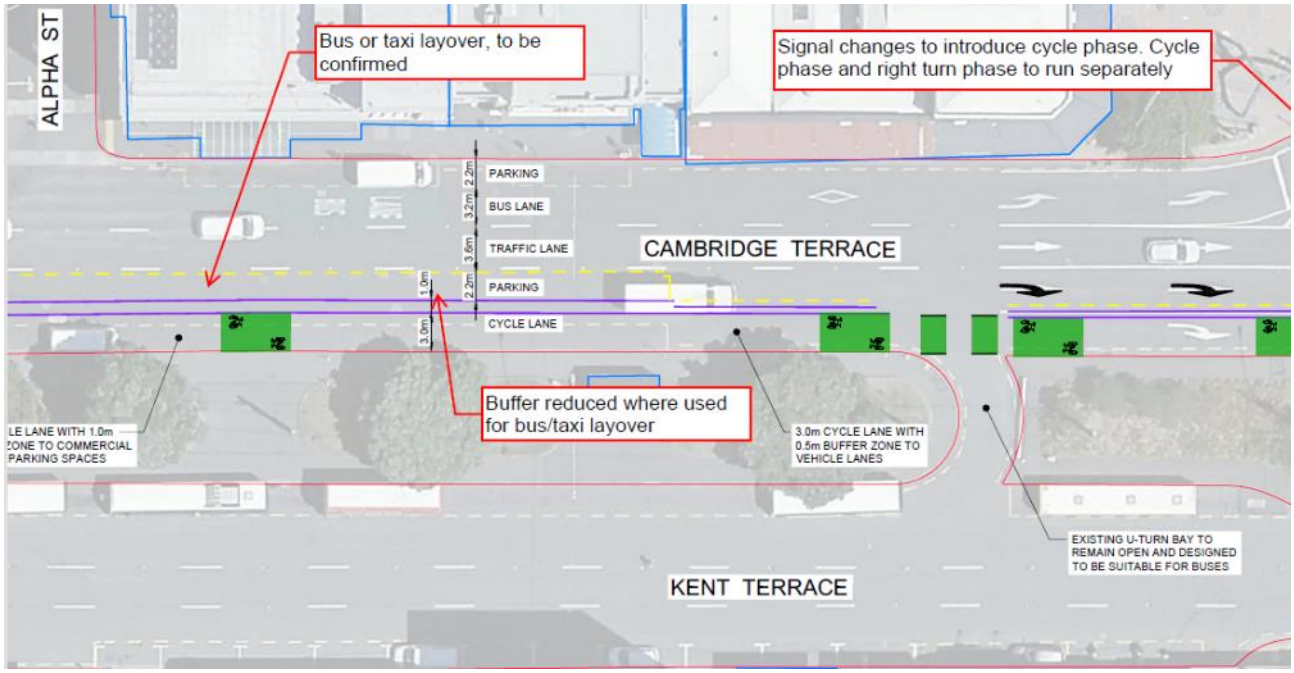

Figure 2-42: Proposed Bus layover Area

The SAT acknowledge that the bus layby will be utilised by regular drivers, and as such there is an effective mechanism to control driver behaviour through driver training and enforcement. The proposed design suggests incorporation of double lines to define the boundary between the park area, and the adjacent bi-directional cycle facility.

The SAT consider that paint markings on their own alongside the bus layover area may be ineffective in establishing the required behaviours by large vehicle drivers. It is considered that additional barrier treatments should be applied, minimising the risk of vehicle intrusion into the adjacent cycle facility.

Recommendation(s)

1. The design should include a high level of control on the nature and style of the facility over the U-Turn pocket as a cyclists could not identify which channel the right turning vehicle would use.
2. The SAT consider that paint markings on their own alongside the bus layover area may be ineffective in establishing the required behaviours by large vehicle drivers. It is considered that additional barrier treatments should be applied, minimising the risk of vehicle intrusion into the adjacent cycle facility.

Frequency Crashes are likely to be occasional	Severity Death or serious injury is very likely	Rating The safety concern is significant
Designer response	Further design development is being undertaken in this area to understand the need for the turning facility and its relationship to the cycleway. If the turning facility is retained it will likely signed as bus-only and would include physical elements to supplement the paint markings and enhance safety for cycleway users.	
Safety Engineer comment	Agree with Designer and SAT.	
Client decision	U-turn pocket to be closed following approval by Metlink, with turning to occur as part of intersection phasing. Design including barriers to included in design updates	
Action taken	Changes as per client decision included in 90% designs	

2.5.6 Courtenay Place / Majoribanks Street

Significant

As with the Vivian Street intersection, the SAT consider that while the intent of the design identified the general through movement, it failed to consider the linkages to and from side roads, and suitable facilities across the central turn area.

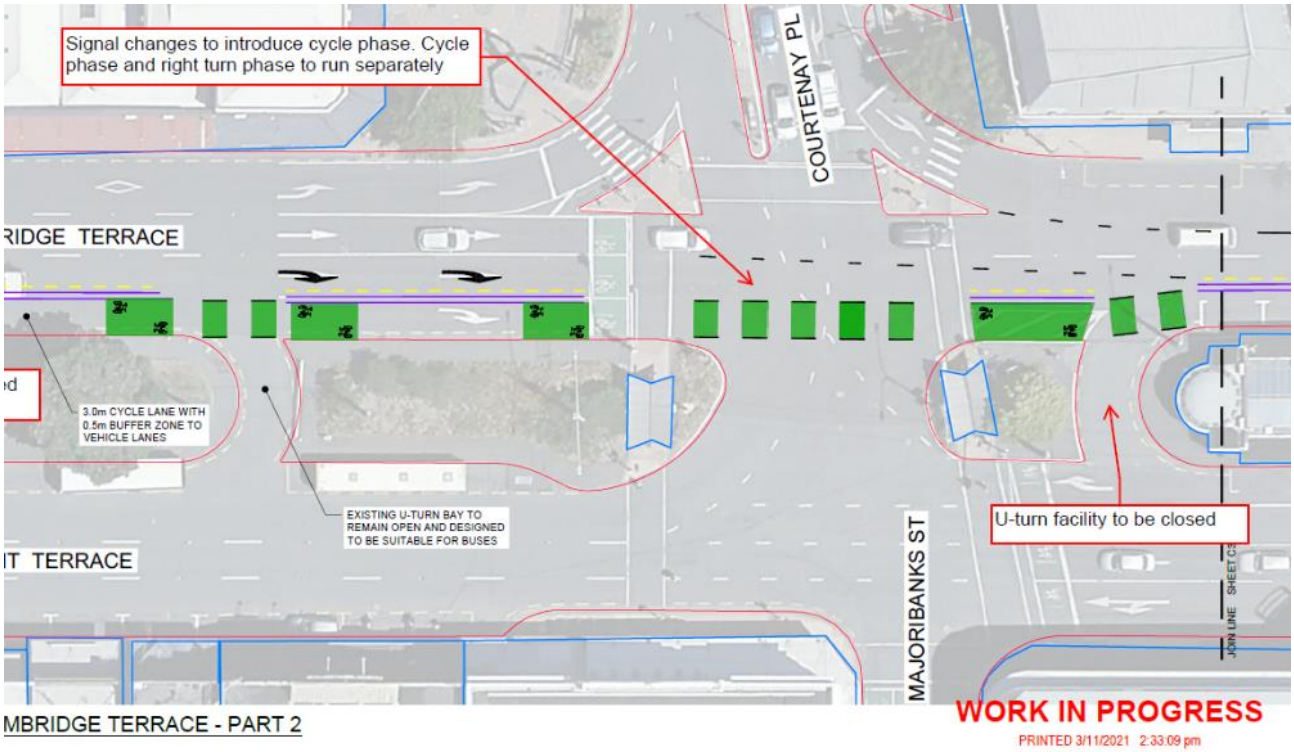

Figure 2-43: Proposed Courtenay Place / Cambridge Terrace design

The following elements have been identified as requiring extensive consideration:

1. The waiting space for eastbound movement could be integrated allowing both cycle and pedestrian movement across the Courtenay Place central median lanes
2. The right turn phase should be separated to enable a safe crossing phase for cyclists (possible pedestrian phase as well?)
3. There is insufficient design detail for the cycle movement Cambridge Terrace (southbound) into Courtenay Place (part of the Golden Mile Project). This movement will be contrary to the permitted through movement on Cambridge Terrace.
4. The design should incorporate the general layout intent of the Golden Mile Project
5. Suitable facilities are required for the cycle turn movement from the cycle facility into Marjoribanks Street.
6. A significant signal profile and phasing design will be required to minimise all expected conflicts with the through and turning movement, with specific consideration of all permitted / required cycle movements.
7. The closure of the current U-Turn facility (north side) will increase the U-turn movement at Courtenay Place. This may have negative impacts on the safe operation of the intersection, especially considering the current left turn slip movement out of Courtenay Place.

It is recommended that the designers undertake a comprehensive redesign of the intersection and facilities, incorporating the linkage to the Golden Mile Project, and considering all turn movements. It is further recommended that an additional safety audit be undertaken early in the preliminary design phase to ensure that all user safety matters are identified and addressed prior to preceding to detailed design.

Recommendation(s)

1. It is recommended that the designers undertake a comprehensive redesign of the intersection and facilities, incorporating the link age to the Golden Mile Project, and considering all turn movements. It is further recommended that an additional safety audit be undertaken early in the preliminary design phase to ensure that all user safety matters are identified and addressed prior to preceding to detailed design.

Recommendation(s)

Frequency Crashes are likely to be common	Severity Death or serious injury is likely	Rating The safety concern is significant
Designer response	The proposed route through this intersection is still being developed. The transitional cycleway will be constructed prior to the Golden Mile project. The cycleway should consider providing appropriate linkages to the adjacent network, however, the Golden Mile project will be responsible for connecting the proposed facility along Courtenay Place with the transitional cycleway.	
Safety Engineer comment	Agree with SAT and Designer. Throughout this project appropriate, safe linkages to the adjacent network must be considered.	
Client decision	Agreed As per response to Finding 2.1.8, Hook turn boxes to be considered for each intersection and provided where appropriate.	
Action taken	As per client decision	

2.6 New World Corner

The New World corner design is considered to be complex, with significant physical and operational constraints. It is the opinion of the SAT that the current design has significant user safety and operation issues that have not been addressed to a level where a suitable facility could be developed.

The following identified issues are presented to guide the designers through the next phases in the route selection and design.

The SAT recommend that additional safety audits be undertaken early during the design process for any proposed design solutions, ensuring that all user safety issues are identified, and that these are fully considered and mitigated in the future designs.

2.6.1 Cable Street / Oriental Parade Intersection **Minor**

The linkage of the Oriental Parade / waterfront area is proposed to be formed as a shared crossing over Cable Street, leading onto a shared path along Oriental Parade, as shown in Figure 2-44 below.

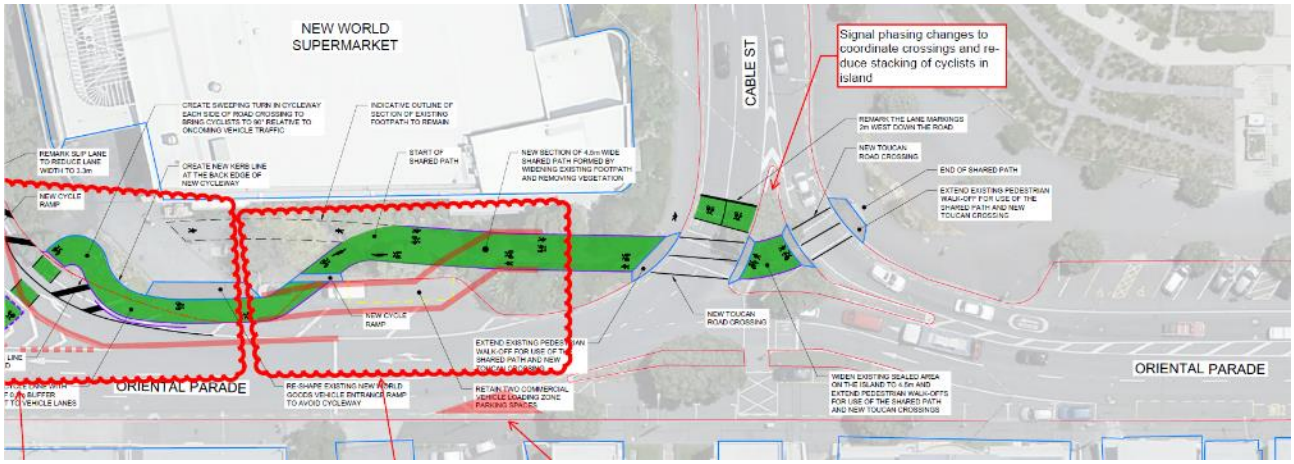

Figure 2-44: Proposed facility route – New World Corner

The SAT generally agree with this design and consider that landing areas and signal controls will be developed to a higher level in future designs. In this matter we make no further comment.

However, of significant concern is the linkage formed from this crossing, and the limitations that the subsequent shared path system would have on the provision of a suitable safe and contiguous path system.

The SAT recommend that the designers consider this crossing in context with the issues identified for the New World link and amend the design of the Cable Street / Oriental Parade intersection as required.

Recommendation(s)

1. The SAT recommend that the designers consider this crossing in context with the issues identified for the New World link and amend the design of the Cable Street / Oriental Parade intersection as required.

Frequency Crashes are likely to be infrequent	Severity Death or serious injury is unlikely	Rating The safety concern is minor
Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.	
Safety Engineer comment	Agree with SAT and Designer	
Client decision	Agree	
Action taken	Further design completed for 90% RSA	

2.6.2 New World Loading Zone

Serious

The formation of the proposed shared path facility to the east of the New World supermarket is detailed as traversing over the current loading / parking area on Oriental Parade.

Figure 2-45: Loading / unloading operations underway for New World

Figure 2-46: Loading / unloading operations underway for New World

Figure 2-47: Current back of house arrangement – New World (view south-west toward Cambridge Terrace)

Figure 2-48: Existing loading / parking area occupied by New World (view north to Oriental Parade)

Observations on site revealed that the loading / unloading operations for the supermarket occurred within the road reserve, and not in the building loading area. It was further noted that the building loading area appeared to have insufficient area for the safe loading / unloading within the property. This has resulted in the operation occurring outside of the property.

The current operation impacts on the loading area defined by the hatched zone and the vertical delineators, as indicated in Figure 2-48. The current configuration has some impact on the safety of pedestrian movement along the current footpath.

The proposed new facility design is significantly impacted by this operation, with the proposed facility occupying the current loading zone.

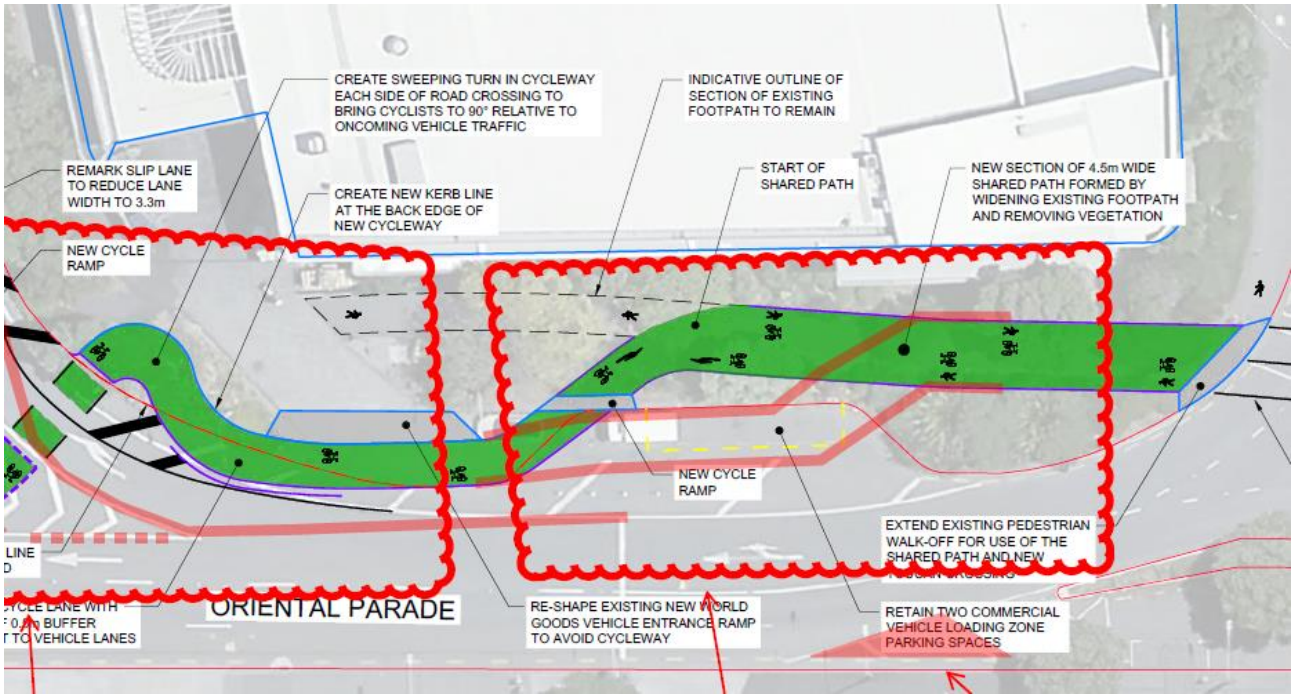

Figure 2-49: Proposed alignment – New World back of house

Movement in this area, and the new facility design is significantly compromised by the vertical change in levels between the current footpath and the road surface. In addition, significant underground utility structures are present in the gardens to the south of the New World loading dock access.

The SAT have considered the current design and are of the opinion that the current alignment and proposed facility has significant design constraints that would need extensive treatment to ensure that a safe and suitable facility could be installed.

The SAT are of the opinion that the current design fails to address user safety and requires a complete and comprehensive redesign.

Recommendation(s)

1. The SAT have considered the current design and are of the opinion that the current alignment and proposed facility has significant design constraints that would need extensive treatment to ensure that a safe and suitable facility could be installed.
2. The SAT are of the opinion that the current design fails to address user safety and requires a complete and comprehensive redesign. Consideration of alternate routes should be undertaken.

Frequency Crashes are likely to be frequent	Severity Death or serious injury is likely	Rating The safety concern is serious
Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.	
Safety Engineer comment	Agree with SAT and Designer.	
Client decision	Agree	
Action taken	Further design completed for 90% RSA	

2.6.3 Wakefield Corner Alignment

Serious

The movement from back of house at New World and leading into Wakefield Street is significantly impacted by the matters identified for the New World loading zone. Elements identified in Section 2.6.2 have a significant effect on the provision of a safe and contiguous facility over the Wakefield Street link, and onto Cambridge Terrace. It is the opinion of the SAT that a comprehensive treatment option should be developed going forward.

The Wakefield Street area is characterised by extensive adjacent planting on the road shoulder, affecting intervisibility, and is associated with a significant change in vertical height between the road surface and the current footpath alongside the New World supermarket.

The SAT are of the opinion that the current design fails to consider these elements, and that the current proposed indicative design is not fit for purpose in this location.

Of significant note is the lack of ability of a user to identify vehicles approaching for the movement from Oriental Parade into Wakefield Street due to the height change, and the requirement to look back over the shoulder to see vehicles approaching from behind. The speed of the turn movement observed would significantly impact on a user's safety for the crossing movement.

The SAT acknowledge designers' comments detailing that consideration of raised platforms etc may be utilised. However, the SAT continue to have significant concern that after these treatments are applied, enabling safe movement of vehicles, will have insufficient impact on overall turning vehicle speed.

It is the opinion of the SAT that the current alignment from Cable Street to Cambridge Terrace has serious safety issues that would require significant redesign if the facility proposed is to proceed safely.

Recommendation(s)

1. It is the opinion of the SAT that the current alignment from Cable Street to Cambridge Terrace has serious safety issues that would require significant redesign if the facility proposed is to proceed.

Frequency Crashes are likely to be common	Severity Death or serious injury is very likely	Rating The safety concern is serious
Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.	

Recommendation(s)

Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Further design completed for 90% RSA

2.7 SAT comments on alignment New World corner options

As presented at the start of this report, the SAT have been requested to provide guidance, where required, to enable identification of project options that may not have been presented as part of the design drawings. This element is typically provided through the Safety Audit and Network Functionality (SANF) framework and is typically outside of a conventional RSA.

The SAT make the following comments for the consideration of the design group, in an effort to explore a suitable solution to a difficult section of the proposed route. The SAT are fully aware that without a suitable and safe linkage to the waterfront, the overall route may be compromised in the expected delivery.

In considering the proposed alignment, and addressing the issues, the SAT have considered the current topography and constraints. As reference, the following figure details the general current arrangement.

Figure 2-50: Aerial view of Cambridge Tce / Oriental Parade / Wakefield St / Cable Street

Source: Wellington City Council GIS

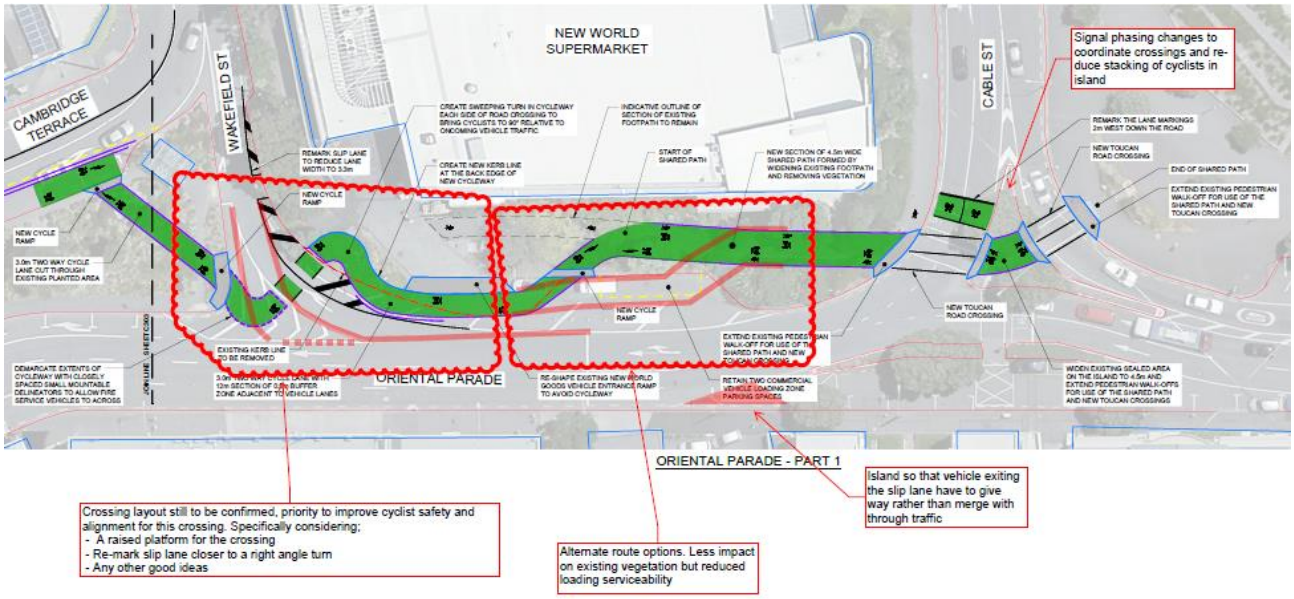

Figure 2-51: Proposed options for New World Corner

It is the opinion of the auditors that the ***combined effects of all the issues*** raised below result in a rating that would be considered **SIGNIFICANT** to **SERIOUS.**

Frequency	Severity	Rating
Crashes are likely to be common	Death or serious injury is very likely	The safety concern is serious

The following elements are presented as a commentary of the thoughts of the SAT and should be considered in the determination of actions going forward cognitive of this rating.

2.7.1 Vehicle Speed – Turning

Comment

The SAT undertook a long period of observations at the New World corner section. It was critical that typical driver behaviour was observed over a time period that allowed identification of key matters that could affect the proposed design, or the consideration of alternate arrangements.

Of note was the speed of vehicles approaching the right hand turn from Oriental Parade into Wakefield Street. This, associated with the poor intervisibility sight lines discussed in Section 2.7.2, results in a user having insufficient perception / reaction time for the crossing movement.

This was confirmed through observation of pedestrians having to run to avoid a turning vehicle.

Any applied design will require significant measures to control vehicle turning speeds. It is acknowledged that this would normally be undertaken through the application of tabletops, and other speed controlling devices. The installation of this type of device is complicated by the needs of other users such as the Fire and Emergency NZ (FENZ) station opposite on the south side of Oriental Parade, and any potential transverse rolling of larger vehicles due to the curved alignment of the right turn lane.

Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs. The current proposal is to reduce speeds by tightening up the curve radius.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Further design completed for 90% RSA

2.7.2 Intervisibility at proposed crossing

Comment

In the first instance, the intervisibility of the existing path system was assessed. This identified that the current intervisibility to the left (east side) is very sub-optimal due to planting and road shoulder shape.

This was confirmed through observation of pedestrians assuming that the way was clear, then having to run to avoid a turning vehicle.

Figure 2-52: Grey vehicle hidden from view (arrowed)

Figure 2-53: Grey vehicle emerges into view. Note close proximity to crossing.

As indicated in Figure 2-52 and Figure 2-53, a typical vehicle is hidden from view for the user waiting at the existing crossing point due to the topography between it and the adjacent lane, and the vegetation. The position of the delivery vehicle being unloaded at the time of inspection further compromised any ability to identify an approaching vehicle intent on turning right in the longer view. This is an important consideration when considering a bi-directional flow.

The SAT acknowledge that one option has the proposed crossing point reorientated and relocated closer to Oriental Parade, as detailed in Figure 2-51 above.

Of significant note to this crossing point is the observational characteristics of cycle users. In the current alignment they are required (westbound movement) to negotiate a downhill grade, through a series of curved alignments, and at the same time observe and react to faster moving vehicles traversing around the right hand turn at speed. The proposed new alignment option (green surface, Figure 2-51) would require a cycle user to traverse through an even tighter curve. The design does not identify what would be the intent of vertical grade. See also Section 2.7.3.

A significant design consideration in this area is the ability, or not, to maintain a suitable grade for access to the New World supermarket back-of-house area. The existing gradient is consistent from the loading area, through to the property boundary. Any modifications to this gradient would require extensive design of the change of grades such that vehicle would not either belly out or gouge the pavement entering the complex.

The SAT are of the opinion that the design options of at grade, or tabletop designs for the crossing will retain significant user safety issues, unless significant controls are installed to prevent the crossing / turning conflict, or to separate the two movements completely.

Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Further design completed for 90% RSA

2.7.3 Existing Services

Comment

A close inspection of the vegetated area that would be affected by the realignment reveals that there are significant utility structures that have not been considered in the design.

Figure 2-54: Existing manhole within garden

Figure 2-55: Light pole within garden

A large manhole is situated at surface level within the garden and will be affected by the proposed new alignment. Similarly, a large light pole is located within the garden.

Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Further design completed for 90% RSA

2.7.4 Topography

Comment

A key design element for consideration of any new facility is the effect that the existing topography will have on the safe movement of shared path users.

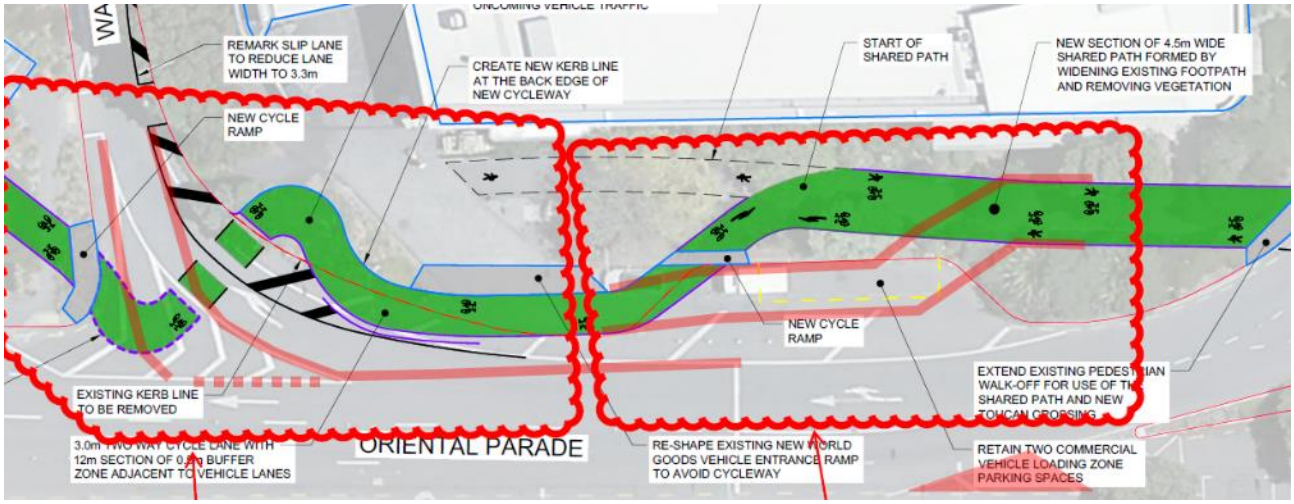

Figure 2-56: Proposed alignment options

All options require the users to traverse from the existing path alongside the rear of the New World supermarket, down to the existing road surface level. This height differential appears to be in the order of 1.2 to 1.5 metres.

Figure 2-57: Embankment down to road

Figure 2-58: Existing road level and path level

All alignment options proposed indicate a short radius turn, through a narrowed facility, to traverse to the existing road level.

The SAT consider that given the grade change, and the limitations presented by the mature trees alongside the existing path, any new facility should be widened through the transition, not narrowed. This greatly improves the potential for frontal impacts due to tight alignment.

Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree
Action taken	Further design completed for 90% RSA

2.7.5 Emergency Services Movements

Comment

In a discussion of the options during the exit meeting, it was acknowledged that a critical factor for consideration in this was the need of FENZ to have unrestricted access in all permitted directions, for attending calls under emergency situations, general access and return to station.

Figure 2-59: FENZ Fire Station right hand side

Figure 2-60: FENZ Fire Station main appliance doors

The SAT acknowledge that with very careful design, there may be options where a ramp-based approach to the proposed crossing could be installed, however this design should not have any adverse side gradients that would lead to a risk of lateral movement of the vehicle as they traverse a sloping side grade.

Any suitable grade would require transitioning down to normal road level by the edge of the through traffic lane, eliminating adverse vehicle roll for the through movement.

Designer response	Further development of the route through this section is being undertaken and will be included in the 60% designs.
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree. FENZ have advised that, while not preferred, a ramp based treatment would still be acceptable for emergency vehicle operation
Action taken	Further design completed for 90% RSA

2.7.6 Oriental Parade Service Road

Comment

A service slip lane is currently located on the south side of Oriental Parade, as indicated in Figure 2-61 below.

Figure 2-61: Existing slip lane – Oriental Parade

The SAT observed a high proportion of drivers that utilised this lane as a free slip around the Oriental Parade / Cable Street traffic signals. Often this was done at speed, despite the three low profile speed tables installed.

The SAT note that a note on the design includes the formation of an island that will deter the straight through movement and force the exiting driver to yield for the merge into the traffic stream.

The SAT commend this inclusion and consider that this should be undertaken no matter what option is adopted.

Figure 2-62: Van RHS drove direct through slip lane bypassing signals

Figure 2-63: Slip lane on right (arrowed)

Designer response	Agree that the improvement is desirable but the solution may not be consistent with the scope of the transitional cycleway (expected to require physical kerb changes).
Safety Engineer comment	Agree with SAT and Designer.
Client decision	Agree with the SAT. to be included in design using temporary materials
Action taken	Included in 90% design drawings

2.8 Alternate Options

As presented at the beginning of this report, the requested scope of service was initially for a conventional Road Safety Audit. Through discussions it was agreed that the SANF style of narrative, and approach would greatly assist the design team.

The following section differs from the typical RSA, as the SAT have explored alternate options that may be worthy of review, considering the constraints of the New World corner, and the linkage to adjacent projects.

The SAT are aware of the proposed Golden Mile project, and the intent of that project for connection through to the CBD area, having applied the SANF framework on the initial concept design for the business case.

A key element of the Golden Mile project is bi-directional cycleways along Courtenay Place, linking onto Cambridge Terrace and Kent Terrace. This facility is proposed to run along Courtenay Place and Manners Street, then connecting via Willis Street onto Lambton Quay. For integration of these two projects, the Cambridge Terrace / Courtenay Place connection would be required to be significantly improved over the current design intent of this project.

Considering that this connection will lead the commuter cyclist wanting to access the CBD, the SAT have considered utilising this connection and then providing linkage via the signals at Blair Street to connect through the calmer side streets, to the waterfront. An outline of the route is demonstrated in Figure 2-64 below. This route would allow use of slow streets, fit to a desire of engagement to the side roads, and utilises existing crossing infrastructure. Slower side roads could be utilised as greenway style treatments with urban form that would encourage slow driving.

The SAT acknowledge that there would be challenges along this alignment, and would require careful consideration of impacts on business and parking, along with changes to signal operation etc.

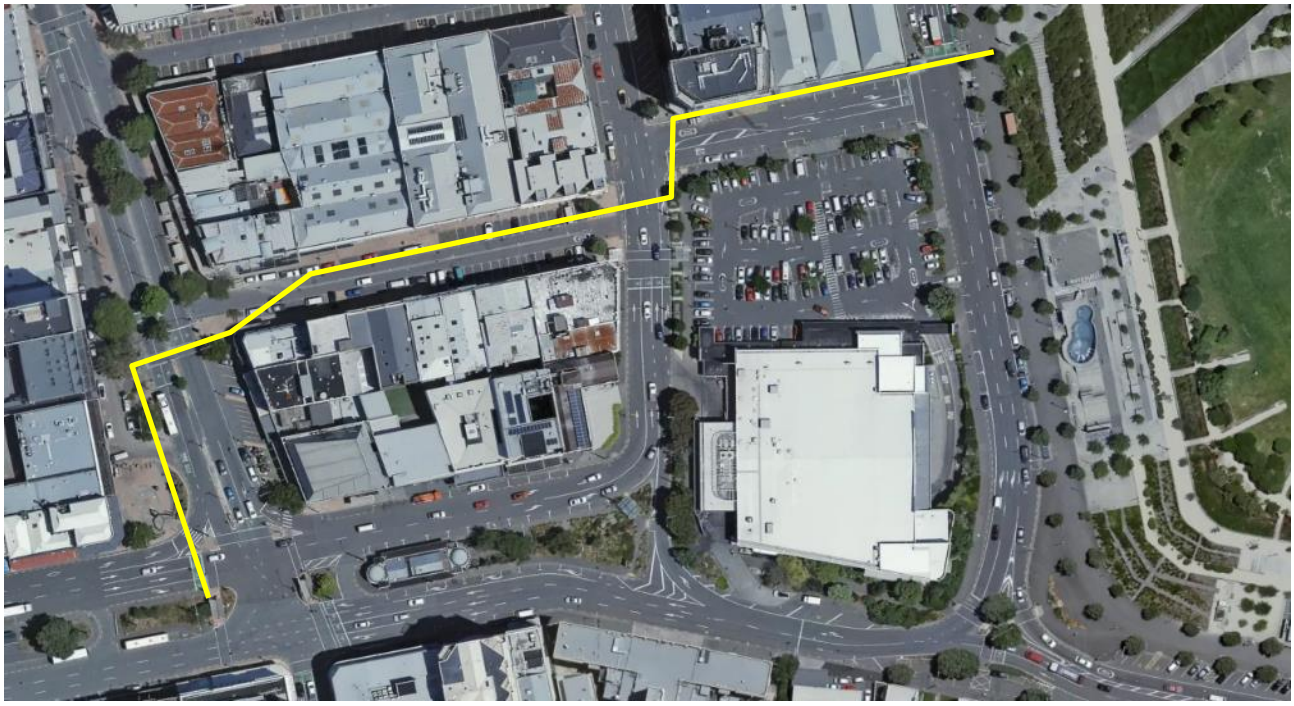

Figure 2-64: Possible alternate route

An alternate alignment such as this eliminates the risk of expensive treatments and design at the New World corner, and encourages users to an area where there is more amenity and associated business (café etc) offering better connection to business.

Designer response	The alternative alignment would reduce safety risk south of the New World site, however, the alternative alignment is expected to: • Result in higher cost treatments (e.g. the need to signalise the intersections of Blair Street / Cable Street and Cable Street / Chaffers Street) • Require delaying the transitional cycleway programme to allow for the construction of the Golden Mile project • Would introduce potential pedestrian and cycle conflicts during the evening /hospitality periods through Courtenay Place / Blair Street • Would add additional travel time and distance for users heading towards Oriental Bay and is not a clear legible route. Given SAT focus / concerns at this location, suggest additional comment is sought on the 60% designs (if not already proposed to be subject to an RSA).
Safety Engineer comment	Agree with Designer.
Client decision	Agree with Designer
Action taken	Further design completed for 90% RSA

3. 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 13 December 2021

Mike Smith, Senior Principal Transportation Engineer – Road Safety, Stantec Christchurch

Signed  Date 13 December 2021

Jon England, Senior Principal Road Safety Engineer, Stantec Wellington

4. 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.

4.1 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.

Signed  Date 14 December 2021

Sam Thornton, CMEngNZ, CPEng, Principal Transportation Engineer, WSP

4.2 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.

I also note the issue of clearly assigning priority in shared spaces between pedestrians and cycle lane users (e.g. where a footpath crosses the cycleway) that requires review and comment in the further safety audits.

Signed Date 16/12/21

[Safety Engineer's name, qualification, position, company]

4.3 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.

Signed Date

[Project Manager's name, qualification, position, company]

4.4 Designer's Statement

I certify that the project manager's decisions and directions for action to be taken to improve safety for each of the safety concerns have been carried out.

Signed Date .....

[Designer's name, qualification, position, company]

4.5 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:.....

Appendices

Appendix A Supplied Documents

Documents supplied in PDF form

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