Transport Planning and Design
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Totara & Kawaka Streets

Scheme design stage safety audit

Report prepared for

Tauranga City Council

September 2017

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 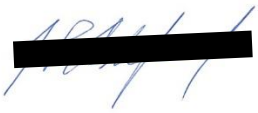 </td></tr>
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Cover photo: Two trucks negotiating the roundabout at Hull Road

Contents

1. Introduction

1.1. Brief

ViaStrada staff have been commissioned by Tauranga City Council to undertake a NZ Transport Agency (NZTA) compliant scheme design stage road safety audit of Totara Street (Hewletts Road to Kawaka Street) and Kawaka Street (Totara Street to Miro Street).

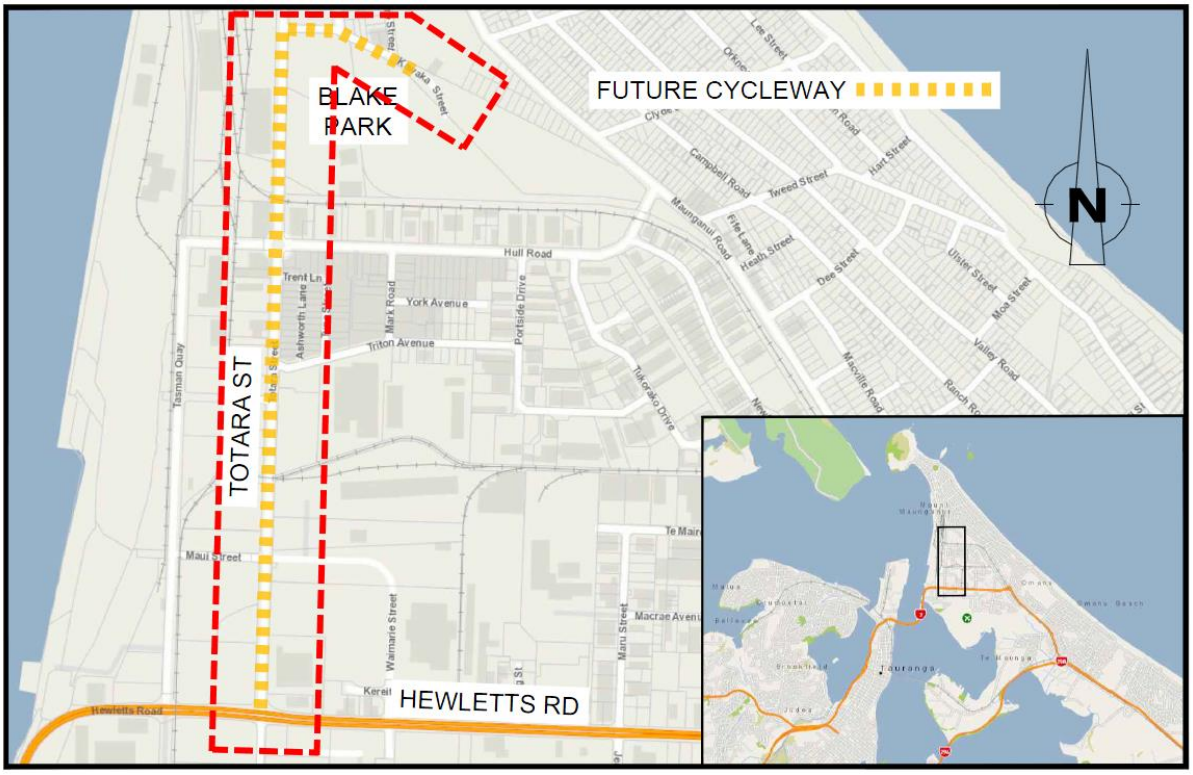

Figure 1: Extent of audit shown by fence on map[1]

1.2. The safety audit team

The post construction stage road safety audit was carried out in accordance with the "NZTA Road Safety Audit Procedure for Projects Guidelines – Interim release May 2013", by the Safety Audit Team (SAT) consisting of:

- [redacted] the safety audit team leader of ViaStrada Ltd
- [redacted] a safety audit team member of ViaStrada Ltd

1.3. Site visits

The day time site visit was undertaken on 14 and 15 September 2017. On the first day, site work was carried out between 1:00pm and 5:30pm by ViaStrada's team leader and a client representative. On the second day, site work was undertaken by ViaStrada's team

[1] Extracted from Opus sheet C01

leader between 8:30am and 10:30am. As is usual for scheme design audits, no night time site visit was undertaken.

1.4. The safety project team

The safety issues raised in this audit will require responses from the designer and the project safety engineer. The client decision and action taken against the safety issues will also be recorded. The following people are identified for these roles:

- Designer response: C. Wilson of Opus
- Safety Engineer: xyz of Tauranga City Council
- Client Decision: xyz of Tauranga City Council
- Action Taken: xyz of Tauranga City Council

1.5. Road environment

Totara Street is located within the industrial / commercial area adjacent to the Port of Tauranga and cater for the full range of road users including pedestrians and cyclists. The posted speed limit is 60 km/h. According to the 2009 speed limit bylaw, the speed limit was 70 km/h, and the audit team is unaware when the speed limit was lowered.

Totara Street has a very high proportion of heavy vehicles (25%) and during the site visit, a considerable number of high-productivity motor vehicles (HPMV) were also observed. HPMV are the largest permissible vehicle on New Zealand roads and operate between Auckland, Tauranga and Hamilton, refer to section 1.6.

Kawaka Street gives access to major recreation facilities located in Blake Park. The posted speed limit is 50 km/h.

1.6. Design vehicles

For intersections, Austroads GRD4 (2009) describes a design vehicle as "the largest vehicle which can perform any particular turning movement from the appropriate approach lane to the appropriate departure lane with adequate clearances to features such as kerbs and roadside furniture".

Based on observations of HPMV during the site visit, the SAT has assumed this should be the maximum design vehicle for this project. Descriptions for the HPMV and other design vehicles are as follows:

- Maximum size HPMV is a truck and full trailer with a total length of 23 m and a maximum weight of 62,000kg.
- Standard maximum size semi-trailer is 19 m with a maximum weight of 44,000kg.
- Design vehicle for Kawaka Street is an 8 m rigid truck.

For additional HPMV specifications, refer to the NZTA website.[2]

[2] http://www.nzta.govt.nz/assets/resources/factsheets/13g/docs/13g-hpmv.pdf

1.7. Crash history

The NZ Transport Agency holds a national database of crashes (CAS) for New Zealand. Crashes are generally investigated for the previous five years to ensure a crash pattern is monitored, rather than one off events.

The CAS database shows there are 86 crashes recorded in the audit area between 2012 and 2017. Of these, 74 have been non-injury and 12 have been minor injury. None are recorded as serious injury or fatal crashes.

A copy of the CAS Crash List Detail Report and list of individual crashes are appended to this report.

1.8. Project information

The project has evolved during the scheme development stage, which is not complete yet. For example, the cycle facility along Totara Street was initially mostly located just off the western property boundary, but it was later relocated so that by now, it is mostly located on the existing carriageway adjacent to the existing western kerb. For some sections, only the older concept drawings were available for the audit. Some components that have been agreed to by the client, for example a proposed signalised mid-block crossing at Blake Park just south of Kawaka Street, have not been designed yet and can thus not be commented on. Plans were received on three dates: 8 and 13 September (electronic) and 14 September (hardcopy)

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

Sheet	Revision	Shows (approx.)	Plotted	Day received	Audited
C01	#	Locality map	6 Sep 17	8 & 14	Yes
C02	#	North of Hewletts Rd	6 Sep 17	8 & 14	Yes
C03	#	South of Maui St	6 Sep 17	8 & 14	Yes
C04	#	Maui St and north	6 Sep 17	8 & 14	Yes
C05	#	South of Astrolabe St	6 Sep 17	8 & 14	Yes
C06	#	Astrolabe St / Triton Ave	6 Sep 17	8 & 14	Yes
C07	#	North of Triton Ave	6 Sep 17	8 & 14	Yes
C08	#	Hull Rd	6 Sep 17	8 & 14	Yes
C08	B	Blake Park crossing	26 Jun 17	13	Yes
C10	B	Totara / Kawaka corner	26 Jun 17	13	Yes
C11	B	Kawaka St at Totara St	26 Jun 17	13	Yes
C12	B	Kawaka St at Miro St	26 Jun 17	13	Yes

The following plans were also received but are believed to have been superseded by those above and have not been included in the audit:

Sheet	Revision	Shows (approx.)	Plotted	Day received	Audited
C02	B	South of Maui St	26 Jun 17	13	No
C03	B	Maui St and north	26 Jun 17	13	No

C02a	C	Maui St	25 Jul 17	14	No
C05	C	Astrolabe St / Triton Ave	25 Jul 17	14	No
C06	C	North of Triton Ave	25 Jul 17	14	No
C07	B	Hull Rd	26 Jun 17	13	No
C07	C	Hull Rd	25 Jul 17	14	No
C08	B	North of Hull Rd	26 Jun 17	13	No
C08	C	North of Hull Rd	25 Jul 17	14	No
C09	C	Blake Park crossing	25 Jul 17	14	No
C10	C	Totara / Kawaka corner	25 Jul 17	14	No
C11	C	Kawaka St at Totara St	25 Jul 17	14	No
C12	C	Kawaka St at Miro St	25 Jul 17	14	No

With regards to Kawaka Street, the above tables shows that the older plans (from June 2017) have been audited. This is because they are identical to the newer plans (from July) apart from the services not being shown (which is irrelevant for the audit), but it is only the older set that is available electronically to the audit team (it is thus easier to use snap shots in the audit report).

1.9. Items not covered

This scheme design safety audit does not cover the aspects of:

- Traffic signal design
- Street lighting
- Railway crossings

Traffic signal design would usually be covered in a scheme audit, but no signal details are shown on the latest set of sheets (i.e. from September 2017), with details removed from inside a box around existing signalised intersections: "New intersection layout subject to detail design". This applies to the existing signalised intersections at Maui Street, and the locations that may potentially have to be signalised: at Astrolabe Street, and at Hull Road. The client advised that the crossing point at Blake Park is also to be signalised, but this is still shown as a simple refuge island on the scheme plan.[3]

Railway crossings are now subject to KiwiRail's Level Crossing Safety Impact Assessments (LCSIAs), and the client advises that a (separate) team from Opus has already undertaken this work. As such, there is no need to further comment in this audit report.

1.10. Audit procedure

The audit follows the NZ Transport Agency Road Safety Audit procedures for projects. 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

[3] Note that the SAT has not had a scheme design from the September 2017 set available for the audit.

assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle/object involved. The audited facility caters for pedestrians and cyclists who are "vulnerable road users" with a higher likelihood of death or serious injury if involved in a conflict with a motor vehicle.

The frequency and severity ratings are used together to develop a combined qualitative risk ranking for each safety issue using the NZTA Concern Assessment Rating Matrix in Table 1.1 below. The qualitative assessment requires professional judgement and experience from a wide range of projects of varying sizes and locations.

Table 1.1 Severity rating matrix

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

The ranking of the frequency of crashes has been assessed in accordance with Table 1.2.

Table 1.2: Indicative crash frequency

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

While all safety concerns should be considered for action, the client will make the decision as to what action will be adopted. This report gives safety ranking guidance and it is acknowledged the client must consider factors other than safety alone. The suggested action for each concern category is given in Table 1.3 below.

Table 1.3: Concern categories

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

It should be noted that the severity rating assigned to the likelihood assigned to 'Death or Serious Injury' is often "Likely" or "Very likely" because crashes between pedestrians and motorised vehicles often results in serious injury or fatality crashes.

1.11. Disclaimer

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

Safety audits, by nature, focus on aspects relating to safety and therefore do not constitute a complete review of design or assessment of standards with respect to engineering or planning documents. Similarly, the safety audit focuses on the plans provided; it is not the role of the SAT to identify all elements such as signage, markings, pedestrian tactile pavers, or traffic signal hardware in the absence of more detailed plans.

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

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

1.12. Previous audit

The audit team undertook an audit of five signalised intersections in Tauranga in late 2013, including the Hewletts Road / Totara Street intersection. That audit report is attached separately for reference. In section 1.1 of that report, the following is stated (emphasis added):

> *This report makes numerous recommendations. Some are for consideration, whereas others are recommendations that should be implemented as time and*

*budget allows. Out of all recommendations, there is only one that should be acted on without delay (**i.e. within days**) to overcome a significant safety risk.*

The urgent recommendation is then outlined in section 1.2, and it refers to the Hewletts Road / Totara Street intersection:

With urgency, mark lane use arrows in the cycle lanes at both the diverge and near the limit line. Use MOTSAM arrows scaled to 30% of their normal size.

The rationale for this was detailed in section 5.6 of that report:

The north approach is laid out in a confusing and counterintuitive manner. When traffic queues back, there is no indication for cyclists which lane to choose, as can be seen in Figure 38. For motorists, further sets of right turn arrow are provided before the diverge, but cyclists do not receive this guidance. Intuitively, cyclists intending to go straight through the intersection would proceed straight ahead at the diverge shown in Figure 38, but this is not where they are supposed to go, and there is no way for them to know other than to read road markings in adjacent vehicle lanes (which more often than not are obscured by traffic queues) and then draw the right conclusions from this. This is a highly hazardous layout and lane use arrows need to be marked with urgency so that straight through cyclists know that they have to choose the kerbside lane. The current layout results in unsuspecting straight through cyclists choosing a position where they are to the right of other straight through traffic. Upon entering the intersection, this can result in serious harm.

Figure 38 from the 2013 report

It is of deep concern that almost four years later, the risk has not been addressed, as can be seen in Figure 2.

Figure 2: Totara approach to Hewletts in September 2017

The SAT appreciates that under the proposal, the existing cycle lanes are to be removed. The December 2013 recommendation remains, however. It is suggested that the concern be addressed with urgency, i.e. within days.

1.13. Numbering of driveways on west side

The scheme plans do not show a chainage, and it is thus difficult to refer to individual locations. To make reporting of issues easier, the following numbering system for driveways has been used. This starts at the southern end of Totara Street and is a complete list up to the crossing point at Blake Park:

Table 1.4: Numbering convention for driveways on west side of Totara Street

ID	# Totara St	Owner	Notes
Hewletts Road			State Highway 2
1	202/206	Fulton Hogan	Commercial
2			Cars only
3			Commercial
4	198	Downer	Commercial
5			Cars entrance only
6	194 & 198	Downer & Mobil	Commercial shared by two companies
7	194	Mobil	Commercial (truck stop access)
Maui Street			Including signalised truck stop exit
8	182	Bulk Storage Terminals Ltd	Commercial
9			Commercial
10			Cars only
Railway crossing			southern

11	178	North Island Forklifts	Commercial
12			Commercial
13			Commercial
14	174	Inghams Enterprises (NZ) Pty	Driveway appears unused
15			Commercial
Astrolabe Street			Cul-de-sac servicing Inghams and Ixom
16	148-168	Ixom	Commercial
17			Commercial
18			Angle parking, proposed to be removed
19			Angle parking, proposed to be kept
20			Cars only
21			Commercial
22	138	TCL Isuzu	Commercial
23			Commercial
24		K & L Distributors	Commercial
Hull Road			Port of Tauranga entrance
25	120	Kiwirail	Mainly cars
Railway crossing			northern
26	60	Bulk Store	Commercial
Blake Park crossing			

2. Safety audit findings

2.1. General issues

2.1.1. Lack of documentation for concept design approach

Ranking – **Comment**	
It seems that no background report in support of the scheme design has been prepared. This is of concern, especially for a high-risk environment such as Totara Street, as it needs to be documented how certain design decisions were arrived at. A specific example of information that should be considered is covered in section 2.1.2.	
Recommendations:	
2.1.1.1.	Have a concept design report prepared.
Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.2. Bi-directional cycleway located across busy driveways with heavy vehicles

Probability of crash occurring – **Occasional** Likelihood of serious / fatal injury – **Very likely** Ranking – **Significant**
Little justification has been provided regarding why it was decided to locate the cycleway on the west side of Totara Street. The SAT was told that this was due to a pump station located on the east side; however, the SAT considers that this localised challenge could be overcome, and should not constitute the deciding factor to affect the entire route. More critically, it appears that the west side involves many more driveways that are used by heavy vehicles; if this observation is correct, a better safety outcome may be achieved on the east side of the road.

The best tool for a quantitative safety analysis is the Separated Cycleway Option Tool (SCOT)[4] and the input assumptions for SCOT, and the tool's safety predictions, should be documented in a background report. However, the SAT acknowledges that SCOT can be quite data-intensive (it requires inputs on turning volumes and adjacent parking occupancy) and, in this situation, is confident that the land-use and road layout would result in SCOT yielding a preference to locate the facility on the east side.

There are several factors which compound this problem: heavy vehicles involve blind spots and bi-directional cycle facilities involve contra-flow cycling, which is known to have a greater risk. Combining these means conflict between people on bikes and heavy vehicles is likely to occur on occasion, and such conflict is very likely to result in serious injury. Therefore, this is considered a significant issue.

Recommendations:

2.1.2.1.	Consider re-designing the cycleway on the east side of the road (this decision could be informed by undertaking some analysis, e.g. using SCOT, if further justification is required).

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.3. Incomplete concept design

Ranking – **Comment**

There are several components missing from the scheme design, with empty boxes marked "… subject to detail design". These components generally involve the most challenging details, and they would usually be the ones subject to significant audit feedback. Naturally, the SAT can only comment on what has been provided, and where concept designs are missing as yet, no auditor feedback can be offered.

It is clear that those missing components will be challenging to design, and in some instances, the SAT is unsure how this could be achieved in a way that is both user-friendly and at an acceptable risk level. The missing components are:

[4] See https://www.nzta.govt.nz/walking-cycling-and-public-transport/cycling/cycling-network-guidance/designing-a-cycle-facility/between-intersections/separated-cycleways/

- Signalised crossing at Maui Street, and its interaction with the Truck Stop (heavy vehicle fuel pump)
- Crossing concept for Astrolabe Street.
- Crossing concept for Hull Road.

It is suggested that this situation represents a significant risk for the overall delivery of the project.

Recommendations:

2.1.3.1.	Complete the scheme design and make the new components subject to a subsequent safety audit.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.4. Left turn into driveways by trucks

Probability of crash occurring – **Occasional**

Likelihood of serious / fatal injury – **Very likely**

Ranking – **Significant**

One of the most obvious problems with the concept design is the number of driveways that have large trucks turning into them. Especially the left turn into the driveway is of concern, as truck drivers have a large blind spot on their left. In April 2016, the Transport Agency issued a Technical Note[5] for the Separated Cycleway Options Tool (SCOT), and the following risk principle is noted:

> "The geometry of heavy vehicles restricts drivers turning left into a driveway from seeing adjacent cyclists travelling in the same (i.e. "with-flow") direction."

Having various risk mitigation tools like judder bars, coloured surfacing, cycle logos combined with directional arrows etc. is one thing, but if truck drivers simply cannot see a person cycling to their left, a high risk remains. To rely on people cycling to control their risk themselves, i.e. expecting people cycling to stop when an adjacent truck is indicating a left turn, is inconsistent with Safe Systems principles. The risk may apply at the following driveways:

5 https://www.nzta.govt.nz/assets/Walking-Cycling-and-Public-Transport/docs/cycling-network-guidance/tech-notes/TN001-separated-cycleway-options-tool-april-2016.pdf

- 202/206 Totara St (Fulton Hogan)
- 198 Totara St (Downer)
- 194 Totara St (Mobil)
- 182 Totara St (Bulk Storage Terminals Ltd)
- 174 Totara St (North Island Forklifts)
- 178 Totara St (Inghams Enterprises (NZ) Pty)
- 148-168 Totara St (Ixom; see Figure 3 below)
- 138 Totara St (TCL Isuzu)
- 138 Totara St (K & L Distributors)
- 60 Totara St (Bulk Store owned by KiwiRail?)

Those are ten major commercial sites. Each of those businesses has between one and three entrances used by heavy vehicles.

Figure 3: B-train leaving Ixom site – this is much less of a problem than entering by left turn

The problem is that truck drivers turning left have a large blind spot, and will not be able to see people cycling in the same direction. Given the large number of trucks turning left at the various driveways, this is expected to result in a crash occasionally. Crashes that do occur are very likely to result in death or serious injury. Therefore, the overall safety rating is significant.

Recommendations:

2.1.4.1.	Either: (a) provide actuated warning signs facing truck drivers, or: (b) give consideration to providing the proposed facility on the east side of the road instead.
Designer Response:	
SAT Response:	

Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.5. Driveways – geometric design

Ranking – **Comment**

Although most of the commercial driveways are reasonably wide, many have corner splays where the grass berm is commonly run over by trucks. Such splays have been observed at driveways 8, 9, 11, 15, 17, 21, 22, and 23 (refer to section 1.13 for a key). Figure 4 shows the northern commercial driveway of Bulk Storage Terminals Ltd as an example.

Figure 4: Chamfer created by truck overrun (driveway 9; Bulk Storage Terminals Ltd)

The problem is that the geometric design of the driveways appears to be based on the assumption that truck drivers will turn into the driveway without running over the berm like at present, and that larger trucks swing wide onto the flush median, as no swept path allowance appears to have been made. This will not work like that in practice, but it is likely that truck drivers will overrun the proposed separators, just as they currently mount the kerb.

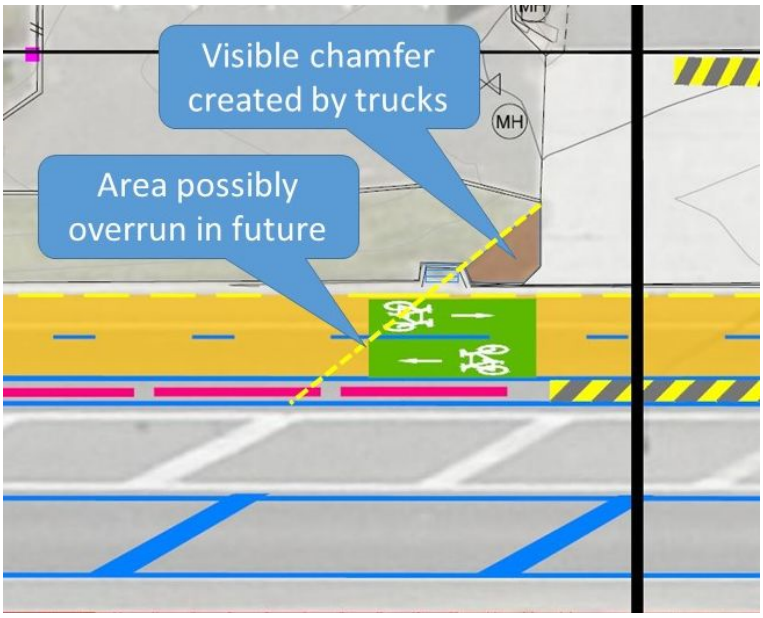

Figure 5: Simple graphic indicating the possible extent of the overrun at driveway 9

This could create an ongoing maintenance problem. It is also possible that this will create a hazard, with bits of broken separator obstructing the cycleway.

Recommendations:

2.1.5.1.	Undertake geometric design of each driveway based on a design vehicle appropriate for each driveway.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.6. Judder bar location

Probability of crash occurring – **Common**

Likelihood of serious / fatal injury – **Likely**

Ranking – **Significant**

At all driveways, the proposed judder bars encountered by drivers leaving a site are placed at the legal boundary. In most cases, this is 8 m clear of the proposed cycleway. An example is shown in Figure 6.

Figure 6: Judder bar setback at driveway 6

The problem is that drivers ought to be reminded that they are about to cross a cycleway in immediate proximity to the conflict point. With such a large offset, some drivers may not even make the connection between the judder bars and the cycleway. Numerous studies from around the world have shown that people cycling in a contra-flow direction are much more at risk from being overlooked than those travelling in the with-flow direction. For New Zealand guidance on this, please refer to the SCOT documentation.[6] Drivers need to receive the reminder where visibility of the facility is optimal. It is suggested that the calming devices be placed so that a design vehicle (be that a truck for commercial driveways, or otherwise cars) does not obstruct the cycleway just before mounting the judder bars.

Placing the judder bars too far from the conflict point will increase the risk of people cycling, especially those in the (unexpected) contra-flow direction. This is expected to result in common crashes. Such crashes that do occur are likely to result in death or serious injury. Therefore, the overall safety rating is significant.

Recommendations:

2.1.6.1.	Place judder bars in driveways with just enough setback so that before mounting the judder bars, vehicles are clear of the proposed cycleway.

Designer Response:	
SAT Response:	

[6] Refer to http://www.nzta.govt.nz/assets/Walking-Cycling-and-Public-Transport/docs/cycling-network-guidance/tech-notes/TN001-separated-cycleway-options-tool-april-2016.pdf

Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.7. Marking detail at driveways

Probability of crash occurring – **Occasional**

Likelihood of serious / fatal injury – **Likely**

Ranking – **Moderate**

The scheme proposes white cycle logos and directional arrows on top of green coloured boxes at driveways. These markings are proposed to be placed just clear of driveways, presumably to minimise maintenance costs (see Figure 7). Convention is to place these markings directly at the conflict point so that their safety impact (i.e. reminding drivers that they are crossing a cycle facility) is maximised.

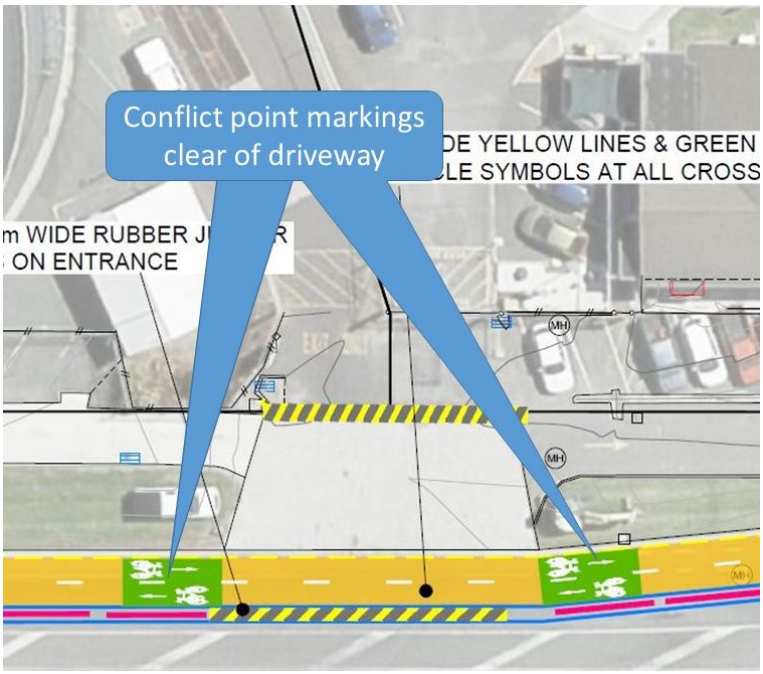

Figure 7: Placement of markings at driveways

Placing the markings away from the conflict point will make them less conspicuous to drivers and therefore increase the risk of collision between vehicles and people on bikes, especially those in the contra-flow (unexpected) direction. This is expected to result in occasional crashes. Such crashes that do occur are likely to result in death or serious injury. Therefore, the overall safety rating is moderate.

Recommendations:	
2.1.7.1.	Place the driveway markings directly at the conflict point.
Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.8. Judder bars creating chicane

Probability of crash occurring – **Occasional**

Likelihood of serious / fatal injury – **Very likely**

Ranking – **Significant**

At some of the driveways, the judder bars are placed in a way that drivers exiting to their left, or driving entering to their right, could avoid the vertical deflection. This is conceptually shown in Figure 8, which uses driveway 21 as the example location (note that the judder bar for exiting vehicles has been shifted closer to the cycleway as per section 2.1.6.1 – the problem still exists even then).

Exiting drivers, for example, may concentrate on whether other drivers are turning into the driveway, and if their way is clear and they can see a gap to turn into, they may adopt a tracking path that completely avoids the judder bars, as shown in the figure. When drivers are making these decisions in quick succession, they may well have forgotten that they should also check for cycleway users. Once again, those users travelling in a contra-flow direction are most at risk of getting overlooked, as the exiting driver would have glanced the other way to identify a suitable gap in the northbound traffic.

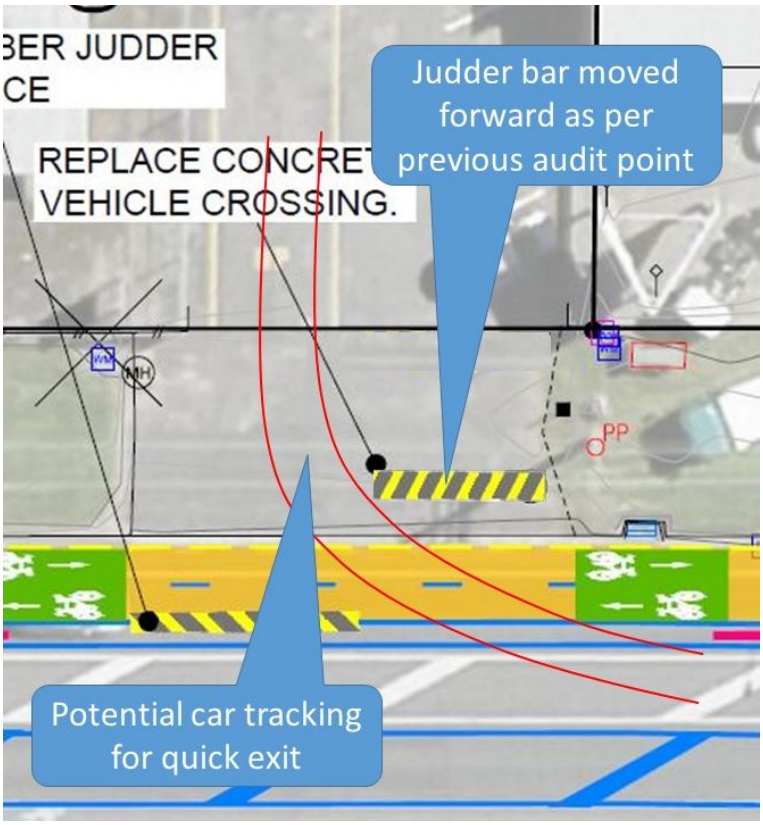

Figure 8: Potential vehicle tracking that avoids the chicane for a 'quick exit'

Crashes resulting from this behaviour can be expected to occur occasionally. Given the speed involved, such crashes are very likely to result in death or serious injury. Therefore, the overall safety rating is significant.

Recommendations:

2.1.8.1.	Make the judder bars long enough to prevent this behaviour from occurring; consider extending them across the whole width of the driveways.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.1.9. Angle parking (driveway 19)

Probability of crash occurring – **Infrequent**

Likelihood of serious / fatal injury – **Unlikely**

Ranking – **Minor**

There are two locations outside Ixom that are used for angle parking; driveways 18 and 19 as per section 1.13. Both appear to be previous driveways, with driveway 18 no longer in use, and driveway 19 previously being combined with the adjacent driveway 20 providing one generously-dimensioned facility. The scheme design proposes the removal of driveway 18, while the two angle parks at driveway 19 are to remain. The situation is shown in Figure 9.

It is inappropriate to require drivers to reverse into a busy arterial road like Totara Street. It is even more inappropriate to require them to back across a two-way cycleway while doing so. This puts people cycling at risk, and is hazardous for the reversing drivers, too.

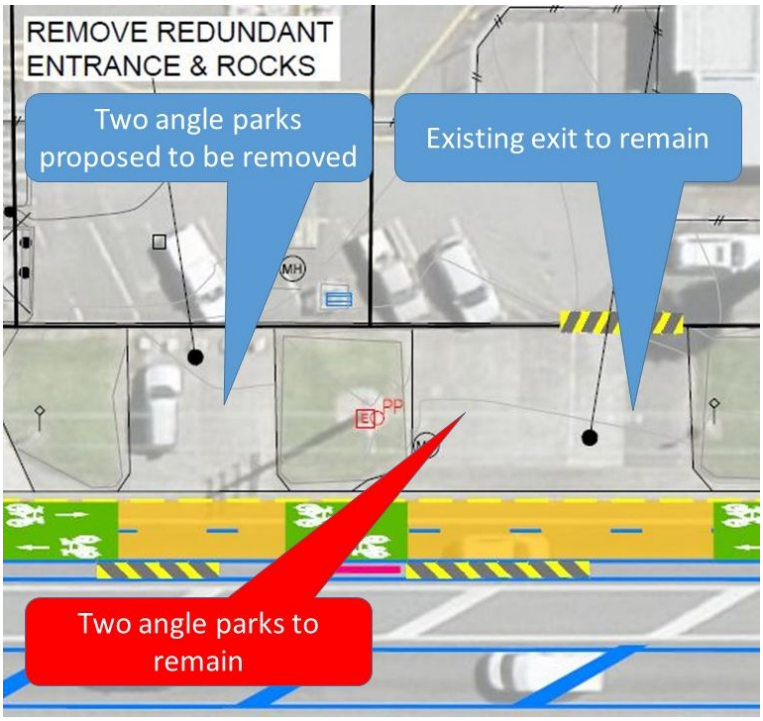

Figure 9: Angle parking (driveway 19) is set to remain

Crashes resulting from reversing may be infrequent. Crashes that do occur are unlikely to result in death or serious injury. Therefore, the overall safety rating is minor.

Recommendations:

2.1.9.1.	Remove the two existing angle parks that are marked at driveway 19.

Designer Response:	
SAT Response:	
Safety Engineer:	

Client Decision:	
Action Taken:	

2.1.10. Parking demand and enforcement

Ranking – **Comment**

During the site visits, there was low parking demand along Totara Street, and very high parking demand along Kawaka Street (more than 100% occupancy). Despite the low demand along Totara Street, illegal parking could still be observed (see Figure 10).

Figure 10: Illegal parking outside Fusion Coffee Roastery

Along Kawaka Street, all formed car parks were occupied, plus much of the grass berms which are supposed to cater for the proposed cycleway (see Figure 11). The footpath shown in Figure 12 was fully parked out (and thus unusable for pedestrians) on Thursday afternoon (the following photo was taken on Friday morning).

Figure 11: Drivers park on the berm that is supposed to become a cycleway as all formed parks are full

Figure 12: During Thursday afternoon, this footpath was fully parked out[7]

From these observations, it appears that current parking enforcement is insufficient to regulate driver behaviour. Installing the cycleway in this location will generate significant push back from motorists who wish to park there – thus it will be necessary to have strong political support to keep the facility available.

Recommendations:

2.1.10.1.	Consider whether there is political will to either undertake parking enforcement, or to lower parking demand through parking charges. If the political will is not there, don't build the facility along Blake Park.

Designer Response:

SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.2. Specific issues on Totara Street

2.2.1. Broken crack fill

Probability of crash occurring – **Infrequent**

Likelihood of serious / fatal injury – **Unlikely**

Ranking – **Minor**

There is a service cover along the shared pathway on Hewletts Road. At its intersection with Totara Street, the fill between the footpath and this service cover is broken, leaving a grove deep enough that can catch a narrow road bike wheel. Visibility around this corner is poor, meaning that riders may take evasive action and they could be trapped by this deficiency even if they are aware of it.

Figure 13: Broken service cover seal (Hewletts / Totara n-w quadrant)

Instances of riders losing control may happen infrequently, and this is unlikely to result in death or serious injury. Therefore, the overall safety rating is minor.

[7] This photo from Friday morning; no photo available from Thursday afternoon

Recommendations:	
2.2.1.1.	Replace the broken crack fill on the shared pathway in the north-west quadrant of the Hewletts / Totara intersection.
Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.2.2. Opportunity for value-engineering

Ranking – **Comment**
The proposed lengthening of the kerbside lane on the approach to Hewletts Road shown in Figure 14 is an expensive change for which the reason for doing so is not evident. During most of the day, long queues can be observed on this approach and the kerbside lane becomes available only after the Totara Street approach has a green light; making the lane slightly longer will make no difference to intersection performance.

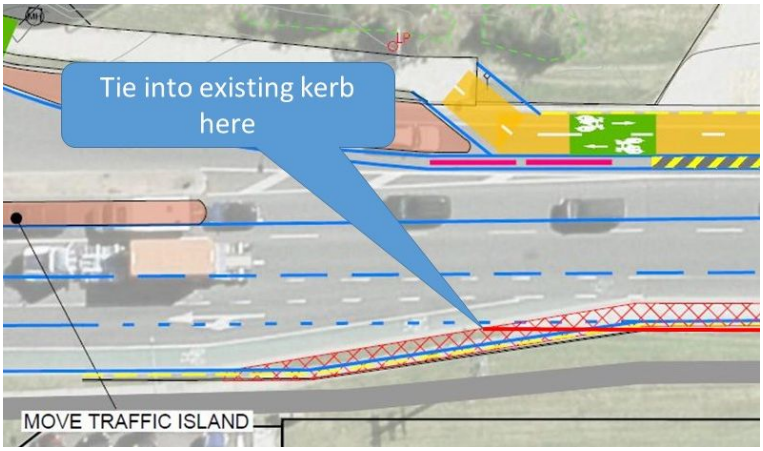

Figure 14: Unnecessary widening on the approach to Hewletts Road

Recommendations:	
2.2.2.1.	Reconsider whether the proposed lengthening of the kerbside lane will achieve good value for money.
Designer Response:	
SAT Response:	

Safety Engineer:	
Client Decision:	
Action Taken:	

2.2.3. Effect of splitter islands at driveway 11

Ranking – **Comment**
Driveway 11 on sheet C05 has insufficient corner splays (see Figure 15), much like many other driveways as discussed in section 2.1.5. The scheme design does as yet not make any provision for relocated splitter islands at the railway crossing. Hence, this driveway may require a different treatment to the eventual design concept to be developed for driveways in general.

Figure 15: Splitter island geometrically constraining driveway 11

Recommendations:	
2.2.3.1.	Consider the impact of relocated splitter islands when designing driveway 11.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	

Action Taken:	

2.2.4. Reinstate vehicle crossing at non-driveway location

Ranking – **Comment**

Sheet C06 shows a design note for a vehicle crossing to be reinstated. The feature visible on the aerial photo is not a driveway; it appears to be a drainage structure. This may be a drafting error.

Figure 16: Drainage structure outside 2 Triton Avenue

Recommendations:

2.2.4.1.	Remove the instruction to reinstate vehicle crossing from sheet C06.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.2.5. Hull Rd roundabout – pedestrian provision

Probability of crash occurring – **Infrequent**

Likelihood of serious / fatal injury – **Likely**

Ranking – **Moderate**

There is a surprising lack of provision for pedestrians at the Hull Road roundabout. There are no formal facilities to cross Totara Street, and the existing crossing point on the west arm has very poor intervisibility (see Figure 17). The auditors don't know whether it is within the brief of the consultant to address these issues, but there is as yet nothing shown on the scheme plan (sheet C08). There will be some pedestrian demand as service businesses (coffee, lunch, etc.) are on the east side of the road or further east along Hull Road, whilst the Port of Tauranga is a major employer.

Figure 17: Poor intervisiblity from the western crossing point at Hull Road roundabout

The problem is that pedestrians either have no refuge (crossing east-west), or have very poor intervisibility from the southern side of the western crossing point. Given that drivers (including truck drivers) turn left into the port entrance at quite some speed due to excellent visibility to the east, this is expected to result in infrequent crashes. Such crashes that do occur are likely to result in death or serious injury. Therefore, the overall safety rating is moderate.

Recommendations:

2.2.5.1.	Provide facilities for pedestrians at the Hull / Totara roundabout that are safe, including sufficient intervisibility.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	

Action Taken:	

2.2.6. Hull Rd roundabout – cycleway separator

Probability of crash occurring – **Occasional**

Likelihood of serious / fatal injury – **Likely**

Ranking – **Moderate**

North of the roundabout with Hull Road, the proposed cycleway continues on the west side of the carriageway, separated from motor traffic with a proposed separator. As is shown in Figure 18, there is no separator where the cycleway transitions from the berm onto the carriageway. The alignment for drivers is such that they may inadvertently drive into the cycleway, instead of remaining on the carriageway.

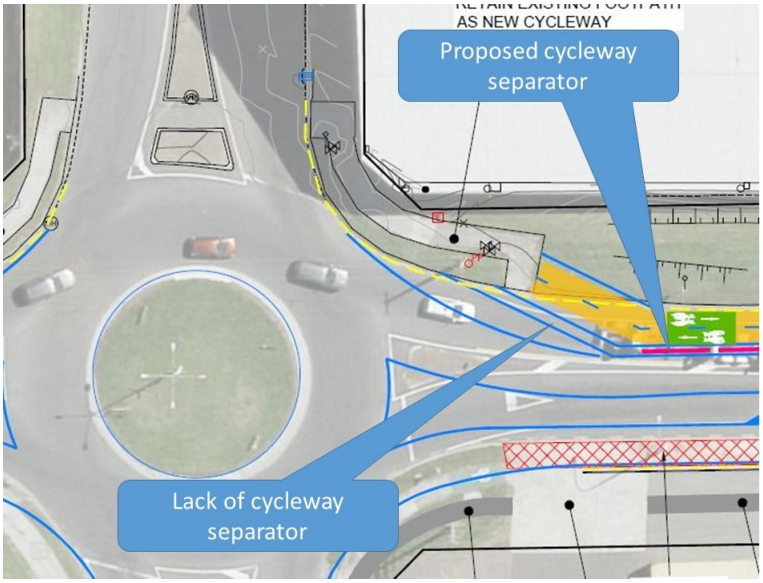

Figure 18: Missing cycleway separator

This may result in occasional crashes between people cycling and motor vehicles. Such crashes are likely to result in death or serious injury. Therefore, the overall safety rating is moderate.

Recommendations:

2.2.6.1.	Provide a cycleway separator north of the Hull Road roundabout so that drivers don't inadvertently drive onto the cycleway. Leave a sufficient gap so that any cyclists circulating within the roundabout can join the proposed facility.

Designer Response:	
SAT Response:	

Safety Engineer:	
Client Decision:	
Action Taken:	

2.2.7. Hull Rd roundabout – slip hazard

Probability of crash occurring – **Infrequent**

Likelihood of serious / fatal injury – **Very unlikely**

Ranking – **Minor**

On Hull Road outside Carters Tyre Service, a low point has formed in the drainage channel right at the pedestrian crossing point. Consequently, mud accumulates here that forms a slip hazard when it rains.

Figure 19: Mud accumulates at the pedestrian crossing point outside Carters Tyre Service

Recommendations:

2.2.7.1.	Correct the levels of the drainage channel during construction work so that water drains to the nearest sump.

Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	

Action Taken:	

2.3. Specific issues on Kawaka Street

2.3.1. Overhang of angle-parked vehicles

Ranking – **Comment**

It is proposed to establish a shared pathway along what is now a grass berm adjacent to some angle parking. The concept design does not prevent for car bonnets to overhang onto the cycleway. Drivers of very long vehicles are even inclined to mounting the berm so that the rear of their vehicle does not overhang into the carriageway (see Figure 20). It is important to capture these issues during concept design, as this may determine whether parking on the opposite side of the road can be maintained or will have to be removed. Wheel stops may work, but they generally become a maintenance headache. To prevent intrusion onto the proposed facility, the kerb should be relocated, with a buffer strip between the angle parking and the cycleway, and a higher kerb provided so that mounting it is discouraged.

Figure 20: Overhang onto the grass berm

Recommendations:

2.3.1.1.	Relocate and heighten the kerb where angle parking is provided next to the proposed pathway so that overhanging bonnets are clear of the facility and vehicles cannot mount the kerb.

Designer Response:	
SAT Response:	
Safety Engineer:	

Client Decision:	
Action Taken:	

2.3.2. Cycleway – driveway interactions

Probability of crash occurring – **Common**

Likelihood of serious / fatal injury – **Unlikely**

Ranking – **Moderate**

Given the parking demand at Blake Park observed during the site visits, it is clear that the driveways into and out of the Blake Park car parks will be busy. As explained elsewhere in this report, the most at-risk people are those cycling in a contraflow direction, i.e. in this case in an eastbound direction. That said, it is necessary to provide good intervisibility at and before the crossing points for cycle travel in both directions. It will be challenging to keep visibility splays unobstructed from informal parking, and it will be necessary to employ passive means like low landscaping, link and chain fences, or high kerbs. The yellow areas in Figure 21 may be those that need further consideration. This is based on our observations that the two western driveways operate as one-way, whilst the eastern one (shown in Figure 11) operates in both directions.

Consideration should also be given as to whether a judder bar is a sufficient calming measure, or whether a raised platform with reasonably short ramps could be more effective. We note that the eastern driveway does not appear to have received any treatment. The western exit, for example, could be squared up as part of this project, to further slow down drivers.

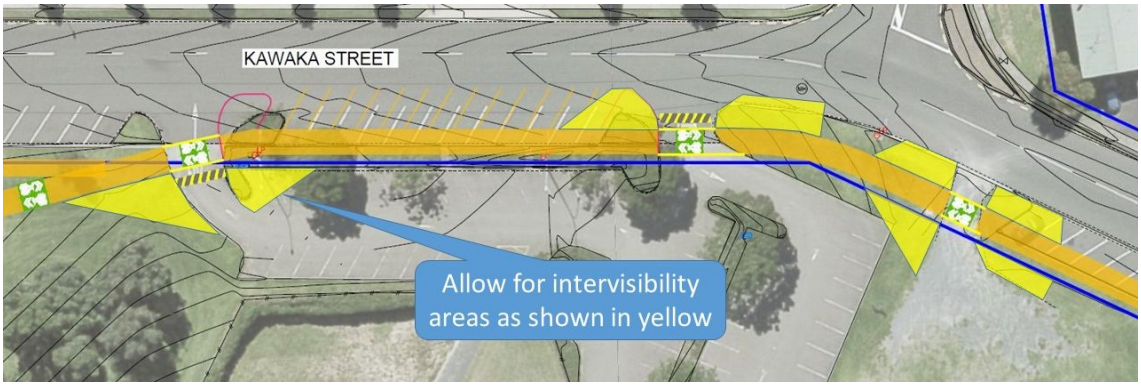

Figure 21: Intervisibility should be ensured for yellow areas

The interaction between people driving and cycling at driveways is often the primary safety issue for pathway projects. Crashes of this nature can be expected to be common, but they are unlikely to result in death or serious injury. Therefore, the overall safety rating is moderate.

Recommendations:	
2.3.2.1.	Ensure good intervisibility at driveways, for example by ensuring that certain areas are unobstructed; it is important to prevent informal parking.
2.3.2.2.	Consider the appropriate traffic calming measures at the high-volume driveways under discussion.
2.3.2.3.	Consider changing the horizontal layout of the driveways to further reduce driving speed.
Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

2.3.3. Pedestrian desire line

Ranking – **Comment**
The platform proposed for Tawa Street creates a circuitous route for pedestrians who want to walk along Kawaka Street. Figure 22 below shows a more logical route that should be allowed for as an alternative to the proposed detour.

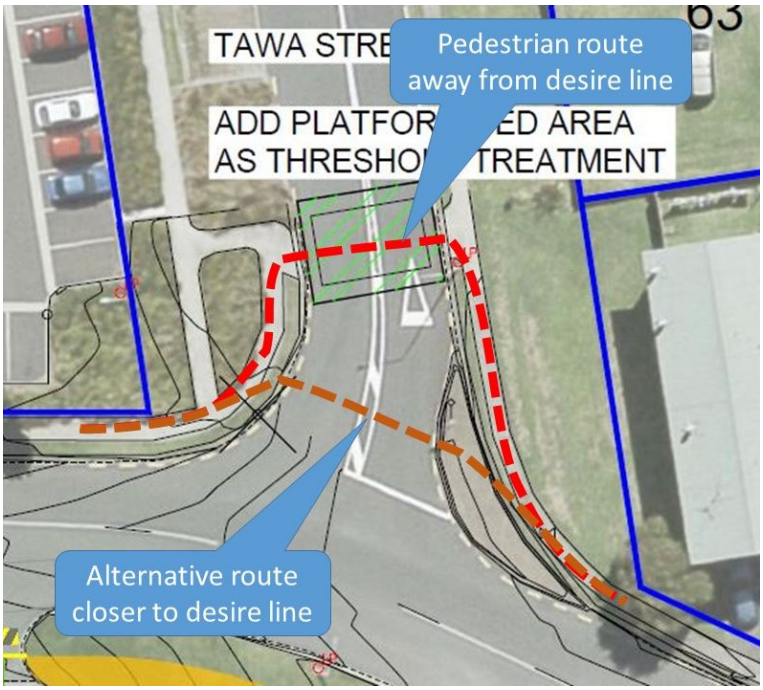

Figure 22: Tawa Street platform should support pedestrian desire line

Recommendations:	
2.3.3.1.	Provide a platform in Tawa Street that supports the pedestrian desire line.
Designer Response:	
SAT Response:	
Safety Engineer:	
Client Decision:	
Action Taken:	

3. Audit statement

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

Twenty issues were identified and are summarised in Table 3.1 below.

Table 3.1: Summary of Issues

Serious	Significant	Moderate	Minor	Comments	Total
0	4	4	3	9	20

Safety Audit Team Leader: Name **Axel Wilke** Position Traffic Engineer and Transport Planner, Director, ViaStrada

Signature ..... Date 25 September 2017

Designer: Name ..... Position .....

Signature ..... Date .....

Technical Services Design Manager: Name ..... Position .....

Signature ..... Date .....

Project Sponsor: Name ..... Position .....

Signature ..... Date .....

Action Completed: Name ..... Position .....

Signature ..... Date .....

Safety Audit Team Leader: Name ..... Position .....

Signature ..... Date .....

Project sponsor to distribute audit report incorporating decision to designer, Safety Audit Team Leader, Technical Services Design Manager and project file

Date .....

4. Appendices

CAS printout of crash list (5 years)

Crash detail report