



**SH1 WAIKATO EXPRESSWAY
NGĀRUAWĀHIA SECTION
110 km/h ROAD SAFETY RETROFIT**
Detail Design Road Safety Audit

2 March 2022

Prepared for:
Waka Kotahi NZ Transport Agency

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**SH1 Waikato Expressway Ngāruawāhia Section
110 km/h Road Safety Retrofit**

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110 km/h Road Safety Retrofit**

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Acronyms / Abbreviations

ATP	audio tactile profiled (road markings)
RRPM	reflectorised raised pavement marker
Waka Kotahi	Waka Kotahi NZ Transport Agency

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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 Road to Zero and the Safe System approach, which is a safe road system 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.



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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. Decision tracking of safety concerns ranked as a comment is optional.

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 existing roadside and median safety barriers along SH1 Waikato Expressway (Ngāruawāhia Section from Gordonton Road interchange to Te Rapa Bypass interchange) will be upgraded to meet the standards set by Waka Kotahi for a 110 km/h speed limit. This will include replacing existing median and roadside barriers with MASH standard barriers, adding roadside barriers where none are currently provided, widening the shoulders to 3.0 m, and sealing the grassed median.

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:

- Keith Weale, Stantec,
- Kirsty Horridge, Stantec. and
- Heather Liew, Waka Kotahi.

1.4 Previous Road Safety Audits

There have been no previous road safety audits of this project.



1.5 Scope of this Road Safety Audit

This is a preliminary design road safety audit of the project described in Section 1.2.

1.6 Briefing, Audit, and Exit Meetings

A site visit was not considered necessary or advisable due to the widespread Covid-19 omicron virus. The safety audit team therefore conducted the safety audit using the most recent May 2021 Google Street View images and December 2021 Argonaut Roadrunner videos instead.

An exit meeting was held with Shane Small and Thayalan Sivachelvan of Waka Kotahi and Luke Rogers and Leshego Mpe of Stellar Projects on 1 March 2022.

1.7 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. 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 has utilised the following descriptor tables to enable a fair and reasonable rating of the risks.

Table 1: Crash Frequency Description

Crash Frequency	Indicative Description
Frequent	Multiple crashes (more than one per year)
Common	1 every 1 to 5 years
Occasional	1 every 5 to 10 years
Infrequent	Less than 1 every 10 years



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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 an 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 2: 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 3.

Table 3: 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 may be 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, the auditors may give suggestions in some instances.

Decision tracking of safety concerns ranked as a comment is optional.



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1.8 Documents Provided

The following drawings were provided for the audit.

SHEET INDEX	
SHEET NUMBER	TITLE
C01	SHEET INDEX
C02	GENERAL NOTES
C03	OVERVIEW PLAN
C05	PLAN AND LONGSECTION CH0-CH300 - SHEET 1 OF 21
C06	PLAN AND LONGSECTION CH300-CH600 - SHEET 2 OF 21
C07	PLAN AND LONGSECTION CH600-CH900 - SHEET 3 OF 21
C08	PLAN AND LONGSECTION CH900-CH1200 - SHEET 4 OF 21
C09	PLAN AND LONGSECTION CH1200-CH1500 - SHEET 5 OF 21
C10	PLAN AND LONGSECTION CH1500-CH1800 - SHEET 6 OF 21
C11	PLAN AND LONGSECTION CH1800-CH2100 - SHEET 7 OF 21
C12	PLAN AND LONGSECTION CH2100-CH2400 - SHEET 8 OF 21
C13	PLAN AND LONGSECTION CH2400-CH2700 - SHEET 9 OF 21
C14	PLAN AND LONGSECTION CH2700-CH3000 - SHEET 10 OF 21
C15	PLAN AND LONGSECTION CH3000-CH3300 - SHEET 11 OF 21
C16	PLAN AND LONGSECTION CH3300-CH3600 - SHEET 12 OF 21
C17	PLAN AND LONGSECTION CH3600-CH3900 - SHEET 13 OF 21
C18	PLAN AND LONGSECTION CH3900-CH4200 - SHEET 14 OF 21
C19	PLAN AND LONGSECTION CH4200-CH4500 - SHEET 15 OF 21
C20	PLAN AND LONGSECTION CH4500-CH4800 - SHEET 16 OF 21
C21	PLAN AND LONGSECTION CH4800-CH5100 - SHEET 17 OF 21
C22	PLAN AND LONGSECTION CH5100-CH5400 - SHEET 18 OF 21
C23	PLAN AND LONGSECTION CH5400-CH5700 - SHEET 19 OF 21
C24	PLAN AND LONGSECTION CH5700-CH6000 - SHEET 20 OF 21
C25	PLAN AND LONGSECTION CH6000-CH6047 - SHEET 21 OF 21

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C31	CROSS-SECTIONS CH60-CH120 SHEET 2 OF 62
C32	CROSS-SECTIONS CH120-CH180 SHEET 3 OF 62
C33	CROSS-SECTIONS CH180-CH240 SHEET 4 OF 62
C34	CROSS-SECTIONS CH240-CH300 SHEET 5 OF 62
C35	CROSS-SECTIONS CH300-CH360 SHEET 6 OF 62
C36	CROSS-SECTIONS CH360-CH420 SHEET 7 OF 62
C37	CROSS-SECTIONS CH420-CH480 SHEET 8 OF 62
C38	CROSS-SECTIONS CH480-CH540 SHEET 9 OF 62
C39	CROSS-SECTIONS CH540-CH600 SHEET 10 OF 62
C40	CROSS-SECTIONS CH600-CH660 SHEET 11 OF 62
C41	CROSS-SECTIONS CH660-CH720 SHEET 12 OF 62
C42	CROSS-SECTIONS CH720-CH780 SHEET 13 OF 62
C43	CROSS-SECTIONS CH780-CH840 SHEET 14 OF 62
C44	CROSS-SECTIONS CH840-CH900 SHEET 15 OF 62
C45	CROSS-SECTIONS CH900-CH960 SHEET 16 OF 62
C46	CROSS-SECTIONS CH960-CH1020 SHEET 17 OF 62
C47	CROSS-SECTIONS CH1020-CH1080 SHEET 18 OF 62
C48	CROSS-SECTIONS CH1080-CH1140 SHEET 19 OF 62
C49	CROSS-SECTIONS CH1140-CH1200 SHEET 20 OF 62
C50	CROSS-SECTIONS CH1200-CH1260 SHEET 21 OF 62
C51	CROSS-SECTIONS CH1260-CH1320 SHEET 22 OF 62
C52	CROSS-SECTIONS CH1320-CH1380 SHEET 23 OF 62
C53	CROSS-SECTIONS CH1380-CH1440 SHEET 24 OF 62
C54	CROSS-SECTIONS CH1440-CH1500 SHEET 25 OF 62
C55	CROSS-SECTIONS CH1500-CH1560 SHEET 26 OF 62
C56	CROSS-SECTIONS CH1560-CH1620 SHEET 27 OF 62
C57	CROSS-SECTIONS CH1620-CH1680 SHEET 28 OF 62



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C57	CROSS-SECTIONS CH2600-CH2680 SHEET 28 OF 62
C58	CROSS-SECTIONS CH2700-CH2780 SHEET 29 OF 62
C59	CROSS-SECTIONS CH2800-CH2880 SHEET 30 OF 62
C60	CROSS-SECTIONS CH2900-CH2980 SHEET 31 OF 62
C61	CROSS-SECTIONS CH3000-CH3080 SHEET 32 OF 62
C62	CROSS-SECTIONS CH3100-CH3180 SHEET 33 OF 62
C63	CROSS-SECTIONS CH3200-CH3280 SHEET 34 OF 62
C64	CROSS-SECTIONS CH3300-CH3380 SHEET 35 OF 62
C65	CROSS-SECTIONS CH3400-CH3480 SHEET 36 OF 62
C66	CROSS-SECTIONS CH3500-CH3580 SHEET 37 OF 62
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C72	CROSS-SECTIONS CH4100-CH4180 SHEET 43 OF 62
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C77	CROSS-SECTIONS CH4600-CH4680 SHEET 48 OF 62
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C80	CROSS-SECTIONS CH4900-CH4980 SHEET 51 OF 62
C81	CROSS-SECTIONS CH5000-CH5080 SHEET 52 OF 62
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C83	CROSS-SECTIONS CH5200-CH5280 SHEET 54 OF 62
C84	CROSS-SECTIONS CH5300-CH5380 SHEET 55 OF 62
C85	CROSS-SECTIONS CH5400-CH5480 SHEET 56 OF 62
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C87	CROSS-SECTIONS CH5600-CH5680 SHEET 58 OF 62
C88	CROSS-SECTIONS CH5700-CH5780 SHEET 59 OF 62
C89	CROSS-SECTIONS CH5800-CH5880 SHEET 60 OF 62
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C91	CROSS-SECTIONS CH6000-CH6046 SHEET 62 OF 62

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SHEET NUMBER	TITLE
C95	BARRIER DETAILS - FLEXIBLE TO SEMI-RIGID RIGID TRANSITION
C96	BARRIER DETAILS - SEMI RIGID TO FLEXIBLE TRANSITION
C97	BARRIER DETAILS - RIGID SEMI-RIGID TO FLEXIBLE TRANSITION
C98	BARRIER DETAILS - FLEXIBLE IN FRONT OF SEMI-RIGID TRANSITION
C99	BARRIER DETAILS - W-BEAM TO RIGID CONCRETE TRANSITION
C100	BARRIER DETAILS - MAINTENANCE ACCESS BAY
C101	BARRIER DETAILS - WIRE ROPE SAFETY BARRIER (WRSB) TO CONCRETE
C102	EDGE BARRIER DETAILS - SHEET 1 OF 2
C103	EDGE BARRIER DETAILS - SHEET 2 OF 2
C110	TYPICAL CROSS-SECTIONS - SHEET 1 OF 2
C111	TYPICAL CROSS-SECTIONS - SHEET 2 OF 2
C120	EXISTING SERVICES - PLAN - SHEET 1 OF 11
C121	EXISTING SERVICES - PLAN - SHEET 2 OF 11
C122	EXISTING SERVICES - PLAN - SHEET 3 OF 11
C123	EXISTING SERVICES - PLAN - SHEET 4 OF 11
C124	EXISTING SERVICES - PLAN - SHEET 5 OF 11
C125	EXISTING SERVICES - PLAN - SHEET 6 OF 11
C126	EXISTING SERVICES - PLAN - SHEET 7 OF 11
C127	EXISTING SERVICES - PLAN - SHEET 8 OF 11
C128	EXISTING SERVICES - PLAN - SHEET 9 OF 11
C129	EXISTING SERVICES - PLAN - SHEET 10 OF 11
C130	EXISTING SERVICES - PLAN - SHEET 11 OF 11



1.9 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 road safety audit team. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor are they an assessment of standards with respect to engineering or planning documents.

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

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



2 Safety Concerns

2.1 Safety Barriers

2.1.1 HEIGHT AND CONDITION OF EXISTING BARRIERS

COMMENT

The drawings state, 'Existing barriers are to remain (depending on condition). Contractor to replace / make adjustments where rail height is non-compliant after pavement treatments.' Presumably, this should apply to the existing terminals as well.

This places the onus on the contractor to decide if the existing rigid barriers, semi-rigid barriers, and terminals need to be replaced or lifted. Unless specified in the project specifications, the contractor would have no suitability criteria or dimensional tolerances on which to decide what barriers and terminals should be replaced or lifted. This could result in deficient barriers and terminals remaining, or serviceable barriers and terminals being replaced unnecessarily.

Recommendation(s)

- 1 Preferably, add 'on instruction of the Engineer' to the notes on the drawing to relieve the contractor of the responsibility of deciding on safety matters.
- 2 Alternatively, specify precisely what parameters and tolerances should be applied when deciding whether an existing barrier system should be adjusted or replaced.

Optional Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

2.1.2 POSITION OF LIGHTING COLUMNS

COMMENT

The proposed offsets to frangible and non-frangible objects are shown in Figure 1. However, the examples of a frangible and a non-frangible lighting column might be the wrong way around.



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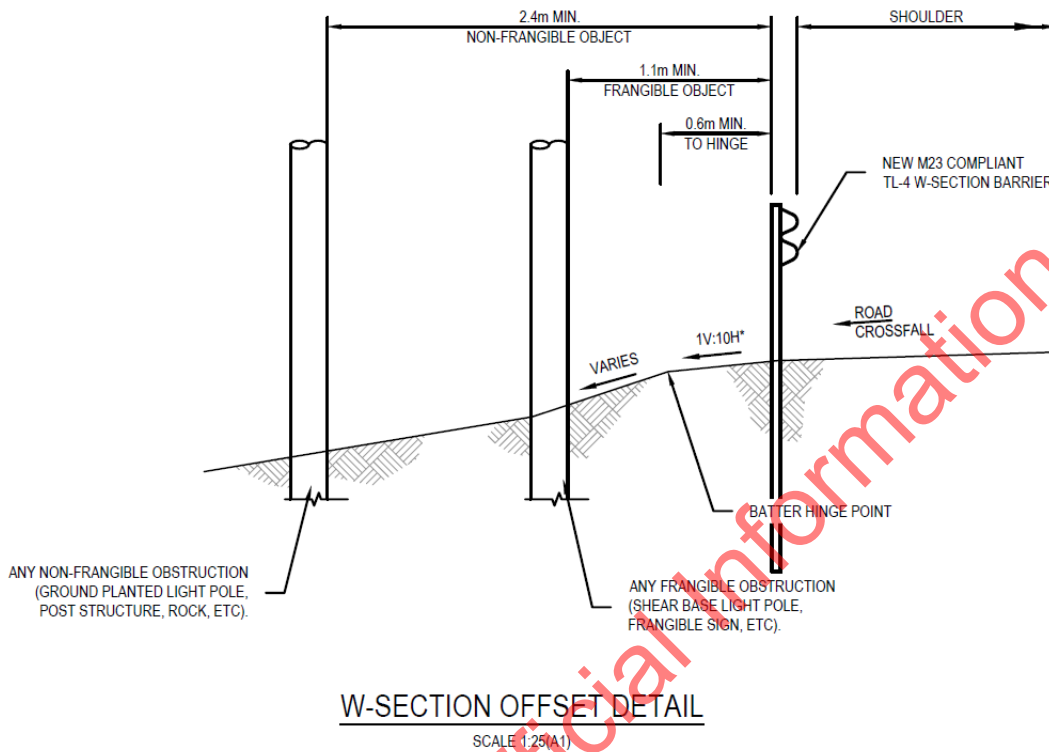


Figure 1: Offsets to frangible and non-frangible lighting columns

Shear base lighting columns are considered to be frangible, but they are designed to be struck directly and at high speed by a vehicle. The influence of a barrier in front of a shear base column on its performance is not currently certain. It is, however, likely that the energy required to shear the lighting column off its base would be reduced by the barrier, and that the angle of impact required for the bolts to slip off the base plate notches would differ. Note the precise 15° orientation of the notches in the base plate to the direction of traffic in Figure 2.

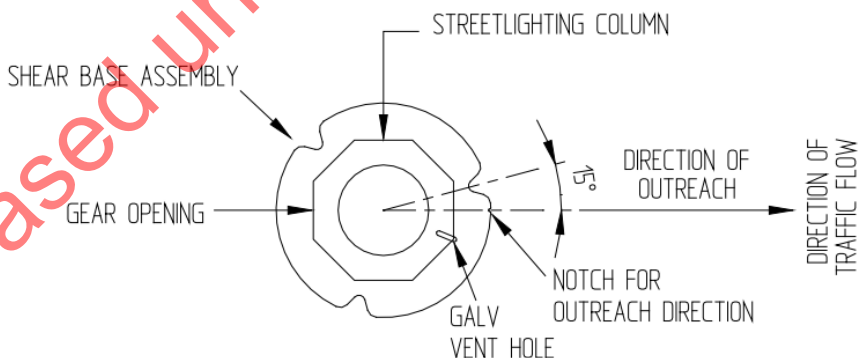


Figure 2: Shear base orientation to traffic



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On the other hand, ground planted lighting columns are generally considered to be frangible, and do not need to be struck at any particular angle to collapse as designed.

Therefore, it is suggested that ground planted lighting columns could be placed closer to the barrier than shear base columns.

The road safety audit team has assigned a comment against the risk ranking of this safety concern as all objects are intended to be at least 1.1 m from the safety barrier.

Recommendation(s)

- 1 Consider allowing ground planted lighting columns to be positioned much closer to the barriers than proposed.
- 2 Where existing shear base lighting columns are to be relocated, specify ground-planted frangible lighting columns to replace the slip-base columns behind the barriers.

Optional Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

2.2 Cross-section

2.2.1 MEDIAN SHOULDER WIDTH

MODERATE

The existing median width is typically 9 m wide (edge line to edge line) as shown in Figure 3. Surfacing the median will create 4.5 m wide shoulders. The outer shoulders are being widened to 3 m as well. The surfaced width for a two-lane carriageway would thus be 14.5 m between barriers.



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2 Safety Concerns

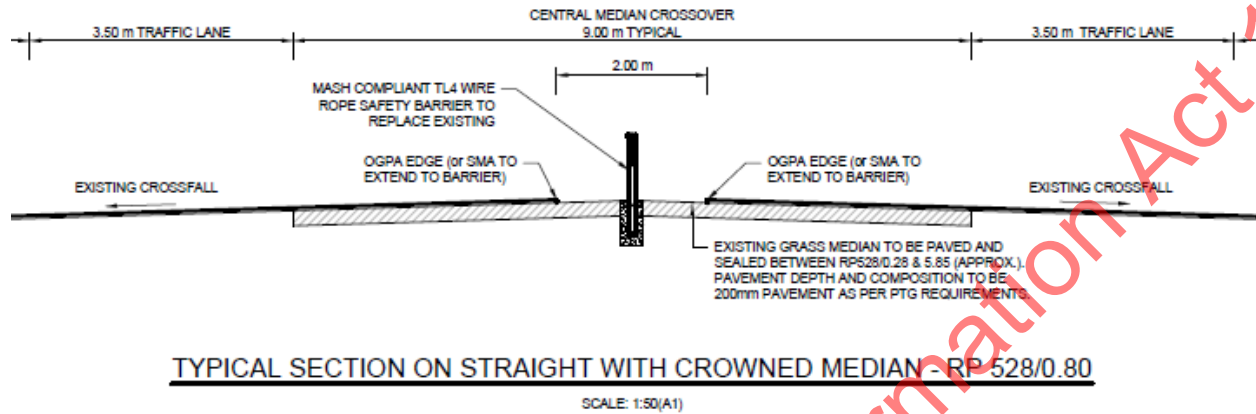


Figure 3: Proposed surfaced median width

The width of the median shoulders seems to be excessive. Generally 3.5 m is accepted as providing sufficient sight distance past median barriers on minimum radius curves. The Ngāruawāhia section has generous curve radii.

With such wide median shoulders, there is a risk of irresponsible drivers overtaking on the shoulder and surprising motorists in the fast lane, notwithstanding the required diagonal road markings and RRPMS.

There is a considerable length of widening required to widen the existing outer shoulders by about 1.0 m to provide safe 3.0 m wide shoulders in front of the roadside barriers. Considering that the median does not need to be 9 m wide, there is a possibility that much of the widening work on the outside edge could be reduced, except for the maintenance bays.

From a safety in design perspective (the extended length of time that workers and general traffic would be exposed to risk during construction) the designers should reconsider the proposed cross-section. It is noted road safety audits are not a substitute for safety in design audits, but sometimes (such as in this case) road safety audits can include safety in design concerns where road traffic safety is concerned.

Risk Ranking

The road safety audit team has assigned the following risk ranking to this safety concern. In ranking this concern the road safety audit team has assumed that industry standard temporary traffic management and speed reduction measures would be in place during construction.

Frequency rating	Crashes resulting from this safety concern could be infrequent.
Severity rating	Death or serious injury resulting from this safety concern could be likely.
Risk ranking	The safety concern is therefore deemed to be moderate.



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Recommendation(s)

- 1 Consider utilising some of the wide median to provide the pavement width required for the widened outside shoulders, thus eliminating the need for extended construction work along the roadside.

Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

2.2.2 AQUAPLANING POTENTIAL

MODERATE

With the increased width of surfacing, the potential for aquaplaning in areas previously not subject to or marginally subject to the risk of aquaplaning should be addressed in the design.

Risk Ranking

The road safety audit team has assigned the following risk ranking to this safety concern.

Frequency rating	Crashes resulting from this safety concern could be common.
Severity rating	Death or serious injury resulting from this safety concern could be unlikely.
Risk ranking	The safety concern is therefore deemed to be moderate.

Recommendation(s)

- 1 Check for aquaplaning potential.

Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	



2.3 Cyclists

2.3.1 CYCLIST ROAD SIGNS AND MARKINGS

COMMENT

The road safety audit team assumes that cyclists would still be allowed to use the 110 km/h sections of the Waikato Expressway.

Some sections of the existing Waikato Expressway cater for cyclists in the form of painted buffer strips (e.g. Rangiriri to Ohinewai shown in Figure 4 below) and signed crossing points across exit and entrance ramps, shown in Figure 5 below. The latter is in an existing 110 km/h speed limit zone. Such shoulder buffers and cyclist crossings are not present on the Hampton Downs or the Ngāruawāhia or other recently opened sections such as the Huntly Bypass.



Figure 4: Existing buffer strip Rangiriri to Ohinewai (Google, 2021)



Figure 5: Exit ramp cyclist crossing at Cambridge (west) interchange (Google, 2019)



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Since the Waikato Expressway looks like a motorway, it would be reasonable to assume that some drivers would not expect to encounter cyclists in such an environment and would therefore not be looking out for cyclists.

While the buffer strips and signed crossing points provide no physical protection for cyclists, the signs and markings may remind drivers to be on the lookout for cyclists. The converse may also be true—where the signs and markings end or are not present, drivers may think that cyclists are not allowed on the expressway.

Recommendation(s)

1. A consistent philosophical approach should be taken regarding the provision of cyclist signs and markings along the entire length of the Waikato Expressway.

Optional Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

2.4 Road Signs and Markings

2.4.1 RRPMS AND ATP

COMMENT

The ATP markings applied on the Longswamp to Rangiriri project (June 2020) coincided with the RRPMS. Not only did the application cover the RRPMS in many cases, but the raised portion of the ATP also tended to mask the full effectiveness of the RRPM reflectivity, effectively reducing the RRPM to about half its reflective area when viewed from the low angle of a passenger vehicle. Figure 3 shows that the ATP had to be removed ahead of each RRPM.



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110 km/h Road Safety Retrofit
2 Safety Concerns**

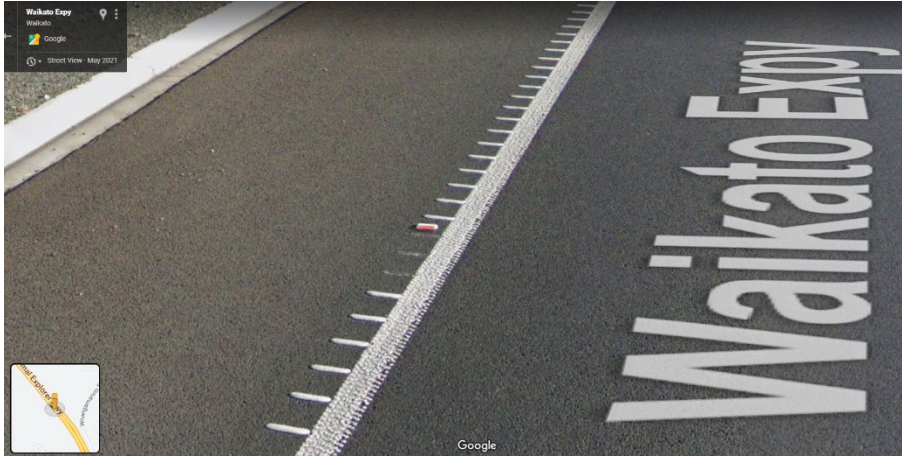


Figure 6: RRPMS on Longswamp to Rangiriri section (Google, 2021)

The RRPMS should be placed just to the left of the ATP marking.

Recommendation(s)

- 1 Position the RRPMS to the left of the ATP marking.

Optional Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

2.4.2 WIDE SHOULDER MARKINGS

COMMENT

As indicated in Section 2.2.1, shoulders wider than 2.5 m (both outside and especially the proposed very wide median shoulders) should be marked with diagonal bars and RRPMS. It is acknowledged that the road signs and marking drawings had not yet been completed at the time of the audit.

Recommendation(s)

- 1 Mark wide shoulders with diagonal bars and RRPMS.



SH1 Waikato Expressway Ngāruawāhia Section
110 km/h Road Safety Retrofit
2 Safety Concerns

Optional Decision Tracking

Designer response	
Client safety engineer comment	
Client decision	
Action taken	

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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 28 February 2022


Technical Director – Roads and Highways, Stantec

Signed  Date 1 March 2022


Senior Road Safety Engineer / Road Safety Leader, Stantec

Signed  Date 2 March 2022

Heather Liew, BEng(Hons), MET
Safety Engineer, Waka Kotahi



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 _____

Designer's name, qualification, position, company

4.2 Safety Engineer's Comment (if applicable)

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

Signed  Date _____

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 Road 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



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5 References

Google. (2019, December). Street View.
Google. (2021, May). Street View.
Google. (2021, February). Street View.

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