

SH58 Safety Improvements

Opus International Consultants

Concept Stage

Safety Audit Report

Date: 18 December 2013

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1. Background

1.1. Safety Audit Procedure

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, that is, minimisation 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 in order that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

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

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

- ☐ Concept Stage (part of Business Case);
- ☐ Scheme or Preliminary Design Stage (part of Pre-Implementation);
- ☐ Detailed Design Stage (Pre-implementation / Implementation); and
- ☐ Pre-Opening / Post-Construction Stage (Implementation / Post-Implementation).

A road safety audit is not intended as a technical or financial audit and does not substitute for a design check on 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 shall 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 to be completed by the designer, safety engineer and client for each issue documenting the designer response, client 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 Safety Audit Team

The road safety audit was carried out in accordance with the "NZTA Road Safety Audit Procedure for Projects Guidelines - Interim release May 2013", by:

- Mark Edwards, Lead Auditor, Opus International Consultants
- Adam Nicholls, Auditor, Opus International Consultants
- Ken Holst, Auditor, New Zealand Transport Agency
- Katie Levin, Observer, Opus International Consultants

The Safety Audit Team (SAT) met at the Opus office in Wellington to review the drawings and discuss the background of the project on 3 December 2013. The client, Wen Wang of the Transport Agency confirmed the scope of the audit and the designer's representative, Jamie Povall of MWH, briefed the safety audit team on the project. Designer Barbara Browne of MWH also attended the briefing meeting. A site inspection was subsequently undertaken on the same date from approximately 10:00AM to 2:00PM.

An exit meeting was held on 4 December 2013 to identify some of the main observations made during the site visit. Those included in the exit meeting were:

- Barbara Browne, MWH
- Mark Edwards, Opus
- Katie Levin, Opus
- Adam Nicholls, Opus
- Jamie Povall, MWH
- William Wallace, Opus (responsible for economic Peer Review)
- Wen Wang, the Transport Agency

1.3. 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 below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

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

Table 1: Concern Assessment Rating Matrix

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 2 below.

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.

Table 2: Concern Categories

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.

1.4. Scope of Audit

This audit is a Concept Stage Safety Audit of the SH58 drawings produced by MWH on behalf of the Transport Agency.

No previous Road Safety Audits have been carried out on earlier stages of the project.

1.5. Documents Provided

The SAT has been provided with the following documents for this audit:

- State Highway 58 Safety Improvements Scheme Assessment Report, MWH (November 2013)

- SH58 Haywards Curves Concept Plan – Option 4 drawings, Revision A
 - 80501811-01-004-C001
 - 80501811-01-004-C004
 - 80501811-01-004-C021
 - 80501811-01-004-C022
 - 80501811-01-004-C023
 - 80501811-01-004-C024
 - 80501811-01-004-C025
 - 80501811-01-004-C026
 - 80501811-01-004-C027
- SH58 Haywards Curves Land Requirement Plan – Option 4 drawings, Revision A
 - 80501811-01-004-C601
 - 80501811-01-004-C602
 - 80501811-01-004-C603
 - 80501811-01-004-C604
 - 80501811-01-004-C605
 - 80501811-01-004-C606
 - 80501811-01-004-C607
 - 80501811-01-004-C610

1.6. 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 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.

1.7. Project Description

The scope of the project is to improve the safety of SH58 and extends from Stn. 340 in the east (north of McDougall Grove) to Stn. 9260 in the west (south of Bradey Road). The recommended option, Option 4 in the Scheme Assessment Report, includes general provision of a minimum cross section that includes 1.5m shoulders, 3.5m lanes and a 2.0m flush median with a wire rope median barrier. In addition to the changes to the cross section, the realignment of three sections of the roadway have also been recommended as well as a new roundabout at the intersection of SH58 with Moonshine Road.

2. Safety Audit Findings

2.1. General Issues

Many of the issues identified were common to all or several parts of the project area. For this reason, general issues will be discussed in this section. The issues identified may be repeated in Section 2.2 where the specific locations of note will be discussed.

2.1.1. Speed Limit and Design Speed

Serious

The speed limit on SH58 is currently 100km/hr and the SAT has been instructed to consider this to be the posted speed for the project. The plans provided indicate that all but one of the curves have a design speed of 90km/hr or less, with one curve having a design speed of 102km/hr. The lowest design speed is 74km/hr and the most common is 87km/hr. There is concern that despite the safety improvements and realignment of some of the out of context curves, the general geometry of the road would not be able to be negotiated safely at 100km/hr. The new sections of realignment and improved cross sections may provide a sense to drivers that the geometry is improved to a standard that is consistent with the posted 100km/hr speed limit. This is of particular concern due to the higher than average number of run off road crashes.

Recommendation:

Based on the issues discussed in the remainder of this document, the site visit and the design speeds of most of the curves, the SAT would recommend a posted speed limit of 80km/hr for all or most of SH58 within the project area.

Frequency Rating: <i>Crashes are likely to be</i> Frequent	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: The scope of the design commission was to consider improvements to the cross section, with realignment at only three sites, to make the speed environment more consistent. Accordingly the client is best placed to respond to this.	
Safety Engineer:	Agree with auditor's comments
Client Decision: <i>be set at 80km/hr</i>	<i>Agree with auditor comments. The speed within the project site shall</i>
Action Taken: <i>permanently</i>	<i>NZTA to reduce speed limit within project site to 80km/hr</i>

2.1.2. U-turn Manoeuvres

Moderate

The provision of a wire rope barrier along most of the length of SH58, and the associated restricted movements, means that more U-turns will need to be performed for people and goods to reach their desired destinations. The additional distance added to some of the private residences in particular are upwards of 2 kilometres in one direction. A total of 4.5 kilometres would be added to one journey for some residents looking to head south on SH58. The subsequent return trip would also require an additional 1.7 kilometres of travel. The additional distances (and time) may cause drivers to make

unsafe manoeuvres in order to take short cuts or accept smaller gaps out of impatience and frustration. In addition, there are several businesses using large trucks on SH58, particularly at the west end of the project. The additional time and distance required to travel to a safe U-turn area (such as the Moonshine Road roundabout) may be foregone for a less safe intersection that is closer. Table 6-1 in the SAR identifies intersection access arrangements and right turn alternatives, i.e. U-turn locations. This does not list private accesses or calculate the likely additional distances travelled as part of these trips.

Emergency services also require adequate access in order to respond to calls in a timely manner. Fire trucks generally have the tools to take down the wire rope barrier quickly and often arrive on site first; however, in the event ambulances and police arrive first or fire services do not attend, they may not be as adequately equipped.

The provision of a wire rope barrier along most of the length of SH58, and the associated restricted movements, also means that accessing businesses along the route will be more challenging. This will be particularly problematic for visitors to the area. The lack of knowledge of the appropriate route to take may result in irregular driving behaviour.

Recommendation:

Consider safety of U-turn locations as well as the distance between them. Consider setting an acceptable detour distance for private accesses and aiming to provide U-turn locations within those parameters. Consult with emergency services to determine other issues they may have.

There are several businesses that would benefit from signage on how to reach their location. This is particularly important for the golf course on SH58 that will require travel to the roundabout at Moonshine Road and U-turns at Mulhern Road in order to enter/exit and may be frequented by non-locals.

Frequency Rating: <i>Crashes are likely to be</i> Common	Severity Rating: <i>Death or serious injury is</i> Unlikely
<p>Designer Response: Consultation with locals, business owners and emergency services has not been undertaken as yet so further consideration needs be given to access and u-turn facilities after consultation which can also take into account the safety audit teams concerns</p> <p>The design has attempted to balance access and safety in determining the concept locations for median breaks and u-turn facilities. Due to the geometry and topography of the area, u-turn facilities cannot be provided in many locations, particularly for heavy vehicles..</p>	
Safety Engineer: <i>Agree with designers response</i>	
Client Decision: <i>Agree with most recommendations, further details to be finalised after consultation.</i>	
Action Taken: <i>To consult with residents, businesses and emergency services in project area on suitable turn-around facilities and locations.</i>	

2.1.3. Drainage Paths

Significant

Along some lengths of SH58 there are some significant grades, a generally hilly topography, large superelevations and no median drainage. It is considered that this could result in a risk of long drainage paths and/or high drainage depths. Due to the high proportion of crashes that have occurred during wet

or icy conditions on SH58 (identified as 53% in the SAR provided), this aspect of the design requires sufficient consideration. The SAT did not have sufficient information to assess the paths in more detail.

Recommendation:

Ensure drainage depths and paths are appropriate. The design team commented during the exit meeting that limits on drainage lengths were considered during design. This needs to be considered in more detail now as detailed design solutions may be difficult given the nature of the route.

Frequency Rating: <i>Crashes are likely to be</i> Common	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: Our design philosophy statement noted that this is an issue due to the topography and stated that it will be considered during detailed design. The use of median drainage and porous pavement have been considered during the Scheme Design but not explicitly designed.	
Safety Engineer: <i>Ensure drainage paths are considered during detailed design to address safety concerns.</i>	
Client Decision: <i>Agree with safety engineer, ensure appropriate surfacing option is selected in addition to assist water draining process.</i>	
Action Taken: <i>Detailed considerations to be given at detailed design for drainage paths as well as surfacing options to minimize surface water depth.</i>	

2.1.4. Underpasses/culverts/etc.

Minor

Throughout the project area there are several features that pass underneath the road including the stock underpass at Stn. 3800, the pedestrian underpass to service the golf course at Stn. 6900 and several culverts as identified in Table 3.1 of the SAR. Run-off road crashes at these locations have the potential of increased severity due to these man-made features. Therefore, adequate protection needs to be provided.

Recommendation:

Ensure guardrails are provided and/or extended to adequately protect the under road features.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Unlikely
Designer Response: Agreed. This will be further considered in the next stage of design.	
Safety Engineer: <i>Agree with auditor's response</i>	
Client Decision: <i>Agree with auditor's reponse.</i>	
Action Taken: <i>To provide guardrails in appropriate locations. To be determined during detailed design.</i>	

2.1.5. Protection of Street Furniture

Significant

There are various sections of road with significant amounts of street furniture. Some examples are:

- Power poles from Stn. 4420 to Stn. 4840 (discussed in Section 2.2.16); and
- Power poles and large trees from Stn. 6960 to Stn. 7260 (discussed in Section 2.2.22).

The power poles seen during the site visit did not appear to be frangible. These items pose added risk to vehicles that exit the roadway.

Recommendation:

Removal, relocation or protection of street furniture should be considered to reduce severity of run off road collisions and deliver a safer road.

Frequency Rating: <i>Crashes are likely to be</i> Common	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: Power services are proposed for undergrounding. Further consideration of trees will be given at the detailed design phase.	
Safety Engineer: <i>Agree with auditor response.</i>	
Client Decision: <i>Agree with auditor response.</i>	
Action Taken: <i>Consider most effective solution at detail design.</i>	

2.1.6. Rationalise Guardrails

Comment

Despite the safety of guardrail terminal ends when installed properly, these increase risk exposure to motorists compared to a guardrail itself. Therefore, short spaces between guardrails should be avoided unless necessary to provide access.

Recommendation:

Due to the increased risk exposure posed by a guardrail termination end, and the added expense, the rationalisation of the guardrails should be completed to minimise small unnecessary gaps.

2.1.7. Lighting

Moderate

The SAT observed during the site visit that the lighting at the various intersections was inconsistent and intermittent. No lighting has been annotated on the plans provided nor does the cost estimate in the

SAR provide a line item for lighting therefore the SAT cannot assess this in detail. This is likely not within the scope at this stage of the project.

Recommendation:

Apply a consistent lighting standard over the length of the project while ensuring sufficient lighting provided at intersections. Review lighting in detail in future project phases and the associated Road Safety Audits.

Frequency Rating: <i>Crashes are likely to be</i> Infrequent	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: Lighting is out of the scope of our current commission. Client to provide comment.	
Safety Engineer: Consider opportunities to improve lighting during detailed design.	
Client Decision: Agree with safety engineer.	
Action Taken: To be considered during detail design.	

2.2. Issues at Specific Locations

2.2.1. Curve No. 4 (near Stn. 700)

Moderate

This horizontal curve occurs at the beginning of the project area where the median is 1.5m. The curve radius is 180m. There is wire rope barrier (WRB) from Stn. 450 to Stn. 880 which runs through the length of the curve. The tight horizontal curve (design speed indicated is 74km/hr) and narrow median with WRB reduces sightlines and poses a risk to motorists.

Recommendation:

Provide adequate signage indicating reduced advisory speed. Provide additional median width where practicable.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: Agreed that additional signage should be considered. Actual median width through this section was reduced form 2.0m to 1.5m in revised project scope to reduce significant earthwork volumes. For eastbound traffic, it is noted that additional effective median width is provided through this section as a result of the widening for the development of the right turn bay to Hugh Duncan Street. For westbound traffic there is limited SSD at present due to the road curvature and whilst it is possible the wire rope barrier could obstruct forward visibility additional shoulder width will be provided. Providing additional median width is likely to prove prohibitive due to cost but can be reassessed at detailed design stage.	
Safety Engineer: Agree with designer response.	
Client Decision: Agree with designer response.	
Action Taken: To investigate options at detail design stage to reduce limited SSD	

risk.

2.2.2. Hugh Duncan Street Intersection

Serious

The intersection with SH58 and Hugh Duncan Street is located on a grade that limits sight distance to the north for both right turns in and right turns out. The sight distance appeared to be less than 100m to the crest of the hill when looking right from the stop line at Hugh Duncan Street (Austroads specifies the Safe Intersection Sight Distance (SISD) for 100km/hr is approximately 250m). The addition of the WRB may reduce the sightlines for traffic turning right into Hugh Duncan Street from SH58. While the current traffic volumes are low on Hugh Duncan Street, the limited right turn options due to the WRB will likely increase use of this intersection for U-turns. Transpower currently operates their gates as left in / left out, and drivers are directed to turn around using the McDougall Grove area. However, other traffic and non-Transpower employees may use Hugh Duncan Street instead of driving the additional distance to McDougall Grove.

Recommendation:

Reconsider U-turn locations and restricted accesses in the subsequent design stages of the project.

Frequency Rating:

Crashes are likely to be **Common**

Severity Rating:

Death or serious injury is **Very likely**

Designer Response: It is accepted that the existing situation of limited SISD at Hugh Duncan Street / SH58 is below the desirable Austroads standards. However it is also noted that there have been zero intersection related crashes at this location during the 5 year assessment period. The provision of wire rope barrier of SH58 north of the Hugh Duncan intersection will however be reduced by 60m to ensure no obstruction of visibility can eventuate for right turning traffic into Hugh Duncan Street. Right turns out from Hugh Duncan Street will be improved with the proposed length reduction of the existing eastbound passing lane on SH58 at this point which removes the need for vehicles to turn out of Hugh Duncan into a passing lane. A new merge area will also be provided (as per MOTSAM requirements) for the right turn out of Hugh Duncan (with lane line continuation). Additionally, as per 2.1.2, further consideration of access and u-turns needs to be carried out after consultation.

Safety Engineer: *Consider left in left out at consultation stage.*

Client Decision: *Agree with safety engineer*

Action Taken: *To consider the most appropriate safety design at detail design stage, post initial consultation.*

2.2.3. Access Road Entrance (Stn. 1230)

Minor

The angle of the access road to the water tower on the west side of SH58 is highly in favour of traffic turning left into the access. However, vehicles exiting the access road are facing oncoming traffic when travelling down to the road entrance.

Recommendation:

Square the entrance to the highway to reduce possibility of entering into wrong way traffic and providing better sightlines for exiting vehicles.

Frequency Rating: <i>Crashes are likely to be</i> Infrequent	Severity Rating: <i>Death or serious injury is</i> Unlikely
Designer Response: <i>Agreed. This will be considered in the next phase of design.</i>	
Safety Engineer: <i>Agree with designer</i>	
Client Decision: <i>Agree with designer</i>	
Action Taken: <i>To be considered at detail design.</i>	

2.2.4. Kaitawa Street / Transpower Accesses (Gates A, B and C) / Old Haywards Road

Significant

Kaitawa Street has good sight distances however it is restricted to a left in / left out access. Some vehicles will use Hugh Duncan Street to perform U-turns. Transpower currently has three accesses to SH58 within approximately 300m of one another. Gate C is located at Kaitawa Street, Gate A is adjacent to Old Haywards Road and Gate B is between the two. Transpower is currently undergoing investigations into the access arrangement at this location.

The plans indicate that the new intersection at Old Haywards Road and SH58 will connect the current Old Haywards Road to SH58 with a more square intersection and the Transpower access will be located within the intersection. This provides a large paved area that has little control and could be used for U-turn movements. There is also a large level difference between SH58 and Old Haywards Road currently. Good sightlines are observed at this location however the proposed intersection layout restricts prevent right turns out from Old Haywards Road to SH58. There is currently a passing lane on SH58 at this location which supports the movement restriction.

Recommendation:

This new project may provide an opportunity to restructure the accesses to reduce conflict points on the highway. It is recommended that the U-turn locations and restricted accesses in the design be reviewed with the safety implications in mind. There may be an opportunity to consult with Transpower on this issue.

At the Old Haywards Road intersection, reduce the amount of pavement that could be used by U-turn vehicles unsafely to only what is required. Provide defined traffic control for Transpower access to the intersection. Consider U-turn locations and restricted accesses in design of this intersection. Sightlines at the intersection seem to be better than other locations for right turns out. However, this would require altering the design of the passing lane and ensuring that the vegetation on the east side of SH58 was cut back appropriately to maintain sight distances.

Frequency Rating: <i>Crashes are likely to be</i> Common	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: <i>As per 2.1.2, further consideration of access and u-turns needs to be</i>	

carried out after consultation.

It is also noted that Hugh Duncan Street is a cul-de-sac with a reasonable daily traffic flow and therefore providing for direct access is considered important to negate unnecessary U-turns (and associated conflict) on the network. Breaking the wire rope barrier at Kaitawa Street would necessitate a further reduction of the existing passing lane length prior to the significant uphill gradient for eastbound vehicles which is not considered feasible.

The final detail of the pavement provision / road markings of Old Haywards Road can be further refined at detailed design stage.

Safety Engineer: *Consider access point safety in more detail after feedback at initial consultation.*

Client Decision: *Agree with safety engineer.*

Action Taken: *Consider further during/ after consultation and implement the most appropriate solution at detail design.*

2.2.5. Old Haywards Road

Moderate

There are raised services present on the west side of SH58 across from the proposed Old Haywards Road intersection. This location is on the outside of a horizontal curve but there is no proposed barrier protection.

Recommendation:

Relocate or protect services using appropriate barrier system.

Frequency Rating: <i>Crashes are likely to be</i> Infrequent	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: <i>Agreed. This will be considered in the next phase of design.</i>	
Safety Engineer: <i>Agree with auditor.</i>	
Client Decision: <i>Agree with auditor.</i>	
Action Taken: <i>To be considered at detail design.</i>	

2.2.6. Curve No. 10 (near Stn. 1940)

Moderate

It is noted on Drawing No. C022 that Curve No. 10 has a tight horizontal radius (185m) and design speed of 78km/hr, a superelevation of 7% and is on a steep grade (~8%). Generally curves with one limiting factor are deemed acceptable; however, this curve has three limiting factors which is

considered an issue, especially as a combination of these limiting factors would all potentially contribute to loss of control and run off road crashes, which are over represented on this route.

Recommendation:

Redesign curve or provide advisory speed signs with reduced speed.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: This is outside the scope of our current commission but we agree that this curve should be considered for realignment.	
Safety Engineer: <i>Provide advisory signs as a minimum.</i>	
Client Decision: <i>Agree with safety engineer.</i>	
Action Taken: <i>To install advisory signs as a minimum during construction.</i>	

2.2.7. End of Passing Lane (Stn. 2280)

Comment

Where the northbound passing lane ends near Stn. 2280, shoulder markings have not been indicated on the plans.

Recommendation:

Ensure provision of appropriate pavement markings to signify the end of the passing lane at this location.

2.2.8. Private Access (2 Mount Cecil Road)

Comment

The plans show that an access to SH58 south of Mount Cecil Road has been closed and guardrail placed at this location. The property has an additional access via Mount Cecil Road and thus the SAT supports the access closure. However, the guardrail seems to extend further than necessary on the inside of the curve.

Recommendation:

Consider reducing the length of the guardrail to no longer than where it sufficiently blocks the access.

2.2.9. Mount Cecil Road

Comment

The intersection with Mount Cecil Road and SH58 occurs at the end of realignment section 3 and thus current sightlines from the intersection may not represent those that will occur once the project is complete. However, while on site it was observed that the vegetation on the east side of SH58, particularly to the north of the intersection, could be impeding sightlines at the intersection. The SAT

had concerns regarding the termination of the WRB at Stn. 2850; however, during the site visit it was seen that the WRB was terminated at this point to provide adequate sight distance and thus the SAT supports this design. The give way line at the intersection is not square and if implemented as drawn would reduce sightlines to the north.

Recommendation:

Ensure adequate sightlines at intersection. Cut back vegetation if necessary. Square give way line at intersection.

2.2.10. Curve No. 14 (near Stn. 2960)

Comment

There is guardrail suggested on the outside of Curve No. 14 from Stn. 2830 to Stn. 2990, approximately, with a 20 metre gap where a current cut bank exists.

Recommendation:

It may be appropriate to provide the additional length of guardrail instead of having four terminating points over this short span of guardrail. The additional guardrail is considered safer than the additional end points as well.

2.2.11. Proposed Winstones Cleanfill Access

Comment

The arrangement proposed at the Winstones Cleanfill Access is for empty trucks exiting the site to the south, i.e. turning right out of the site, to cross over the active traffic lane and accelerate up the hill using a wide shoulder. This shoulder extends past Mount Cecil Road providing additional space should the trucks be unable to merge back into the traffic lane in the allotted distance. The SAT supports this design with the caveat that care be taken to ensure the acceleration lane not be misjudged as a passing lane and that sufficient space be obtained to provide the lane as designed as the design exceeds the current designation.

Recommendation:

The current plans show triangle of paint, presumably to show drivers where to go but prevent mainstream traffic from using the lane. It is recommended that instead of as shown on plans, a wide edgeline of 200mm be used to prevent traffic from using the lane as a passing lane. Truck drivers will be able to be briefed on the appropriate procedures when leaving the site. Also, ensure the designation is achieved to provide the width of the shoulder lane as drawn.

2.2.12. Curve No. 18 (near Stn. 4280)

Significant

There is currently no guardrail proposed on the outside of Curve No. 18 (east side of SH58) despite the hazards present (several non-frangible power poles and a drop-off). There is currently guardrail proposed on the inside of Curve No. 18 (west side of SH58) from Stn. 4040 to Stn. 4170. The SAT observed several hazards on this side of the road during the site visit including a drop-off and some large trees close to the road beyond the protection of the guardrail.

Recommendation:

Extend the guardrail from Curve No. 17 (Stn. 4040) through Curve No, 18 to Stn. 4380 on the east side of SH58. Extend the guardrail from Stn. 4170 through Curve No, 18 to Stn. 4220 on the west side of SH58.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Very likely
Designer Response:	Agreed. This will be considered in the next phase of design.
Safety Engineer:	Agree with designer.
Client Decision:	Agree with designer.
Action Taken:	To be considered during detailed design.

2.2.13. Stn. 4420 to Stn. 4840

Moderate

There is currently no guardrail proposed on the east side of SH58 for this stretch of road (between the existing accesses that are to be retained) despite the power poles present and this being the end of a passing lane.

Recommendation:

Provide guardrail from Stn. 4540 to Stn. 4700 on the east side of SH58. There are a number of power poles outside this length from Stn. 4220 through to Stn. 4850 that should be removed or protected.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response:	Agreed. This will be considered in the next phase of design in conjunction with the undergrounding of the power services.
Safety Engineer:	Agree with auditor.
Client Decision:	Agree with auditor.
Action Taken:	To be considered during detailed design.

2.2.14. Harris Road

Comment

The intersection with Harris Road has been suggested as the access point for the business located at the southwest corner of the intersection. This business appears to be a house moving company which requires a larger access point. The current Harris Road is significantly higher in elevation than the businesses premises, thus making the use of this access impractical.

Recommendation:

Ensure adequate provision is made for the business access noting in particular the need to transport large loads. This location may be considered as a full movement intersection due to the good sight lines from Harris Road, however, it is noted this would be in conflict with the end of the passing lane.

2.2.15. Stn. 4750 to Stn. 4960**Comment**

There is currently guardrail proposed on the west side of SH58 for this stretch of road (between Harris Road and an existing private access that is to be retained) despite this being a straight stretch of road adjacent to a cut slope.

Recommendation:

Consider removing guardrail if unnecessary.

2.2.16. Private Access (Stn. 6210)**Comment**

The roundabout proposed at Moonshine Road has proposed concrete medians at each leg. These medians restrict access to a private residence at Stn. 6210 (400A). Turning "right out" of the residence will be minimally impacted as the roundabout can be used to complete this movement easily in the new layout. However, turning "right-in" will require a significant detour to Harris Road, adding an additional distance of approximately 3 kilometres (total) to the trip. The SAT was concerned that instead of making this detour, unsafe manoeuvres may be attempted by drivers wishing to access the property, such as, driving the wrong way up the east approach leg, particularly during off peak periods.

Recommendation:

Consider shortening median or providing a route across the median to allow right turns into property.

2.2.17. Moonshine Road Roundabout**Serious**

Several issues and considerations were identified at the new roundabout at Moonshine Road. Those are:

- The roundabout appears to be off balance and the SAT question the need for the dedicated left lane into Moonshine Rd. This may be confused as an additional through lane as is provided on the other SH58 leg;
- Larger traffic volumes will be using the roundabout than are currently as this will become a facility for U-turns. This needs to be accommodated for in the circulatory width of the carriageway;
- No provision can be seen on the plans to accommodate the existing bus stop at this location, nor for pedestrian access or egress to the bus stop. This a significant concern, especially if the bus stop was rearranged to locations on both sides of SH58;
- The right lane turn only marking on the right lane of the east approach may be ignored by oncoming traffic as there are two exit lanes provided. This could create conflicts due to the expectations of other drivers using the roundabout;
- Several accesses occur within the current area that would occupy the roundabout; and
- Several services are located within the current area that would occupy the roundabout.

Recommendation:

The recommendations to consider in further design of the roundabout and for the current conceptual design are as follows:

- Remove the left turn lane on the west approach if unnecessary or provide two lanes through and to the east exit of the roundabout to ensure consistency;
- Ensure the roundabout is adequately designed for U-turns, particularly for large vehicles. Consideration may also be given to providing a two-lane roundabout with the hatching where two lanes are not required (i.e. at the head of the medians) to ensure adequate space;
- Provided facilities for pedestrians and buses. The design team commented during the exit meeting that provision of a bus stop was being considered on Moonshine Road;
- Allow right and through movement from the right lane of the east approach;
- Ensure adequate provision of access for properties within the existing intersection;
- Ensure services adequately protected and maintenance access provided; and
- Ensure adequate deflection to reduce speed of through movement from east to west.

Frequency Rating:

Crashes are likely to be **Frequent**

Severity Rating:

Death or serious injury is **Likely**

Designer Response: Accepted - two through lanes will be provided on the west approach and the eastern exit. Hatching will be provided at the head of the medians. The design and size of roundabout has been tracked to ensure adequacy for u turning for large vehicles and deflection.

The eastern approach will be amended to provide for through movements and right turns from the right lane.

Access provision for properties within the intersection will be provided for, following public consultation. Similarly, a bus stop facility on Moonshine Road is being considered to replace the current location on SH58 – this would negate the need for a bus stop either side of SH58 (as well as removing associated pedestrian crossing demand).

Safety Engineer: *Check that the roundabout operates efficiently and safely. Ie. Sidra model with the increase in u-turn traffic movement.*

Agree with other safety audit team comments.

Client Decision: *Agree with SAT. Access to the roundabout should be for SH traffic only and private accesses should be diverted to moonshine road.*

Relocation of bus stop to moonshine road is a good idea, to be considered further.

Agree with other Designer & auditor comments.

Action Taken: *Bus stop relocation to be reviewed and taking into account vehicle and pedestrian safety as well as turn around facility for bus if required.*

Detail design shall reflect on agreed designer, safety engineer and SAT comments.

2.2.18. Access to Golf Course (Stn. 6950)

Significant

The Judgeford Golf Course, unlike a private access, is a destination that will receive many trips per day. A significant portion of those trips will need to make U-turns on their way to or leaving the destination. This puts additional pressure on the closest intersections in either direction, Moonshine Road and Mulhern Road, and thus additional risk.

Recommendation:

While the roundabout at Moonshine Road should be able to handle these additional trips, the small intersection at Mulhern Road is less equipped. Consideration may be given to providing turn around bays at Mulhern Road.

Frequency Rating: <i>Crashes are likely to be</i> Common		Severity Rating: <i>Death or serious injury is</i> Likely	
Designer Response: <i>Agreed. Further consideration of access and u-turn facilities will be undertaken after consultation.</i>			
Safety Engineer: <i>Agree with auditor.</i>			
Client Decision: <i>Agree with auditor.</i>			
Action Taken: <i>Further consideration for turn-around facility to be made post consultation.</i>			

2.2.19. Stn. 6960 to Stn. 7260

Minor

This stretch of road is has trees and power poles on both sides adjacent to the road. Plans have not indicated whether these trees will be removed thus they pose a hazard to vehicles.

Recommendation:

If the trees are to be removed, then only the power poles require protection. However, consideration of the bordering golf course and associated stray golf balls would then need to be taken. If the trees are to remain, then guardrail protection should be provided.

Frequency Rating: <i>Crashes are likely to be</i> Occassional	Severity Rating: <i>Death or serious injury is</i> Unlikely
Designer Response: Agreed. Further consideration will be given to this in conjunction with undergrounding of the power services.	
Safety Engineer: <i>Agree with auditor.</i>	
Client Decision: <i>Agree with designer.</i>	
Action Taken: <i>Most appropriate solution to be agreed at detail design stage.</i>	

2.2.20. Flightys Road and Murphys Road

Significant

The east and west approaches to Flightys Road and Murphys Road have lengthy right turn bays with the WRB terminating well in advance of the intersection. This is inconsistent with the rest of the project design. In addition, this intersection is the closest turn around opportunity for the businesses to the west that will require areas for their trucks to make U-turns. If they don't make the turn at this intersection they have to travel an additional 4 to 5 kilometres to use the Moonshine Road roundabout as a turnaround point putting additional pressure on this intersection.

Recommendation:

Design WRB and right turn bays to be more consistent with the rest of the project. Ensure adequate space available for U-turning trucks or provide other facilities. The possibility of relocating the intersection of Flightys Road and Murphys Road further east on SH58 is a project that is being considered outside of this commission. The SAT would support that general idea as it would improve sightlines and could be designed effectively for truck movements.

Frequency Rating: <i>Crashes are likely to be</i> Common	Severity Rating: <i>Death or serious injury is</i> Likely
Designer Response: In general, movement of this intersection is supported, but we have not seen the latest iteration of this proposal and it was not considered within the scope of this project.	
Safety Engineer: Consider at consultation stage.	
Client Decision: Consider appropriate turn around option after consultation.	
Action Taken: Consider appropriate turn around option after consultation.	

2.2.21. Accesses (Stn. 8740 and Stn. 8880)

Comment

There are seemingly two accesses to the Rural Service Centre from SH58, one at Stn. 8740 and one at Stn. 8880. Stn. 8880 also provides access to a private residence.

Recommendation:

This new project may provide an opportunity to restructure the accesses to reduce conflict points on the highway.

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 problems identified have been noted in this report.

Signed: Mark Edwards
Mark Edwards
Lead Auditor, Opus International Consultants

Date: 18/12/2013

Signed: Adam Nicholls
Adam Nicholls
Auditor, Opus International Consultants

Date: 18/12/2013

Signed: Ken Holst
Ken Holst
Auditor, New Zealand Transport Agency

Date: 18/12/2013

Designer: Name James W Position DESIGN TEAM LEADER.

Signature JAMIE POTU Date 24/2/14.

Safety Engineer: Name SC JAMES Position SENIOR SAFETY ENGINEER

Signature SC JAMES Date 21/2/14

Project Manager: Name Wen Wang Position Project Manager

Signature Wen Wang Date 24/02/14

Action Completed: Name _____ Position _____

Signature _____ Date _____

Project Manager to distribute audit report incorporating decision to designer, Safety Audit Team Leader, Safety Engineer and project file.

Date: _____