

**Mackays to Peka Peka (M2PP)  
Kāpiti Expressway  
SH1/OTAIHANGA ROAD  
ROUNDAABOUT  
POST CONSTRUCTION  
ROAD SAFETY AUDIT**

**A REPORT PREPARED FOR  
NZ TRANSPORT AGENCY**

**Reference: 10341  
July 2014**

Hawke's Bay office:  
PO Box 28 208, Havelock North 4157

Tel: (06) 877 8040  
Mob: 0274 978 031  
E-mail: [steve@trafficplanning.co.nz](mailto:steve@trafficplanning.co.nz)

## Project Information:

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<b>Prepared By</b>	Jos Vroegop (TPC), Steve Reddish (TPC), Jon England (MWH)
<b>Date</b>	July 2014

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**TABLE OF CONTENTS**

**1.0 INTRODUCTION..... 1**

- 1.1 Road safety audit definition and purpose ..... 1
- 1.2 The project.....2
- 1.3 Previous safety audits.....2
- 1.4 The safety audit team.....2
- 1.5 Report format.....3
- 1.6 Disclaimer .....4

**2.0 SAFETY AUDIT FINDINGS..... 5**

- 2.1 Moderate Concern – Extent of guardrail on southbound approach ..... 5
- 2.2 Minor Concern – Delineation of the southbound approach curve ..... 7
- 2.3 Minor Concern – Warning signage on northbound approach ..... 7
- 2.4 Minor Concern – Carriageway condition on northbound approach..... 9
- 2.5 Moderate Concern – Hazardous fence/barrier posts ..... 10
- 2.6 Moderate Concern – Markings and signage for cyclists ..... 11
- 2.7 Moderate Concern – Holding rails at cyclist crossing points ..... 14
- 2.8 Moderate Concern – Southbound cycle exit onto shoulder ..... 15
- 2.9 Minor Concern – Signage issues..... 17
- 2.10 Comment – Turbo markings ..... 19
- 2.11 Comment – CCTV maintenance.....20

**3.0 AUDIT STATEMENT ..... 21**

## 1.0 INTRODUCTION

### 1.1 Road safety audit definition and purpose

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 safety 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.

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 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 the following project milestones:

- Concept stage
- Scheme or Preliminary design stage
- Detailed design stage, and
- Pre-opening / Post-construction stage.

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 to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of mitigating the road safety concerns identified should also be considered.

In accordance with the procedures set down in the revised NZ Transport Agency Guideline "Road Safety Audit Procedures for Projects" (interim release May 2013), this is a report to the client who then refers the report to the designer. The designer should consider the report and comment to the client on each of the concerns

identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the safety 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 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 feedback loop. The road safety audit team leader will disseminate this to team members.

## **1.2 The project**

The project for which this is the road safety audit is the recently constructed roundabout at the intersection of SH1 and Otaihanga Road, located between Paraparaumu and Waikanae, Kāpiti.

## **1.3 Previous safety audits**

Preliminary design and detailed design stage safety audits were undertaken by the current safety audit team in August 2012 and May 2013. The findings were noted in two separate reports dated 24 August 2012 and 10 May 2013 respectively. Two earlier road safety reviews of the roundabout proposal were also carried out by the current safety audit team in January and March 2012.

## **1.4 The safety audit team**

The road safety audit was carried out, as far as practicable, in accordance with the NZTA Guideline "Road Safety Audit Procedures for Projects" (November 2004) by:

- Jos Vroegop, Senior Consultant, Traffic Planning Consultants Ltd, Auckland
- Steve Reddish, Senior Associate, Traffic Planning Consultants Ltd, Hawke's Bay
- Jon England, Senior Road Safety Engineer, MWH New Zealand Ltd, Wellington

The SAT attended a briefing meeting at the offices of the M2PP Alliance, Paraparaumu, on Monday 21 July 2014 and carried out both daytime and night time site inspections the same day. A debrief meeting was held on Wednesday 23 July 2014 to advise the designers of the preliminary findings of the safety audit team.

## 1.5 Report format

The potential road safety problems identified have been ranked as follows. The expected probability of a crash occurring (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 (the likelihood of a fatality or serious injury) is qualitatively assessed on the basis of factors such as expected speeds, type of collision, type of vehicle, and road user 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 Assessment Matrix in Table 1 below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 1: Assessment Matrix

Likelihood of Fatality or Serious Injury	Probability of a Crash Occurring			
	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 category of concern is given in Table 2.

Table 2: Categories of Concern

CONCERN	Suggested Action
<b>Serious</b>	Serious concern that must be addressed and requires changes to avoid serious safety consequences.
<b>Significant</b>	Significant concern that should be addressed and requires changes to avoid serious safety consequences.
<b>Moderate</b>	Moderate concern that should be addressed to improve safety.
<b>Minor</b>	Minor concern that should be addressed where practical to improve safety.

In addition to the ranked safety issues, it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication, but which lie outside the scope of the safety audit. Therefore 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 directly 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 safety auditors.

All potential concerns, comments and recommendations set out in this safety audit report should be noted and acted upon if appropriate.

## 1.6 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant documents, the specified road and environs, and the opinions of the 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. Road safety audits do not constitute a design review or an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific 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 strictly on the basis that anyone relying on it does so at their own risk without any liability to the safety auditors or their organisations.

## 2.0 SAFETY AUDIT FINDINGS

### Preamble:

Overall, the safety audit team (SAT) considers that the roundabout is appropriately designed and constructed for the location and provides a significantly safer intersection environment than the previous priority controlled T-intersection layout.

The SAT is aware that two trucks have overturned on the roundabout, one northbound and one southbound, and that two motorists have turned right onto the roundabout against the circulation, again one northbound and one southbound. At least one of the right turns onto the circulating carriageway was from the left hand approach lane. Despite these incidents, the SAT is of the view that there is no fundamental flaw in the roundabout design.

### 2.1 Moderate Concern – Extent of guardrail on southbound approach

Probability of Crash Occurring – Infrequent

Likelihood of Serious/Fatal Injury – Likely

**Outcome – Moderate**

On the east side of the southbound approach guardrail has been installed that only partially protects a culvert headwall and substantive double concrete power pole (see **Photo 1**). Any loss of control on the approach curve and over-correcting can lead to a vehicle leaving the carriageway on the inside of the curve.



**Photo 1 – Lack of protection for headwall and power pole**

**NB** Extending the guardrail northwards could also provide protection for the next concrete power pole to the north located on the inside of the southbound approach curve after the start of the solid median (see **Photo 2**).





**Photo 2 – Concrete power pole on the inside of the southbound approach curve**

**Recommendation:**

*Extend the guardrail on the east side of the SH1 southbound approach northwards to protect the exposed headwall and power poles.*

<b>Designer Response:</b>	<p>There is a 150mm AC water main in close proximity to the barrier that restricts extending the barrier further north.</p> <p>The measures to mitigate the hazards shall consist of the following:</p> <ul style="list-style-type: none"> <li>• Replace the headwall with a traversable headwall.</li> <li>• Create an earth bund around the power pole shown in Photo 1 to avoid filling in swale.</li> <li>• Locally fill around the base of the power pole shown in Photo 2.</li> </ul>
<b>Safety Engineer:</b>	Agree with Designers solution to the issues identified by the SAT
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with Designers solution.
<b>Action Taken:</b>	<p>Measures to mitigate the hazards have been implemented as follows;</p> <ul style="list-style-type: none"> <li>• Headwall replaced with a traversable headwall.</li> <li>• An earth bund around the power pole shown in Photo 1 has been created to avoid filling in swale.</li> <li>• Locally filled around the base of the power pole shown in Photo 2.</li> </ul>
<b>STATUS</b>	CLOSED

## 2.2 Minor Concern – Delineation of the southbound approach curve

Probability of Crash Occurring – Occasional  
Likelihood of Serious/Fatal Injury – Unlikely

**Outcome – Minor**

In the safety audit of the detailed design, the SAT when discussing the benefits of a median wire rope barrier on the curved southbound approach, noted:

Installation of wire rope barrier would also improve delineation of the southbound approach curve; especially at night given that reflectors are normally applied to the top of the wire rope supports.

Whilst street lighting has been installed along the outside of the curve highlighting the northbound carriageway in particular, the SAT noted that there are no reflectors on the wire rope barrier posts and delineation of the curve southbound could be improved if reflectors were installed.

**Recommendation:**

*Install reflectors on the wire rope median barrier posts.*

<b>Designer Response:</b>	The Alliance agree with the SAT recommendation.  The constructor is to install reflectors on the wire rope median barrier posts at every 10m +/-2m spacing.
<b>Safety Engineer:</b>	Agree
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with Designers solution.
<b>Action Taken:</b>	The constructor has installed reflectors on the wire rope median barrier posts at 10m spacing +/-2m spacing.
<b>STATUS</b>	CLOSED

## 2.3 Minor Concern – Warning signage on northbound approach

Probability of Crash Occurring – Infrequent  
Likelihood of Serious/Fatal Injury – Unlikely

**Outcome – Minor**

Northbound, there is no permanent advance warning of the roundabout until drivers have negotiated a left hand curve some 250m prior to the roundabout, the ADS sign also being located around the curve. Whilst there is good visibility of the roundabout and adequate stopping distance after negotiating the curve, the SAT considers that some advance warning signage of the roundabout prior to the curve is desirable to replace the temporary VMS sign advising “new road layout” (see **Photo 3**).



**Photo 3 – Curve on northbound approach prior to roundabout**

**Recommendations:**

- a. Install gated PW-8 roundabout warning signs with supplementary 300m signs prior to the left hand curve on the northbound approach.
- b. In the meantime change the message on the temporary VMS signs to “new r’bout ahead” (or similar) to more positively identify the change.

<p><b>Designer Response:</b></p>	<p>The ADS sign was designed to be installed prior to the left hand curve. However, when it came to be installed it was found the verge was not wide enough in this location. A decision was made to install this sign after the left hand curve.</p> <ol style="list-style-type: none"> <li>a. The Alliance agree with the SAT recommendation to install a gated PW-8 roundabout warning signs with a supplementary plate 300m prior to the left hand curve.</li> <li>b. The VMS sign message was updated to suit SAT recommendation, for the period it remains in place as agreed with the NZTA.</li> </ol>
<p><b>Safety Engineer:</b></p>	<p>Installing additional warning signs prior to the curve is unlikely to increase awareness of the roundabout due to the large distance to the roundabout and drivers ability to remember the information on advanced warning signs.</p> <p>Speed surveys undertaken, but not available to the SAT at the time the audit was undertaken, indicate that approach speeds are appropriate for the design.</p> <p>Based on this additional PW-8 signs are not considered necessary.</p> <p>Agree with change to VMS sign text.</p>
<p><b>Client Decision:</b></p>	<p>Further to the advice of the Safety Engineer confirm agreement with Designers solution. Note that the VMS on the northbound approach to</p>

	the roundabout has already reassigned and is no longer located on this approach.
<b>Action Taken:</b>	<ul style="list-style-type: none"> <li>a. Based on the Safety Engineer's response a gated PW-8 sign will not be installed as they are not considered to offer an operation or safety benefit.</li> <li>b. As stated by the Client the northbound approach VMS has been reassigned. The southbound VMS remains with a new message stating "New Road Layout Ahead". Removal of the VMS on the southbound approach shall be carried out in consultation with the NZTA.</li> </ul>
<b>STATUS</b>	CLOSED

## 2.4 Minor Concern – Carriageway condition on northbound approach

Probability of Crash Occurring – Infrequent  
Likelihood of Serious/Fatal Injury – Unlikely  
**Outcome – Minor**

There is a short section of SH1 carriageway on the northbound approach that is in poor condition and on which the road marking is equally poor (see **Photos 3 and 4**). This area is between the new seal for the roundabout approach and reseal of existing carriageway. In wet and/or dark conditions poor road surface and poor road markings can lead to some drivers failing to correctly stay within their traffic lane, especially as the poor surface is partly on a curve.



**Photo 4 – Poor condition of carriageway and markings**

### **Recommendation:**

*Reseal the short section of the SH1 northbound approach between the roundabout works and the reseal of the existing alignment.*

<b>Designer</b>	This section of SH1 was not part of the roundabout construction scope
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<b>Response:</b>	of works. The Alliance agree with the SAT recommendation and this information has been passed on to the NZTA for consideration.
<b>Safety Engineer:</b>	Agree the current surfacing could cause confusion for drivers in certain light conditions as well as in the wet and should be resurfaced. Our understanding is that this will be undertaken prior to Labour Weekend.
<b>Client Decision:</b>	Confirm that this work has already been instigated and will be undertaken by the Transport Agency Network Outcomes Contractor before 27 Oct 2014 (Labour weekend)
<b>Action Taken:</b>	The proposed surfacing work is scheduled to be undertaken by NZTA network maintenance contractor before 27 Oct 2014 (Labour weekend).
<b>STATUS</b>	CLOSED

## 2.5 Moderate Concern – Hazardous fence/barrier posts

Probability of Crash Occurring – Infrequent

Likelihood of Serious/Fatal Injury – Likely

**Outcome – Moderate**

1. Adjacent to the exit to the access road on the east side of the roundabout is a low wooden fence/barrier with substantial posts which are not frangible. Any vehicle, including a motorcycle, losing control on the circulating carriageway and hitting any of these posts is likely to result in injury for the occupant(s).
2. The above type of fence/barrier has also been constructed along the west side of the cycle path where the path exits the southbound approach (see **Photo 5**). Any vehicle losing control and going through the gap between the barriers will hit the fence/barrier posts. (**NB** It is noted that the fence/barrier is also a potential hazard for cyclists turning onto the path and at the curve in the path.)



**Photo 5 – Low fence/barrier at cycle exit from southbound approach**

**Recommendation:**

*Make the fence/barrier posts frangible where they may be hit by an errant vehicle (ie adjacent to the roundabout exit to the access road and adjacent to the cycle path exit from the southbound approach).*

<b>Designer Response</b>	The Alliance agree with the SAT recommendation.  The constructor is to drill a 40mm hole through the first six wooden posts on the 150mm edge to create a frangible post system in accordance with the orientation criteria in NZS 3845. The hole needs to be at ground level.
<b>Safety Engineer:</b>	Agree with Design team's solution.
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with Designers solution.
<b>Action Taken:</b>	The constructor has drilled 40mm holes through the first six wooden posts on the 150mm edge to create a frangible post system as noted above.
<b>STATUS</b>	CLOSED

## 2.6 Moderate Concern – Markings and signage for cyclists

Probability of Crash Occurring – Occasional

Likelihood of Serious/Fatal Injury – Likely

**Outcome – Moderate**

The SAT noted a number of issues with regard to the markings and signage for cyclists. The safety concern is that if it is not clear to cyclists where they are expected to go to safely negotiate the roundabout, they could be put at risk of a crash:

1. At the first southbound cycle exit there is a left turn arrow in the shoulder which theoretically requires all cyclists to turn onto the path at that point even though the shoulder continues (see **Photo 6**). There should be an ahead arrow as well or preferably remove the left turn arrow. It would also be helpful if there was a sign advising cyclists to continue ahead for Otaihanga Road.



**Photo 6 – First southbound cycle exit**

2. At the second southbound cycle exit where a left turn arrow in the shoulder theoretically requires cyclists to exit, the edge line does not terminate at the cyclist exit (see **Photo 7**). Also there is no sign advising cyclists to exit at this point for Otaihanga Road. Some cyclists proceeding south may wish to stay on the carriageway and take “ownership” of the adjacent traffic lane. The arrow does not convey this choice and the edge line marking directs them into the kerb. A similar situation occurs on the northbound approach.



**Photo 7 – Second southbound cycle exit**

3. The existing cycle direction signage does not provide for continuous and consistent directional advice for cyclists who are not familiar with the roading layout. Apart from the signage issues noted above, the SAT also noted that the sign on the cycle path located south of the exit to the access road is located too far from the decision point for a cyclist needing to either use the access road to head south or the cycle path to head to Otaihanga Road (see **Photo 8**).



**Photo 8 – Cyclist direction sign too far from decision point**

4. All of the cycle direction signs are mounted too high for cyclists to clearly see. Given the head position of cyclists and the peaks on many helmets, the signs have been mounted at a height that they are not readily seen when cyclists are in a position to be able to read the small lettering (see **Photo 9**).



**Photo 9 – Example of cyclist direction sign mounted too high**

**Recommendations:**

- a. Review the markings where the shoulders terminate at the cycle exits on the southbound and northbound approaches having regard to the concerns raised in items 1 and 2 above.
- b. Review the direction signage for cyclists to provide consistent and continuous directions at all decision points.
- c. Mount all cyclist direction signs at a height that can be readily seen by cyclists.



<b>Designer Response</b>	<ul style="list-style-type: none"> <li>a. The Alliance agree with the SAT recommendations. An ahead arrow will be painted along with the left turn arrow. A sign will be provided to inform cyclists to continue ahead to Otaihanga Road. The edge line will terminate immediately after the cyclist exit and the arrow will be removed. Instruction to be sent to site.</li> <li>b. The Alliance agree with the SAT recommendation that all cyclist direction signs will be moved to the decision points.</li> <li>c. The Alliance agree with the SAT recommendations that cyclist direction signs will be lowered so they are visible to cyclists.</li> </ul>
<b>Safety Engineer:</b>	<ul style="list-style-type: none"> <li>a. Agree with SAT</li> <li>b. Agree – Once the signs are moved it would be useful to test the signs by asking a cyclist unfamiliar with the route to cycle through and check that the directions make sense and are provided in sufficient time to be useful.</li> <li>c. Agree.</li> </ul>
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with Designers solution.
<b>Action Taken:</b>	<p>The constructor will be instructed to carrying out the following works:</p> <ul style="list-style-type: none"> <li>a. A straight through arrow will be painted along with the left turn arrow. A sign will be provided to inform cyclists to continue ahead to Otaihanga Road. The edge line will terminate immediately after the cyclist exit and the arrow will be removed.</li> <li>b. All cyclist direction signs to be moved to the decision points.</li> <li>c. Cyclist direction signs will be lowered.</li> </ul> <p>Confirmation that the above has been completed shall be forwarded to the designer to close out this item.</p>
<b>STATUS</b>	ACTIVE

## 2.7 Moderate Concern – Holding rails at cyclist crossing points

Probability of Crash Occurring – Infrequent

Likelihood of Serious/Fatal Injury – Likely

**Outcome – Moderate**

Short holding rails are located at each cyclist/pedestrian crossing point. However, these holding rails are generally impractical to use and could potentially be a safety hazard for cyclists. Their location is adjacent to where the kerb is not fully flush with the carriageway and as a result the front wheel of the cycle is likely to extend over the kerb when a cyclist is holding onto the rail (see **Photo 10**). It was also noted that the proximity of the holding rails to the kerb has already resulted in one of the holding rails being hit (see **Photo 11**). The above factors would put a cyclist using the holding rails at risk.



Photo 10 – Holding rail at kerb



Photo 11 – Damaged holding rail

**Recommendation:**

Remove the short holding rails at each crossing point and provide longer holding rails located more appropriately for ease of use by cyclists.

<b>Designer Response</b>	The Alliance agree with the SAT recommendation.  All short holding rails will be removed from site. The cycle/footpath sign posts will remain, but will be installed on a new post.
<b>Safety Engineer:</b>	Agree with SAT concern, Design team need to consider if there is room to accommodate longer hold rails at more appropriate locations.
<b>Client Decision:</b>	Agree with the Safety Engineer that the Design team should assess the practicality of installing hold rails at locations where they will be useful. Suggest that the Safety Engineer and client is consulted further when the assessment is complete.
<b>Action Taken:</b>	The short holding rails have been removed from site and the cycle/footpath sign posts installed on new posts.
<b>STATUS</b>	CLOSED

## 2.8 Moderate Concern – Southbound cycle exit onto shoulder

Probability of Crash Occurring – Infrequent

Likelihood of Serious/Fatal Injury – Likely

**Outcome – Moderate**

The shape of the cycle exit onto the SH1 southbound shoulder south of the roundabout (see **Photo 12**) would appear to force cyclists to make a wider turn onto the shoulder than the equivalent 45° exit onto the northbound shoulder north of the roundabout. It

is acknowledged that this exit was constructed with input from a cyclist organisation, but the safety concern is that a cyclist making a speedy turn onto the shoulder may swing wide and be in conflict with a vehicle exiting the roundabout close to the kerb line (see **Photo 13**).



**Photo 12 – Cycle exit southbound onto SH1**



**Photo 13 – Southbound exit from roundabout**

***Recommendation:***

*Amend the shape of the southbound cycle exit onto SH1 to ease the left turn onto the shoulder.*

<b>Designer Response</b>	The intension of the design radius is to slow the cyclists down so they can look to the right and safely merge with the State Highway 1 traffic.  It is not proposed to amend this exit where it is considered to operate safely.
<b>Safety Engineer:</b>	Agree with the SAT. The drop kerb should be extended to the south and additional concrete path provided to allow cyclists to move smoothly on the carriageway.
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with the SAT recommendations.
<b>Action Taken:</b>	In discussion with the client, it was agreed that the operation of the cycle lane exit would be monitored in the period up to Christmas. The Alliance will also consult with local cycle group representative(s) to determine the safest arrangement before issuing any instruction to alter the pavement and kerb arrangement.
<b>STATUS</b>	ACTIVE

## 2.9 Minor Concern – Signage issues

Probability of Crash Occurring – Infrequent  
Likelihood of Serious/Fatal Injury – Unlikely

**Outcome – Minor**

1. The SAT noted that the PW-43.3 sign mounted on the median facing southbound traffic on the SH1 southbound exit is mounted higher than the sign on the left hand side and is not so easily seen (see **Photo 14**).



**Photo 14 – Right hand side PW-43.3 mounted higher than left hand side**

2. All the roundabout Give Way signs have a supplementary “Give Way” wording which is not strictly needed. The concern that the SAT noted is that for the extra-large signs on the southbound approach, the supplementary “Give Way” wording

sign is below head height (see **Photo 15**). This could be a hazard for a pedestrian or a cyclist.



**Photo 15 – Low mounting of supplementary sign**

**Recommendation:**

*Address the signage issues noted above.*

<b>Designer Response</b>	<ol style="list-style-type: none"> <li>The Alliance agree with the SAT recommendations. The Constructor will mount the left hand side sign higher so it is at the correct mounting height in accordance with MOTSAM. The median sign will also be changed to the correct height.</li> <li>The Alliance agree with the SAT recommendation. The "Give Way" supplementary signs will be removed from these locations.</li> </ol>
<b>Safety Engineer:</b>	<ol style="list-style-type: none"> <li>As the sign on the right is likely to be hit by trucks if it is lowered, leaving the sign at its current height would be acceptable. Increasing the height of the sign on the left would make it less visible and therefore should also be left at its current height.</li> <li>Agree with Designer response.</li> </ol>
<b>Client Decision:</b>	Confirm the recommendation of the Safety Engineer.
<b>Action Taken:</b>	<ol style="list-style-type: none"> <li>As per the Client's decision the signs are to be left at their current height.</li> <li>The constructor has been instructed to remove the "Give Way" supplementary signs at this location. Confirmation that this has been completed shall be forwarded to the designer to close out this item.</li> </ol>
<b>STATUS</b>	<ol style="list-style-type: none"> <li>CLOSED</li> <li>ACTIVE</li> </ol>

## 2.10 Comment – Turbo markings

The SAT is of the view that the turbo markings applied to the north side of the circulating carriageway do assist with safe access to the frontage road. It was noted that a significant number of drivers making a right turn from Otaihanga Road to SH1 southbound did traverse the turbo markings rather than being directed into the outer circulating lane. The area of carriageway from which the previous hatch markings were removed did appear to have a rough surface and “shadow” markings in certain light and wet conditions. This may have influenced drivers’ choice of path across the turbo markings.

The SAT is also of the view that the situation on the southern side of the roundabout should be monitored in terms of whether turbo markings should be applied there. There is a reasonably heavy right turn movement into Otaihanga Road and at times conflicts were observed between a vehicle completing the right turn manoeuvre across the two circulating lanes and a vehicle northbound entering the roundabout.

<b>Designer Response</b>	<p>In discussion with NZTA, turbo markings on the south side of the roundabout are not considered necessary. The Alliance believe there are no safety concerns with vehicles turning right from the Waikanae Southbound approach, however, we will continue to monitor if the issue occurs.</p> <p>To remove the existing hatching in the location of the north side turbo marking involved water blasting the white lining off the pavement. As such this resulted in an untidy finish. We believe this is an aesthetic issue not a safety issue so we are not proposing to reseal this area.</p>
<b>Safety Engineer:</b>	<p>Agree with the Designer’s response. Following the removal of the line markings there was loose material located in the area where drivers are now encouraged to go. This loose material combined with the ghost marking may be contributing to the lack of compliance with the new markings. The loose material in the circulating portion of the lane should be swept.</p>
<b>Client Decision:</b>	<p>Further to the advice of the Safety Engineer confirm agreement with Designer’s solution.</p>
<b>Action Taken:</b>	<p>The constructor has been instructed to sweep the loose material in the circulating portion of the lanes. Confirmation that this has been completed shall be forwarded to the designer to close out this item.</p>
<b>STATUS</b>	<p>ACTIVE</p>

### 2.11 Comment – CCTV maintenance

The SAT noticed that a CCTV camera has been installed on a street light pole in the northwest quadrant of the roundabout. However, there is no facility provided for a maintenance vehicle attending to the camera.

<b>Designer Response</b>	The CCTV camera has been temporarily installed at this location. The permanent location will be agreed with the NZTA. Consideration for maintenance will be given when deciding the permanent CCTV location.
<b>Safety Engineer:</b>	Agree with Designer
<b>Client Decision:</b>	Further to the advice of the Safety Engineer confirm agreement with Designer's response.
<b>Action Taken:</b>	The permanent location of the CCTV camera is to be agreed with the NZTA. Maintenance access will be considered based on the final location of the CCTV.
<b>STATUS</b>	ACTIVE

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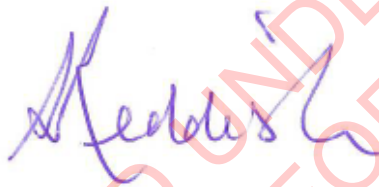
**3.0 AUDIT STATEMENT**

We certify that we have visited the site to identify features of the project that could be changed, removed or modified in order to improve safety. The problems identified have been noted in this report, together with recommendations, which should be studied for implementation.



Signed:..... Date: 1 August 2014

Jos Vroegop, BE, ME, MIPENZ, MITE  
Senior Consultant  
Traffic Planning Consultants Ltd, Auckland



Signed:.....Date: 1 August 2014

Steve Reddish, BSc(Eng), MIPENZ, MCIHT, FITE, Dip TE  
Senior Associate  
Traffic Planning Consultants Ltd, Hawke's Bay



Signed:.....Date: 1 August 2014

Jon England, BE (Civil), MIPENZ, CPEng, IntPE (NZ), RPEQ  
Senior Road Safety Engineer  
MWH New Zealand Ltd, Wellington



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

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

**Safety Engineer:** Name..... Position.....

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

**Project Manager:** Name..... Position.....

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

**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:.....

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