



**Twilight Road Cleanfill, Clevedon
Detailed Design Road Safety Audit**

20 December 2016





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Final Report	[REDACTED]	[REDACTED]	[REDACTED]

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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:

- [REDACTED] Senior Transport Consultant, Commute Transportation Consultants Ltd
- [REDACTED] Director, Commute Transportation Consultants Ltd

[REDACTED] visited the site on 14 December 2016, and assessed general traffic operation and recently completed road works along Twilight Road between Kimptons Road and the site access at 261 Twilight Road. Detailed Design drawings and a Geotechnical Assessment Report for the proposed widening were provided by Sat Civil Ltd via email on 11 December 2016.

A copy of the plans used for the Road Safety Audit are included in Attachment A.

1.3 REPORT FORMAT

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.

Table 1: 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 2 below.

Table 2: Concern Categories

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

In addition to the ranked safety issues it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

1.4 SCOPE OF AUDIT

This safety audit is a Detailed Design Road Safety Audit of proposed road widening for a cleanfill site access at 261 Twilight Road in Brookby. As a condition of consent, the proposed cleanfill operation (operated by P & I Pascoe Ltd) required road widening to be undertaken on the southern side of Twilight Road between 354 and 261 Twilight Road.

The audit is required in accordance with a request from Auckland Transport to Sat Civil Ltd.

The audit does not include a review of pavement design details, overall carriageway widths etc as the project has already been constructed in accordance with approved plans. The audit largely focusses

on potential safety issues with the constructed design on-site and proposed signage and road markings.

1.5 DOCUMENTS PROVIDED

The following documents have been provided for audit:

- Detailed Design Drawings, Twilight Road Widening (From #354 to Brookby Clean Fill Site), AECOM, 22 April 2016.
- Geotechnical Assessment Report, Road widening with drainage upgrade from 261 to 354 Twilight Road, P & I Pascoe Ltd, 8 March 2017 (sic).

Both documents are included in Attachment A.

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 safety audit team (SAT). However, it must be recognised that eliminating safety concerns cannot be guaranteed since as 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.

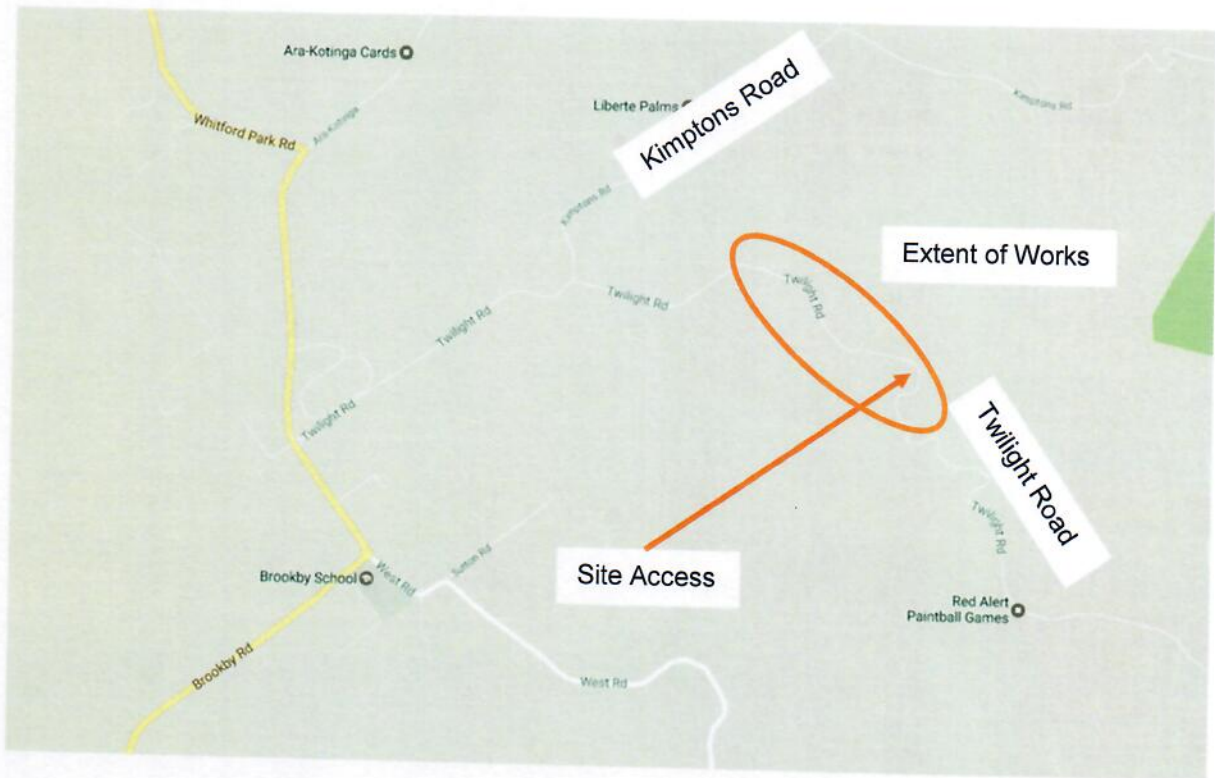
While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

1.7 PROJECT DESCRIPTION

P & I Pascoe Ltd proposes to develop a cleanfill operation at 261 Twilight Road in Brookby. The cleanfill has a single access located on the southern side of Twilight Road and the resource consent requires that all trucks travel to and from the west of the site i.e. via Brookby Road and that road widening is undertaken to enable opposing vehicles to pass one another on Twilight Road. Road widening and new channel have been constructed on the southern side of Twilight Road near the site and re-sealing and new road markings have been installed across the full width of Twilight Road.

Figure 1 shows the location of the proposed cleanfill access and extent of proposed road widening works.

Figure 1: Site Location



2 SAFETY AUDIT FINDINGS

2.1 POWER POLES ON NORTHERN SIDE OF TWILIGHT ROAD SIGNIFICANT

Power poles on the northern side of Twilight Road are located in very close proximity to the carriageway. The SAT is concerned that vehicles travelling eastbound on Twilight Road may be travelling at higher speed (due to the road widening) and potentially collide with these poles.

The main issues with the power pole locations are summarised as follows:

- Poles on outside of curve and vehicles potentially losing control and colliding with pole. These poles are located near ch.660, Ch. 760 and ch. 860 – ch. 940.
- Poles on the inside of curve and vehicle potentially cutting the corner and colliding with pole. In some cases the poles did not have any hazard reflectors to warn vehicles of the pole during the night. These poles are located at ch. 720, ch. 1060 – ch. 1100 and ch. 1160. The pole at ch. 1160 appears to be new.

The poles are shown in Photograph 1 to Photograph 6.

Photograph 1: Power Pole at ch. 660



Photograph 2: Power Pole at ch. 760



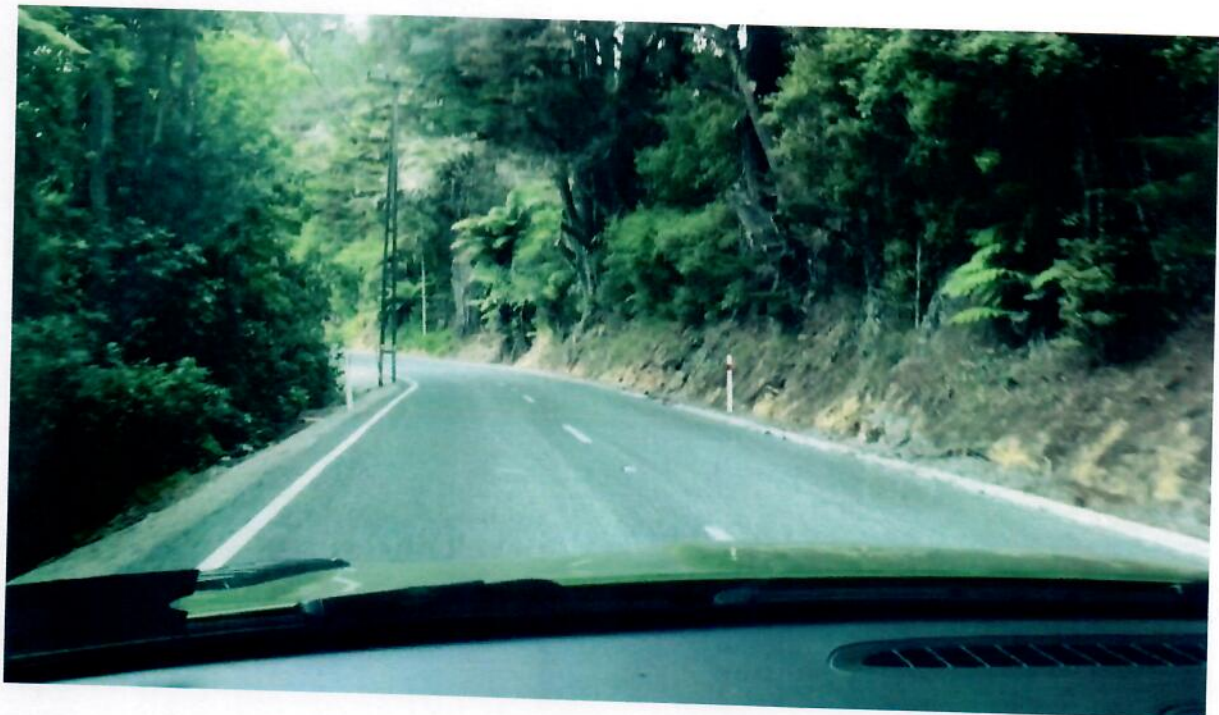
Photograph 3: Power Poles at ch. 860 – ch. 940



Photograph 4: Power Pole at ch. 720



Photograph 5: Power Poles at ch. 1060 – ch. 1100



Photograph 6: Power Pole at ch. 1160



Based on a review of google streetview, it appears that the poles previously had further clearance from the carriageway and the widening has occupied this clearance area. An example is shown in Photograph 7.

Photograph 7: Power Pole at ch. 760 (prior to widening)



Recommendations

- Provide hazard reflectors on all poles.
- Provide cold applied markings with audio tactile profile to provide delineation for vehicles at night.

- Consider limiting speeds through this section of road (either through speed advisory signage or regulatory signage).

Table 3: Item 2.1 Power Poles on Northern Side of Twilight Road

Frequency Rating: Crashes are likely to be Occasional	Severity Rating: Death or serious injury is Very likely
Designer Response: Hazard reflectors have to be added to all power and telecommunication poles where they were missing. Advice from Ross Roadmarking is that ATP markings on chipseal get dislodged and so we do not consider it practical to apply. Speed limit restrictions were discussed with Auckland Council and would be a matter for Auckland Transport.	
Safety Engineer:	Click here to enter text.
Client Decision:	Agreed to install new hazard markers on poles where they are missing
Action Taken:	Hazard markers have be installed.

2.2 NORTHERN ROAD EDGE

SIGNIFICANT

Twilight Road has a number of sections where the road shoulder falls steeply away from the carriageway. These sections are located on the northern side of Twilight Road and while these existed prior to the cleanfill works, the widening has removed clearance areas (albeit small) between the carriageway and batter. Furthermore, the widening is likely to increase operating speeds and increase the potential for loss of control crashes. Photograph 8 shows an example of this steep fall and in this case, the SAT is concerned a vehicle could potentially cut the corner and lose control.

Photograph 8: Steep Fall on Northern Side of Twilight Road



In the event of a loss of control crash, there are likely to be serious injuries if they occur on the northern side of Twilight Road. It is recommended that safety barriers are established on the northern side of Twilight Road on the outside of all bends and on inside of bends where there is potential for vehicles to cut corners. It should be noted that it is not for the SAT to decide who should be responsible for establishing safety barriers however in our opinion, there are two key matters that need to be considered:

- The issue existed prior to the road widening associated with the cleanfill operation i.e. there was an existing road safety issue, and
- The road widening resulting from the cleanfill operation is likely to result in increased operating speeds for general vehicles on Twilight Road due to the wider alignment and improved road condition. Unfortunately, as a consequence of increased operating speeds this may also increase the risk of loss of control crashes.

In addition to safety barriers, it is recommended that the edge lines on both the northern and southern sides of the road use cold applied plastic (CAP) with an audio tactile profile to further reduce the risk of 'run-off road' crashes. The cold applied plastic has been demonstrated to have excellent durability suitable for use in environments with high numbers of heavy vehicles.

Recommendations

- Establish road safety barriers to prevent vehicles running off the road
- Establish cold applied plastic markings, with audio tactile profile, for edgelines on both sides of Twilight Road.

Table 4: Item 2.2 Northern Road Edge

Frequency Rating: Crashes are likely to be Infrequent		Severity Rating: Death or serious injury is Likely	
Designer Response: No work was undertaken to the LHS of Twilight Road so the situation existed prior to the works being undertaken. We have discussed the matter with Auckland Council and consider it a matter for Auckland Transport to assess. Advice from Ross Roadmarking is that ATP markings on chipseal get dislodged and so we do not consider it practical to apply.			
Safety Engineer:		Click here to enter text.	
Client Decision:		Agree with designers comments	
Action Taken:		No action taken	

2.3 TREE NEAR CH. 650

MODERATE

On the southern side of Twilight Road near ch. 650, road works appear to have stopped in the vicinity of an existing large tree. The SAT is concerned that the tree may become unstable due to the recent road widening and should be removed as soon as possible to prevent it collapsing onto the road.

Photograph 9: Tree on Inside of Bend at ch. 650



Recommendations

- Remove tree on southern side of Twilight Road at ch. 650
- Continue drainage channel to west to meet other section of drainage channel and construct appropriate road side batters.

Table 5: Item 2.3 Tree Near Ch.650

Frequency Rating: Crashes are likely to be Occasional		Severity Rating: Death or serious injury is Very likely
Designer Response:	We agree that the tree should be removed and the channel continued.	
Safety Engineer:	Click here to enter text.	
Client Decision:	Agree to work being completed	
Action Taken:	Tree has been removed, batter formed and the channel continued.	

2.4 SIGHT DISTANCE

MINOR

The sight distance at the quarry entry was reviewed and the SAT is concerned that the required visibility (70 m in accordance with consent conditions) is unlikely to be met for light vehicles). Despite the low observed traffic volumes and traffic speeds, and that the sight distance is likely to be acceptable for heavy vehicles, it is considered that the sight distance should apply from a 1.1 m drivers eye height at the access to oncoming vehicles on Twilight Road (also 1.1 m).

Photograph 10: Visibility to East along Twilight Road



Photograph 11: Visibility to West along Twilight Road



Recommendations

- Review available sight distance and confirm a 70 m sight line can be achieved between a light vehicle at the quarry exit (1.1 m eye height) to approaching vehicles on Twilight Road (1.1 m car height).
- Relocate sight access sign so it does not obstruct visibility to oncoming vehicles.

Table 6: Item 2.4 Sight Distance

Frequency Rating: Crashes are likely to be Occasional	Severity Rating: Death or serious injury is Unlikely
Designer Response:	Agree that the sight line should be reviewed and the site access sign relocated.
Safety Engineer:	Click here to enter text.
Client Decision:	Agree with designer comments
Action Taken:	Sight line has been reviewed and the bench has been trimmed to achieve the 70m sight distance. The site access sign has been relocated so as not to obstruct visibility for oncoming vehicles.

2.5 EDGE MARKER POSTS AND EDGE LINE MARKINGS

MINOR

The SAT observed that there were no edge marker posts on the northern side of Twilight Road at approximately ch. 940 and there were no edge line markings on both sides of Twilight Road between approximate ch. 1200 and the quarry access.

To provide appropriate delineation and prevent run-off road crashes, it is recommended that edge marker posts and edge line markings are installed.

Photograph 12 shows the area where no edge marker posts are installed (we note however there were construction markers still on-site and therefore edge marker posts may yet to be installed at this location).

Photograph 12: No Edge Marker Posts (ch.940)



Photograph 13 shows the area where no edge lines are installed. We note this is an existing section of road that was not upgraded however for consistency, we recommend that an edge line (CAP markings with audio-tactile profile) are established on both sides of the road.

Photograph 13: No Edge Line Markings between ch. 1200 and Quarry Access



Recommendations

- Establish edge marker posts on the northern side of Twilight Road near ch. 940.
- Establish edge line markings on Twilight Road between ch. 1200 and quarry access.

Table 7: Item 2.5 Edge Marker Posts

Frequency Rating: Crashes are likely to be Occasional		Severity Rating: Death or serious injury is Unlikely	
Designer Response: Agree that edge marker posts and edge line markings should be added on both sides of Twilight Road between CH1200 and the cleanfill access			
Safety Engineer:		Click here to enter text.	
Client Decision:		Agree for work to be undertaken	
Action Taken:		Edge lines on both sides of Twilight Road have been added as well as additional edge marker posts.	

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: Date: 20 December 2016

..... BE, MIPENZ, CPEng

Senior Transport Consultant, Commute Transportation Consultants Ltd

Signed: Date: 20 December 2016

..... BE, ME, MIPENZ, CPEng

Director, Commute Transportation Consultants Ltd

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

Signature... .. Date... 9-2-17.....

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

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

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

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

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

Signature... .. Date... 9-2-17.....

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

Date: ... 8-2-17.....

ATTACHMENT A – AUDIT DRAWINGS