# STATE HIGHWAY 58 SAFETY IMPROVEMENTS

STATE HIGHWAY 2 TO LANES FLAT

# SCHEME ASSESSMENT ADDENDUM

Prepared for NZ Transport Agency

September 2016

MWH

BUILDING A BETTER WORLD

## QUALITY STATEMENT

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## REVISION SCHEDULE

| Rev No | Date | Description | Signature or Typed Name (documentation on file). | | | |
|---|---|---|---|---|---|---|
| | | | Prepared by | Checked by | Reviewed by | Approved by |
| - | 24 March 2016 | Working Draft for Client Comment | JP, DR | JP | PP | |
| - | 15 April 2016 | Working Draft for Client Comment | JP, DR | JP | PP | |
| 1 | 20 June 2016 | Final Draft | JP, DR | JP | PP | AS |
| 2 | 27 Sept 2016 | Update following client feedback | JP | JP | DR | AS |
| | | | | | | |

# Executive Summary

Provided in separate report.

# NZ Transport Agency

## State Highway 58 Safety Improvements

State Highway 2 to Lanes Flat

## Scheme Assessment Addendum

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# 1 Introduction

State Highway 58 is a Regional highway which connects the major urban centres within Kapiti and Porirua to the west to the urban centres of Hutt City and Upper Hutt to the east.

State Highway 58 is narrow and windy and has many roadside hazards. This has contributed to a large number of high severity crashes in recent years and it is therefore classified as a high risk rural road.

The Transmission Gully (TG) and Petone to Grenada Link Road (P2G Link Road) state highway projects will result in changes to traffic volumes on this link and the function of this route in the future.

This Scheme Assessment Addendum Report discusses the strategic context and problems with the current corridor and presents recommendations for improving safety and efficiency.

## 1.1 Addendum Purpose

This Addendum to the SH58 Scheme Assessment Report (SAR) is provided to document the various developments to the SH58 Safety Improvement project and wider environment since the original SAR was commenced in 2013.

Given the elapsed time and piecemeal nature of the SAR and subsequent revisions, coupled with the considerable network changes that are proposed (either currently being investigated, designed or constructed[1]), a more significant update to the previous SAR is deemed necessary.

The most recent update of the SH58 SAR, Revision 4, was undertaken in July 2015. Whilst this was relatively recent, this followed earlier updates from the original draft SAR submission in September 2013 and is therefore a mixture of older and newer content. Further, Rev4 does not provide the most effective case for the project in terms of the justification for investment and remains solely safety focused.

Rather than re-writing the SAR, and potentially losing some of the project development 'story', this Addendum seeks to build on Rev4. In a small number of aspects, the Addendum refers back to Rev4 where there is no material difference – however for the most part the Addendum provides a thorough update and introduces additional information where it is necessary. Additional information is required to better demonstrate the case for investment, the benefits sought and expected, and the wider implications of the proposed improvements particularly given the wider network changes that are expected (or possible).

## 1.2 Report Context

This SAR Addendum is intended as primarily a technical document, and continues the style of the Scheme Assessment Report.

During this project's development, the NZ Transport Agency has developed its own Business Case approach (an adaptation of the Treasury's Better Business Case approach) for project identification and development. Whilst much of the information supplied within the previous reports remains relevant, there are a number of aspects that need to be addressed to satisfy the Business Case approach. Accordingly, an additional report[2] has been produced to cover the overall strategic context project development requirements of the business case process.

Within the Executive Summary & Business Case (BC) Alignment Report, the project development history has also been described to record the various investigations that have been undertaken on SH58 in recent years and explains how the current corridor proposals have been developed and adapted over time.

The diagram below shows how this report refers to information from the previous SAR (Rev 4 and appendices) and the concurrently developed Executive Summary & BC Alignment Report.

[1] Refer Section 3.1 for further Regional Context

[2] Executive Summary & Business Case (BC) Alignment Report

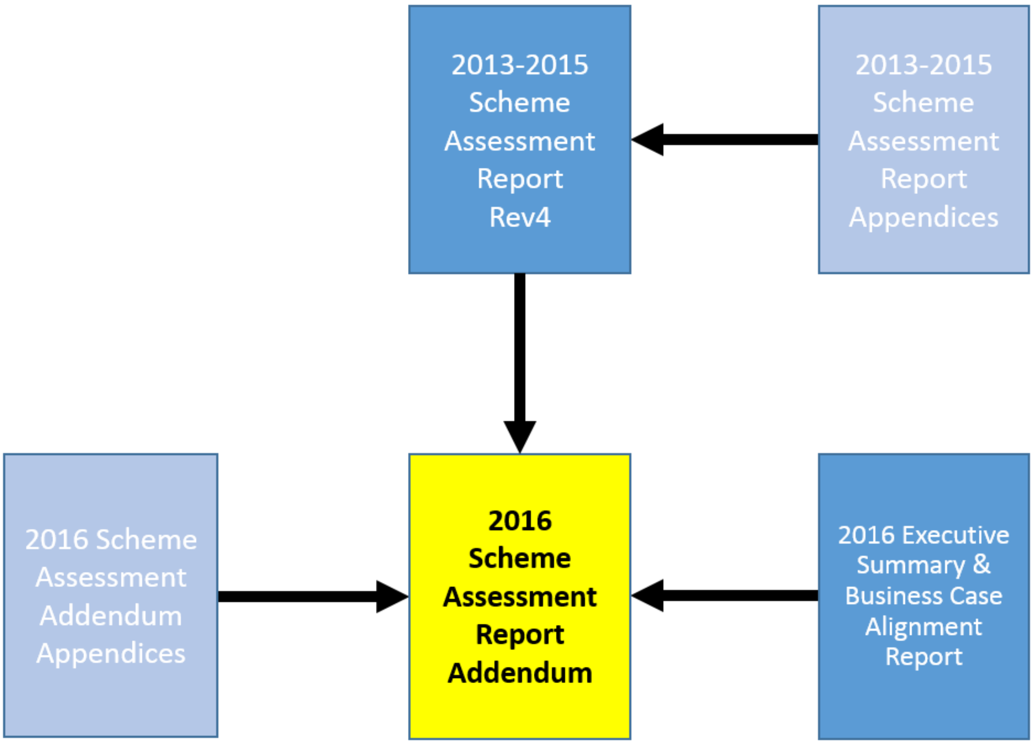


**Figure 1-1: SAR Addendum Development Graphic**

## 1.3 Project Scope

The project scope has evolved throughout the course of the SAR development and is now substantially different from the original scope. In summary, the original project scope was to consider improvements to the cross section in combination with a small number (originally three, then increased to four) of horizontal curve realignments. The original extent of the project is from east of (and excluding) the intersection with SH2, to the intersection with (but exclusive of) the Pauatahanui Roundabout.

The project scope has developed throughout the course of the project progression during the investigations. The current scope is best defined as follows:

- Project extent from east of the proposed SH2/58 interchange works, to Bradey Road (Lanes Flat), a distance of 9km, recognising the TG interchange that will be provided at Pauatahanui;
- Cross section improvements that provide 1.5m sealed shoulders, 3.5m traffic lanes (single lane except for where existing passing lanes exist and are to be retained) and 2.0m median, including upgrades of structures as required;
- Median barrier provision throughout, broken only at key intersections where there is a demonstrable requirement to do so;
- Suitable turnaround facilities to account for median barrier turning restrictions;
- Extensive edge barrier that protects against roadside hazards; and
- Horizontal curve realignments to provide a largely consistent horizontal alignment.

A further aspect of the project scope is to ensure the proposed improvements consider the longer term trends, regional development aspirations and identify how increased demand on the corridor in the future is likely to affect the level of service and operation.

# 2 Problem Description

The project was originally proposed as a safety improvement project based upon the observed poor crash history along the corridor.

As the project has developed and adjacent projects, such as TG and P2G Link Road, have become more certain, a more holistic approach to improving SH58 has been adopted to ensure improvements are consistent with the wider regional context and long term strategy.

Safety remains the primary driver for the project, but the project scope is now broader to incorporate other issues that require consideration.

The project objectives are:

- *To enhance safety of travel on the Wellington State Highway network, and specifically SH58*
- *To maintain or improve journey times and journey time reliability between SH2 in the Hutt Valley, and Transmission Gully*
- *To enhance resilience of the Wellington State Highway network*
- *To appropriately balance the needs of local and state highway traffic*

*By developing and constructing a cost effective roading solution that is consistent with a standard expected for a Regional state highway under the One Network Road Classification.*

Key project outcomes being sought are:

> *To reduce the number of deaths and serious injuries along SH58 by investing in cost effective treatments that promote a Safe System; by focusing on providing safer roads and roadsides, and safe speeds*
>
> *To maintain travel time reliability along the corridor by reducing the number of journeys impacted by closures and ensuring that the highway has adequate capacity in the medium to long term*

Further information in regards to these outcomes is presented in Section 4, however a brief summary is presented below.

## 2.1 Safety

The project length has experienced a large number of high severity (fatal and serious) crashes in recent years. In the last five-year period from 2010 to 2014 there have been a total of 118 crashes, including three fatal and nine serious injury crashes resulting in 13 deaths and serious injuries (DSI).

Run off road and head on crashes contributed to 75% of the reported crashes and 83% of the high severity crashes. Compared to national figures, this section of highway is over-represented in high severity run off road crashes. Overall, 42% of the total fatal and serious crashes occurred in the wet, higher than the regional average of 28%[3].

As a result of high severity crash density, this section of highway (and the rural entirety of SH58) is classified as a high-risk rural road.

The key issues and deficiencies relating to the high crash rate and low 2.7 KiwiRAP star rating include:

- The project length contains 24 horizontal curves which could be considered as 'out of context'[4] given they are on a rural road with a radius less than 400 m and curve speeds 10 km/h lower

[3] High Risk Rural Roads Guide (HRRRG), Appendix B, proportion of rural state highways severe crashes occurring in the wet for the South-west North Island region.

[4] Whether a curve is 'out of context' is dependent upon the approach and departure speed relative to the curve speed but this measure is a simplistic method of categorisation.

than the approach speed. A number of these are in succession, creating tight reverse curves and broken-back[5] alignments, which reduce forward sight distance.

- The road exhibits a high-speed environment[6]. The curves in question have curve advisory speeds between 65-75 km/h. Research has shown that curves requiring a reduction in speed of more than 15% from the surrounding speed environment are difficult for drivers to read and will increase the risk of loss of control crashes occurring[7].
- The SH58 carriageway is narrow, with 73% of shoulders along the 9 km section being below 1.5 m; reducing the recovery room for errant vehicles[8].
- 80% of the project length has moderate to severe (34% severe) roadside hazards, consisting of steep slopes, power poles and drop offs. The roadside hazards and narrow shoulders have resulted in approximately half of all injury crashes involving a hit object (cliff, fence, tree etc.).
- Lack of continuous median barrier protection; there is a single 750 m section of wire rope barrier in the 9 km project length[9].
    - Research has shown that as traffic volumes exceed 6,000 AADT, the head on high severity crash rate exceeds the run off road crash rate[10]. As the project length has an AADT of 14,250 (2015), the head on crash risk is approximately 1.6 times greater than the run off road risk.
    - Therefore, although there have been few head-on crashes when compared to run off road crashes, the potential crash risk is high.

In summary, the poor horizontal alignment (out of context curves), roadside hazards and narrow cross section all contribute to the high injury crash risk.

At least an additional six DSI (or two DSI/year) are estimated to occur on SH58 in the time between TG opening (est. 2020) and P2G Link Road opening (est. 2023) as a result of the increased volumes on a KiwiRAP 2 star road. The additional 2 DSI per year is in addition to the 2.6 DSI/year, which is already occurring.

## 2.2 Travel Time Reliability

Average travel times along the corridor at the moment are approximately 7 to 7.5 minutes with 95%ile travel times typically 8.5 to 9.5 minutes, equating to a buffer time[11] of approximately 2 minutes.

Travel time reliability appears to be worse in the interpeak compared to the peak which shows that it is likely that the highway form is affecting travel times rather than high traffic volumes. Overall, based on Austroads metrics[12], travel time reliability is not currently an issue along the corridor.

Nevertheless, with TG and nearby growth areas, traffic volumes will be increasing over the next 20 years, even with the P2G Link Road in place. Traffic volumes in excess of 20,000 vehicles per day once TG opens are predicted, with SH58 expected to be operating near capacity. With the P2G Link Road in place, traffic volumes are expected to be approaching 17,000 vehicles per day by 2031. As a result,

[5] NZTA, SHGDM, Section 4, *"Two horizontal curves in the same direction, sometimes joined by a short straight, can form an unsightly alignment which is commonly known as a 'broken back' alignment".* These alignments are hazardous as drivers expect to have exited the curve when in reality they are required to negotiate the next curve almost immediately.

[6] Refer Section 4.3 for speed survey data.

[7] NZTA, Research Report 371, Relationship between Road Geometry, Observed Travel Speed and Rural Accidents and NZTA (LTNZ), Research Report 323, Curve speed management July 2007.

[8] Austroads, Road Geometry Study for Improved Rural Safety, Technical Report AP-T295-15, Section A.3.3.

[9] Additional median barrier, around 650m in length, is due to be installed in 2016 as part of the scour site realignment works which is discussed further in Section 6.1.3.

[10] NZTA, High Risk Rural Roads Guide, Figure 3-6.

[11] The buffer time represents the extra time (buffer) most travellers add to their average travel time when planning trips. This is the extra time between the average travel time and near-worst case travel time (95th percentile).

[12] Coefficient of variation in peak periods ranges between 0.08 and 0.15, this correlates to a 'Low / Low-Medium' band according to Austroads. Refer Section 4.3 for further detail on coefficient of variation and buffer time indices.

travel time reliability issues, due to recurrent congestion may arise, especially prior to the opening of the P2G Link Road.

The number of crashes, as a result of the corresponding road closures/delays, is also causing travel time reliability issues, refer Section 4.4. The predicted increase in traffic volumes, and the resulting increase in crashes, will further compound the crash related, travel time reliability issue.

Accordingly, there is a need to ensure that any investment along this corridor reduces the number of incidents that close the highway and also takes the future traffic volumes into consideration to ensure this link continues to be efficient.

# 3 Site Description

## 3.1 Regional Context

The SH58 corridor is classified as a Regional highway[13], recognising its contribution to the social and economic wellbeing of the Wellington region, which provides an east-west link connecting SH2 Hutt Valley with SH1 Paremata.

In the wider area, there are numerous improvement projects in various stages of development or construction. These projects all have a relationship with SH58, to varying degrees and are described below, and shown in Figure 3-1.

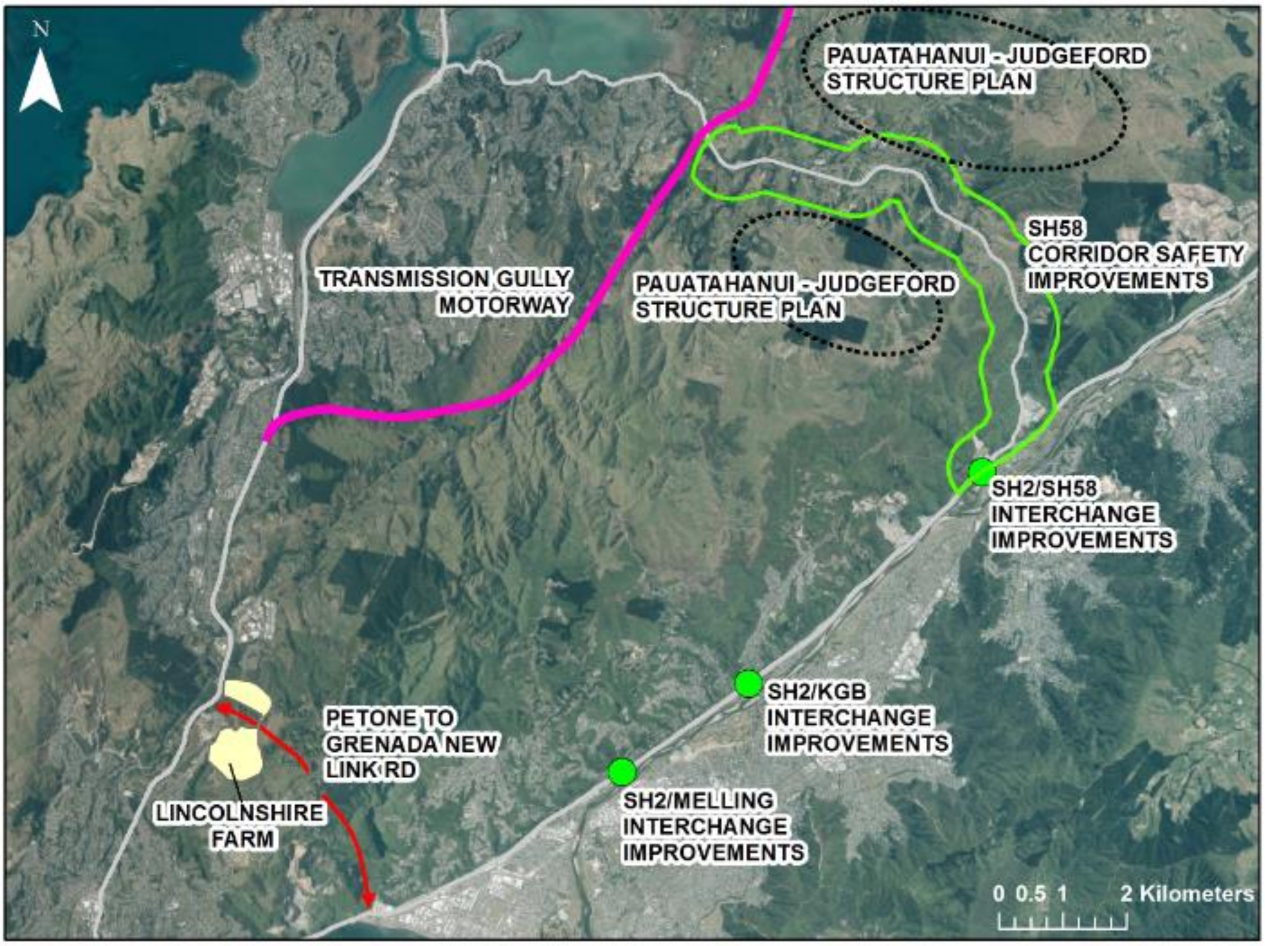


**Figure 3-1: Regional context plan**

13 NZTA, One Network Road Classification (ONRC), https://www.nzta.govt.nz/assets/Road-Efficiency-Group-2/docs/onrc-north-island-map.pdf

- **SH2/SH58 Interchange:** Removal of the at-grade traffic signal intersection, and replacement with a grade separated roundabout interchange. This project is currently in the early stages of construction and expected to be open to traffic in mid-2017.
- **Transmission Gully:** A new motorway between Linden and Mackays that crosses SH58 at Lanes Flat where there is a new grade separated service interchange proposed. Transmission Gully is currently being constructed and is due to be open to traffic in 2020.
- **Petone to Grenada Link Road:** Investigations are continuing for a new link road connecting Petone to Grenada – which is likely to comprise a six lane highway. A preliminary alignment has been confirmed[14] but it is not yet certain that the project will be delivered.
- **SH2/Melling Interchange:** Removal of the at-grade traffic signal intersection, and replacement with a grade separated interchange. This project is only in the early stages of development and does not yet have an Indicative Business Case but is due for investigations to commence in 2016. Should a project proceed here, the current indications are that improvements would not be open to traffic for at least 4-5 years, but this has little certainty.
- **SH2/Kennedy Good Bridge (KGB):** Removal of the at-grade traffic signal intersection, and replacement with a grade separated interchange. Similar to SH2/Melling, this potential project has not yet commenced the investigation phase, and no firm investigation commencement date is currently programmed. Given that no investigations are currently programmed, a new interchange is likely to be in the 5-10 year horizon period.
- **Lincolnshire Farm Structure Plan:** The 2006 plan proposes the development of the Lincolnshire Farms area which is located between SH1 and SH2 over 10-15 years including new road connections, 45 hectare business area, 900 new households and new link road connecting Grenada and Petone (i.e. P2G Link Road described above).
- **Pauatahanui-Judgeford Structure Plan:** Includes a large geographical area either side of SH58 (east and west) and could result in additional lifestyle-residential, light-industrial and commercial activities. The plan assumes certain transportation improvements to support the plan growth, such as roundabouts on SH58 at Moonshine Road and Flightys/Murphys Road – however, any infrastructure improvements to give effect to the plan need to be confirmed. The area shown in Figure 3-1 is approximate only.

## 3.2 Project Location and Highway Characteristics

The project length negotiates a series of hills from SH2 in the Hutt Valley (RP) 0/0.1), rising to Mount Cecil Road in Haywards Hill, through to Lanes Flat and Bradey Road in the west (RP 0/9.3).

The carriageway consists of a standard two-way two-lane rural highway, but with one eastbound passing lane and one westbound passing lane. The width of the highway is constrained in a number of locations due to the rolling/mountainous terrain. There are a series of high-speed horizontal and vertical curves. Several of the horizontal curves are out of context and have been posted with curve speed advisory signs of between 65 and 85 km/h.

The dominant land uses adjacent to this stretch of road are rural, with the remainder being rural-residential, park reserve or industrial, such as two Transpower substations[15], Griffiths Drilling (on the former Downer Edi site), Winstone Dry Creek Quarry and a logging mill. Beyond the immediate neighbouring properties there is a greater focus on rural-lifestyle properties, and also includes commercial activities, such as BRANZ. Winstones also have a long standing interest in developing a new cleanfill site on the western side of SH58, between Mount Cecil Road and Moonshine Road[16].

A detailed location plan, showing the study area and proposed realignment and widening extents, is shown below in Figure 3-2.

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[14] https://www.nzta.govt.nz/media-releases/petone-to-grenada-link-road-one-step-closer-as-preferred-route-confirmed/

[15] Located at Haywards and just east of the Pauatahanui roundabout.

[16] The application for a Winstones Cleanfill site at this location was rejected by a panel of independent commissioners in January 2014. However, it is understood Winstones may retain a possible interest for a new cleanfill site along SH58.

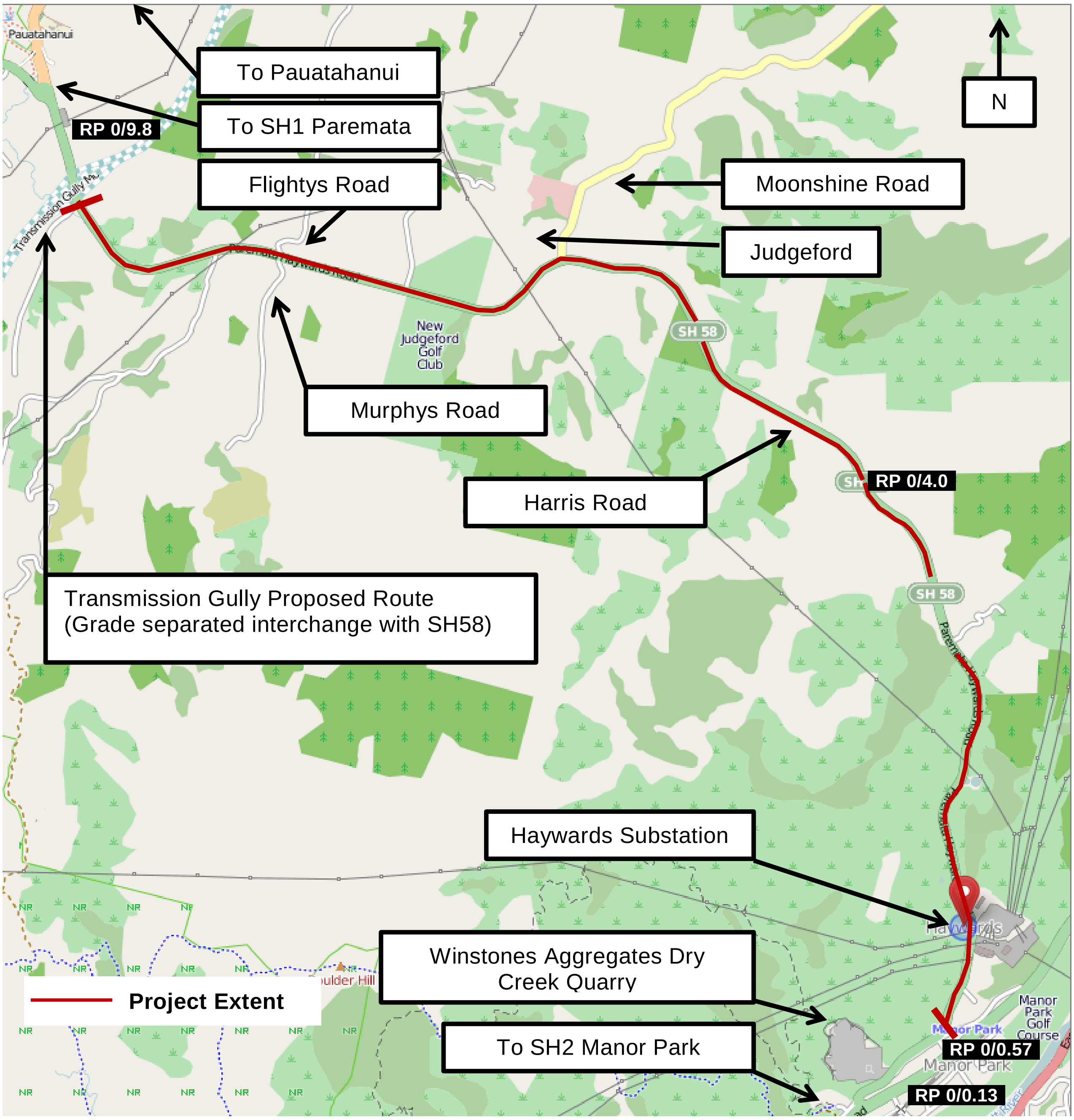



**Figure 3-2: Study Area Overview Plan**

**Key highway features and constraints along the project length include:**

- Highway Alignment
    - The current State Highway 58 length within the project area is characterised by significant vertical curvature, in additional to the curvilinear horizontal alignment. This is a direct result of the existing topography, with the road running through rolling and mountainous terrain.
    - The result of the topography on the SH58 road geometry is considerable with significant grades, 24 out of context curves and narrow shoulders that affect the operation of the road.

- Guardrail and Median Barriers
  - 760m[17] of wire rope median barrier from RP 0/1.515-2.275, installed in 2003.
  - Limited side protection in the form of W-section guardrail along the project length.
- Passing and Overtaking
  - Two passing lanes
    - 1.37 km westbound (increasing) uphill passing lane at Haywards, from RP 0/0.880-2.253 (excluding tapers).
    - 1.23 km eastbound (decreasing) downhill passing lane, east of Moonshine Road, from RP 0/5.966-4.735 (excluding tapers).
  - 71% of the project length has no overtaking (double yellow lines and/or insufficient sight distance).
- Property and Access
  - 10 local roads that are accessed via the state highway along the project length.
  - The highway is designated as a Limited Access Road (LAR) and the Transport Agency have over the past several years imposed conditions to restrict detrimental development on properties adjoining SH58.
  - In saying this, a number of private properties are accessed[18] off the state highway, increasing in frequency on approach to semi-rural Judgeford and Pauatahanui.
- Public Transport, Walking and Cycling
  - Walking and cycling facilities in this area are limited, with no facility other than the road shoulder (of varying width).
  - SH58 is part of the Greater Wellington's regional cycling network[19], with a number of mainly recreational cyclists using the route. Active modes are discussed in Section 0.
  - Public transport along SH58 consists of limited number of bus services, with the majority of these services covering the Porirua to Pauatahanui section only; a single public service covers the entirety of SH58[20]. Refer Section 4.7.
  - The study length is also part of a school bus route servicing Pauatahanui School, with a bus stop at the SH58/Moonshine Road intersection. This bus stop has been observed as being very busy at peak times, with a number of buses and cars parked on the highway and Moonshine Road (refer to Rev4 for further details).
  - As part of the Pauatahanui-Judgeford Plan there will also be opportunities for walkway/cycleways along Pauatahanui Stream as the area is subdivided through the provision of Esplanade Reserves and/or Strips.
- Significant Businesses
  - Brittons House movers, located at the corner of SH58 and Harris Road
  - Griffiths Drilling, located west of Belmont Road
  - Judgeford Golf Club, located between Mulhern Road and Moonshine Road

[17] Additional median barrier, around 650m in length, is due to be installed imminently as part of the scour site realignment works which is discussed further in Section 6.1.3.

[18] Both licensed accessways and physical frequent use accessways are shown on the project drawings, Scheme Drawings are contained in Appendix F.

[19] Greater Wellington Regional Cycling Plan (2008), http://www.gw.govt.nz/assets/importedfiles/5938_CyclingPlan2wit_s11794.pdf

[20] Metlink, #97, Polytech Link route, http://www.metlink.org.nz/info/network-map/

- Existing Structures
    - The existing structures are outlined in the table below.
    - A structural assessment technical note is provided in Rev4 of the SAR.

**Table 3-1: Existing Structures**

| Existing Structure | RP Start | Length | Width |
|---|---|---|---|
| Dry Creek Quarry Culvert | 0/0.33 | 10m | 10m |
| Stock Subway Culvert | 0/3.84 | 10m | 8m |
| Pauatahanui Culvert No. 1 | 0/5.99 | 21m | 14.6m |
| Pauth Stream Culvert No. 2 | 0/6.87 | 10.5m | 7.3m |
| Golf Course Subway | 0/6.92 | 11.5m | 10.3m |
| Pauth Stream Culvert No. 3 | 0/7.45 | 12.8m | 7.25m |
| Murphys Road Culvert | 0/8.16 | 14m | 10m |
| Pearce Bridge | 0/8.36 | 13.3m | 12m |
| Pauth Stream Bridge No. 7 | 0/8.97 | 18m | 9.7m |

## 3.3 Recent and planned works affecting the project length

The key planned or expected works affecting the project length are described in Section 3.1.

One section of realignment (known as the 'Scour Site') has also been accelerated within the project extent and this is described in detail in Section 6.1.3.

Other works have been undertaken along the SH58 corridor, including installation of guardrail along multiple locations of the route, completed in 2012-2013.

A speed limit review of SH58 is also in process with the Transport Agency (in conjunction with Porirua City Council[21]) considering reducing the speed of SH58, between SH2 and Lanes Flat, from 100km/h, to 80km/h. This is discussed further in Section 7.

[21] A reduction in posted speed limit has been consulted on jointly by NZ Transport Agency and Porirua City Council. Should the proposal proceed, both SH58 and adjoining local roads would see a reduced posted speed to 80km/h.

## 3.4 Proposed Realignment Sites

Five sites in particular have been identified as being inconsistent with the adjacent speed environment and have been investigated for realignment, these are described below.

Refer to the project drawings[22] for the extent of each realignment site, where each site and the extent is labelled. The sites are not contiguous.

**Table 3-2: Realignment Site Details**

| Site | Route Position | Realignment Length | Curve Number(s) | Geographic Area |
|---|---|---|---|---|
| 1 | RP 0/0.574 to 1.064 | 500m | 1,2,3 | East of Hugh Duncan Street |
| 2 | RP 0/1.128 to 1.470 | 350m | 4,5 | Old Haywards Road |
| 3 | RP 0/2.411 to 3.00 | 600m | 9,10 | East of Mount Cecil Road |
| 4 | RP 0/3.376 to 4.00 | 600m | 13 | Scour Site (between Mount Cecil Road and Harris Road) |
| 5* | RP 0/1.670 to 2.30 | 650m | 7,8 | West of Old Haywards Road |

*Realignment Site 5 was a later addition to proposed works hence it is out of sequence with the other realignment sites

These sites were selected because they had been identified in an earlier 2009 PFR[23](sites 1, 2 & 3), had been subject to recent serious and fatal crashes (site 4) and to provide a consistent horizontal alignment between realigned curves (site 5).

### 3.4.1 Site 1 – East of Hugh Duncan Street (RP 0/0.574 to 1.064; 490m)

Both approaches to this site consist of high-speed straights and curves. Travelling west, the road is on an uphill grade entering into a tight left hand curve followed by a moderate right hand curve. A westbound passing lane develops immediately after this right hand curve, followed by a moderate left hand curve. The first left hand curve travelling west has a speed advisory sign of 75km/h with poor visibility through the curves due to a bank with high vegetation. The lack of sight distance reduces the driver's ability to read the transition between the tighter curves and increases the risk of a crash occurring. Figure 3-3 below shows the approach to the curve from the east.

Out of context curves along this site include:

- 147 m radius curve with a length of 150 m, left hand curve (RP0/0.61-0.76);
- 160 m radius curve with a length of 100 m, right hand curve (RP0/0.76-0.86); and
- 233 m radius curve with a length of 100 m, left hand curve (RP0/0.93-1.03).

Other features include:

- Existing 1.4 km westbound uphill passing lane from RP 0/0.89 to RP 0/2.25 (excluding tapers);
- Approx. 50 m of drop off protection guardrail eastbound from RP 0/0.66 – 0.71;
- Intersection of Hugh Duncan Street and SH58 at RP 0/0.95, 250 ADT, stop controlled with a right turn bay and flush median provided; and
- 3 licensed accessways.

[22] Scheme Drawings are contained in Appendix F

[23] MWH (2009) SH58 Curve Realignment Project Feasibility Report


**Figure 3-3: Approach to Site 1 from the east (Increasing RP0/0.62)**

### 3.4.2 Site 2 – East of Old Haywards Road (RP 0/1.128 to 1.470; 340m)

Both approaches to this site consist of high-speed straights. Travelling west, the road is relatively flat with a westbound passing lane and right turn bay for the Haywards Substation access. The road then steepens into an uphill grade and a medium left hand curve followed by a tight right hand curve. This arrangement could lead to vehicles accelerating at the passing lane to overtake vehicles at the beginning of the series of curves. This could lead to an increased risk of a crash occurring. The downhill approach transitions from a high-speed section with a steep downhill grade onto a tight left hand curve, posted at 65 km/h, which is out of context with the surrounding speed environment.

Out of context curves along this site include:

- 198 m radius curve with a length of 190 m, left hand curve (RP0/1.20-1.39); and
- 100 m radius curve with a length of 100 m, right hand curve (RP0/1.42-1.52).

Other site features include:

- Existing 1.4 km westbound uphill passing lane from RP 0/0.89 to RP 0/2.25 (excluding tapers)
- Guardrail eastbound from RP 0/1.00 – 1.36
- Three Haywards Substation private access intersections with SH58 including:
  - Kaitawa Street (RP 0/1.17), existing RTB;
  - Atiamuri Crescent (RP 0/1.33), flush median; and
  - Adjacent to Old Haywards Road (RP 0/1.44), flush median.
- Two further licensed accessways


**Figure 3-4: Approach to the tight, uphill, right hand curve on Site 2 from the east (Increasing RP 0/1.42)**

### 3.4.3 Site 3 – East of Mount Cecil Road (RP 0/2.411 to 3.000; 590m)

The approach to this site, heading west, enters a right hand curve approximately 200m after the termination of the uphill passing lane. It then enters a left hand curve followed by a short straight and a second left hand curve. This alignment is termed a 'broken back' which are hazardous, as drivers expect to have exited the curve when in reality, they are required to negotiate the next curve almost immediately.

This section of road has a reverse curve sign with a concealed exit (Mt. Cecil Road) on approach to the second left hand curve, however there is no supplementary curve speed advisory sign. It is likely that the speed reduction necessary to safely navigate the out of context curves is exacerbated by vehicles exiting the passing lanes at high speeds as the gradient becomes level at the crest of the hill.

Out of context curves along this site include:

- 216 m radius curve with a length of 100 m, left hand curve (Broken back) (RP 0/2.46-2.63);
- 270 m radius curve with a length of 160 m, left hand curve (Broken back) (RP 0/2.70-2.86); and
- 250 m radius curve with a length of 190 m, right hand curve (RP 0/2.91-3.07).

Other site features include:

- Intersection of Mt. Cecil Road (no exit) and SH58 at RP 0/2.97, 20 ADT, Give Way controlled with right turn bay provision.
- Two licensed accessways

**Figure 3-5: Approach to the short straight between the two left hand curves in the 'broken back' alignment heading west (Increasing RP 0/2.58)**

### 3.4.4 Site 4 – East of Mount Cecil Road (RP 0/3.376 to 4.00; 620m)

The approach to this site from the east enters a medium left hand curve approximately 100 m west of the reverse curve signage (PW-20). It then enters another tighter left hand curve, after an approximately 70 m short straight; as discussed in Site 3 above, this alignment is termed a 'broken back'. Immediately following this broken back curve is a medium right hand bend and vertical crest curve.

This section of highway also includes a scoured site / drop off at approx. RP 0/3.6 – 3.8, located on second left hand curve travelling west. The existing guardrail installation is 80m long and offers limited protection of the drop off and one power pole. The drop off has been undermined by a stream below, and with the slip crest only metres away from the guardrail, reducing the founding of the guardrail posts significantly. As a result, the guardrail is leaning away from the highway and it is likely the guardrail will not operate as intended.

Out of context curves along this site include:

- 297 m radius curve with a length of 140 m, left hand curve (broken back) (RP 0/3.49-3.63);
- 156 m radius curve with a length of 70 m, left hand curve (broken back) (RP 0/3.69-3.76); and
- 242 m radius curve with a length of 240 m, right hand curve (RP 0/3.80-4.04).

There are two licensed accessways along this section.


**Figure 3-6: First curve in the 'broken back' alignment heading west (Increasing)**

**Figure 3-7: Second curve in the 'broken back' alignment heading west (Increasing)**

### 3.4.5 Site 5 – Section between realignment Site 2 and Site 3 (RP 0/1.670 to 2.30; 630m)

This section includes a westbound passing lane and wire rope median barrier for the majority of its length which was installed in 2003.

This section contains three out of context curves in a reverse curve arrangement, including one 75 km/h posted speed advisory for a 185 m radius curve right hand curve (75km/h advisory travelling westbound, 65km/h advisory eastbound) at RP 0/1.84-2.07. This 75 km/h curve is preceded by a medium, 400 m radius, left hand curve and followed by a tight, 250 m radius, left hand curve.

This section of realignment was not included in the previous Rev4 of the SAR, but has since been introduced. This is covered in greater detail in Section 6.2.1.5.


**Figure 3-8: Approach to 185m radius curve heading west (Increasing RP 0/1.84)**

There are four licensed accessways along this section.

## 3.5 Services

Refer to Rev4 of the SAR for a description of existing services.

# 4 Data & Evidence Base

## 4.1 Traffic Volume and Capacity

### 4.1.1 Existing

The telemetry traffic count site located on SH58 East of Pauatahanui (RP 0/9.1) has recorded a 2015 AADT of 14,250. Figure 4-1 below shows:

- An overall traffic growth of 2% per annum for both the SH58 count sites was recorded between 1992 and 2007[24];
- From 2007 onwards, overall traffic volumes at both count sites show negligible growth. This is likely to be associated with the global financial crisis (GFC)[25].
- Total heavy vehicle growth, although likely affected by the GFC between 2007 and 2009, show strong signs of recovery in 2010. From 2010 onwards, the total HCV volumes on SH58 at the West of SH2 (Haywards Hill) show recorded growth of 3% per annum. In contrast, the total HCV volumes on SH58 near Pauatahanui have reduced by approximately 4% per annum (noting that the longer term trends are still positive as shown in the figure below).

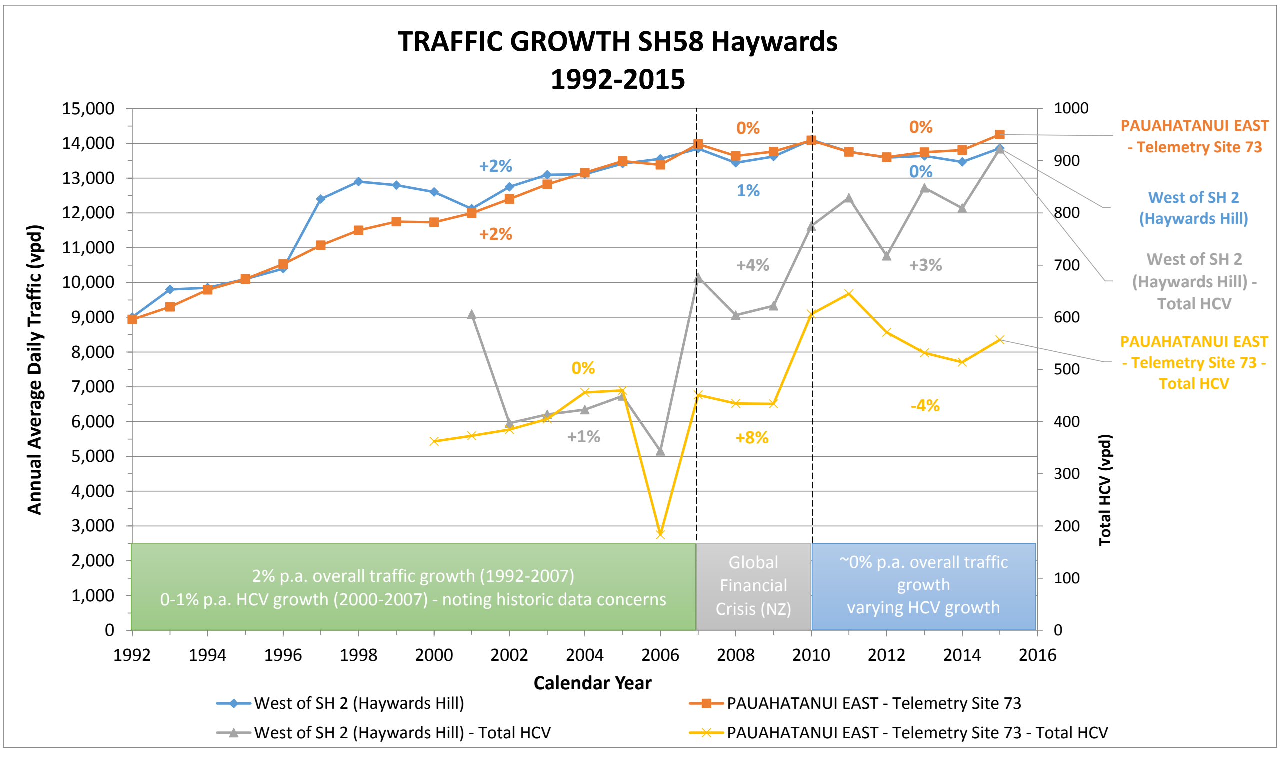



**Figure 4-1: Haywards SH58 Traffic Growth 1992-2015**

Refer Appendix A for further detail, including directional peak hour flow graphs.

[24] Unstable volumes were recorded for the West of SH2 (Haywards Hill) count site between 1997 and 2000. Total heavy commercial vehicle (HCV) volumes prior to 2007, also appear to be unstable for both count sites.

[25] The global financial crisis affected NZ between approximately 2007/08 and 2009/10, based on NZ's annual GDP growth, https://data.oecd.org/gdp/real-gdp-forecast.htm#indicator-chart.

Table 4-1 outlines the current traffic volumes of the nearest telemetry count site as well as the local roads located within the project extent.

**Table 4-1: Current Traffic Volumes[26]**

| Location | Type | Volume |
|---|---|---|
| SH58 West of SH2 - Haywards Hill (RP 0/0.10) | Single Loop, continuous<br>ID: 05800000 | 13,850 AADT (2015) |
| SH58 Pauatahanui East (RP 0/9.14) | Telemetry Site 73<br>ID: 05800009 | 14,250 AADT (2015) |
| Hebden Crescent (RP 0/0.03) | Local road count | 450 ADT |
| McDougall Grove (RP 0/0.30) | Local road count | 100 ADT |
| Hugh Duncan Street (RP 0/0.95) | Local road count | 250 ADT |
| Kaitawa Street (RP 0/1.17) | Private Access | N/A – Substation Access |
| Atiamuri Crescent (RP 0/1.33) | Private Access | N/A – Substation Access |
| Old Haywards Road (RP 0/1.44) | Local road count | 100 ADT |
| Mount Cecil Road (RP 0/2.99) | Local road count | 20 ADT |
| Harris Road (RP 0/4.47) | Local road count | 40 ADT |
| Moonshine Road (RP 0/6.32) | Local road count | 600 ADT – low count compared to MWH short term pm peak survey (approx. 1,200 vph) |
| Mulhern Road (RP 0/7.31) | Local road count | 175 ADT |
| Murphys Road /Flightys Road (RP 0/8.01) | Local road count | Murphys Road: 220 ADT<br>Flightys Road: 410 ADT |
| Belmont Road (RP 0/8.37) | Local road count | 55 ADT |
| Bradey Road (RP 0/9.32) | Local road count | 275 ADT |

[26] Note: SH58 volumes sourced from the Transport Agency's Traffic Monitoring System (TMS) and local road count data sourced from CAS/RCA records.

### 4.1.2 Future

The section below provides a brief summary of the future traffic demands along SH58 based on the Wellington Transport Strategic Model (WTSM). Refer Section 8.1 for further detail on the future traffic volumes and traffic modelling information.

Figure 4-2 below shows:

- Minimal traffic growth is anticipated until the introduction of TG, where traffic volumes are expected increase to over 20,000 vpd on SH58. By 2031, traffic volumes are expected to be over 23,000.
- With the P2G Link Road in place, traffic volumes return to base levels. By 2031, traffic volumes are expected to be approaching 17,000 vpd.
- From 2031 onwards, modelled growth is minimal, with or without the P2G Link Road in place.

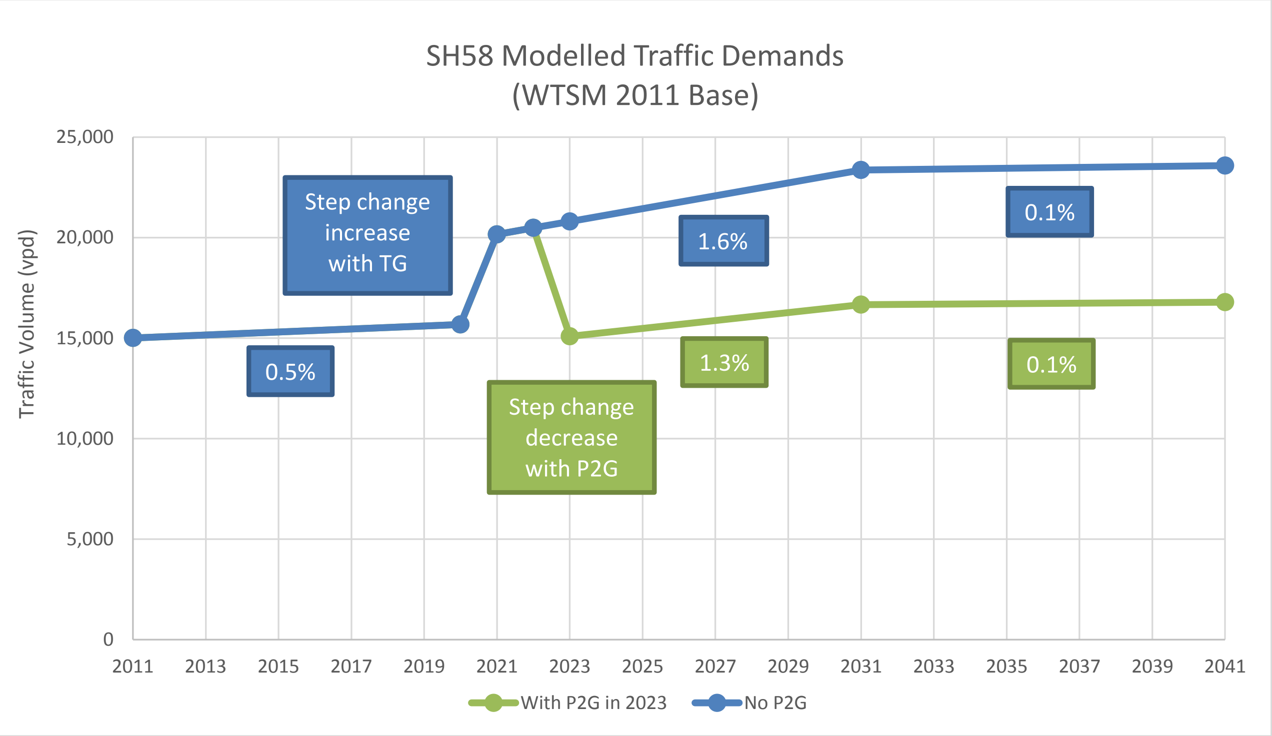



**Figure 4-2: SH58 Modelled Traffic Demands (WTSM 2011 Base)**

Due to uncertainty in future traffic volumes, sensitivity testing was undertaken based on +-1% traffic growth applied to the base modelled scenarios outlined above. The resulting traffic volume range is presented in Section 8 and Appendix C.1.1.

In summary the modelling and traffic demands show:

- With TG in place in 2021:
  - SH58 is expected to operate near capacity (with a volume to capacity ratio approaching 90%) in the critical AM peak period.
  - By 2031, SH58 is expected to be over capacity.
- With the P2G Link Road in place, currently estimated to be 2023:
  - SH58 is expected to be under 70% capacity in the AM peak period.
  - By 2031 and through to 2041, SH58 is expected to be under 75% capacity.

## 4.2 Traffic Composition

The 2015 traffic composition of the count site within the study area and the nearby telemetry site have been assessed with the results shown in the figures and table below.

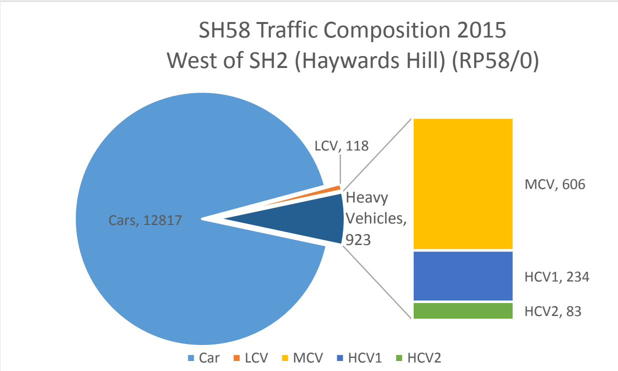



**Figure 4-3: West of SH2 Count Site Traffic Composition**

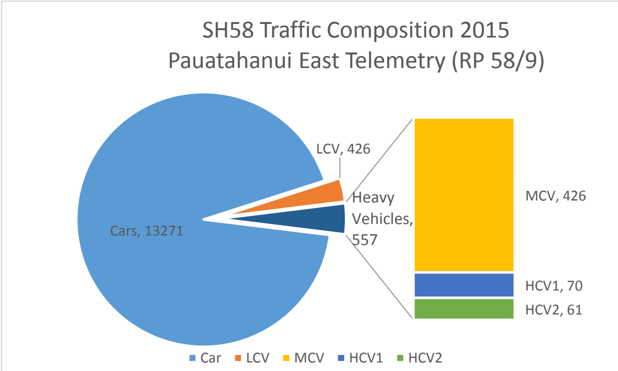



**Figure 4-4: Pauatahanui East Count Site Traffic Composition**

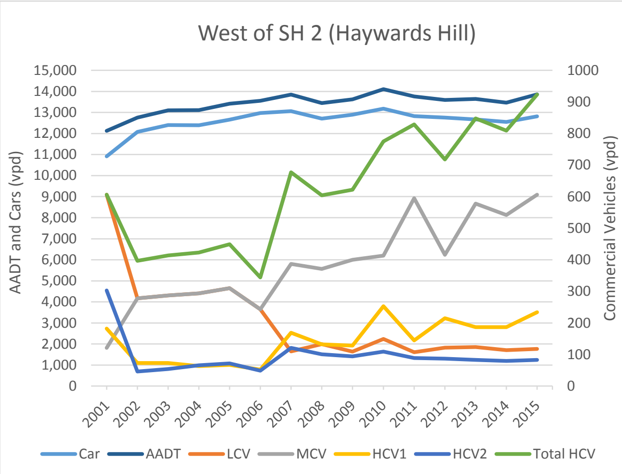



**Figure 4-5: West of SH2 Count Site Traffic Composition Growth**

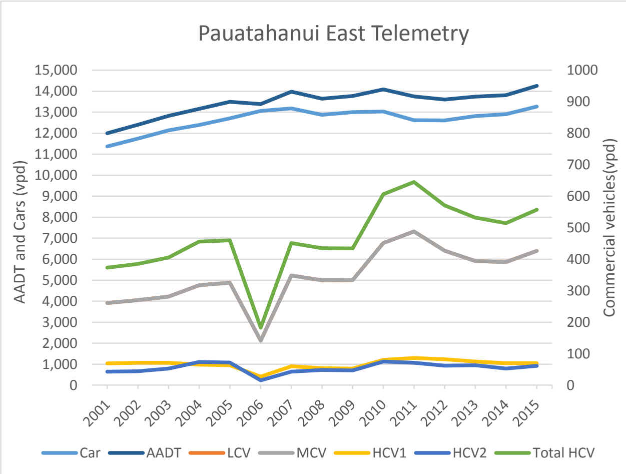



**Figure 4-6: Pauatahanui East Count Site Traffic Composition Growth**[27]

**Table 4-2: 2014 Traffic Monitoring Site Traffic Composition**

| Location | 2015 | Total AADT | Car LV-I | Light LV-II | Medium MCV | Long HCV-I | V.Long HCV-II | HVs (MCV, HCV) |
|---|---|---|---|---|---|---|---|---|
| West of SH2 (Haywards) RP 58/0 | AADT (vpd) | 13,858 | 12,817 | 118 | 606 | 234 | 83 | **923** |
| | % | 100% | 92% | 1% | 4% | 2% | 1% | **7%** |
| | Growth (5 year) | 0% | 0% | 1% | 3% | 6% | -2% | **3%** |
| SH58 Pauatahanui East RP 58/9 | AADT (vpd) | 14,254 | 13,271 | 426 | 426 | 70 | 61 | **557** |
| | % | 100% | 93% | 3% | 3% | 0% | 0% | **4%** |
| | Growth (5 year) | 1% | 1% | -4% | -4% | -7% | -5% | **-5%** |

The figures and table above highlight:

- Traffic composition for the two count sites is similar with cars representing 92-93% of the AADT.
- Heavy vehicles are growing at a higher rate than light vehicles; therefore, the percentage of heavies will increase over time. This could in turn have an impact on overall travel time, capacity and safety.

[27] Pauatahanui is a telemetry site and the TMS data splits LCV and MCV exactly evenly, so LCV numbers are in effect sitting exactly behind the MCV AADT line with equal totals.

- There are a higher number of heavy vehicles, and higher heavy vehicle growth, at the eastern end of SH58. This indicates that a number of heavy vehicles may not use SH58 as a through route but rather have origins and destinations along SH58, prior to Pauatahanui.

## 4.3 Travel Speed

Travel speed data has been collected using the following sources:

- TomTom Traffic Stats for 2013[28];
- Dual tube speed survey (NZ Transport Agency/HTS, 2005) east of the Pauatahanui Roundabout (approx. RP 0/9.1 – near Telemetry site);
- Dual tube speed survey (TDG, 2011) near the proposed Winstones Clean Fill site, west of Mt. Cecil Road (approx. RP 0/3.22);
- Car following travel time surveys[29], July 2013, along the four proposed realignment sections (approx. RP0/0.5 to RP0/4.0); and
- Design speed estimates for the existing situation using geometric data[30].

The purpose of collecting and analysing the travel speed and travel time data is to verify the existing speed environment and validate the economic assumptions relating to travel time savings.

The results of the various surveys are outlined in Figure 4-7 and the tables below.

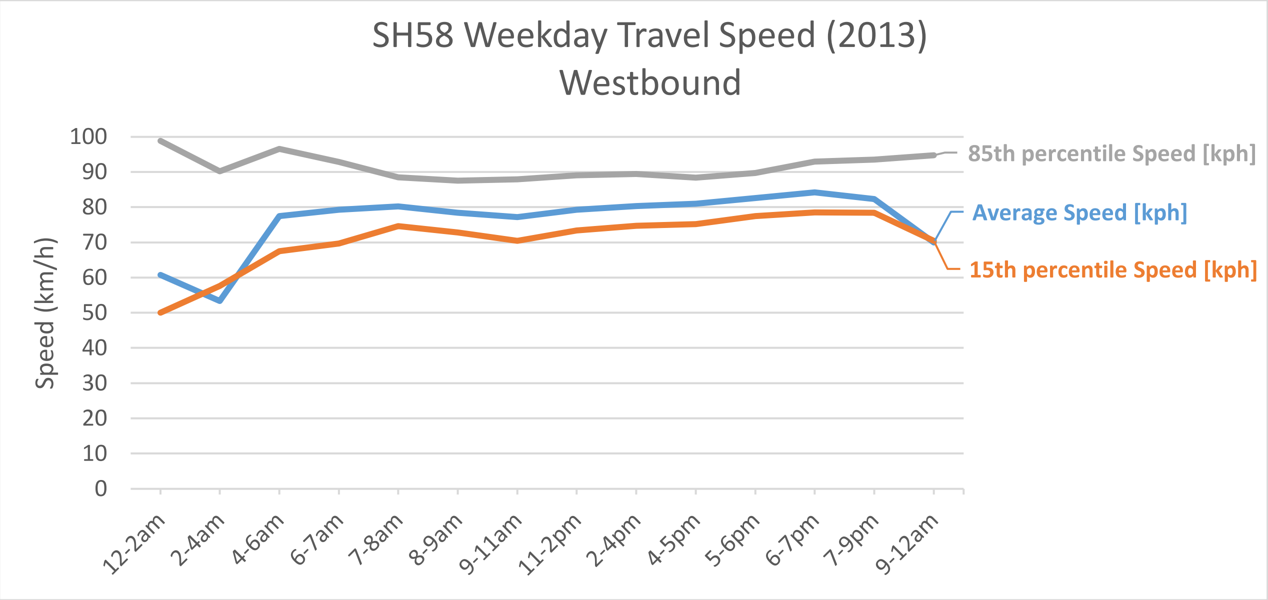



**Figure 4-7: SH58 Weekday Route Travel Speed (TomTom 2013) Westbound[31]**

[28] Note that more up to date travel time information is available; however, this includes the effects of the temporary speed limit at the Scour Site.

[29] These surveys involved following another vehicle, at approximately the same speed, along each of the four realignment sites and recording the travel time and distance travelled. This was repeated three to four times in each direction.

[30] Note: Design speed estimates haves been calculated based on the current geometry (with a number of sites also containing multiple curves). LIDAR data has been used. Therefore, the results are only approximate. Refer Section 8.3.2.1 for the option design speed estimates.

[31] Note that Figure 4-7 above shows significant increases in variability during the off-peak period from 12am to 6am, this is due to the reduced traffic volumes, resulting in a correspondingly low TomTom sample size.

**Table 4-3: TomTom 2013 Weekday Peak Average Route Travel Speeds**

| | AM #1 7:15-7:45 | AM #2 7:45-8:15 | AM #3 8:15-8:45 | Interpeak 10-1:30 | PM #1 16:15-16:45 | PM #2 16:45-17:15 | PM #3 17:15-17:45 |
|---|---|---|---|---|---|---|---|
| Eastbound Mean | 7.0 min 79 km/h | 7.0 min 79 km/h | 7.3 min 76 km/h | 7.2 min 77 km/h | 7.1 min 79 km/h | 6.9 min 81 km/h | 6.9 min 81 km/h |
| Eastbound 95th %tile | 8.5 min 66 km/h | 8.4 min 66 km/h | 9.1 min 62 km/h | 9.1 min 61 km/h | 8.6 min 65 km/h | 8.1 min 69 km/h | 7.9 min 71 km/h |
| Buffer Index[32] | 20% | 19% | 23% | 26% | 22% | 17% | 15% |
| Westbound Mean | 7.3 min 77 km/h | 7.8 min 74 km/h | 7.4 min 76 km/h | 7.2 min 77 km/h | 7.2 min 78 km/h | 7.0 min 79 km/h | 7.2 min 77 km/h |
| Westbound 95th %tile | 9.3 min 60 km/h | 9.1 min 61 km/h | 9.5 min 59 km/h | 8.9 min 62 km/h | 8.4 min 77 km/h | 8.2 min 68 km/h | 8.7 min 64 km/h |
| Buffer Index | 28% | 16% | 29% | 24% | 18% | 17% | 21% |

**Table 4-4: HTS and TDG Dual Tube Speed Surveys**

| Weekly | 2005 HTS Group (RP 0/9.1) | | | | 2011 TDG (RP 0/3.1) | |
|---|---|---|---|---|---|---|
| | Increasing | | Decreasing | | Increasing | Decreasing |
| | April '05 | August '05 | April '05 | August '05 | Oct '11 | Oct '11 |
| Volume (vpd) | 6,742 | 6,581 | 6,549 | 6,345 | - | - |
| Mean speed (km/h) | 90 | 91 | 88 | 88 | 92 | 91 |
| 85th %tile (km/h) | 97.1 | 103.1 | 99.5 | 99.8 | 100 | 99 |

**Table 4-5: Estimated Realignment Travel Speeds**

| Realignment Site | TomTom 2013 Weekday Interpeak Average Speed (km/h) | | Car-following Speed Survey (km/h) | | | Design Speed Estimates (km/h) |
|---|---|---|---|---|---|---|
| | Westbound (Inc) | Eastbound (Inc) | Westbound (Inc) | Eastbound (Dec) | Both Directions | Existing |
| 1 | 64 | 67 | 77 | 81 | 79 | 70 |
| 2 | 69 | 68 | 72 | 82 | 78 | 80 |
| 5* | 70 | 73 | | | | |
| 3 | 75 | 76 | 86 | 85 | 86 | 85 |
| 4 | 78 | 75 | 84 | 82 | 83 | 82 |

*Realignment site #5 was added since the SH58 SAR and is located between sites 2 and 3 (58/0/1.670 – 2.300)

32 Coefficient of variation is the standard Austroads metric for travel time reliability. Buffer index is an alternate measure which has been used to maximise the sample size of the TomTom data set, with research indicating a strong relationship between the two measures, refer Appendix A for further detail. The buffer index represents the extra time (buffer) most travellers add to their average travel time when planning trips. This is the extra time between the average travel time and near-worst case travel time (95th percentile). The buffer index is stated as a percentage of the average travel time.

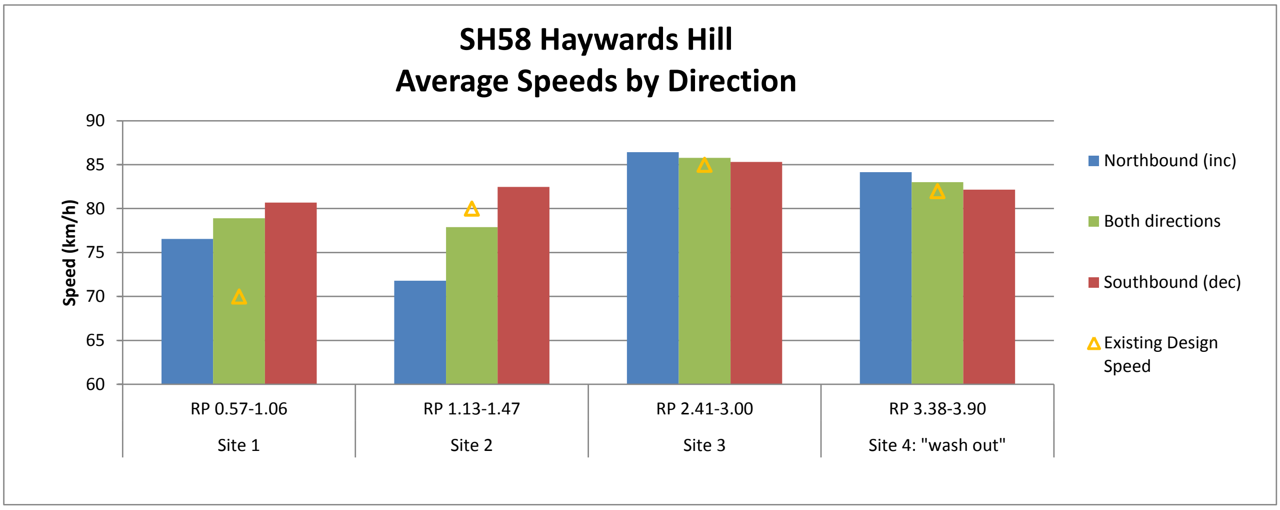



**Figure 4-8: SH58 Realignment Site Average Speeds**

As outlined in Table 4-4 above, both the speed surveys conducted in April/August 2005 and October 2011 show similar results with a mean speed of 90 km/h and an 85th percentile speed of 100 km/h at sites suitable for speed tubes (straight). In comparison, the five realignment sites to the east (refer Table 4-5 and Figure 4-8) show much lower mean speeds. This is likely due to the spot speed surveys being located along relatively straight sections, in contrast to the average speeds surveys which were conducted along the curvilinear alignment of the realignment sites.

Table 4-5 and Figure 4-8 also show that Site 1 and Site 2 had the lowest average speeds of the realignment sites from the car-following surveys undertaken; these trends correlate well with the existing design speed estimation (refer Figure 4-8 triangular symbols).

The observed travel speeds are similar or higher for three of the four sites when compared to the existing design speed estimates, this is not unsurprising due to the relatively high speed environment.

Further Traffic data, including graphs of AADT, peak hourly flows and speed survey data are detailed in Appendix A.

### 4.3.1 Summary

In summary, the travel speed data shows:

- The average route travel speed is 80km/h with minimal variation throughout the day or by direction, despite the existing 100 km/h posted speed limit. Additionally the 85$^{th}$ and 95$^{th}$ percentile speeds also show minimal variation. Based on Austroads metrics therefore, travel time reliability is not currently an issue along the corridor. This indicates that speeds are not currently constrained by traffic congestion but rather by highway form/road geometry.
- Existing speeds at the five realignment sites are lower than the route average speed by up to 16km/h.
- Previous spot speed surveys[33] show higher average speeds of 90km/h; however, due to the nature of dual tube surveys, these were undertaken on relatively long straight sections and the results are therefore not consistent with the overall form of SH58, but rather represent the 85$^{th}$ percentile speed.

33 Undertaken by TDG in 2011, west of Mount Cecil Road

## 4.4 Resilience and Reliability

Resilience and reliability have a number of aspects;

- how often are trips delayed because of scheduled and unscheduled events (e.g. natural hazards (resilience) or crashes (reliability)) on the road; and
- how the road and wider transport network manages, and recovers from, the events (e.g. increased travel demand due to events occurring on other parts of the road network)

### 4.4.1 Risks

The Wellington Region Road Network Earthquake Resilience Study (2012) identified that SH58, particularly around the Haywards Hill would perform poorly in a large event. This is presented in Figure 4-9 and Figure 4-10 below.

In summary, for a major earthquake (e.g. a rupture of the Wellington Fault[34]):

- The Haywards Hill section of SH58 would suffer extensive damage, resulting in full closure of the section for three months or more; and
- The remainder of SH58 project extent is expected to suffer moderate damage, reducing much of SH58 to a single lane for up to three months.

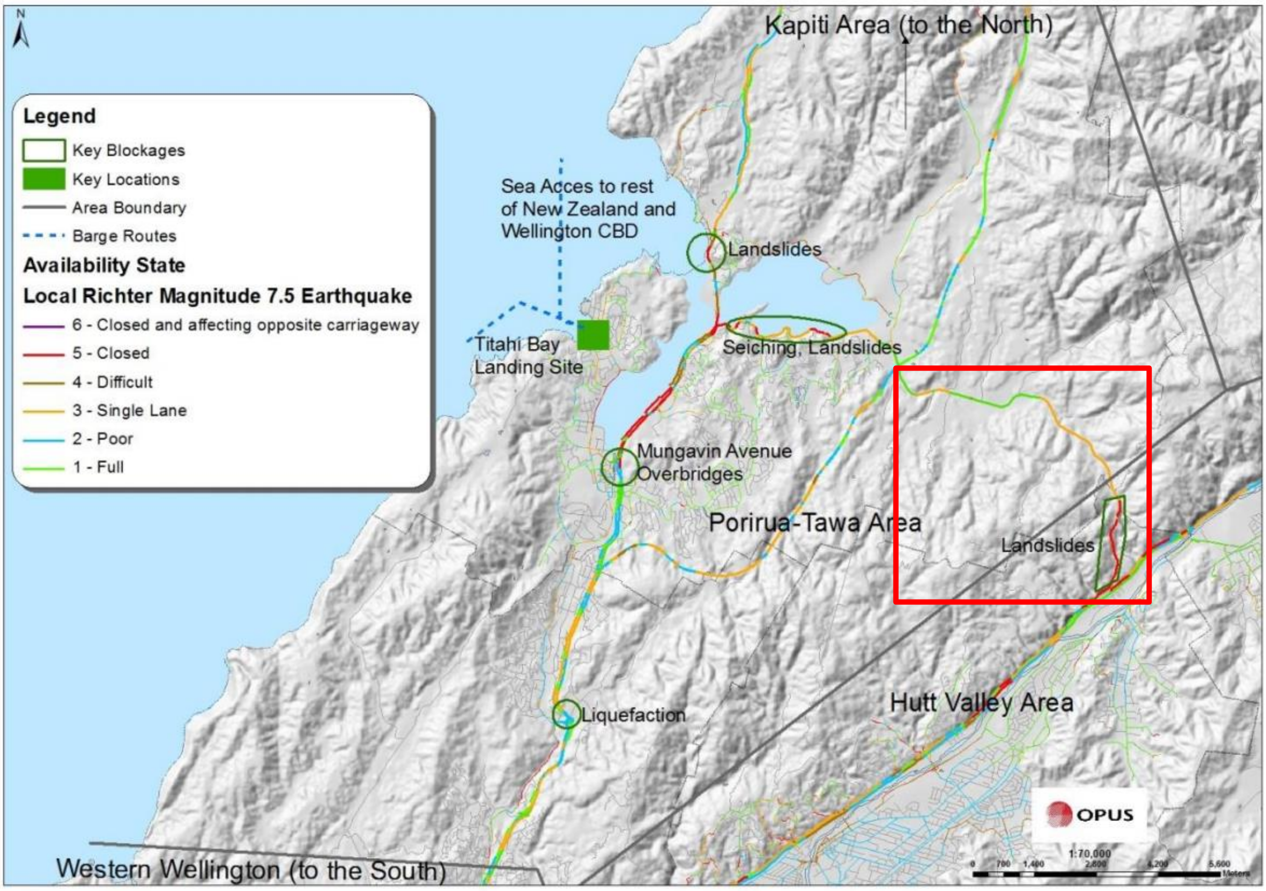



**Figure 4-9: Wellington Region Major Earthquake Network Availability (Source: GWRC/WeLG/WREMO Transport Access Report March 2013)**

34 *It's Our Fault: Re-evaluation of Wellington Fault conditional probability of rupture*, 2010, GNS Science and Victoria University's study findings show that the Wellington Fault has an estimated probability of rupture in the next 100 years of ~11% (with sensitivity results ranging from 4% to 15%), http://db.nzsee.org.nz/2010/Paper23.pdf

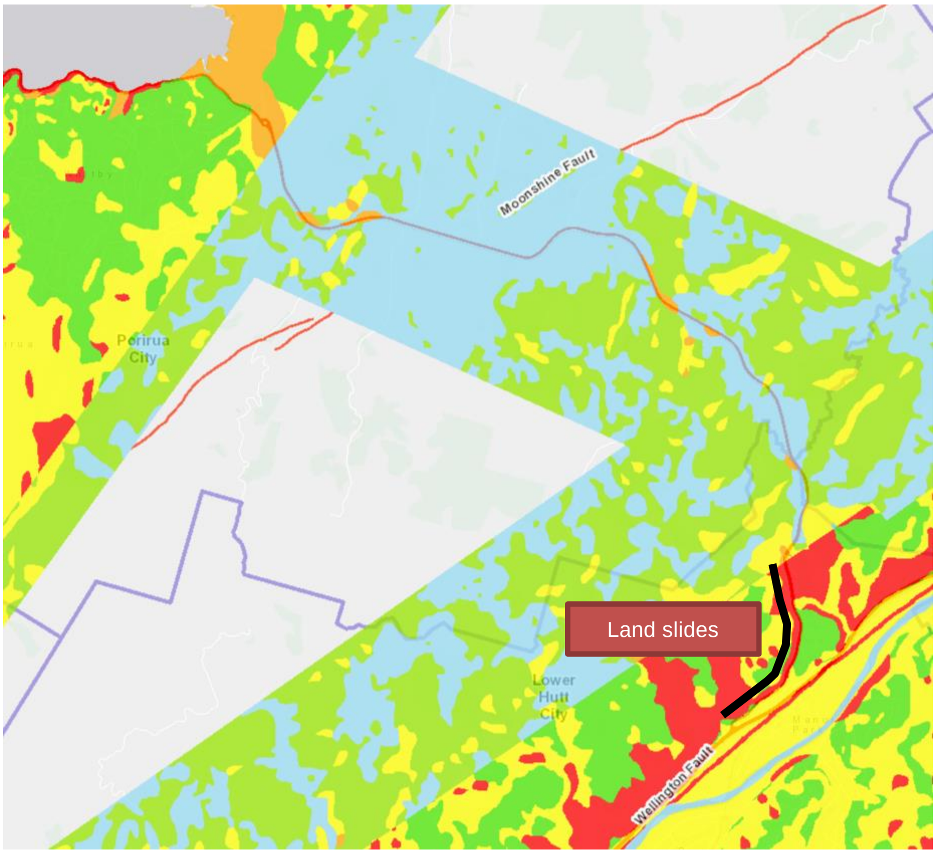



**Figure 4-10: Earthquake Hazard and Slope Failure (Combined Risk, red = high) (Source: GWRC GIS)**

It is possible that realignment works could mitigate some of the residual earthquake risk on the sections that are proposed for potential realignment - however this would need to be confirmed following detailed investigation and then designed accordingly. This should be considered during the detailed design phase.

### 4.4.2 SH58 Road Events

The Traffic Road Event Information System (TREIS) operated by NZ Transport Agency Traffic Operations Centre (TOC) was queried to determine the number, frequency, and impact of events on SH58. There have been 260 reported events on SH58 between SH2 and Pauatahanui from 2011 to 2015, the number and average delay (if applicable) of events are summarised in Table 4-6 below.

**Table 4-6: TREIS SH58 Events between SH2 and Pauatahanui 2011 to 2015**

| Event Type[35] | Road Closed | | Delays | | Caution |
|---|---|---|---|---|---|
| | Number | Avg Duration | Number | Avg Duration | Number |
| **Crash** *(Reliability)* | 11 (73%) | 2.5 hrs | 4 (50%) | 1.25 hrs | 74 (30%) |
| **Weather** *(Resilience)* | 2 (13%) | 3.25 hrs | | | 7 (3%) |
| **Roadworks** *(Reliability)* | 1 (7%) | 5 hrs | 1 (13%) | 6.5 hrs | 4 (2%) |
| **Spill** *(Reliability)* | 1 (7%) | 1 hr | | | 25 (10%) |
| **Object on Road** *(Reliability)* | | | 1 (13%) | 2.5 hrs | 53 (20%) |
| **Traffic Congestion** *(Reliability)* | | | 1 (13%) | 2.25 hrs | 2 (1%) |
| **Animal/Stock** *(Reliability)* | | | | | 42 (16%) |
| **Breakdown** *(Reliability)* | | | | | 11 (4%) |
| **Slip** *(Resilience)* | | | | | 10 (4%) |
| **Other** | | | 1 (13%) | 3.5 hrs | 21 (8%) |
| **Total** | **20** | **2.5 hrs** | **8** | **2.5 hrs** | **260** |

Crashes are the most common cause of road closure, delay, and caution events. Crashes have on average caused closures (average closure time of 2.5 hours) or delays (average delay of 1.25 hours) three times a year. Crashes account for 73% of the closures along project extent, followed by weather (13%). Objects on the Road (20%), and Animals on the Road (16%) are most common caution events to be reported in TRIES. Objects and animals on the road are a hazard to motorists, particularly when there is reduced sight distance through horizontal and vertical curves. Traffic congestion does not at this stage represent a significant factor in delays.

### 4.4.3 Alternative Routes

SH58 is the key route between the Hutt Valley and Porirua, Kapiti Coast, and further north. SH1/SH2 is the alternative route for closures or incidents on SH58. During off-peak times the alternative detour takes an additional 20 minutes to complete, during peak times this can be drastically longer.

### 4.4.4 SH58 As An Alternative Route

SH58 is the alternative route between Wellington and Hutt Valley when incidents or closures occur on SH2 between Ngauranga and Petone. Increased travel demand along SH58 was investigated by examining TMS daily flow graphs for the telemetry count site. These graphs revealed that there have been three occasions between 2011 and 2015 where daily flow above was 18,000 vpd (approximately 3,000-4,000 vpd above typical flow). Further analysis into the effects of these high flow events was not completed as they are infrequent.

[35] Note that while TREIS road closure data is considered reliable, Caution and Delay events are assigned by traffic operations centre staff (at times with guidance from network contractors and consultants). Based on correspondence with WTOC staff, there is currently no official guidance or definition to distinguish between a delay and a caution event.

## 4.5 Crash Data

### 4.5.1 Crash History

A review of NZ Transport Agency's CAS database over the five-year period 2010 to 2014, summarised in Table 4-7 below, revealed a total of 118 crashes (12 high severity crashes resulting in 13 DSI[36]) along the approximately 9 km project length, from the proposed SH2/SH58 interchange[37] (RP 0/0.5) to Lanes Flat (RP 0/9.3).

**Table 4-7: Annual Distribution of Crashes**

| Year | Fatal | Serious | Minor | Non-Injury | Total | DSI |
|---|---|---|---|---|---|---|
| 2010 | 1 | 1 | 8 | 16 | **26** | **2** |
| 2011 | 0 | 3 | 5 | 16 | **24** | **3** |
| 2012 | 0 | 5 | 9 | 20 | **34** | **5** |
| 2013 | 1 | 0 | 6 | 12 | **19** | **2** |
| 2014 | 1 | 0 | 3 | 11 | **15** | **1** |
| **Five Year Total** | **3** | **9** | **31** | **75** | **118** | **13** |
| 2015[38] | 0 | 1 | 3 | 10 | **14** | **1** |

Examining the 10 year crash history, presented in Figure 4-11 below, reveals an increasing trend in both deaths and serious injuries and the overall number of crashes up until 2012. Since 2012, there has been a reduction in the total number of crashes; however, there have also been two fatal crashes[39]. The crash history therefore reflects the random nature of crashes, especially those of high severity.

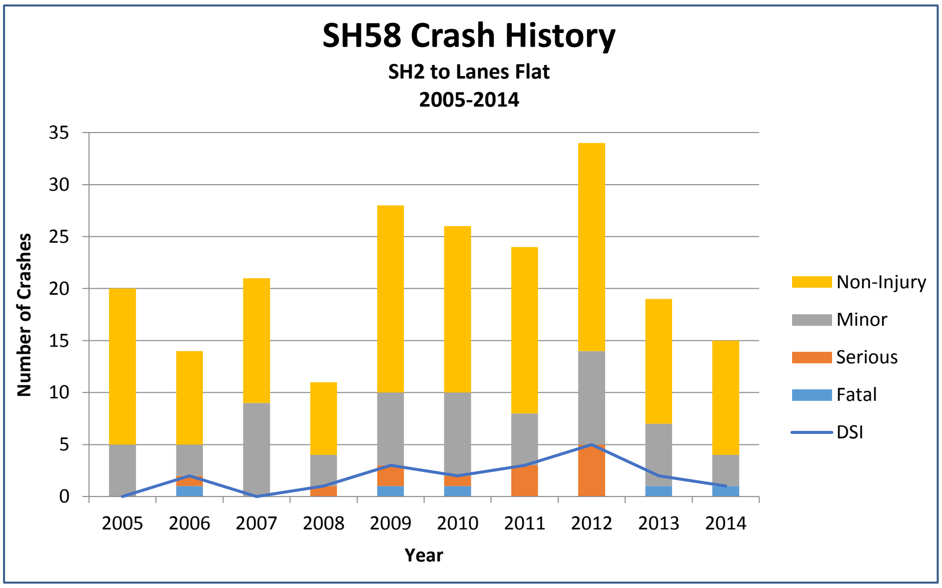



**Figure 4-11: SH58 10 year Crash History**

[36] Noting that DSI is a measure of the total deaths and serious casualties rather than crashes. For example, a single recorded fatal crash could have had multiple fatalities, depending on the number of other vehicles and passengers involved.

[37] Crashes occurring at, and on approach to, the intersection of State Highway 2 and State Highway 58 have been excluded from the analysis as this is the study area and will be addressed in the SH2/SH58 Haywards Interchange Project under construction. There have been 30 crashes on the SH58 approach or turning onto SH58 at the existing signalised intersection between 2010 and 2014. This included one serious injury crash and three minor injury crashes.

[38] 2015 is incomplete as CAS data was retrieved in Feb 2016, noting there is lag of approximately three months between a crash occurring and being loaded on to the CAS database.

[39] It should be noted that Realignment Site 4 was operating under a temporary speed limit of 70km/h in 2013 and 2014 which will have influenced the observed crash numbers during this period.

Figure 4-12 below provides an outline of the crash distribution and out of context curves along SH58 with the following tables providing a summary of the CAS output data for the study area. Additional outputs from the CAS database are contained in Appendix B.

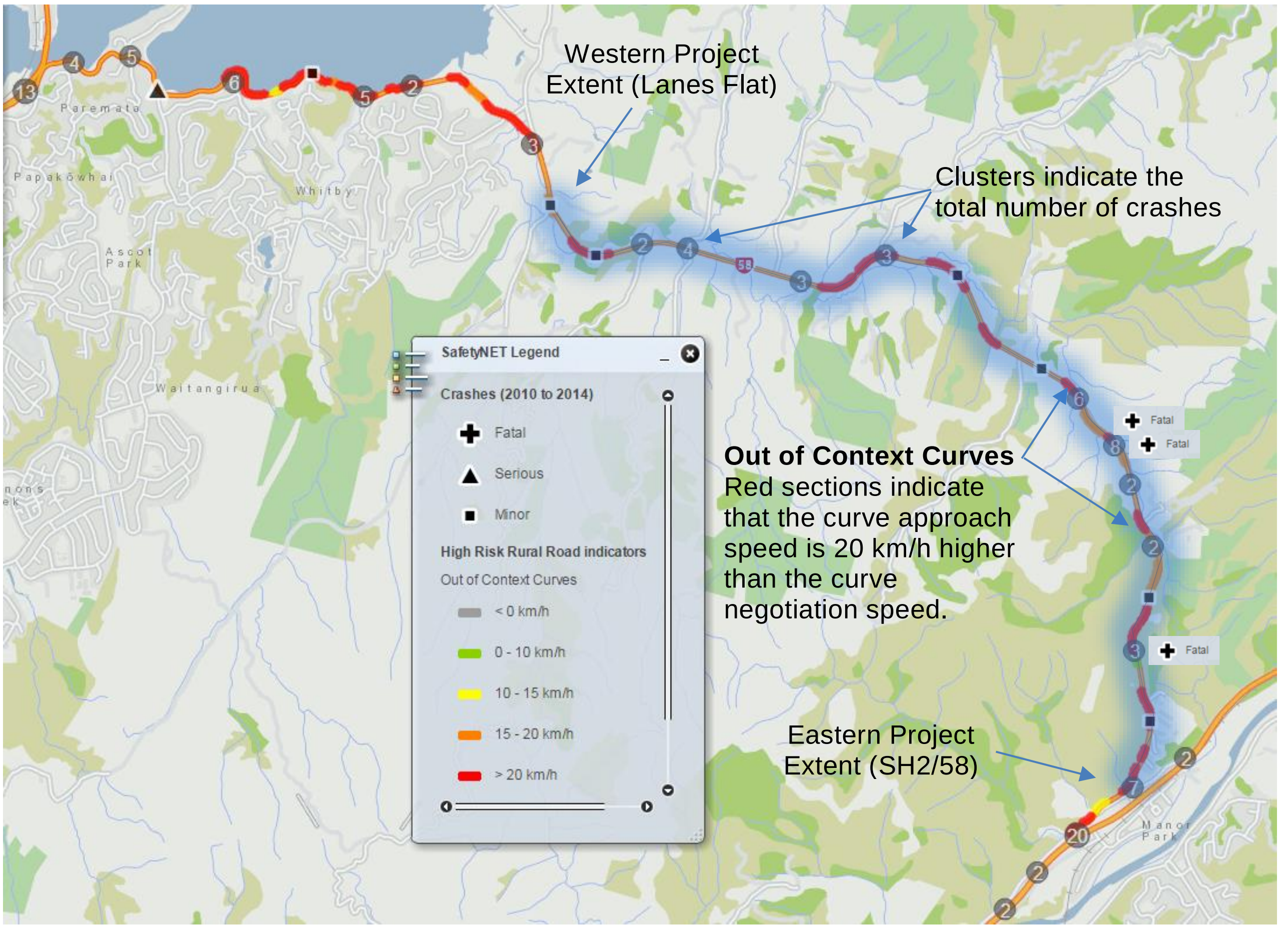



**Figure 4-12: Crash Distribution and Out of Context Curves (Source: NZ Transport Agency SafetyNET)**

**Table 4-8: CAS Crash Type**

| Crash Type | Number of Reported Crashes | % of Reported Crashes | % of Reported High Severity Crashes |
|---|---|---|---|
| Bend – Lost Control/Head On | 71 | 60% | 33% |
| Rear End / Obstruction | 15 | 13% | 17% |
| Straight Road Lost Control/ Head On | 14 | 12% | 33% |
| Overtaking Crashes | 9 | 8% | 17% |
| Crossing / Turning | 6 | 5% | 0% |
| Miscellaneous Crashes | 3 | 3% | 0% |
| Pedestrian Crashes | 0 | 0% | 0% |
| **Total** | **118** | **100%** | **100%** |

Table 4-8 shows that the majority of reported crashes have been 'Bend – Lost Control/Head On'. In terms of high severity crashes, bend and straight loss of control crashes contribute to two thirds of these crashes. The CAS crash type data therefore reflects the high speed environment, out of context curves and highway form.

**Table 4-9: High Risk Rural Roads Guide (HRRRG) Crash Type**

| Crash Type | Number of Reported Crashes | DSI | % of Reported Crashes | % of Reported High Severity Crashes |
|---|---|---|---|---|
| Run off Road | 76 | 6 | 64% | 50% |
| Head On | 13 | 5 | 11% | 33% |
| Intersection Crashes | 12 | - | 10% | -% |
| Other | 17 | 2 | 14% | 17% |
| **Total** | **118** | **13** | **100%** | **100%** |

Table 4-9 shows run off road and head on crashes contributed to 75% of the reported crashes and 83% of the high severity crashes. Compared to national figures, this section of highway is over-represented in high severity run off road crashes.

Comparing the High Risk Rural Road Guide (HRRRG) crash types on SH58 with the Wellington Network shows:

- There are more run off road and head on deaths and serious injuries reported; and
- There are fewer Intersection and other crash types.

**Table 4-10: Environment Factors Crash Summary**

| Road Surface | Fatal | Serious | Minor | Non-injury | Total | % Injury | % of Total Injury | Severity Ratio | % of Total F+S crashes |
|---|---|---|---|---|---|---|---|---|---|
| Dry | 0 | 7 | 14 | 34 | 55 | 38% | 49% | 0.33 | 58% |
| Wet | 3 | 2 | 17 | 41 | 63 | 35% | 51% | 0.23 | 42% |
| Day | 0 | 2 | 7 | 20 | 29 | 31% | 21% | 0.22 | 17% |
| Night | 3 | 7 | 24 | 55 | 89 | 38% | 79% | 0.29 | 83% |
| Weekday | 3 | 4 | 23 | 48 | 78 | 38% | 70% | 0.23 | 58% |
| Weekend* | 0 | 5 | 8 | 27 | 40 | 33% | 30% | 0.38 | 42% |

* Weekend between 6pm Friday and 6am Monday

Table 4-10 above shows that:

- 63 crashes (53% of all crashes) occurred in wet conditions which is very high compared to the Wellington State Highway network average of approximately 32%.
- 35% of crashes which occurred under wet conditions resulted in injury; of which 23% were high severity (causing fatal or serious injury).
- 42% of the total fatal and serious crashes occurred in wet conditions, higher than the regional average of 28%[40].
- 83% of the total fatal and serious crashes occurred in dark conditions, significantly higher than the regional average of 36%[41].

40 HRRRG, Appendix B, proportion of rural state highways severe crashes occurring in the wet for the South-west North Island region.

41 Ibid.

**Table 4-11: Hit Object Crashes**

| Object Hit* | Number of Reported Crashes | % of All Reported Crashes | Number of Reported Injury Crashes | % Of Which Resulted in Injury | Number of Reported High Severity Crashes | % Of Which Resulted in High Severity |
|---|---|---|---|---|---|---|
| Fence | 30 | 25% | 10 | 33% | 1 | 10% |
| Upright Cliff/Bank | 20 | 17% | 7 | 35% | 1 | 14% |
| Utility post/pole | 12 | 10% | 4 | 33% | 0 | 0% |
| Tree | 10 | 8% | 4 | 40% | 0 | 0% |
| Guard/guide rail & median barrier | 10 | 8% | 1 | 10% | 0 | 0% |
| Overbank/Cliff | 7 | 6% | 1 | 14% | 0 | 0% |
| Ditch | 5 | 4% | 1 | 20% | 0 | 0% |
| Bridge or River | 3 | 3% | 3 | 100% | 1 | 33% |
| All Other | 4 | 3% | 1 | 25% | - | -% |
| **Total Objects Hit** | **73** | **62%** | **21** | **29%** | **2** | **10%** |
| No Objects Hit | 45 | 38% | 22 | 49% | 10 | 45% |

Table 4-11 shows that 73 crashes have involved at least one object being hit (equating to over 60% of total crashes), with hit object injury crashes contributing to approximately 49% of all reported injury crashes. The most frequently hit objects include; fences, banks/cliffs, poles, trees. Note that some crashes could have involved more than one object hit; 49% of the total number of injury crashes involved one or more objects hit (21% of the total number of injury crashes involved multiple hit objects).

**Table 4-12: Crash Causation Factors of Reported Injury Crashes**

| Causation | Reported Crashes with Causation Factor | Reported Injury Crashes with Causation Factor | % High Severity |
|---|---|---|---|
| Poor Handling | 50 | 15 | 47% |
| Too Fast | 42 | 19 | 11% |
| Road Factors | 31 | 11 | 27% |
| Poor Observation | 30 | 11 | 18% |
| Poor Judgement | 20 | 8 | 25% |
| Incorrect Lane/position | 11 | 5 | 60% |
| Alcohol/Drugs | 8 | 3 | 67% |
| Vehicle Factors | 8 | 2 | 50% |
| Fatigue | 7 | 1 | 0% |
| Weather | 6 | 2 | 50% |
| Failed to Giveway/Stop | 5 | 2 | 0% |
| Failed to Keep Left | 4 | 2 | 50% |
| Overtaking | 4 | 1 | 0% |
| Disabled/Old/Ill | 4 | 4 | 50% |
| Other (all remaining) | 46 | 19 | 18% |

Table 4-12 shows that, of the 'Road factors' crashes:

- 94% (29 crashes) were due to “Slippery” conditions; 69% of due to rain or ice, 16% due to oil/fuel and 13% due to other reasons.
- The remaining two crashes were due to visibility limitations.

### 4.5.2 Realignment Site Crash Summary

A summary of the crashes on each of five realignment sites and the remaining midblock sections is outlined in Figure 4-13 below.

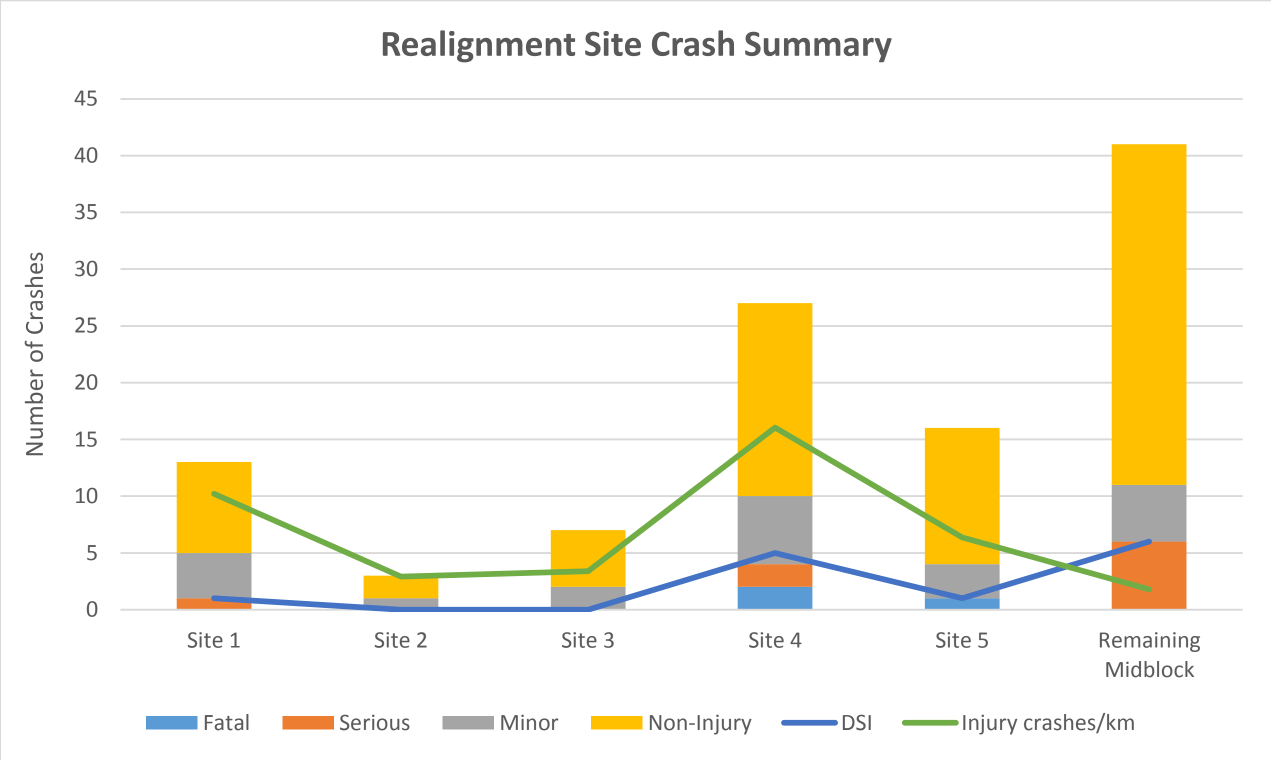



**Figure 4-13: Realignment Site Crash Summary**

Figure 4-13 above shows that all the realignment sites have a higher injury crash rate than the midblock sections. Of the realignment sites, Site 4 has the largest number of overall crashes, deaths and serious injuries as well as the highest injury crash rate. Table 4-13 below provides further detail on the crashes which have occurred at each site.

**Table 4-13: Crash Summary**

| Realignment Site | Location | Crashes: Fatal | Serious | Minor | Non-Injury | DSI | Comments |
|---|---|---|---|---|---|---|---|
| **Site 1** | RP 58/0/ 0.574 – 1.064 | 0 | 1 | 4 | 8 | 1 | • The serious injury crash involved a motorcyclist travelling westbound losing control and colliding with the rear of a car that was travelling very slowly on a left hand curve.<br>• The minor injury crashes involved:<br>  • Two crashes were a single eastbound car travelling too fast when entering a corner, losing control when turning right and hitting a bank and or tree;<br>  • A westbound SUV travelling too fast when entering a corner, swinging wide, and colliding head on with another vehicle; and<br>  • An Eastbound SUV colliding with the rear end of another eastbound car.<br>o The non-injury crashes were all bend or straight loss of control/head on crashes with the exception of one rear end crash.<br>o 61% of the crashes occurred in dark (night/twilight) conditions, including two minor injury crashes and six non-injury crashes.<br>o 61% of the crashes occurred in wet or icy conditions, including three minor injury crashes and five non-injury crashes. |
| **Site 2** | RP 58/0/ 1.128 – 1.470 | 0 | 0 | 1 | 2 | 0 | • The minor injury crash involved a westbound van travelling too fast when entering a corner, losing control when turning left and hitting guardrail/barrier.<br>• The non-injury crashes were single vehicle loss of control.<br>• 66% (2) of the crashes occurred in wet or icy conditions, including the minor injury crash.<br>• One non-injury crash occurred in dark (night/twilight) conditions. |
| **Site 3** | RP 58/0/ 2.411 – 3.000 | 0 | 0 | 2 | 5 | 0 | • Both minor injury crashes occurred in wet conditions, with the driver entering the corner too fast; resulting in one loss of control while overtaking and one rear end crash.<br>• The non-injury crashes involved three bend loss of control crashes, one loss of control head-on crash and one hit object.<br>• 57% (4) of the reported crashes occurred in wet or icy conditions including both minor injury crashes.<br>o 43% (2) of the reported crashes occurred in dark conditions (non-injury). |

| Realignment Site | Location | Crashes | | | | | Comments |
|---|---|---|---|---|---|---|---|
| | | Fatal | Serious | Minor | Non-Injury | DSI | |
| **Site 4** | RP 58/0/ 3.376 – 4.000 | 2 | 2 | 6 | 17 | 5 | • The two fatal crashes occurred approximately 3 months apart, both were eastbound loss of control head-on in wet conditions on the departure of the scour site curve. Both crashes occurred while a temporary speed limit was in place at the site.<br>• The serious injury crashes involved:<br>  • An eastbound car entering a corner too fast, losing control when turning and colliding with another car head on, similar to the two fatal crashes.<br>  • An eastbound van losing control turning right colliding with a fence, flipping down a bank and coming to rest in a small stream.<br>• The minor injury crashes involved:<br>  • Four eastbound and one westbound bend loss of control followed by hit object (cliff/bank, poles, and fence).<br>  • One eastbound bend loss of control head on crash.<br>• The non-injury crashes involved 16 bend or straight loss of control /head on crashes and one rear end crash.<br>o 74% of reported crashes occurred in wet conditions including all fatal and serious injury crashes, and five of the minor crashes.<br>o 29% of crashes occurred in dark conditions, these were all non-injury crashes. |
| **Site 5** | RP 58/0/ 1.670 – 2.300 | 1 | 0 | 3 | 12 | 1 | • The fatal crash occurred when a westbound van lost control while overtaking on a wet surface with worn tyres.<br>• The minor injury crashes included<br>  • A westbound car travelling too fast and losing control on a bend hitting the embankment.<br>  • An eastbound cyclist lost control hitting an object on the road.<br>  • A westbound motorcyclist losing control on a bend.<br>• The 12 non-injury crashes included; nine bend lost control crashes seven of which hit guardrail/barrier, and three crash occurred while overtaking (two lost control while overtaking).<br>o 56% of the crashes occurred in wet or icy conditions including the fatal crash, two minor injury crashes and six non-injury crashes.<br>o 25% of the crashes occurred in dark (night/twilight) conditions including two minor injury crashes. |

| Realignment Site | Location | Crashes | | | | | Comments |
|---|---|---|---|---|---|---|---|
| | | Fatal | Serious | Minor | Non-Injury | DSI | |
| **Remaining Midblock Sections** | The remaining approx. 6km section of the SH58 project extents | 0 | 6 | 5 | 30 | 6 | • The serious crashes included:<br>• Four loss of control crashes, one occurred while overtaking another vehicle.<br>• One head-on on bend crash,<br>• One rear-end crash were an eastbound vehicle hit a cyclist.<br>• 55% of crashes were loss of control, 17% crossing/turning, 11% Rear end/obstruction, 11% overtaking, and 6% head-on.<br>• When considering the three high risk rural roads guide (HRRRG) high severity crash types, run off road crashes account for 66% (54% nationally42), head on 17% (21% nationally) and intersection -% (13% nationally).<br>• Compared to national figures, this section of highway is overrepresented in high severity run off road crashes.<br>• 43% of the crashes occurred in wet/icy conditions, seven minor and 21 non-injury crashes. |

### 4.5.3 Crash Risk

The project area has been assessed using both the High Risk Rural Roads Guide[43] (HRRRG) and the draft High Risk Intersections Guide[44] (HRIG). Refer Appendix B for crash risk calculations.

Based on published 2012 KiwiRAP risk maps SH 58 from Porirua to SH 2 Upper Hutt has:

- High collective risk (annual average fatal and serious injury crashes per km); and
- Low-medium personal risk (annual average fatal and serious injury crashes per 100 million vehicle km).

Due to the high collective risk (ranked 12th nationally), the entire rural length of SH58 is classified as a high-risk rural road.

The calculated KiwiRAP star rating for this section of SH58 is 2.7, resulting in a published 2 star KiwiRAP rating. This is below SH58's One Network Road Classification (ONRC) Safety Customer Level of Service aim of "Mostly KiwiRAP 3-star equivalent or better" for a Regional Road.

The crash risk for the project length is as follows:

- High collective risk (0.27 high severity crashes per km per year).
- Medium personal risk (5.2 high severity crashes per 100 million veh km).

Therefore this section is classified as a high-risk rural road with predominately a 'Safer Corridors' treatment strategy. In addition, due to the high volume of the route, there is justification for medium to high cost improvements under a 'Safe System Transformation' treatment strategy.

Potential treatment strategies could include providing corridor roadside hazard treatment, intersection improvements, corridor shoulder widening, curve easing and median treatments[45].

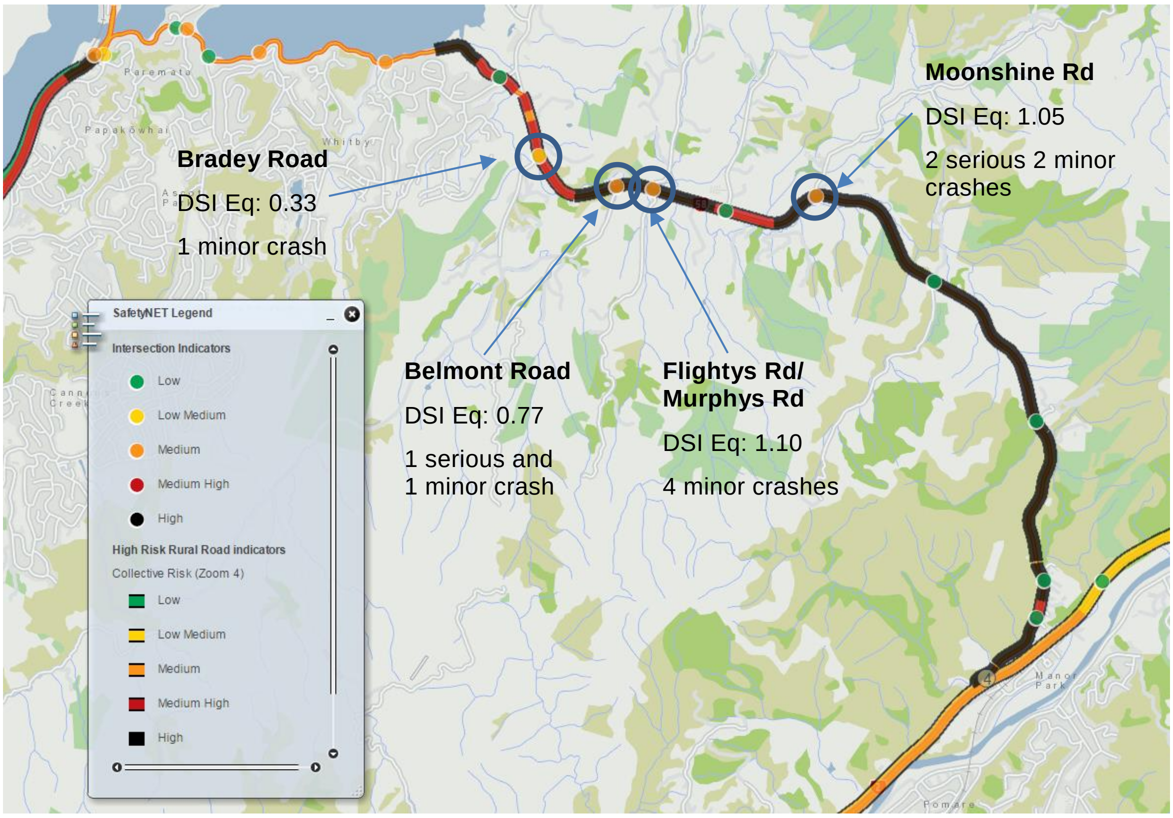



**Figure 4-14: SH58 Collective Risk and Intersection Risk (Source: NZTA SafetyNET)**

[43] High Risk Rural Roads Guide (HRRRG), NZ Transport Agency, September 2011

[44] High Risk Intersection Guide (HRIG), NZ Transport Agency, August 2013

[45] As outlined in Section 2, research has shown that as traffic volumes exceed 6,000 AADT, the head on high severity crash rate exceeds the run off road crash rate.

Figure 4-14 above also identifies a number of medium risk intersections, these are further detailed in Table 4-14 below. Two intersections in the study area were identified as having three or more injury crashes, in the five year period 2010-2014. These include; Moonshine Road and Flightys/Murphys Road. Both intersections were analysed further according to the HRIG with the treatment philosophy detailed in the table below. The treatment philosophies for both intersections indicate there is justification for a change in intersection form. Refer Appendix B.2 for the full HRIG analysis.

**Table 4-14: Intersection Risk Summary**

| Intersection | Collective Risk | DSI Equivalent | Crash comments | HRIG Treatment Philosophy |
|---|---|---|---|---|
| Hugh Duncan St | Low | 0 | - | N/A |
| Mt Cecil Road | Low | 0 | - | N/A |
| Harris Road | Low | 0 | - | N/A |
| Moonshine Road | Medium | 1.05 | 2 Serious and 1 Minor | Safety Management or Safe System Transformation Works |
| Flightys Rd/Murphys Rd | Medium | 1.10 | 4 Minor crashes | Safe System Transformation Works |
| Belmont Rd | Medium | 0.77 | 1 Serious and 1 Minor | N/A |
| Bradey Rd | Low Medium | 0.33 | 1 Minor crash | N/A |

### 4.5.4 Crash Rate

The site specific crash rate for each site has been compared to what would be expected as typical. The typical crash rate was found for each of the curves using the crash prediction model for mid-block crashes in the New Zealand Transport Agency's Economic Evaluation Manual (EEM).

#### 4.5.4.1 Midblock

An analysis of the 2010 to 2014 crash data shows that 31 injury crashes occurred in the latest five year period (6.2 injury crashes per year). The typical crash rate was found to be 5.7 injury crashes per year based on 2015 traffic flows at the telemetry site; indicating that the project extent is performing approximately 10% worse than expected, after taking into account the traffic volume and highway form.

#### 4.5.4.2 Realignment Sites

An analysis of the 2010 to 2014 crash data for the five realignment sites shows that 22 injury crashes occurred in the latest five year period (4.4 injury crashes per year). The typical crash rate was found to be 3.4 injury crashes per year based on 2015 traffic flows at the telemetry site. This indicates that the crash rate along these realignment sites is approximately 30% higher than expected.

The curve context table within the RAMM database identifies curves considered to be out of context with the surrounding road environment. Part of this table includes a predicted collective crash risk for each curve included, based on New Zealand curves. The predicted crash rate for the five realignment curves was calculated as 3.6 injury crashes per year; higher than the typical EEM model but still over 20% lower than the actual realignment crash rate.

**Table 4-15: Realignment Crash Rate**

| Parameter | Injury Crashes per Year |
|---|---|
| Site Specific (Actual) Realignment Crash Rate | 4.4 |
| Typical Crash Rate (EEM) | 3.4 |
| Predicted Crash Rate (Curve Context RAMM) | 3.6 |

### 4.5.5 Overall Crash Summary

The crash analysis highlights:

- **Crash history and trends**
  - There have been a 12 high severity crashes, resulting in 13 DSI, in the five year period from 2010-2014. This includes three fatal crashes.
  - Run off road and head on crashes contributed to 75% of the reported crashes and over 80% of the high severity crashes. Compared to national figures, this section of highway is over represented in both high severity run off road crashes and high severity crashes which occur in wet conditions.
  - Of the five realignment sites, site 4 (the Scour Site) has the largest number of overall crashes, injury crash rate and DSI.
- **Crash risk**
  - Due to the high collective risk (ranked 12th nationally), the entire rural length of SH58 is classified as a high-risk rural road.
  - The calculated KiwiRAP star rating for this section is 2.7, below the One Network Road Classification (ONRC) Safety Customer Level aim of 'Mostly KiwiRAP 3-star equivalent or better' for a Regional state highway.
  - Three intersections were identified as being 'Medium' collective risk including; Moonshine Road, Flights/Murphys Road and Belmont Road.
  - Crash rate analysis shows that SH58 has experienced more crashes than expected, when assessed against either the corridor or specific realignment sections.

Overall, the high speed environment, poor horizontal alignment (out of context curves), roadside hazards and narrow cross section all contribute to the high severity crashes experienced and the on-going high injury crash risk.

## 4.6 Active Modes Data

The section of SH58 between SH2 and Pauatahanui provides a popular recreational cycle route. In order to quantify the typical level of cyclist usage over this section, a manual cyclist count was undertaken via footage recorded by a mounted NZ Transport Agency camera located as shown in Figure 4-8 below. Counts were completed during a weekday morning and afternoon period (i.e. Friday 7:30am – 9:30am and 2:30pm – 4:30pm) and a full weekend day (i.e. Saturday 7am - 6pm) in February 2016.

The manual counts were then converted via the Cycle Network and Route Planning Guide (CNRPG) method to provide an equivalent AADT for the section. The following table provides a summary of the count data and calculated AADT values:

**Table 4-16: Summary of Cyclist Activity – SH58**

| Period | Manual Cyclist Count |
|---|---|
| Friday – Morning Period | |
| 7:30am – 8:30am | 1 |
| 8:30am – 9:30am | 0 |
| Total | 1 |
| AADT (Fri AM) | 2.6 |

| Period | Manual Cyclist Count |
|---|---|
| Friday – Afternoon Period[46] | |
| 2:30pm – 3:30pm | 0 |
| 3:30pm – 4:30pm | 0 |
| Total | 0 |
| **AADT (weekday average)** | **1.3** |
| Saturday | |
| 7:00am – 8:00am | 5 |
| 8:00am – 9:00am | 7 |
| 9:00am – 10:00am | 40 |
| 10:00am – 11:00am | 33 |
| 11:00am – 12:00pm | 8 |
| 12:00pm – 01:00pm | 2 |
| 01:00pm – 02:00pm | 2 |
| 02:00pm – 03:00pm | 2 |
| 03:00pm – 04:00pm | 3 |
| 04:00pm – 05:00pm | 0 |
| 05:00pm – 06:00pm | 1 |
| Total | 103 |
| AADT (Sat) | 156 |
| **AADT (weekend average)** | **156** |

It can be noted from the resulting data, that the weekend morning peak period (9:00am – 11:00am) accounts for a heavy majority of the cyclist activity for the route, which indicates this route is largely used by weekend recreational cyclists, rather than commuters.

In addition, the 2015 Strava Labs[47] heat map shown in Figure 4-8 indicates comparative levels of tracked cyclist activity on SH58 (red=high, yellow=low). As depicted below, the largest mid-route source of cyclist trips stem from Moonshine Road, with higher volumes of cyclists between Moonshine Road and Pauatahanui than from SH2 to Moonshine Road.

[46] The video data captured during the assessment ended at 4.30pm, the PM peak for cycling was therefore not recorded during this short assessment period.

[47] It is noted that Strava data has a selection bias; however, it provides one data source in lieu of more detailed actual counts or estimates.

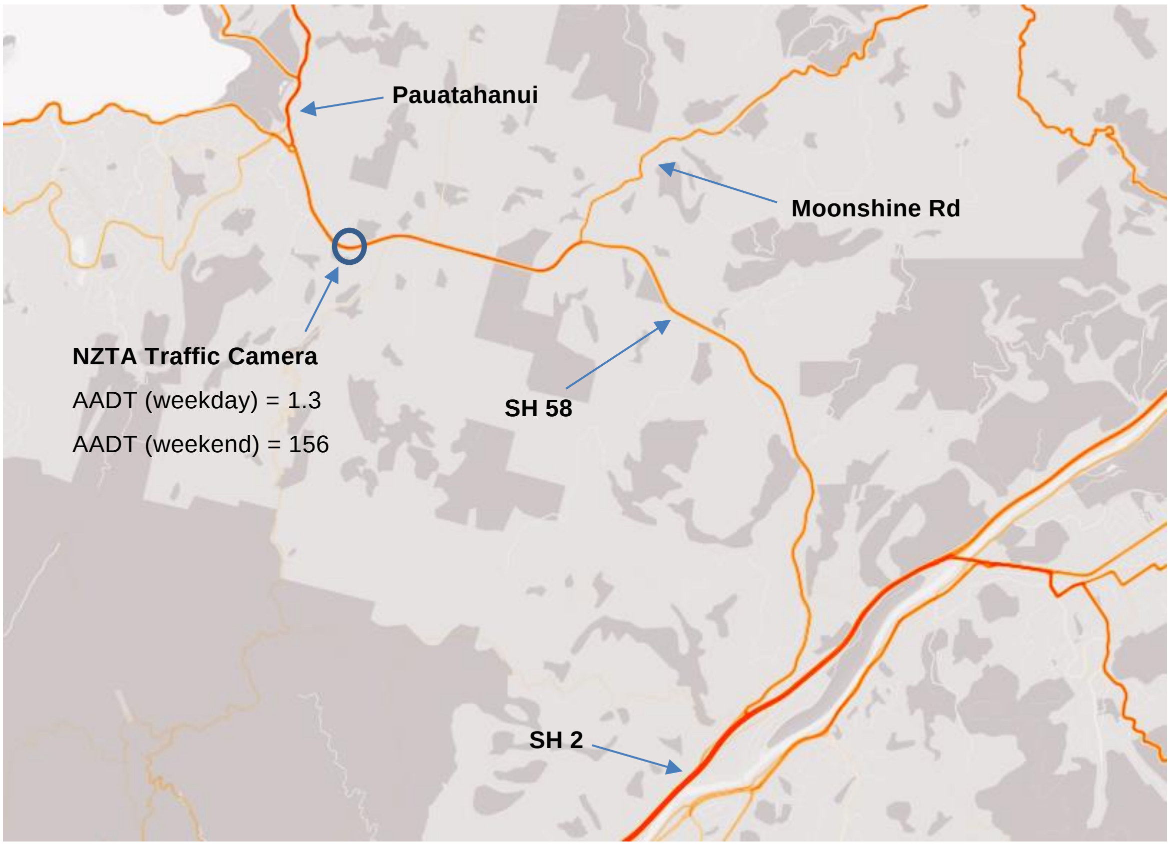



**Figure 4-15: Strava Labs Heatmap for cyclist activity for 2015**

## 4.7 Public Transport Data

One bus service and three school bus service routes operate through SH58 between SH2 and Pauatahanui. These Routes are:

- 97H; 2 services daily (purely commercial), westbound AM, eastbound PM;
- 970; 2 services daily (term times only), westbound PM, eastbound AM;
- 971; 2 services daily (term times only), westbound PM, eastbound AM; and
- 973; 2 services daily (term times only), westbound PM, eastbound AM.

There are seven locations on the route where there are stops. These are:

- Hillside (near McDougall Grove);
- Substation – Hail to Ride (eastbound only);
- (near Judd’s Farm) – Hail to Ride;
- At Moonshine Road;
- At Mulherns Road;
- At Flightys Road / Murphy Road; and
- At Mill (between Bradey and Belmont Road).

# 5 Consultation & Stakeholders

## 5.1 Pre-existing information

### 5.1.1 SH58 Strategy Study Consultation (2009)

During the production of the 2009 Strategy Study, meetings were undertaken with Porirua City Council, Upper Hutt City Council and Greater Wellington Regional Council.

These meetings were used to provide an understanding of the content and proposed works broadly detailed within the developing strategy, and to seek input from these stakeholders.

There are no specific issues or details in the minutes of these meetings that warrant particular discussion or repeat here. One aspect that was raised by local authorities was a desire to understand timing of strategy study recommended works and allowance for future growth.

### 5.1.2 Petone to Grenada Engagement Feedback (mid-2014)

As part of the engagement process for the P2G Link Road project, the Transport Agency encouraged feedback and received a large number of submitters on SH58 (although this was not a topic specifically consulted on).

At the time of the above consultation, a number of members of the public were concerned about project options for the P2G Link Road which involved the creation of a "Takapu Link Road" to TG or widening of SH1 between Tawa and Linden to mitigate future capacity concerns. These proposals were perceived by members of the public as being an unnecessary addition to the P2G Link Road, and as an alternative to these proposals, a number of members of the public proposed the four-laning of the SH58 route in order to avoid providing additional capacity on either a Takapu Link or in the widening of SH1. Subsequently, a detailed MCA process was followed which resulted in a proposal to future proof for further capacity requirements through a managed motorway proposal on SH1 rather than widening or a Takapu Link.

The P2G Link Road Engagement Report can be located at:
http://www.nzta.govt.nz/assets/projects/petone-grenada-link-road/docs/p2g-engagement-report-201408.pdf

A common response centred on a preference to see SH58 being a priority for investment (over P2G), with the following overarching themes:

- Being the better use for state highway investment.
- SH58 improvements going ahead as an alternative.
- Upgrading to a motorway standard.
- Widening SH58 to 4 lanes and providing a full interchange at Haywards/SH2 intersection.

The main points made by submitters in relation to SH58 are provided below.

Many submitters outlined that they thought SH58 should be the main route of resilience. Comments relating to the resilience of SH58 in the context of this project related to:

- Volume of SH58 increasing on completion of TG; and
- SH58 being more resilient to earthquakes and further from fault lines in comparison to P2G.

Many submitters also commented on SH58 being a more direct route. Common responses related to:

- SH58 being more direct westbound route for much of the Hutt Valley;
- That SH58 is a more appropriate route from Porirua to the Hutt;
- SH58 provides better access to Upper Hutt as well as Lower Hutt; and
- Everywhere north of Petone will use SH58 over P2G.

Of particular interest for the SH58 Safety Improvements project, many submissions also highlighted the unsafe nature of SH58 at present. It was outlined that improvements needed to occur before the opening of TG when traffic on the route will greatly increase. Other responses related to:

- Not improving SH58 will result in more deaths and serious injuries;
- It is a known blackspot;
- For safety alone, upgrading SH58 should be a priority; and
- Not widening SH1 North of Grenada might cause delays due to an increase in future traffic volume in a few decades time.

Several submitters commented on the need for improving the intersection between SH2 and SH58.

Several submissions commented on the comparative cost of the P2G Link Road with upgrading SH58 and that this is likely to be far less.

Many submitters also commented on comparative gradients and distances between the P2G route and SH2/SH58 route with many outlining that a SH2/SH58 route west has a less steep gradient than that of P2G/TG.

## 5.2 Consultation Process

The SAR stage consultation was undertaken in late 2014 to obtain feedback from landowners, stakeholders and the general public on the proposed safety upgrades of Option 4, while design for the improvements were at an early stage.

The following actions were undertaken:

- Letters were sent to the interested parties to outline progress and options and seeking feedback and arranging a meeting with the Transport Agency representatives to discuss the proposed improvements.
- Individual meetings were held for directly affected landowners and stakeholders.
- Open Day sessions were held for the general public.

The following groups to be consulted were identified as follows:

- **Directly Affected Landowners:** *Landowners whose land would likely to be required for the proposed safety improvements*.
- **Landowners Affected by Access:** *Landowners adjacent to the project area whose access to SH58 from their properties is likely affected by the proposed safety improvements (including the proposed median barrier)*.
- **Hugh Duncan Street/McDougall Grove residents:** *Residents and/or the property owners of Hugh Duncan and McDougall Streets while not directly affected by the upgrades, had been previously involved with proposed upgrades to SH58 by the Transport Agency and were included for this reason*.
- **Interested Stakeholders:** *The stakeholders included groups such as Cycle Aware, the NZ Police and Iwi.*

The consultation activities comprised:

Open days at Pauatahanui and Upper Hutt;

A mail out; and

One on one meetings with landowners.

## 5.3 Stakeholders

In addition to the directly affected residents and businesses along the corridor, the wider local community and road users, stakeholders for the project were identified as:

Hutt City Council;

Upper Hutt City Council;

Porirua City Council;

Greater Wellington Regional Council;

Hugh Duncan Community;

Fletcher Concrete and Infrastructure Ltd (Winstones Aggregates);

Transpower New Zealand Ltd;

Police – Safety and Security;

NZ Automobile Association;

Cycle interest group;

Heavy Haulage Association;

Road Transport Forum NZR;

Road Transport Association New Zealand;

Iwi; and

Britton House Movers (located at intersection of SH2 and Harris Road)

## 5.4 Consultation Outcomes

The main themes and issues that arose from the consultation are summarised below. These themes and issues have been sourced from the consultation records.

### 5.4.1 Landowners

Feedback from directly affected landowners and landowners whose access would be affected, identified that they acknowledged the high number of crashes that occur on SH58 and were generally supportive of the project.

Most of the landowners, while being supportive of the proposed speed reductions and realignment of SH58, were concerned about the loss of land, changes to private access to SH58 and the left-in, left-out access that would result from the median barrier.

### 5.4.2 Submissions

Submissions made using the feedback forms provided at the Open Days and electronically on the project website were compiled and analysed.

Seventy one submission forms were filled out from the Pauatahanui Open Day.

There were 68 submissions lodged on the project website. Submitters generally supported the proposed safety upgrades (80% of submissions were in support). Sixty percent of submissions supported the median barrier. Seventy five percent of submitters supported the reduction of speed proposed.

Sixty five percent of respondents supported the proposal to install a wire rope barrier along SH58.

Public opinion on the project was gauged via the open days held at the Pauatahanui School and the Upper Hutt library. Over 200 people attended the Open Days. The following themes were identified through conversations and break-out meetings with attendees:

- General support for lowering the speed limit.
- General support for fixing the scour site corner and installing the median barrier.
- Concern was expressed by the residents of Flightys and Murphys Roads regarding the long wait and confusion at these intersections, particularly when cars are waiting to exit both intersections.
- Safety at Flightys and Murphys Roads are exacerbated at school pick up and drop off time due to the bus stops at the intersection. Provision for children crossing the road to get to the bus stop was requested.
- The difficult entrance/exit arrangements on/off SH58 at Flightys Road creates an increased probability of crashes

The following themes were identified from the website submissions:

- The median barrier will reduce space for cyclists and motorcyclists and will be dangerous.
- General support for the reduction in speed.
- Those opposed to the reduction in speed generally feel that it would not reduce the amount of crashes on SH58.
- General concern about the change in access proposed at intersections, particularly at the intersection of Harris Road and SH58.
- General concern that the design does not cater enough for cyclists who use the road.

### 5.4.3 Consultation Summary

The consultation undertaken to date on the proposed SH58 safety improvements concept design was intended to provide information to, and seek feedback from, affected persons and stakeholders and the general public.

The information gathered will inform the next stage of design prior to more detailed consultation with those who are directly affected by the upgrades as part of the preparation of the NoR and any resource consent applications that may be required under the RMA.

Relationships have been initiated with landowner, stakeholder and the general public by the exchanging of information at an early stage of the design. The feedback sought from the consultation has been recorded. The consultation process has been successful in yielding information that will be used in the next stage of design.

The top five issues identified during the consultation by the public, landowners and stakeholders are:

- The land purchase proposed;
- The inconvenience of altered private access to SH58;
- Safety of turning arrangements at intersections due to the proposed median barrier restricting right turns;
- The safety upgrades do not cater for cyclists and motorcyclists; and
- The upgrades will increase noise and stormwater run-off.

The changes made to the project as a direct result of the December 2014 consultation process are described in Section 6.2.1.3.

It is noteworthy that very few comments were received during the public consultation in relation to a desire from the community for four-laning of SH58.

# 6 Option Description

Refer to Rev4 of the SAR for a full detailed description of the originally investigated project options, the change and subsequent refinement of the scope, and selection process for the recommended option.

Detailed below in Section 6.1 is a brief summary of the recommended options during various milestone stages of the SAR, and a description of how these were arrived at, and then refined. Section 6.2 describes the changes made to the preferred option proposed by this SAR Addendum (i.e. changes made since Rev4 of the SAR).

## 6.1 Option Development & Refinement

### 6.1.1 Option 3

Of the initial three cross section options considered for the corridor improvements, Option 3 was selected as the recommended option at that time[48]. Option 3 consisted of carriageway widening to achieve 1.5 m shoulders, 3.5 m traffic lanes and a 2.0 m wide median with median wire rope barrier provision, as shown on the typical section below:

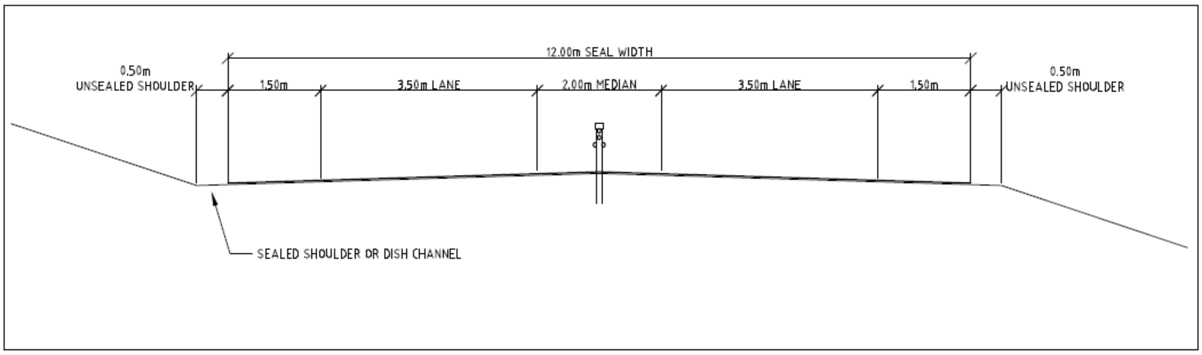



**Figure 6-1: Original Option 3 Cross Section Typical Detail**

In addition, Option 3 also included the four horizontal curve realignment sites (Sites 1-4) described in Section 3.4.

### 6.1.2 Option 4

Prior to stakeholder and public consultation, Option 3 was further refined to create Option 4. Option 4 was created on the basis of identifying any areas within the project extent that could be amended to improve the efficiency of the overall scheme design.

This optimisation had dual purposes; firstly to ensure the project fits within a likely envelope of affordability, and secondly, to ensure a suitable level of economic efficiency and value for money.

The changes made to Option 3, to create Option 4 are detailed below:

- Removal of Site 1 Realignment: Due to the challenging topography through this section, the earthworks quantities were calculated as being extremely significant in terms of cut material volumes which had a consequential effect on the scheme estimate. Realignment of this section was therefore omitted in Option 4, with only an improved cross section proposed. The suitability and implications of this approach are described in detail in Rev4.
- Project Western Extent (Bradey Road): Originally the western extent was proposed to extend to just east of the Pauatahanui Roundabout. Given the extent of the proposals for TG, the section of SH58 improvements between Bradey Road and Pauatahanui Roundabout were removed. Accordingly,

48 Refer Rev4 of the SAR for further detail.

610m of the project was removed with the revised project extent consequently ending immediately east of Bradey Road.

- Do-minimum speed: The do-minimum option speed for the project length was reduced from the current 100km/h posted speed limit, to 80km/h. This reduction was on the basis of the NZ Transport Agency staff advising that they are already planning to reduce the speed limit given the high risk nature of this section of SH58 and the poor crash history[49].

Option 4 was the corridor option consulted on with stakeholders, affected landowners and the wider community in late 2014.

### 6.1.3 Scour Site Realignment Acceleration (Realignment Site 4)

Early in the SAR investigations during 2013, it became apparent that there was a clear network maintenance issue at one particular location on the SH58 Corridor being investigated. This location, at approximately RP0/3.75 had been a known issue for a number of years and subject to various investigations (since at least 2010). The site has become known generally as the 'Scour Site' - a steep north-east facing slope at a pinch point on SH58 where Pauatahanui Stream was eroding the toe of the slope and which consequentially is causing the highway shoulder to fail (with the shoulder being approximately 0.5 m wide at this point).

The general focus of potential remediation has shifted throughout the intervening period. Initially, the emphasis being on protecting the road from the stream scour. This subsequently developed into realignment of the stream itself, to provide an increased offset from the stream to the scoured slope face. When progress with the stream realignment was stalled due to consenting issues with Greater Wellington Regional Council (GWRC), further options were then considered relating to the road realignment.

Multiple options were then considered for realignment, including minor, mid-range and full realignment as per the proposals in the developing SAR (i.e. Realignment Site 4).

The need for realignment was further brought into focus due to two separate fatal crashes occurring at the Scour Site curves during late 2013 and early 2014. As a result of the extremely poor crash history at this location, in combination with the maintenance issues and road undermining, the Transport Agency made the decision to expedite the scour site realignment.

The decision was made to provide the full SH58 SAR realignment as opposed to providing a less significant realignment in the first instance, which would subsequently be realigned again with the wider SH58 SAR improvements.

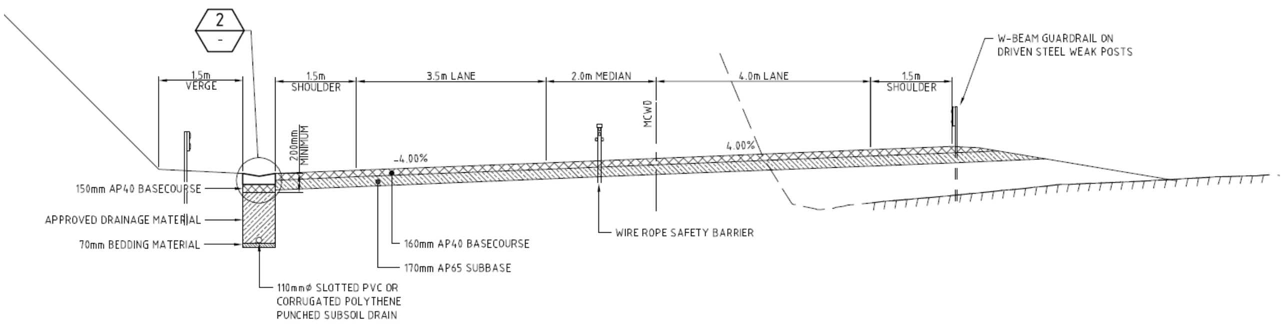



**Figure 6-2: Typical Cross Section Detail of Scour Site Realignment Works**

The Scour Site realignment physical works were commenced in late 2014 and are substantially complete. The works have provided cross-sectional upgrades for 860m of length (RP0/3.00 to RP0/3.86), together with realignment of a horizontal curve within the upgrade extents (Site 4 realignment of horizontal curve No. 16). The curve realignment has removed the broken back alignment of two same direction curves (of 290m and 160m radii with varying and excessive superelevation) to a

[49] Refer Section 7 for further information on legal speed limit.

single horizontal curve with radius of 425m. The improved section has removed a short substandard westbound passing lane, and also has median barrier throughout together with extensive edge barrier protection.

**Figure 6-3: Photograph of Scour Site Realignment works during construction**

For the purposes of this SAR Update, the improvement works at the Scour Site form part of the overall corridor improvements. This is on the basis that the improvement works are part of a corridor strategy that requires a consistent and continuous level of upgrade throughout the corridor length. The costs and benefits of works along the corridor should be considered holistically so that the suitability of the overall corridor treatment can be assessed. There is also a risk that by removing the costs and benefits of the Scour Site improvements from the wider corridor, that the overall economic efficiency reduces because one particular high risk site has been treated. This approach is not advocated because the risk along the entire corridor remains significant and the historic crash data only provides a snapshot in time of where actual crashes have taken place, rather than considering risk along the entire corridor, where the KiwiRAP star rating system provides a better forward looking predictor of safety performance.

## 6.2 Option 5 Development

Following the development of Option 4, it was determined that a further option should be considered that provided a more comprehensive and robust 'whole-of-corridor' improvement, and is therefore presented in this SAR Addendum. The general basis of Option 5 retains those cross section and realignment improvements from Option 4; the additions to the corridor improvements are described below.

#### 6.2.1.1 Interface with SH2/SH58 Interchange

When the SH58 Corridor SAR work was commenced in 2013, the proposed improvements at the intersection of SH2/SH58 intersection were well established and a proposed design was in an advanced state of development. However, it was envisioned that the new interchange would be constructed here within the next 10 years (i.e. by 2023).

In recognition of this, and to ensure that works proposed within the SH58 Corridor SAR (and any subsequent design phase or physical construction), the project extent for the SAR was set 300 m back from the existing intersection, recognising that the interchange works would extend back a considerable distance from the existing traffic signals.

With the accelerated delivery of the SH2/SH58 interchange, there is now certainty as to the design, and extent, of the interchange works. This means that the SH58 SAR Corridor works can be tied into the extent of the interchange construction with confidence that there will not be unnecessary sacrificial works.

Option 5 of the improvement works in the SAR therefore seeks to connect in closely to the extent of works proposed in the SH2/SH58 interchange construction, which is a point on SH58 to the immediate west of the McDougall Grove / Annabell Grove intersection. This effectively shortens the SH58 Corridor SAR works and ties in closely to the interchange works given the interchange design work is complete.

Therefore the Option 5 scheme stage design seeks to tie into the latest version of the proposed works for SH2/SH58 interchange works on SH58, recognising that this project is in the early stages of construction via a Design & Construct procurement method.

#### 6.2.1.2 Reintroduction of Site 1 Realignment

During the initial SAR development, it was intended to realign two of the easternmost horizontal curves on SH58 – west of Hugh Duncan Street, to 280mR and 400mR respectively. This section of realignment, was termed Site 1 Realignment. Realignment of these curves was therefore proposed as part of Option 3. Due to the topography through this section, the size of the cut faces and volume of material resulting from realignment through this section is extremely significant, with cut faces up to 40 m in height. The cost of the earthworks alone for realignment of these two curves, to the radii described, was estimated to be $2M+.

At that time, and in order to achieve an affordable scheme design that would demonstrate an acceptable level of economic efficiency, a number of options were considered to reduce the estimated costs. This cost reduction and optimisation process involved a number of changes to reduce overall project works, with the optimised option renamed from Option 3 to Option 4. In Option 4 Realignment Site 1 was omitted from the project, but with an improved cross section and median wire rope barrier still proposed. Whilst this reduced the volume of earthworks significantly, substantial cuts would still have been required to accommodate the wider cross section given the proximity of the bluff faces to the road edge and the constrained highway width at this location.

It was recognised that the removal of this section of realignment would result in some loss of the overall safety benefits that the scheme expected to achieve; however, given the improved cross section, the median wire rope barrier (and probable edge barrier), potential for a posted speed reduction on the entire corridor (from 100km/h to 80km/h) plus the proximity to the SH2/SH58 interchange works, then removal was considered acceptable.

Since the project has been effectively on hold since the end of 2014, the approach to the treatment of this realignment has been reconsidered. In considering the overall expenditure on the corridor itself, together with the expenditure at both extents (SH2/SH58 interchange and SH58/TG interchange), it is no longer considered suitable to retain a short section of the highway that is substandard without being realigned as part of the overall works, as this would be out-of-context and would, at some future point, require further improvements which would not represent a cost-effective approach.

Realignment Site 1 is now reintroduced into the project works as part of the Option 5 proposals.

#### 6.2.1.3 Post Consultation Modifications

Following the late 2014 stakeholder and community consultation process and compilation of feedback, it was apparent that there was considerable public support for introducing a new roundabout on SH58 at the intersection of Flightys Road and Murphys Road.

A roundabout at this location had been considered as part of the initial scheme design, as well as being a recommendation of the 2009 SH58 Strategy Study. It was ultimately omitted from the projects proposals that were consulted on the basis that it would create significant delay to state highway through traffic, and in relatively close proximity to the new roundabout already proposed in the SAR at Moonshine Road. Furthermore, the crash statistics at this intersection did not necessitate a wholesale intersection control change.

The feedback from stakeholder and community consultation again highlighted the support for a roundabout at this location to assist with turning movements at this intersection, as well as vehicle turnarounds necessitated by the proposed median barrier and has therefore been introduced to the proposed corridor works as part of Option 5.

To facilitate a roundabout at this location, it is necessary to realign both Flightys Road and Murphys Road, which also involves a new bridge on Flightys Road. A separate technical note on the new roundabout and bridge is provided as an Appendix to Rev4 (Appendix T).

With a new roundabout proposed at this location, to complement the roundabout proposed at Moonshine Road, it is also possible to alter the intersection at Mulhern Road to permit left-in/left-out movements only. This is highly desirable given the tight nature of this intersection and large numbers of heavy vehicles that access this road. The two new roundabouts provide excellent turning facilities in close proximity, whilst only requiring a fairly minimal detour.

Following feedback from Transpower representatives, the proposed access to the Transpower site has been changed. Instead of allowing all movements, except right turns out at Old Haywards Road[50] as was initially proposed, they have expressed a desire to maintain right turns 'in' at Kaitawa Street. The proposals have therefore been updated to allow for this. Given the proximity to Hugh Duncan Street (to Kaitawa Street) and presence of the uphill passing lane, this change has necessitated also making Hugh Duncan Street left-in, left-out and right-in only[51]. This is not expected to be problematic given the diversion length for right turns out of both locations is less than 2km, using the SH2/58 interchange. From a Safe System perspective, this is also preferable.

No other project changes have been proposed following community consultation.

#### 6.2.1.4 Bridges & Structures

For Rev4 of the SAR, a high level structural assessment was undertaken of the nine existing structures identified along the corridor extent. This high level assessment comprised a desk top study and walkover based assessment that considered whether the existing structures would be suitably compatible with the wider corridor improvements being proposed within Option 4. The key aspects being considered to formulate a recommendation for improvement works were:

- Expected remaining life
- Width – and therefore suitability for cyclists
- Suitability for installation of median wire rope barrier

These factors were selected on the basis of ensuring route consistency, together with addressing a theme from the public consultation where cyclists raised a number of locations where the available width was constrained and therefore made cycling over these structures uncomfortable.

The structural works recommended in the Rev4 Assessment are detailed below:

[50] Right turn in would be permitted but right turns out would be prevented to avoid a merge on a passing lane on an uphill 9% grade, by providing overlapped guardrail.

[51] To be achieved by staggering / overlapping guardrail.

**Table 6-1: Initial High Level Structural Assessment Summary**

| Structure | Remaining Life (Years) | Widening Req. | WRSB* Possible | Weight Restriction | Recomme-ndation | Estimated Cost($NZD) |
|---|---|---|---|---|---|---|
| **Dry Creek Quarry Culvert** (RP 0/0.33) | 50 | No | yes | no | do nothing | 0 |
| **BSN 38 Culvert** (RP 0/3.84) | 50 | No | yes | no | do nothing | 0 |
| **Pauatahanui Culvert No.1** (RP 0/5.99) | 50 | No | yes | no | do nothing | 0 |
| **Pauatahanui Stream Bridge No.2** (RP 0/6.87) | 20 | Yes | yes | no | widen one side | 200,000 |
| **Golf Course Subway** (RP 0/6.92) | 90 | Yes | yes | no | widen one side | 90,000 |
| **Pauatahanui Stream Bridge No.3** (RP 0/7.45) | 20 | Yes | yes (if widened) | no | widen one side, separate cycle bridge other side | 270,000 |
| **Murphy's Road Culvert** (RP 0/8.16) | Replacement recommended by Network Consultant | No | yes | no | do nothing | 0 |
| **Pearce Bridge** (RP 0/8.36) | 80 | No | yes | no | do nothing | 0 |
| **Pauatahanui Stream Bridge No.7** (RP 0/8.97) | 80 | Yes | yes | no | widen one side | 340,000 |
| | | | | | | |
| **New Flightys Road Bridge** | NA | NA | NA | NA | New bridge | 420,000 |

**WRSB: Wire Rope Safety Barrier*

The cost of these structural works is now included in the cost estimate for Option 5 (as well as the economic evaluation undertaken).

Whilst these costs have now been included in the project expected estimate, it is important to note the high level nature of this assessment and that no level of concept design has been undertaken. On this basis, the project cost estimate has allowed a 50% contingency for all structural works noted above. The proposed new bridge at Flightys Road (which has also not been subject to any level of design work), has been estimated to have a physical works cost in the region of $420,000.

#### 6.2.1.5 Realignment of Site 5

A further change being incorporated into Option 5 is the realignment of three additional horizontal curves. Previously, these horizontal curves, located 1700-2300 m from the SH2 intersection (and situated between the proposed realignment Site 2 and Site 3), had not been proposed for realignment. The two curves necessitating this section of realignment have fairly tight horizontal radii, or 185 m and 250 m (Stn. 1940 and 2140 respectively).

The environment through this section of SH58 is also an extremely constrained section of the road characterised by large vegetated bluff faces (of up to 40 m in height) on the western side and steep gullies on the east of the existing road alignment. Greater Wellington Regional Council also operates large capacity water infrastructure in close proximity to the existing road on the western side of the highway – with a number of large sized water tanks and a pump station in existence along this section.

These two curves were previously excluded from the Rev4 SAR due to them not having being investigated in the 2009 PFR for realignment, and it is envisaged they were omitted during the previous

PFR due to the complexity and cost factors that create difficulties in attempting to rectify the horizontal geometry through this section.

With the creation of Option 5, and the wholesale improvements being considered for the corridor, not realigning at these two curves would result in a situation where they would become out of context to the rest of the corridor and subject to greater crash risk with potential crash migration.

These two curves are therefore proposed for horizontal realignment as part of the Option 5 update. It is proposed to realign both of these curves to 350 mR. Whilst this does result in a very significant volume of earthworks and cut material, it does maintain a good level of horizontal curve consistency along the corridor.

## 6.3 Median Barrier Provision

During the option development, significant emphasis and analysis was undertaken as to where to continue the median barrier through a side road intersection (creating a left in/ left out arrangement) or where the barrier should be broken. This has significant implications for users of SH58. The proposed intersection treatments are summarised below:

**Table 6-2: Option 5 – Intersection Access Arrangements**

| Location | RP | Proposed Treatment | Right Turn Alternatives | Comments |
|---|---|---|---|---|
| Hugh Duncan Street | 0/0.95 | WRB broken to allow right turn in only, right turn bay provided | Right turn entry provided for. For exit, turnaround at SH2/58 | Right turn out not possible to provide with proximity of Kaitawa Street right turn bay. |
| Kaitawa Street | 0/1.17 | WRB broken to allow right turn in only, right turn bay provided | Right turn entry provided for. For exit, turnaround at SH2/58 | Substation Access. Transpower have requested right turn in availability. Right turn out not feasible. |
| Atiamuri Crescent | 0/1.33 | WRB through intersection left in and out only | U turn at Old Haywards Road for entry. For exit, turnaround at SH2/58 | Substation Access Transpower currently operate with LILO access. |
| Old Haywards Road / Substation access | 0/1.44 | WRB through intersection left in and out only | Right turn entry provided for at Kaitawa Street. For exit, turnaround at SH2/58 | Right turn out prevented to avoid a merge on a passing lane on an uphill 9% grade. Right turn in provided at Kaitawa Street following feedback. |
| Mount Cecil Road | 0/2.99 | WRB broken to allow all movements, right turn bay provided | None required | Very low volumes 20 ADT and on apex of crest but zero crashes and difficult to provide alternatives |
| Harris Road | 0/4.47 | WRB broken to allow all movements, right turn bay provided | None required | Low vehicle flows (32 ADT - 2009) however right turns allowed to cater for business. Preventing right turns out was considered but rejected. Passing lane reduced in length to allow right turn bay. |

| Location | RP | Proposed Treatment | Right Turn Alternatives | Comments |
|---|---|---|---|---|
| Moonshine Road | 0/6.32 | Roundabout proposed to provide full access and turnaround facilities | None required | 576 ADT (2010) – low count compared to MWH short term pm peak survey (approx. 1,200 vph) |
| Mulhern Road | 0/7.31 | WRB through intersection left in and out only | Roundabout at Murphys / Flightys and roundabout at Moonshine Road | More appropriate turning facilities in close proximity. |
| Murphys Road /Flightys Road | 0/8.01 | Roundabout proposed to provide full access and turnaround facilities | None required | High vehicle numbers and a number of intersection crashes here. Roundabout provides good turning provision for other intersections and accessways. |
| Belmont Road | 0/8.37 | WRB through intersection left in and out only | Right turn entry turnaround at Moonshine Road. Right turn exit, turnaround at Pauatahanui roundabout | Due to presence of horizontal curves, allowing right turn in and out is not appropriate |

A thorough assessment has been undertaken as to where the proposed wire rope barrier could be broken and the effect this would have directly on access. In addition, a key component of any proposal to prevent direct access is a consideration of alternative turning locations – in terms of the location, diversion length and safety (both in terms of actual crashes and also crash potential).

Whilst the proposals submitted are considered a good solution in terms of balancing access provision, safety and reasonable turnaround alternatives, it is accepted that there are other options that exist that may also offer suitable levels of access and could indeed be preferable to some of those affected. It is recognised that the provision of median barrier with the effect of limiting access and forcing vehicles to divert is a highly contentious and emotive issue for those affected.

## 6.4 Project Access Plan

A schematic of the proposed project works is provided below. This plan details the project extents, the realignment site locations, the proposed new roundabout locations and the movements available at each intersection (as a result of the proposed breaks in the median barrier).

For more detail please refer to the Scheme Drawings[52].

[52] Scheme Drawings are contained in Appendix F

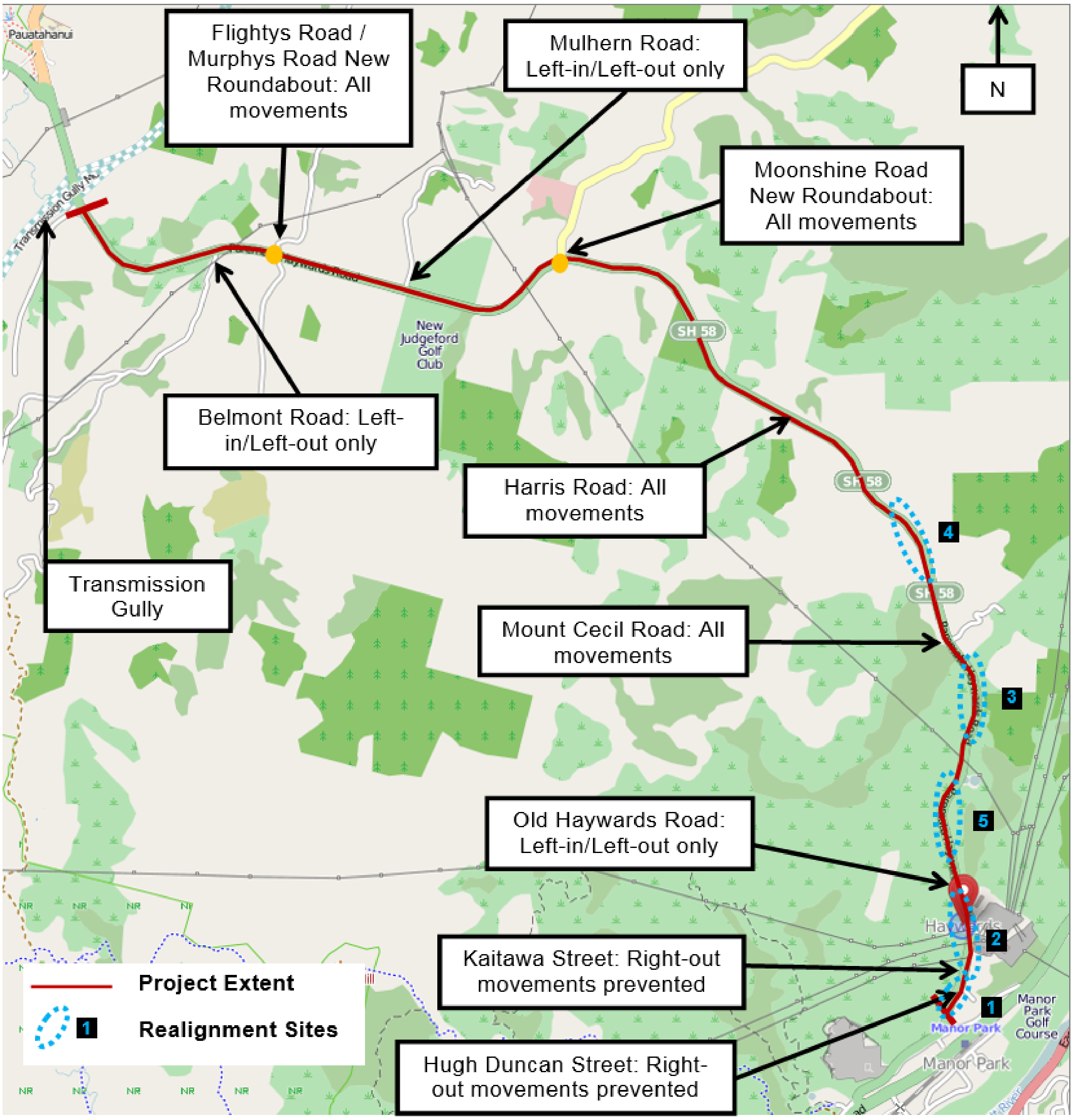



**Figure 6-4: Proposed project works**

# 7 Legal Speed

## 7.1 Background

The NZ Transport Agency has been considering whether to reduce the legal speed along SH58, between SH2 and Lanes Flat, since 2013. Whilst the speed reduction was not specifically part of the physical works investigation, it needs to be considered alongside the physical works proposals.

A Speed Limit Review Report[53] undertaken in 2013 included a speed limit warrant (between SH2 and Lanes Flat) in accordance with Speed Limits New Zealand and determined that the recommended speed limit from the warrant is 100km/h. Irrespective of the warrant, the report went on to recommend that a 80km/h speed reduction should be considered for the majority of this section of highway, noting the very high collective risk rating.

The 2013 Speed Limit Review Report suggested retaining the 100km/h speed between SH2 and RP0/2.3 (i.e. the end of the westbound uphill passing lane). It is expected that this recommendation is on the basis of being able to retain this passing lane which would be unusual in an 80km/h environment. The two other passing lanes were proposed for either removal or conversion to a slow vehicle bay.

During the public consultation for the proposed (physical works) safety improvements along this corridor in December 2014, the NZ Transport Agency consulted on the possibility of reducing the posted legal speed between SH2 and Lanes Flat from 100km/h to 80km/h. There was general support for lowering the speed limit from this consultation.

## 7.2 Speed Limit Change Economic Assessment

An economic assessment of reducing the posted speed limit on SH58 from 100km/h to 80km/h was carried out in accordance with simplified procedures (SP3) of the Economic Evaluation Manual with the expected change in mean speed, and the resulting impact on crashes, assessed according to HRRRG methodology[54]. Refer Appendix C.2 for further detail.

It is noted that an economic evaluation of a change in posted speed limit is not required under current legislation. The purpose of this evaluation is therefore to provide a summary of the economic case for a speed limit reduction.

The key inputs and assumptions of the evaluation are outlined below:

- Based on TomTom 2013 data[55], the average route travel speed is 80km/h with minimal variation throughout the day or by direction, despite the existing 100 km/h posted speed limit. Additionally the 85$^{th}$ percentile speed is 90km/h with minimal variation.

53 Spiire (2013) State Highway Speed Limit Review

54 NZTA, High Risk Rural Roads Guide, Figure D-1 and Figure 2-3.

55 Note that more up to date travel time information is available from TomTom; however, this includes the effects of the temporary speed limit at the Scour Site.

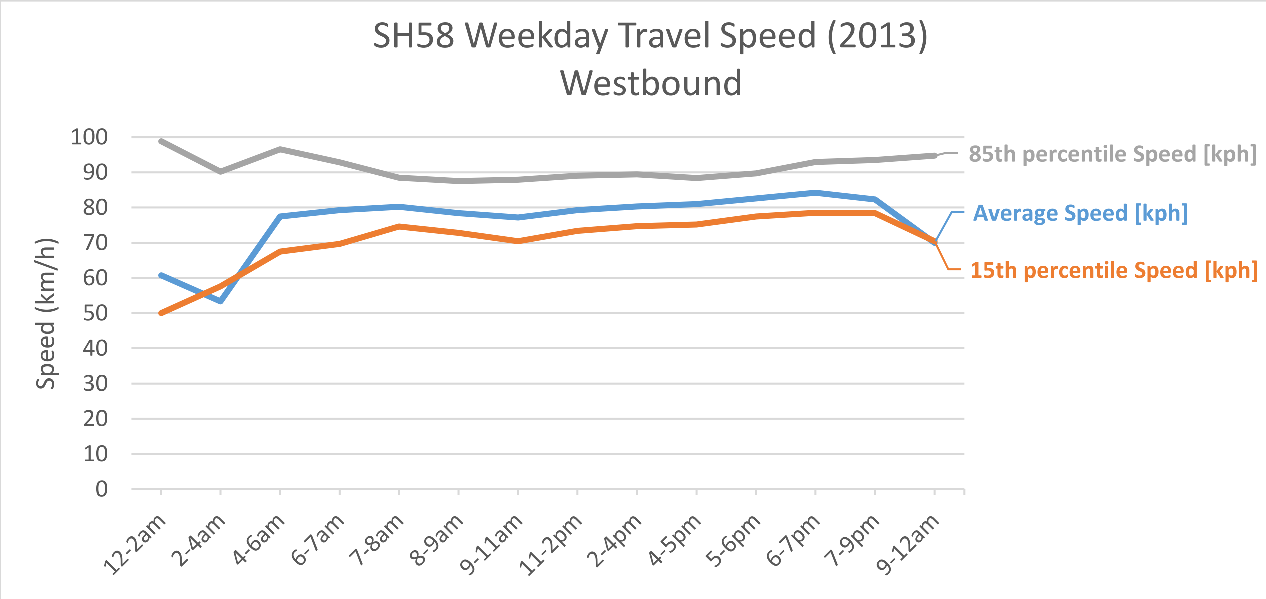



**Figure 7-1: SH58 Weekday Route Travel Speed (TomTom 2013) Westbound**

- The predicted average speed, following the posted speed limit reduction, was assessed against the research[56] on the relationship between a change in speed limit and the resulting change in mean speed.
    - Figure D-1 from the HRRRG, reproduced below, shows that for a 20km/h reduction in posted speed limit there is typical mean speed reduction of -6% (ranging from 0% to -20%, in approximately three data groups).
    - It is expected that the effect of speed limit change on the mean speed of SH58 would be on the lower end of the range, at approximately -2.5%, based on the existing 80km/h mean speed. This equates to a predicted average speed of 78km/h following the speed limit reduction.

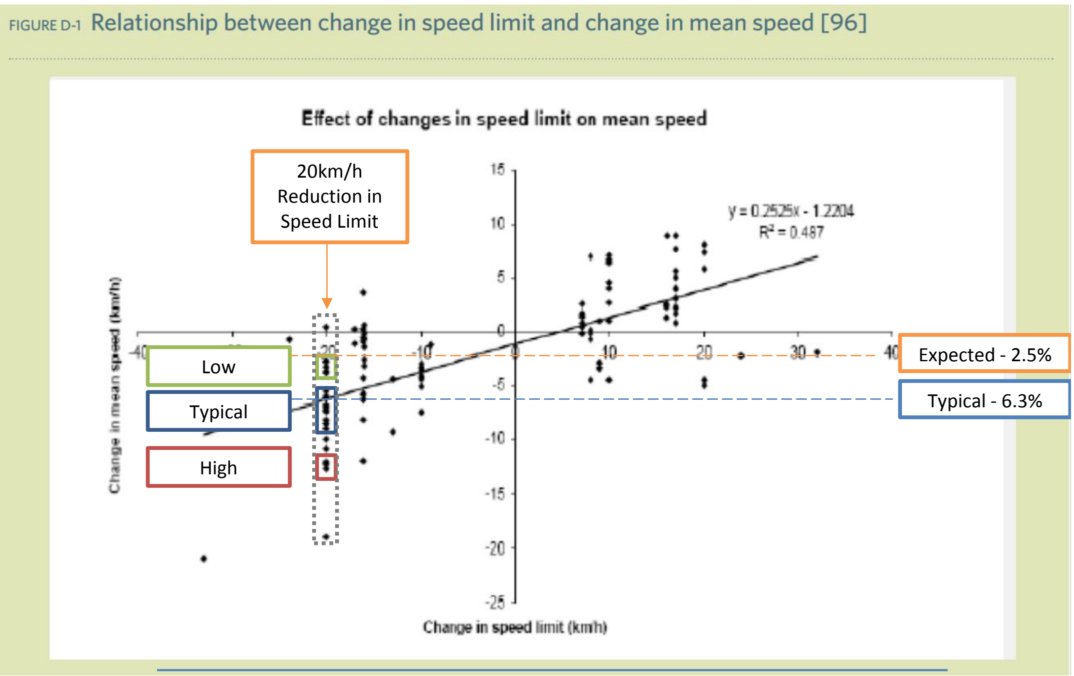



**Figure 7-2: Speed limit change and mean speed relationship (Source: NZTA HRRRG)**

56 Austroads, AP-T141/10: Infrastructure /Speed Limit Relationship in Relation to Road Safety Outcomes, https://www.onlinepublications.austroads.com.au/items/AP-T141-10 and Elvik et al. (2004)

The following types of benefits/dis-benefits were assessed, resulting from the decrease in mean speed:

- **Travel time and vehicle operating costs;**
  - Travel time and vehicle operating costs were assessed according to SP3 methodology based on the 80km/h existing and 78km/h predicted mean speed.
  - An AADT of 14,250 vpd and a project length of 8.8 km were adopted.
- **Crash benefits**
  - Method A, crash by crash analysis, was adopted to determine the crash benefits from the speed limit reduction.
  - The crash reductions were assessed based on the relationship between a change in mean speed and casualties on rural roads[57], presented in, and reproduced below.
  - The following crash reductions[58] are expected, based on a 2.5% reduction in mean speed:
    - 9% reduction in fatal crashes;
    - 7% reduction in serious crashes; and
    - a 4% reduction in minor and non-injury crashes.

The economic case for the change in speed limit is summarised in the table below. The annual benefits have also been presented as it is expected that the speed limit reduction will be progressed 2-3 years prior to the implementation of the physical works.

**Table 7-1: Speed Limit Change: Economic Summary**

| Period | Travel Time Benefits | VOC and $CO_2$ Benefits | Safety Benefits | Net PV Benefits |
|---|---|---|---|---|
| 40 year | -$8.6M | $1.7M | $7.4M | $0.5M |
| Annual | -$0.49M | $0.09M | $0.48M | $0.08M |

The results of the economic assessment show that the travel time disbenefits are balanced out by combined safety, vehicle operating and $CO_2$ benefits. In real terms, this shows that the proposed speed limit reduction will have a neutral. A BCR has not been presented due to the negligible signage costs of the speed limit change.

Sensitivity testing was also undertaken using the typical mean speed reduction from a 20km/h reduction in posted speed limit, equating to an estimated mean speed of 75km/h. This 5km/h reduction, while having the effect of increasing the safety and vehicle operating and $CO_2$ benefits, results in the overall annual benefits reducing from $0.5M in the base case to marginally greater than zero.

## 7.3 Speed Limit Summary

### 7.3.1 Discussion

Since the Spiire (2013) State Highway Speed Limit Review, TomTom data is now available which has recorded vehicle speeds (between SH2 and Lanes Flat) as being around 80km/h mean speed (which does not fluctuate by direction or time of day) and 90km/h 85th percentile speed, despite the 100km/h limit. Previous spot speed surveys show higher average speeds of 90km/h; however, due to the nature of dual tube surveys, these were undertaken on relatively straight sections and the results are therefore not consistent with the overall form of SH58.

[57] NZTA, HRRRG, Figure 2-3, Relationship between change of mean speed and causalities on rural roads

[58] Note the percentage change in casualties from Figure 2-3 of the HRRRG was adjusted based on the weighted DSI/crashes ratio for key crash types from the 2010-2014 crash history of SH58, calculated a 1.16, refer Appendix C.2 for further detail.

Nevertheless, SH58 between SH2 and the Pauatahanui Roundabout meets the warrant for a 100km/h highway. It is however noted that, the existing mean speed and 85th percentile along SH58 do align to the guidance for an 80km/h posted speed limit as noted in the Land Transport Rule: Setting of Speed Limits 2003.

The Speed Limit Rule does however outline that speed limits can be set that differ from the calculated limit if the following clauses are met:

- **Clause 3.2(5): Speed limits that differ from the calculated speed limit**
  - *A road controlling authority may propose to set a speed limit that differs from the calculated speed limit, but may set the proposed speed limit, in accordance with section 7, only if:*

    a) *a speed limit different from the calculated speed limit is the safe and appropriate speed limit for a road with regard to the function, nature and use of the road, its environment, land use patterns and whether the road is in an urban traffic area or a rural area; or*

    b) *the proposed speed limit is less than 50 km/h and 3.2(6) applies.*
- **Clause 7.1(6): Consultation – additional information**
  - *If a proposed speed limit is 50 km/h or more, and the proposed speed limit is not the calculated speed limit, the road controlling authority must provide the [Agency] with written evidence that the proposed speed limit complies with 3.2(5) unless section 4 applies.*

For the speed limit change on SH58, only Clause 3.2(5) is relevant. Therefore, based on the high crash risk, existing mean operating speeds at 80km/h and an overall neutral economic case, that an 80km/h posted speed limit on SH58 between SH2 and Pauatahanui Roundabout is safe and appropriate.

Further, an 80km/h speed limit is also supported based on assessment of SH58 against the draft Speed Management Guide[59], due to the high collective risk and medium personal risk. This is outlined in Figure 7-3 below.

**Table 4.2 Proposed Safe and Appropriate Speeds classification method – Rural Roads (incl rural towns)**

| Function / Feature | Road Safety Metric | Infrastructure Risk Rating | Safe and Appropriate Speed (km/h) |
|---|---|---|---|
| • **ONRC** is Class 1<br>• **Median Divided**<br>• **No direct property access**<br>• **Grade separated intersections** | • **Road Network** Personal Risk ≤ Low-Medium;<br>• **Road Network** Collective Risk ≤ Medium-High; | • **'Low'** | • **110**[12] |
| • **ONRC** is Class 1 – 3 | • **Road Network** Personal Risk ≤ Medium;<br>• **Road Network** Collective Risk ≤ Medium-High; | • **'Low' or 'Low-Medium'** | • **100** |
| • **Any ONRC** | • **Road Network** Personal Risk ≤ Medium-High; | • **'Low' to 'Medium'** | • **80** |

As a Regional Highway (Class 2) with a high collective risk and medium personal risk the 'safe and appropriate speed' is 80km/h rather than 100km/h

**Figure 7-3: Draft speed management guide - safe and appropriate speeds**

[59] NZTA, The Draft Speed Management Guide aims to give effect to the significant new direction and framework for speed management in NZ. It is currently in draft form while a demonstration project is carried out in the Waikato region. https://www.pikb.co.nz/additional-resources/?Search=speed%20management%20guide

### 7.3.2 Recommendation

Based on the previous speed limit assessment undertaken and the neutral economic case, it is recommended that the NZ Transport Agency progresses the 100km/h to 80km/h legal speed reduction between SH2 and Lanes Flat immediately[60].

Reducing the speed limit before delivering the physical works will allow realisation of the speed reduction safety benefits much earlier than the safety benefits could be achieved from the physical works, which would be at least 2-3 years[61] later than when a legal speed reduction could be achieved.

[60] Our recommendation is for the full section length to be reduced to 80km/h. Whilst retaining the passing lanes would be unusual in an 80km/h environment, this is not considered a major issue. There are very limited safe passing opportunities along the corridor and the uphill passing lane at Haywards would continue to allow passing of slower vehicles at this point. The remaining eastbound passing lane, east of Moonshine Road is also on a large uphill grade which would be a positive place for passing, and the benefits here are further enhanced following the physical works when this passing opportunity would allow vehicles to pass immediately after the new roundabout at Moonshine Road.

[61] Due to the timeframes required for design, consenting and construction.

# 8 Option Evaluation

## 8.1 Assessment Against Objectives

A matrix-type assessment of the five project options has been undertaken, considering alignment of each option to the project objectives. This includes the four main project objectives, together with the two other sub-objectives (relating to a cost-effective solution and consistency with the One Network Road Classification) – to ensure all aspects are adequately considered.

A rating score is applied to each objective listed in Table 8-1 below, which compares each option generally against the other options. The rating system uses a five point scale -2, -1, 0, +1 & +2, with -2 the most negative, zero as neutral and +2 most positive. Despite using a five point scale no option was scored below a zero as this was considered to be little to no alignment with project objective and negatives beyond this were not necessary. The six objectives considered were:

- **To enhance safety of travel on the Wellington State Highway network, and specifically SH58**: *a subjective assessment as to the relative safety of each option, but including the predicted crash savings.*
- **To maintain or improve journey times and journey time reliability between SH2 in the Hutt Valley, and Transmission Gully**: *Considering overall journey time and journey time reliability relative to the current situation and against the other options. For example, the impact of crashes causing delays or closures of the road is considered.*
- **To enhance resilience of the Wellington State highway network**: *high level consideration of whether aspects of the options would improve or worsen likely route resilience.*
- **To appropriately balance the needs of local and state highway traffic**: *considers whether a reasonable level of balance for both sets of users is achieved, or whether one is favoured to the detriment of the other.*
- **By developing and constructing a cost effective roading solution**: *considers the BCR achieved by the project.*
- **consistent with a standard expected for a Regional state highway under the One Network Road Classification**: *whether the option most closely aligns with the levels of service for a regional highway in terms of mobility, safety, amenity and accessibility.*

The assessment was carried out by the project team and includes a mix of quantitative and qualitative aspects.

Further detail of MCA scoring is provided in Appendix D.

**Table 8-1: Summary of MCA Scoring**

| Option | Enhance safety on State Highway Network, Specifically SH58 | Maintain or improve journey times & Reliability | Enhanced Resilience | Appropriately balance the needs of local & state highway traffic | Total score MAIN OBJECTIVES | Cost effective roading solution | Consistent with a regional highway ONRC standard | Total Score ALL OBJECTIVES |
|---|---|---|---|---|---|---|---|---|
| Option 1: 1.5m shoulders, 4 curve realignments | +1 | - | +2 | +1 | 4 | +2 | - | 6 |
| Option 2: As per Option 1 with 2m flush median | +1 | - | +2 | +1 | 4 | +2 | +1 | 7 |
| Option 3: As per Option 2 with median barrier included | +2 | +1 | +1 | +1 | 5 | +2 | +1 | 8 |
| Option 4: As per Option 3 with removal of Site 1 realignment and 80km/h do-min | +2 | +1 | - | +1 | 4 | +2 | +1 | 7 |
| Option 5: As per Option 3, plus 80km/h do-min, roundabout at Flightys/Murphys, addition of realignment Site 5 & bridge improvements | +2 | +1 | +1 | +2 | 6 | +1 | +2 | 9 |

## 8.2 Preferred Option

On the basis of alignment to the project objectives, the recommended option is therefore considered to be Option 5, as this scores highest against both the four main objectives and the total six criteria.

This remainder of this section provides an overview of the evaluation undertaken on Option 5, including discussion on;

- Traffic performance;
- Cost estimation;
- Crash risk;
- Economic efficiency; and
- Construction staging.

Evaluation of the option provided in this SAR Addendum can be considered in isolation – however for further details of earlier evaluation of previous Options, refer to Rev4.

## 8.3 Traffic Volumes and Capacity

### 8.3.1 Introduction

Traffic modelling was undertaken to identify the future traffic demands along SH58 for scenarios involving TG and P2G Link Road.

Traffic modelling was undertaken by Greater Wellington Regional Council (GWRC) using the Wellington Transport Strategy Model (WTSM), with a 2011 base year[62], for the scenarios outlined below:

- Do Minimum with existing number of lanes on SH58 between TG and the Haywards Interchange – referred to as 'Do Min';
- Do Minimum with the P2G Link Road in place and existing number of lanes on SH58 between TG and the Haywards Interchange – referred to as 'Do Min with P2G';
- SH58 four laning Option between TG and Haywards interchange – referred to as '4L Option';
- SH58 four laning Option between TG and Haywards interchange with the P2G Link Road in place – referred to as '4L Option with P2G';

The SH58 four laning options, with and without the P2G Link Road, were undertaken as sensitivity scenarios to determine the likely unconstrained demand along SH58[63]. The four scenarios presented above are detailed in the SH58 Four Lane WTSM Testing report by GWRC and contained in Appendix C.1.1.

The proposed safety improvement scheme was not modelled in WTSM, as the relatively small scale of improvements would likely not make a difference in the regional nature of the model. However, a number of scenarios with and without the scheme were undertaken using Highway Capacity Manual (HCM 2010) analysis based on WTSM modelled unconstrained flows, refer Section 8.3.3 and Appendix C.1.2 for further detail.

In addition to WTSM and HCM analysis, traffic modelling was also undertaken by Jacobs using the Northern Wellington SATURN Model (NWSM) for scenarios with and without the P2G Link Road, including the impact of the proposed safety improvement scheme. The purpose of the NWSM assessment was to investigate intersection performance and likely efficiency improvements as a result of the scheme.

[62] The 2011 base of the WTSM model was used by GWRC rather than the 2013 base to be consistent with the P2G Link Road analysis to date.

[63] Although it is noted that the modelling showed minimal increases in demand flows as a result of four laning, in the order of 2% (i.e. capacity is not constraining demand)

### 8.3.2 Traffic Volumes

As presented in Section 4.1.2 above and Figure 8-1 below:

- Minimal traffic growth is anticipated until the introduction of TG, where traffic volumes are expected increase to over 20,000 vpd on SH58. By 2031, traffic volumes are expected to be over 23,000 vpd.
- With the P2G Link Road in place, traffic volumes return to base levels. By 2031, traffic volumes are expected to be approaching 17,000 vpd.
- From 2031 onwards, modelled growth is minimal, with or without the P2G Link Road in place.

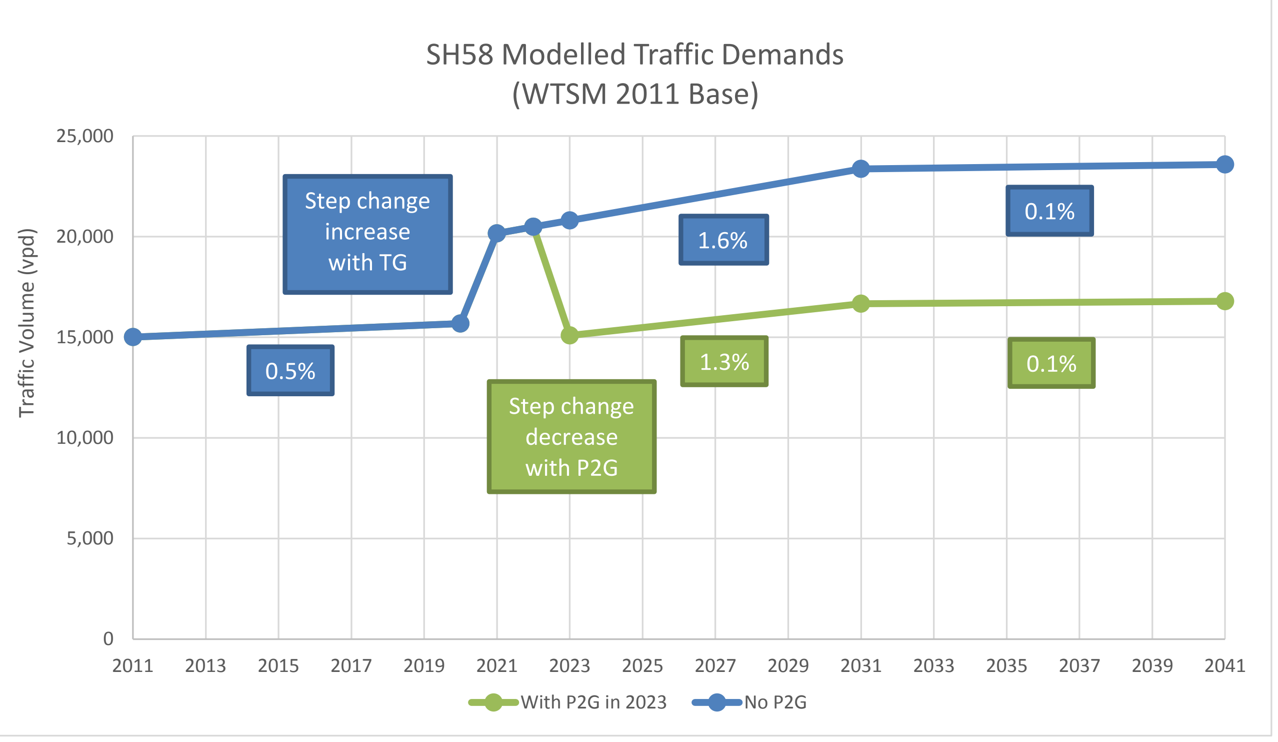



**Figure 8-1: SH58 Modelled Traffic Demands (WTSM 2011 Base)**

Due to uncertainty in future traffic volumes, sensitivity testing was undertaken based on +-1% traffic growth applied to the base modelled scenario outlined above. The resulting traffic volume range is presented in Table 8-4 below and Appendix C.1.1.

### 8.3.3 Levels of Service

The WTSM levels of service, reported in terms of volume to capacity ratios, adopt a modelled capacity of 1,400 PCU / lane/ hour for SH58[64]. Volume to capacity ratios for key scenarios are outlined in Table 8-2 below for the AM 2 hour peak period.

**Table 8-2: WTSM 2011 AM Peak Volume to Capacity Ratios (Eastbound)**

<table>
<tr><th>Scenario</th><th>2011</th><th>2021 (with TG)</th><th>2023</th><th>2031</th><th>2041</th></tr>
<tr><td>No P2G</td><td rowspan="2">55% (43% to 55%)</td><td rowspan="2">89% (69% to 89%)</td><td>92% (72%-92%)</td><td>107% (83% - 107%)</td><td>107% (83%-107%)</td></tr>
<tr><td>With P2G (2023)</td><td>66% (52%-66%)</td><td>74% (57% - 74%)</td><td>74% (57% - 74%)</td></tr>
</table>

In summary, the WTSM modelling shows that SH58 in the AM peak with P2G Link Road in place, performs at under 75% capacity through to 2041. However, in the period between TG opening and P2G Link Road opening, SH58 is likely to be near capacity, with volume to capacity ratios of over 90%. Note that the above volume to capacity ratios assume that the proposed scheme will have no impact.

Refer Appendix C.1.1 further detail on the WTSM modelling outputs.

The HCM analysis in general shows similar trends to the WTSM modelling, as outlined in the Table 8-2 below, with predominately LoS E[65] predicted once TG is implemented, with LoS improving once P2G Link Road is in place. Without P2G Link Road, SH58 will be over capacity by 2031. The HCM assessment shows that LoS is not noticeably improved with the safety scheme in place as the minor increase in shoulder width and improved curve geometry is negated by the loss of the small residual passing opportunity (due to new median barrier)[66].

**Table 8-3: HCM AM peak (Decreasing - Eastbound) LoS**

<table>
<tr><th>Scenario</th><th>2011</th><th>2021 (with TG)</th><th>2031</th><th>2041</th></tr>
<tr><td>No P2G</td><td rowspan="4">LoS D/E[67]</td><td rowspan="4">LoS E (LoS F[68] one section)</td><td rowspan="2">LoS F (E some sections)</td><td rowspan="4">Not Assessed</td></tr>
<tr><td>No P2G (with scheme)</td></tr>
<tr><td>With P2G (2023)</td><td rowspan="2">LoS E (one section at C)</td></tr>
<tr><td>With P2G (2023) (with Scheme)</td></tr>
</table>

Refer Appendix C.1.2 for further detail on the HCM procedure and LoS outputs.

Similarly, the NWSM modelling also shows similar trends, with SH58 near capacity for both midblock and intersections with TG in 2021 and easing once P2G is in place. Without P2G, SH58 will be over capacity by 2031.The modelling also showed the scheme improving LoS for both midblock and

[64] It is noted that capacities of 1,400 PCU/lane/hr are likely to be conservative along SH58, with capacities likely to range from 1,400 to 1,700-1,800. However, the WTSM adopted capacities are conservative and therefore provide an indication of a worst-case scenario. The values provided in Table 8 2 above show a V/C range based on a capacity range from 1,700 to 1,400.

[65] HCM 2010, At LOS E, demand is approaching capacity. Passing on Class I and II highways is virtually impossible, and PTSF is more than 80%. Speeds are seriously curtailed. On Class III highways, speed is less than two-thirds the FFS. The lower limit of this LOS represents capacity.

[66] This is considered to be conservative as the methodology does not consider the impact of the removal of right turns and the likely increase in speed as a result of median barrier separation of the traffic lanes. Since there is no difference in grades, or traffic profiles between existing and the scheme, the LoS profiles are very similar.

[67] Note that HCM guidance indicates that passing capacity decreases as passing demand increases. Therefore, operating quality often decreases rapidly as demand flow increases, even at relatively low V/C ratios. This is currently the case for SH58, where the base scenarios shows LoS D/E at V/C ratio below 60%.

[68] HCM 2010, LOS F exists whenever arrival flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists on all classes of two-lane highway.

intersections, on the basis that the improved cross section and geometry would result in an increase in capacity; however, this is not supported by the HCM analysis.

Refer Appendix C.1.3 for further NWSM modelling outputs.

### 8.3.4 Modelling Outcomes

The overall modelling outcomes are summarised in the Table 8-4 below, key outcomes are:

- The opening of TG in 2020 is expected to result in a step change in traffic volumes along SH58 to over 20,000vpd, resulting in SH58 operating near capacity (LoS E) in the peak periods. In addition, the crash risk on the KiwiRAP 2 star SH58 is expected to further deteriorate with the additional traffic following the opening of TG.
- The proposed SH58 safety improvements are expected to significantly reduce the crash risk along SH58 and it is recommended that the scheme is implemented prior to TG opening. It is noted that the safety improvements will not address the capacity issues as a result of TG.
    - At least an additional six DSI (or two DSI/year) are estimated to occur on SH58 in the time between TG opening (est. 2020) and the P2G Link Road opening (est. 2023) as a result of the increased volumes on a KiwiRAP 2 star road. The additional 2 DSI[69] per year is in addition to the 2.6 DSI/year, which is already occurring.
- With the P2G Link Road in place, traffic volumes on SH58 are expected to return to approximately existing levels and no capacity concerns are predicted in the longer term[70].
- Should the P2G Link Road not progress, then it would be necessary to provide significant extra capacity on SH58 when volumes increase after the opening of TG, with four laning being required.
- In the interim period between TG and the P2G Link Road opening, a period currently estimated to be at least three years, a management plan including the following should be considered; Travel demand management (TDM) measures, promotion of alternate modes, provision of improved driver information systems and consideration of localised capacity improvements.

**Table 8-4: Summary of Modelling Outcomes**

| **Scenario** | **2011 Base** | **Post TG before P2G** | **Immediately after P2G** | **P2G plus 10 years** | **P2G plus 20 years** |
|---|---|---|---|---|---|
| **Timeframe** | | 2021 | 2023 | ~2031 | ~2041 |
| **Modelled Traffic Volume[71]** | 15,000 vpd | 20,200 vpd (19,500 – 21,500 vpd) | 15,100 vpd (14,200 – 16,700 vpd) | 16,700 vpd (14,600 – 19,800 vpd) | 16,800 vpd (14,600 – 22,000 vpd) |
| **AM Peak V/C Ratio (EBD)[72]** | 55% | 89% (69% – 89%) | 66% (52% – 66%) | 74% (57% – 74%) | |
| | High | Very High 7.3 DSI/year | Low (with Scheme) | | |

[69] Due to the 40% increase in traffic volumes on a 2 star KiwiRAP highway post TG/pre P2G, the predicted DSI/year increases from 5.2 to 7.3 DSI/year (~ 2 DSI/year).

[70] This is supported by the modelling undertaken for the P2G Link Road: http://www.nzta.govt.nz/assets/projects/petone-grenada-link-road/docs/p2g-final-report-to-rtc-with-appendix.pdf

[71] Range presented in brackets indicates a +- 1% traffic growth applied to the base modelled scenario. Noting that growth was restricted to a minimum of 0%.

[72] Range based on a capacity between 1400PCU/lane/hr to 1700PCU/lane/hr.

| Scenario | 2011 Base | Post TG before P2G | Immediately after P2G | P2G plus 10 years | P2G plus 20 years |
|---|---|---|---|---|---|
| Timeframe | | 2021 | 2023 | ~2031 | ~2041 |
| Crash Risk (Predicted DSI/year[73]) | 5.2 DSI/year (Predicted) *(Actual 2.6 DSI/year)* | Medium (with Scheme) 2-4 DSI/year | Up to 2-3 DSI/year[74] | | |

## 8.4 Costs

The expected and 95th percentile estimates for this project are detailed in the table below.

**Table 8-5: Scheme Estimates**

| Option Description | Expected Estimate ($M) | 95th Percentile Estimate ($M) |
|---|---|---|
| **Option 5** | 47.9 | 60.3 |

The cost estimate for Option 5 has been compiled using the elemental breakdown method. The project has been split into 7 regions (Region A – G) to allow economic analysis of staged construction. Region C (SH58 Scour Site Realignment) has been constructed to practical completion. The forecasted cost at completion is $2.7M. As such no elemental breakdown of work items has been included for Region C.

Refer Appendix C.3 for the Project Estimate forms for the regions outlined below.

**Table 8-6: Summary of Costs**

| Region* | Base Estimate | Expected Estimate | 95th %tile Estimate |
|---|---|---|---|
| Region A | $2,395,000 | $2,850,000 | $3,606,000 |
| Region B | $13,959,000 | $16,860,000 | $21,693,000 |
| Region C[75] | $2,255,000 | $2,700,000 | $3,378,000 |
| Region D | $3,069,000 | $3,593,000 | $4,467,000 |
| Region E | $4,808,000 | $5,635,000 | $7,012,000 |
| Region F | $2,674,000 | $3,182,000 | $4,028,000 |
| Region G | $10,872,000 | $13,127,000 | $16,114,000 |
| **TOTAL** | **$40,032,000** | **$47,947,000**[76] | **$60,298,000** |

**Regions are explained in Section 8.7.1*

No specific design has been undertaken for environmental compliance. An allowance of approximately 7.50% of construction costs has been used. This is consistent with the previous estimate.

Earthworks form a large portion of the works for Region A, B and F. Earthworks cut batters and fill embankments profiles have been based on expected ground conditions from desktop only geotechnical studies. Likewise, the percentage of type R1 and R2 rock is based on desktop work rather than specific ground investigations. There is a risk that actual ground conditions could vary markedly from those expected. Region F has a large allowance for importing bulk fill, while Region B has a large volume of

[73] Calculated based on the change in volume and the changes in KiwiRAP star rating, Refer Section 8.5 for further detail.

[74] Note that based on the current correlation between predicted and actual DSI, this could be as low as 1 DSI/year.

[75] Note that Region C has now been fully constructed

[76] A full parallel estimate has since been completed and the expected estimate has been increased to $53.9M. A separate parallel estimate report is available which details the background to this.

cut to waste. It may be possible to stage the work such that the excavated material from Region B could be used as bulk fill for Region F. This would reduce the cost of construction. Widening for sight distance around barriers has not been allowed for and will likely increase the volume of bulk earthworks required. This has been allowed for in the contingency.

No specific drainage design has been undertaken for the works. An allowance for constructing drainage works has been prorated from the recently tendered and constructed SH58 Scour Site Realignment (Region C).

Where the existing highway is being retained, a 150 mm overlay has been allowed for to provide shape correction and pavement rehabilitation. On areas of realignment, full depth pavement construction has been allowed for. Pavement depths are based on previous testing undertaken for the SH58 Scour Site Realignment. As noted in the earthworks section, widening for sight distance around barriers has not been allowed for and will likely increase the volume of pavement metal required. This has been allowed for in the contingency.

Costs for widening existing bridges have been taken from a July 2015 report prepared by MWH for the NZ Transport Agency. Costs in the report are based on a $\$/m^2$ rate which is consistent with scheme level investigation. A relatively large contingency (50%) has been allowed for the expected cost estimates.

Traffic services such as barriers and road marking have been measured off the design plans. There is a risk more side protection barriers will be required as design standards and philosophies change, however the traffic services is considered fairly low risk compared to other sections of the estimates.

An allowance for a single trench with multiple service ducts has been allowed for along the length of the project. Specific allowance has been made for protection of the existing Greater Wellington Regional Council bulk water main where the project works are in close proximity to the water main.

A lump sum allowance for general landscaping (such as flax and tree planting) has been allowed for in lieu of any specific landscaping deign. This is consistent with a scheme level estimate. Separate allowance for top soiling and seeding exposed earthworks slopes has also been allowed for.

Traffic management has been allowed for on a lump sum basis. The sums have been formulated from typical daily costs for traffic control and expected duration of the works.

The preliminary and general lump sum is typically 12.5% of the physical works costs. This is consistent with other similar projects tendered and constructed around the region.

No allowance has been made for extraordinary construction costs (such as archaeological finds).

## 8.5 Option Crash Risk

Option 5 was assessed using the KiwiRAP Assessment Tool (KAT) to determine the effect of the options on KiwiRAP star rating, and subsequently the estimated number of injury crashes and DSI.

**Table 8-7: KiwiRAP Option Assessment**

| Option | Extent Average Star Rating | Published Star Rating | High severity crashes/ year | DSI / year | % Reduction | DSI Saved /10 years[77] |
|---|---|---|---|---|---|---|
| | | | Predicted[78] | Predicted | | |
| Do Min | 2.7 | 2 | 4.3 | 5.2 | | |
| Option 5 | 3.5 (Low) | 3 | 2.4 | 2.9 | 45% | 12 |
| | 3.8 (Calculated*) | 3 | 1.8 | 2.2 | 58% | 15 |
| | 4.0 (High) | 4 | 1.5 | 1.8 | 66% | 17 |

*Note: the analysis did not account for the breaks in the median barrier. As the curve easing considered in the options is relatively minor we have adopted a conservative approach and not included it in the KAT modelling at this stage.

Table 8-7 shows the scheme is expected to deliver:

- A high 3-4 Star KiwiRAP rating, achieving the ONRC Safety LoS targets for a Regional Route;
- A 45-66% reduction in high severity crashes/year; and
- An estimated 12-17 DSI saved over 10 years (Based on a KiwiRAP rating of between 3.5 and 4 stars).

The consequences of not investing include:

- Continued and increasing numbers of deaths and serious injuries:
  - Based on the previous five year calendar period, there have been 2.6 DSI/year; this is significantly less than that predicted by the 2.7 star rating based on current SH58 volumes. This indicates that there is the potential for the number of deaths and serious injuries along the route to increase, even if there is no change in traffic volume.
  - An additional six DSI (or an additional two DSI/year) are estimated to occur in the time between TG opening (est. 2020) and P2G Link Road opening (est. 2023) as a result of the increased volumes on a KiwiRAP 2 star road.

[77] Note that the DSI Saved/10years has been calculated using the actual DSI from 2010-2014 (2.6 DSI/year) and the percent reduction determined from the Do-min KiwiRAP star rating to the Option star rating (e.g. 2.7 star to 3.5 star results in a 45% reduction in DSI/year). This reduction is then applied to the actual DSI/year to determine the DSI Saved/10 years, this is a conservative approach as the actual DSI has been less than the KiwiRAP predicted DSI for the route.

In addition, it is noted that KiwiRAP focuses on state highway links that have speed limits of 80km/h or more. It does not differentiate between an 80km/h and 100km/h route. Nevertheless, based on travel speed data presented in Section 4.3 and discussions on legal speed in Section 7, the posted speed limit reduction on SH58 to 80km/h, although likely to reduce speed variability, is unlikely to have a drastic impact on overall crash risk. This is due to the mean speed of SH58 already operating at 80km/h along the route.

[78] The calculated KiwiRAP star rating for Option 5 according to Figure C-2, Appendix C of the HRRRG. A range is presented due to the uncertainty around the specific star rating.

## 8.6 Economic Evaluation

The economic evaluation of Option 5 was carried out in accordance with modified full procedures of the Economic Evaluation Manual Volume 1 (EEM, Nov 2013), with a 40 year analysis period, 6% discount rate and latest update factors applied[79].

The key inputs and assumptions of the Option 5 evaluation are outlined below: Refer Section 1.3 for further detail on the updated project scope.

- Do-Minimum was assessed as being; 80km/h posted speed limit and continued maintenance. This reduction from the 100km/h posted speed limit was on the basis the NZ Transport Agency staff advising that they are already planning to reduce the speed limit given the high risk nature of this section of SH58 and the poor crash history (see also Section 7 above).
- Time zero of 2016, an indicative scheme opening year of 2021 and a three year construction duration.
- WTSM modelling outputs were used for both traffic volumes and traffic growth (WTSM 2011 base was used for consistency with the P2G Link Road).
- The types of benefits/dis-benefits assessed included:
    - Safety Benefits (2010-2014 crash history):
        - **Curves:** realignment of five sites and median barrier works.
        - **Midblock:** widening and median barrier works.
        - **Intersection:** upgrade of the Moonshine Road T junction and Murphys Road/ Flightys Road X junction to a 3 and 4 leg roundabout respectively.
    - Travel Time, Vehicle Operating Costs and $CO_2$:
        - **Curve Realignment:** travel time costs and vehicle operating costs arising from the length of highway undergoing curve realignment were assessed, based on TomTom 2013 data, where applicable.
        - **Moonshine Road and Murphys/ Flightys Road intersection:** travel time and vehicle operating costs relating to the delays incurred from the existing Moonshine Road T junction and proposed roundabout have been assessed using SIDRA. The Murphys/ Flightys assessment was based on Moonshine Road[80].
        - **Wire Rope Barrier effects:** Travel time and vehicle operating dis-benefits relating to the wire rope barrier have been assessed based on the additional delays introduced from turning restrictions.
- No wider economic benefits were considered in the analysis.
- An external Economic Peer Review was undertaken in February 2014 by Opus International Consultants. Although there have been a number of changes made to the project scope with the introduction of Option 5, the economic evaluation approach which was agreed with the Peer Reviewer has not been fundamentally changed.

[79] It is noted that the January 2016 EEM has recently been released; however, as the original economic evaluation was completed and peer reviewed prior to November 2013, this high level update of costs and benefits has used the latest guidance and update factors where feasible.

[80] Noting that this was undertaken at a high level, including the conservative assumption that the travel time and vehicle operating costs would be the same as those of the 3-leg Moonshine Road roundabout. In terms of crash analysis, full procedures were undertaken.

#### 8.6.1.1 Economic Case

The calculated BCR for Option 5 is provided in the table below.

**Table 8-8: Option 5 Benefit Cost Ratio**

| Option | Expected Cost Estimate | PV Cost | Travel Time, VOC and CO2 Benefits | Safety Benefits | Total PV Benefits | BCR |
|---|---|---|---|---|---|---|
| **Option 5** | **$48.0M** | **$42.0M** | **-$3.3M** | **$56.5M** | **$53.2M** | **1.3**[81] |

A range of sensitivity tests were carried out with the results summarised in the table below.

**Table 8-9: Option 5 Sensitivity Testing**

| Type | Variable/Comment | With P2G BCR |
|---|---|---|
| Benefits (Safety) | Crash Reduction: Pessimistic | 1.2 |
| | Crash Reduction: Median | 1.3 |
| | Crash Reduction: Optimistic | 1.4 |
| Costs | Base Project Estimate | 1.5 |
| | Expected Estimate | 1.3 |
| | 95th Percentile Project Estimate | 1.0 |
| Discount Rate | 4% Discount Rate | 1.7 |
| | 6% Discount Rate | 1.3 |
| | 8% Discount Rate | 1.0 |
| Traffic Growth | As below – 1% | 1.0 |
| | +0.5% growth to 2021, 2021 onwards as per WTSM (2021-2031: 1.3%, 2031+:>0.1%) | 1.3 |
| | As above + 1% | 1.5 |

The sensitivity testing shows the BCR is robust in the 1-3 band under a range of likely scenarios, with the BCR being most sensitive to changes in the cost estimate and discount rate. The BCR without the P2G Link Road has been assessed as 1.5; however, the scheme under this scenario will not deliver an appropriate LoS for a Regional Highway (refer Section 8 above) so it is not recommended to pursue this scenario.

In summary, the assessment profile for Option 5 is HML (Priority 4) with a 'High' Strategic Fit (as SH58 is a High Risk Rural Road, with high collective risk) and 'Medium' Effectiveness rating (as the project delivers significant safety outcomes, is correctly scoped, with appropriate timing and forms part of a wider network approach).

**Comparison to Previous Stage**

Overall, the Option 5 BCR is 1.3, a 15% decrease from Option 4 with an incremental BCR of 0.6[82]. However, as presented in Section 8.1, Option 5 was preferred based on assessment against all the project objectives.

[81] Following the parallel estimate process, the expected estimate was increased to $53.9M, which results in a BCR of 1.13.

[82] Key changes between Option 4 and Option 5 include the following; A $17M increase in costs due to additional realignment sites, changes due to updated project timing and the effect of discount and the TT/VOC benefits being very similar to Option 4 as the addition of the dis-benefits from the Flightys/Murphys roundabout is balanced out by the increased travel time benefits from the realignment sites.

## 8.7 Construction Staging

### 8.7.1 Staging Description

Staging the construction of these improvements could have significant benefits in terms of road user experience and funding demands.

It is recognised that a number of factors will influence how to best stage construction including funding availability, customer impact and delay, achieving safety (and other project) outcomes, provision for turnarounds (given the median barrier effects), progression of adjacent projects, corridor development and land acquisition. A separate staging strategy note, refer Appendix E, to this SAR Addendum is provided which details some of the staging options that should be considered.

Three separate staging strategies have been proposed. These are not by any means exhaustive and will need to be reviewed as further works commence on the project and in conjunction with the likely procurement strategy.

For the development of the staging programmes, the entire route has been segmented into geographical sections ('Regions'). This has resulted in seven regions of varying lengths and cost. The regions have been selected as being able to be completed as a single project phase, with cognisance of the construction implications and effects on side road and property access (i.e. there is an element of judgement / realism applied, rather than just a theoretical approach that could not be delivered in practice). However, it is noted that this segmentation is subjective and could be changed at a later date.

The 100km/h to 80km/h legal speed reduction is not considered to be part of the staging as this is expected to be implemented much earlier and as an isolated and standalone project i.e. it does not influence, and is not influenced by, the timing of the physical safety improvement works. The staging assessment and staging BCR calculations have been undertaken on the basis that the 80km/h legal speed has been implemented prior to the physical works.

Services relocations and protections are assumed to be undertaken during the main works (i.e. as part of that stage of works), rather than as an enabling works programme for the full corridor.

The regions used do not change between the staging programmes i.e. Region A is always the same geographical extent regardless of the staging programme. This method has been employed to make the cost estimation process more manageable.

Geographical staging extents (i.e. Regions) are:

A. **Hugh Duncan Street East** – comprising the 300m section from the project eastern extent to Hugh Duncan Street;

B. **Hugh Duncan Street West** – comprising the 2000m section west from Hugh Duncan Street to Mount Cecil Road;

C. **Scour Site** – comprising the 800m section west from Mount Cecil Road to the western extent of the Scour Site works;

D. **Harris East** – comprising the 900m section from the Scour Site to Harris Road;

E. **Harris West** – comprising the 1300m section west from of Harris Road to east of Moonshine Road;

F. **Moonshine** – comprising the 500m section centred on Moonshine Road intersection and including the proposed roundabout; and

G. **Western extents** – comprising the 2600m section from west of Moonshine Road to Bradey Road (Lanes Flat).

This is shown in the figure below:

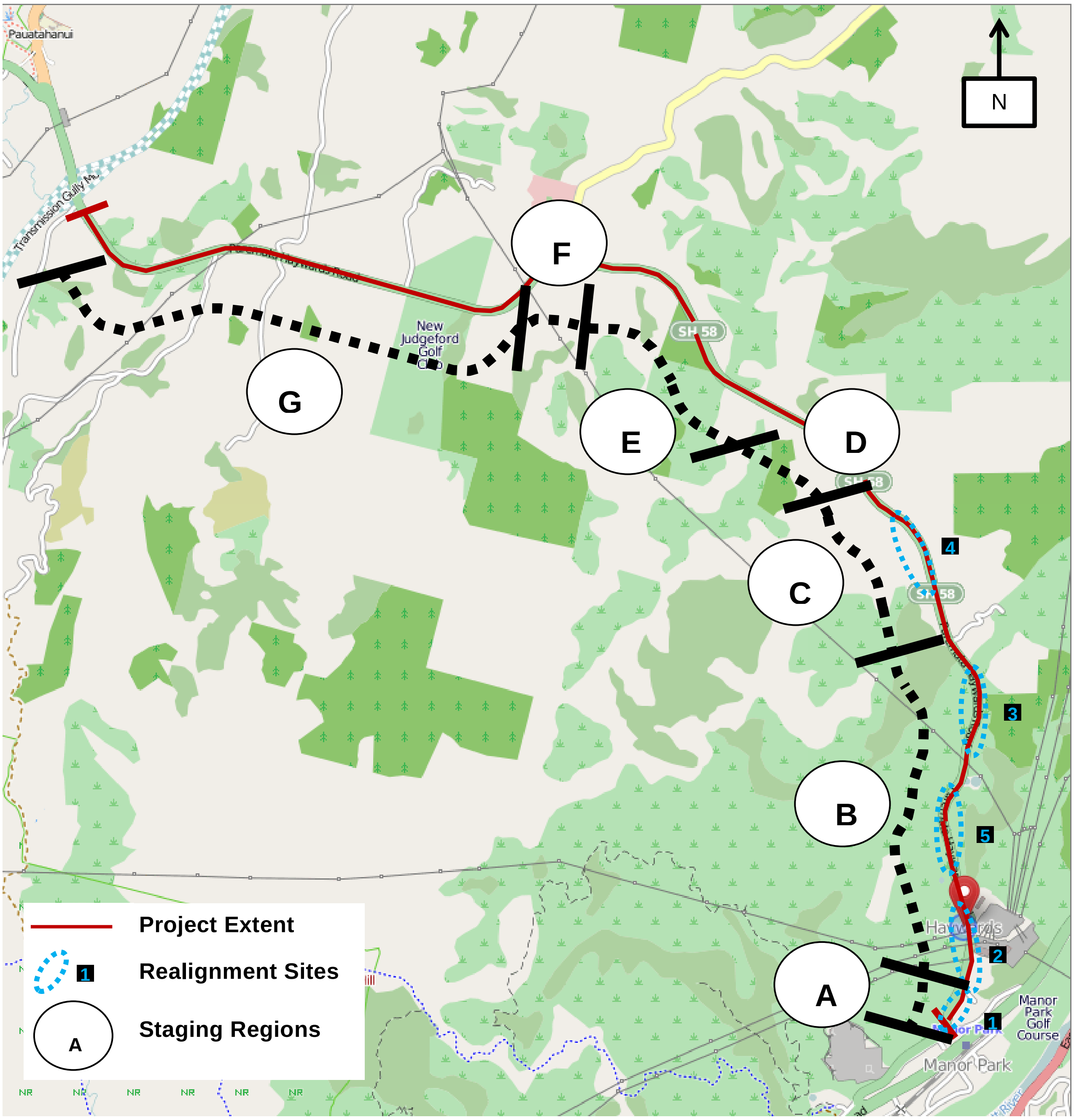



**Figure 8-2: Staging Regions**

The three strategies considered are described below:

A. ***Safety Programme***: staging is prioritised based upon observed injury crashes per kilometre. This does not take into account KiwiRAP, non-injury crashes or crash severity. This is a relatively coarse measure of prioritising safety, which can be refined as the project progresses.

B. ***Economic Efficiency Programme***: This programme prioritises the sections based on the calculated BCR for that section of works. This is a relatively simplified process that uses the expected estimate for that section and the various costs and benefits (i.e. VOC, Travel Time, Crash Benefits, median barrier delays) to obtain a BCR for each region. These are then combined for the proposed regions in each stage to create a Stage BCR. Whilst this approach has been calculated with a good degree of accuracy for the economics, as well as some judgement around practicalities, ultimately this is a theoretical approach to staging and not one that should be considered.

C. ***Community Acceptability Programme***: Staging is prioritised based upon the expected level of community acceptance of the works on that particular section. The level of acceptance is a subjective measure, but generally based on the expected level of disruption to adjacent residents, businesses and side roads, anticipated duration of the physical works in that geographical region, and convenient turning facilities.

Other strategies exist but at this stage of the project development, it is considered these three are the most feasible. A strategy around construction efficiency was also considered, particularly in respect of balancing cuts and fills given the quantity of earthworks on this project; however this was discounted as the entire project and the various sections have almost entirely an excess of cut material, so balancing of materials is not realistic.

As the project develops, the staging will need to be reconsidered, particularly with respect to intended delivery timeframes, procurement methods, land acquisition, Transport Agency priorities and relationship to adjacent project works (SH2/58 interchange, TG and P2G Link Road).

### 8.7.2 Staging Recommendations

From the staging assessment work completed, a number of recommendations are provided; however it is imperative that the staging options are refined and updated as the next stage of design progresses because this will influence the proposed staging.

The project can be staged, and indeed will need to be, given the length of the corridor and scale of works to be undertaken. Nonetheless, it is important to note that the project should be delivered as a single ‘package’ with a fairly condensed programme over a maximum of 3-4 years. Delivering the project in smaller discrete packages over an extended period of time, or omitting certain sections, should be avoided. This is because the route is a single uniform corridor with generally consistent characteristics[83] that apply throughout. This is evidenced by the observed crash history, and also the KiwiRAP rating along the corridor which remains fairly stable (of mostly 2-star but with a small number of 1-star and 3-star sections).

Treating only certain sections in isolation without the ultimate intent of creating a continually connected corridor of upgraded highway will not provide the Safe System transformation required to achieve the desired project safety outcomes. Further, only treating discrete sections is expected to result in significant crash migration which would be entirely unacceptable.

**The recommended staging option is the Safety Programme**. Whilst the three programmes considered have merit, this programme best meets the project objectives of improved safety with the outcome being reduced fatal and serious injury crashes on this corridor. The Safety Programme Detail is provided in Table 8-10 below.

Details of each staging option is provided in Appendix D along with the expected estimate for each section length and associated BCR.

A more detailed assessment of the delivery risks and considerations for the safety staging programme of work is provided in Table 8-11 below.

As previously stated, whilst some form of staging is inevitable, the full corridor should be prioritised for the upgrades over the shortest time period possible. This is because the corridor falls between the higher standard SH2 (and SH2/58 interchange) and TG. Works at either end of the SH58 corridor extent are expected to be completed in advance of the full corridor improvements being finished.

With staged construction there is an inevitability that drivers will pass from a very high standard on the adjacent networks, to a much lower standard on SH58 – with corresponding risks of crash migration to curvilinear alignment with no median protection, narrow shoulders, limited edge protection and high side friction.

With the staging of works, careful consideration will need to be given to the driver experience of transitioning between the higher and lower standards, and potential fluctuating standards on SH58 as works are progressed – temporary measures during construction may be warranted to reduce these risks as sections are progressively upgraded.

[83] With the exception of topography which is more mountainous and rolling in the eastern half of the project.

**Table 8-10: Safety Staging Programme Detail**

| Staging: Safety Programme | | | | | |
|---|---|---|---|---|---|
| | **Regions** | **Works Description & Staging Justification** | **Risks** | **Expected Cost** | **Indicative BCR** |
| Stage Zero | • Scour Site Realignment (C) 12.5 injury crashes per Km | • Realignment of scour site section between Mount Cecil Road and scour site at RP, due to high density of crashes at this location plus need to mitigate undermining of road from stream | • Large amount of corridor benefits are realised in short section of works, reducing economic efficiency of wider corridor<br>• Crash migration | $2.7M | 8.6 |
| Stage 1 | • East of Hugh Duncan Street to SH2/58 extent (A) 20.0<br>• Moonshine Roundabout (F) 0.5 | • Short section of improvement but very high cost due to significant cuts for realignment. Works to connect into 2/58 interchange works. This section is very high cost but extremely high injury crash proliferation here. Addressed early due to higher standard improvements from 2/58 leading immediately into very poor alignment with extremely high injury crash rate.<br>• The roundabout at Moonshine is provided in Stage 1 to cater for some turning movements in later stages. This also recognises the need for the roundabout early should the Winstones cleanfill site proposals eventuate. | • Major delays to customers in close proximity to the 2/58 works that will have already caused traveller disruption.<br>• All service relocations / protections undertaken but then parts of scheme may be omitted from project in future (for reasons unknown at this stage) meaning unnecessary cost outlay | $6.0M | 2.5 |
| Stage 2 | • West of Scour Site to Harris (D) 7.8<br>• TG to Moonshine Road (G) 3.5 | • West of scour site to Harris Road completed in Stage 2 due to large number of injury crashes on this section, providing a completed length from west of Hugh Duncan Street to Harris Road. Informal turnarounds will take place at Harris and Mount Cecil intersections (despite challenging grades), with formal facilities at Moonshine Road and 2/58.<br>• TG extent (or Pauatahanui Roundabout if TG interchange not complete) also undertaken due to high injury crash numbers. This section includes a new roundabout at Flightys/Murphys. Turning is well catered for with this new roundabout, plus Moonshine and TG at either end of this section. | • Major delays to customers<br>• Crash migration<br>• Unsafe turning manoeuvres at intersections when not suitable to do so (such as with large vehicles), or U-turning around barrier itself on SH58 which is even less desirable | $16.7M | 0.0 |
| Stage 3 | • West of Hugh Duncan to Mount Cecil (B) 3.5<br>• West of Harris to Moonshine Roundabout (E) 3.1 | • The section west of Hugh Duncan to Mount Cecil Road is targeted last despite the high number of loss of control crashes, as the injury crash rate per Km is low. This section is very high cost due to the three realignment sections with large scale earthworks. Median barrier provision along this section has little to no effect on access as Hugh Duncan Street and Mount Cecil Road are fully accessible and right turns in to Transpower are accommodated, with right turns out using 2/58 interchange.<br>• Remaining 1.3km length between Harris and Moonshine to be undertaken as final stage due to low numbers of injury crashes. | • Major delays to customers<br>• Crash migration to these two untreated sections is a probable outcome and will need to be proactively addressed. | $22.5M | 0.9 |

Note: It has been assumed for the purposes of Staging that all service relocations and protections are carried out during the phase / extent of work they are associated, rather than in a single package as early works contract.

**Table 8-11: Safety Staging Programme Delivery Risks**

| Safety Programme Staging – Delivery Considerations | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Risks to Delivery | | | | | |
| **Stage** | **Region(s)** | **Services** | **Property** | **Consenting** | **Construction** | **Other** | **Recommendation** |
| **Stage Zero**<br>Total Stage Cost: $2.7M | • **Scour Site Realignment (c)** | • N/A (Complete) | • N/A (Complete) | • N/A (Complete) | • N/A (Complete) | • N/A (Complete) | • N/A (Complete) |
| **Stage 1**<br>Total Stage Cost: $6.0M | • **East of Hugh Duncan Street to SH2/58 extent (a)**<br>• **Moonshine Roundabout (f)** | • Moonshine Roundabout conflict with service relocations (GWRC water main here)<br>• Unknown services costs and difficulty over control of their programme | • Land acquisition for Moonshine Roundabout may prove difficult | • Challenging consents, particularly for large earthworks in (A) | • Sacrificial work cost for SH2/58 interchange tie-in<br>• Material disposal – need to identify suitable site for large quantity of cut to waste material | • By not progressing TG to Moonshine Road first, potential criticism that main problem is not being addressed (due to traffic increases post TG) | • Commence full scale geotech testing and design of large cuts as early as possible – investigate potential to accelerate this realignment with physical works forming part of 2/58 contract<br>• Similarly, embark on property strategy with property agent early, prioritising these sites<br>• Engagement with service providers, to influence design, especially GWRC water main<br>• Consider implications of splitting utility works into each stage.<br>• Clearly communicate staging strategy and reasoning |
| **Stage 2**<br>Total Stage Cost: $16.7M | • **West of Scour Site to Harris (d)**<br>• **TG to Moonshine Road (g)** | • Service conflicts on TG to Moonshine section<br>• GWRC water main is problematic | • TG to Moonshine section relies on large number of properties for land acquisition (timing)<br>• Large amount of land required for new roundabout at Flightys/Murphys | • Numerous waterways along section likely to necessitate consents with long lead time<br>• Numerous bridges along the TG to Moonshine length which adds complexity / time | • With Harris complete, long section of continuous median barrier (1.7km) with inappropriate intersections either side that will be used for turning<br>• Tie-into TG works needs careful planning – likely to have some sacrificial works<br>• | • TG to Moonshine could need eventual 4-laning in event of no P2G Link Road, so could need redesign of works and more significant land acquisition<br>• TG to Moonshine section is the most under threat from additional TG volumes for crashes and delay<br>• TG section has potential to cause major traffic delays | • Advance designs to allow consents to be sought earlier. Advancement of designs allows service relocations to be firmed up earlier.<br>• Property strategy and acceleration of acquisition<br>• Provide sufficient informal turning area in bell-mouth of local roads to allow standard car to turn around. Educate residents along this section that intersections not suitable for larger vehicle turning<br>• Proceed with project on basis that P2G Link Road is delivered, but keep informed and if there is risk to this, proposed SH58 safety works will need to consider longer term 4-laning |
| **Stage 3**<br>Total Stage Cost: $22.5M | • **West of Hugh Duncan to Mount Cecil (b)**<br>• **West of Harris to Moonshine Roundabout (e)** | • Major realignment sections will necessitate significant (cost and time) service relocations | • Most land for both sections is already in NZTA ownership but some land required from Belmont Regional Park & others<br>• Need to agree final access treatments with Transpower | • Major earthworks consents required for (B) | • Large numbers of heavy plant and haulage vehicles will be required on site due to material volumes | • TTM for this section will create major delays even if well managed.<br>• Crash migration to untreated sections worsened given the poor alignment section west of Hugh Duncan Street is not upgraded until final stage | • Commence design works for realignment sections early to allow acceleration of service relocations (which would be better undertaken in advance of physical works contract to condense programme on this section).<br>• Early engagement with consent authorities<br>• Develop a traffic management plan for road users and construction traffic and seek to divert traffic off SH58 during major works<br>• Develop a plan for interim works – such as improved road markings, signage and safe hit posts in anticipation of crash migration |

# 9 Planning & RMA

This section (Section 9) has been provided by NZ Transport Agency.

## 9.1 Background Planning context

SH58 between the intersection with SH2 and the Pauatahanui roundabout traverses both Hutt City and Porirua City districts. A small section of the highway is also located within the Upper Hutt City boundary. The boundaries are indicated in Figure 9-1 below. SH58 is located entirely within the Greater Wellington Region.

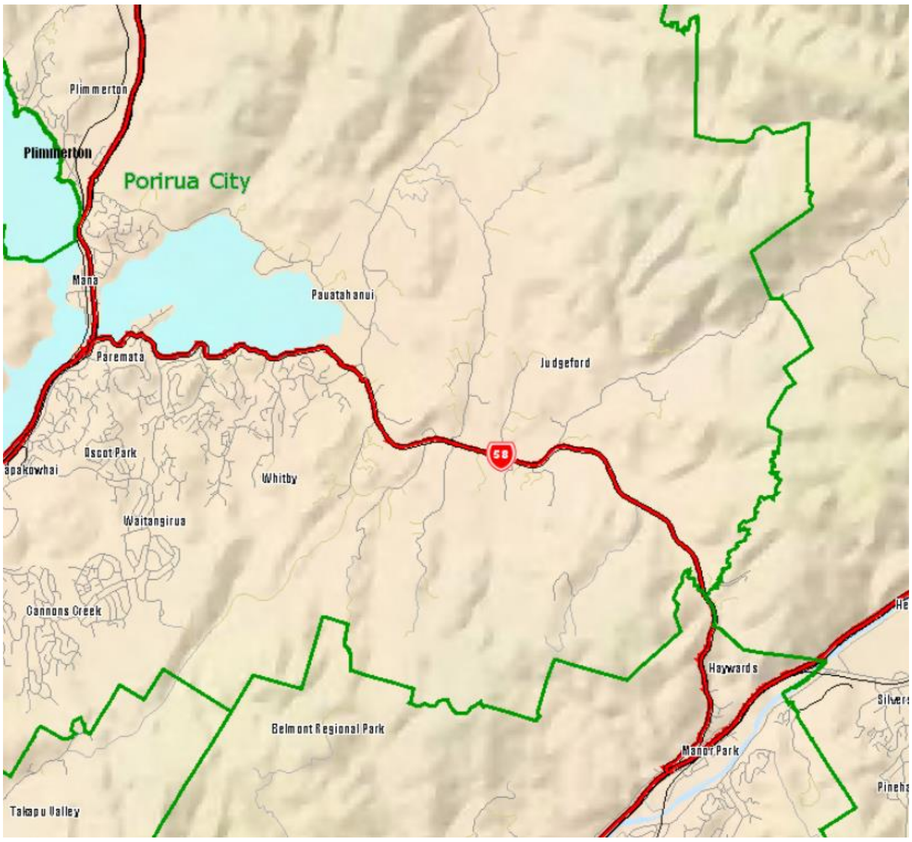



**Figure 9-1: District Boundaries**

### 9.1.1 Existing designations

The existing designations associated with SH58 are outlined in the table below.

**Table 9-1: Existing Designations**

| Council | Designated reference and purpose | Conditions? | Comments |
|---|---|---|---|
| Hutt City | TNZ3<br>'State Highway Purposes' | Yes | Includes the SH2/58 intersection and extends a short way up SH58 |
| Hutt City | TNZ4<br>'State Highway Purposes' | Yes | Includes the SH58 Upgrade Project (the four laning) consented around 2000. Council have agreed that the designation conditions only apply to the four laning project and not to other works. |
| Porirua City | K0404<br>'Limited Access Road (State Highway)' | Yes | There are a significant number of conditions attached to the designation that relate specifically to the proposed four laning project which was subject to a designation around 2000. The designation envelope was also significantly widened as part of the SH58 four laning designation process. |
| Upper Hutt City | Not shown in the district plan | Yes – as per K0404 | The Upper Hutt City Council have not put the designation in the plan due what is assumed to be an administrative error. |

## 9.2 Required Environmental approvals

### 9.2.1 Territorial Authority Approvals

Outline plans and designation alterations will be required from Hutt City, Porirua City and Upper Hutt City Councils.

**Hutt City Council Approvals**

The Designation Alteration and Outline Plan requirements from Hutt City are anticipated to be relatively straight forward. Council have agreed that the myriad conditions on the TNZ4 designation only apply to the SH58 four laning project and not too any other works. The designations in Hutt City extend a considerable distance beyond the carriageway in a number of areas. However, based on the conceptual plans, the designation will still need to be extended in several areas to include sufficient land for the project.

There is a potential issue with the current designation boundary (as indicated on SAR plan 80501811-01-005-C022) as the current road appears to be outside the designated area. However this may be an administrative error with Council's spatial data.

**Porirua City Council Approvals**

The SH58 designation in Porirua has some complicating factors which are likely to require additional time to resolve to enable the appropriate environmental approvals to be obtained.

The reference to the original underlying SH58 designation was accidentally removed from the Porirua District plan sometime in the last 10 years. Somehow, the existing SH58 has all the conditions relating specifically to the now defunct "four laning" project attached to designation K0404 - the only designation that applies to SH58 in Porirua.

The four laning conditions should apply to the section of road from Mt Cecil road to 750m past Harris Road and should only apply to the four laning project. However neither of these matters are clear as currently presented in the Porirua District Plan.

Obviously the four laning conditions are not applicable to the safety project so these will need to be altered to reflect the safety project works. Furthermore, a significant amount of additional land was added to the K0404 designation as part of the four laning designation process. It will not be possible to undertake any safety project related works on land that was originally designated for the four laning project without assessing the effects of the safety project works and ensuring that they are adequately managed through appropriate (revised) conditions.

A designation alteration process will be used to revise all the conditions to make them relevant to the Safety Project as well as enable the longer term operation and maintenance of SH58. This will require extensive consultation with Porirua City Council and probably landowners and other stakeholders (incl iwi). The designation alteration is very likely to be at least limited notified.

Helpfully, Porirua City Council planner officers have confirmed that they understand the K0404 designation is for the 'Construction, operation, realignment, maintenance and repair' of that section of SH 58 subject to the four laning designation. Despite the four laning not being carried out, they also understand the purpose of the designation was to improve the safety of that section of SH 58. Given works has been carried out in that regard (the Scour works) they consider that designation K0404 has been given effect to.

The conceptual plans indicate that a significant amount of additional land will need to be designated (as part of the alteration process) to enable road widening (largely cut) and in particular the construction of the proposed roundabouts.

**Upper Hutt City Council Approvals**

A 400m long section of the west bound lane of SH58 (east from Mt Cecil Road) is located within the Upper Hutt District. This section of road was designated by the Transport Agency as part of the proposed SH58 'four laning' upgrade. It is unknown whether there was also an underlying designation. However, there is no designation for SH58 shown in the Upper Hutt District Plan.

The Upper Hutt City Council have been contacted in April 2016 with a request to update their District Plan to include the designation. Assuming this matter can be resolved, the planning requirements are likely to be similar to those for Hutt City.

### 9.2.2 Regional Consents

Regional consents will be required for the safety project. Additional civil engineering detail will be required to assess the exact nature of consents required, including detailed design data on earthworks volumes, location, works methodology, and proposed drainage and stream works details. However, likely consenting triggers include:

1. Earthworks associated with cut and fill
2. Stormwater discharges during construction works
3. Works in beds of streams and stream diversions during construction
4. Modifications and/or new bridges and structures (eg culverts)
5. Fill disposal (cut to waste).

### 9.2.3 Other approvals

Approval may be required from Heritage New Zealand for earth disturbance. Additional civil design work will be required to determine the need for an Authority to Modify (based on location).

An assessment will need to be made to determine whether there are any potential contaminated sites within the project area. If any sites are identified, these will need managed, and potentially consented, in accordance with the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NESCS).

## 9.3 Timeframes

A table outlining indicative planning requirements and associated timeframes is provided below.

**Table 9-2: Timeframes for consents**

| Action | Time required (indicative) |
|---|---|
| Assessment of effects and consultation with affected parties (including provision of feedback to stakeholders on confirmed design | 3-4 months |
| Prepare and lodge Designation Alterations (from HCC, PCC and UHCC) | Prepare Alteration/NOR – 2 – 3 months |
| Process Designation alterations (HCC, PCC) | 4-5 months+ (Assumption that limited notified required) |
| Prepare and lodge Outline Plans (from HCC, PCC and UHCC) | 2 months (can be prepared in parallel to Alterations) |
| Process Outline plan (from HCC, PCC and UHCC) | 20 working days |
| Draft and lodge regional consent applications (Greater Wellington). Assuming some stakeholder consultation will be required as part of this process). | 2-3 months (can be prepared in parallel to Alterations and Outline plans) |
| Process regional consents (statutory process) | 3 months+. Assuming limited notified. Can be processed in parallel with designation alterations and/or outline plans |
| Draft and lodge Authority to modify (if required) and consent under NESCS (if required). | 2 months (can be prepared in parallel to Alterations and Outline plans, regional consent ) |
| Process Authority to modify and consent under NESCS (statutory process) | 2 months. Can be processed in parallel with designation alterations and/or outline plans |

The total likely time required for this process is therefore approximately 13-14 months. The designation option could be appealed, and if so this would add approximately 12-18 months to the timeframe.

# 10 Risk

The project risk register for this project has been updated as part of this SAR Addendum. An entirely new risk register has not been created, but the previous version has been updated to incorporate new risks and to revise previous risks where the status has changed since Rev4 of the SAR.

The risk register is contained in Appendix G and provides greater detail than below. The key risks are summarised below:

| Phase | Risk | Description | Score | Category | Treatment |
|---|---|---|---|---|---|
| Project Property | Land Acquisition | Difficulty in acquiring land. Caused by obstructive landowner or excessive cost demands. | 210 | Cost - Minor<br>Delay - Substantial | Consultation |
| Investigation and Reporting | Project objectives not achieved | Investigations indicate that constraints or conditions will not allow full achievement of project intentions and objectives (e.g. inadequate width for median barrier). | 200 | Cost - Major<br>H&S - Medium | Design |
| | Change in scope of works | Updated project scope (Opt 5) deemed unaffordable and project delayed / abandoned | 200 | Cost – Medium<br>Delay – Major<br>Reputation - Medium | Design & NLTP Funding Allocation |
| | Project Economics | Early delivery of scour site realignment has realised many of the corridor crash cost savings - so project loses prioritisation of regional importance, but fatal and serious crashes persist | 140 | Cost – Medium<br>Delay – Major<br>Reputation - Medium | Economic Evaluation |
| | Construction cost changes significantly different from I&R | Scope is for a 'light' SAR. With no geotechnical testing, stormwater design or bridge design, there is the chance that basic construction costs will be significantly underestimated. LiDAR data may also lead to inaccurate quantities estimates | 120 | Cost - Major | Cost Estimation |
| | Limited consultation | Stakeholders respond that they are not adequately consulted & project has since changed | 120 | Delay - Minor | Further consultation |
| Design and Project Documentation | Appeals to Environment Court | Project taken to Environment Court | 120 | Delay - Major<br>Cost - Minor | Statutory Planning & Consultation |
| | Consents not achieved | Consent not granted | 80 | Delay - Medium<br>Cost - Minor | Statutory Planning - Early and pre-lodgement engagement |
| | Onerous consent conditions | Consent conditions impose substantial changes to project | 80 | Delay - Medium<br>Cost - Minor | |

| Phase | Risk | Description | Score | Category | Treatment |
|---|---|---|---|---|---|
| | | | | | with Council(s). |

# 11 Conclusion & Recommendation

## 11.1 Assessment Findings

The key findings are:

### 11.1.1 Safety

The high speed environment, poor horizontal alignment (out of context curves), roadside hazards and narrow cross section all contribute to the high severity crashes experienced and the on-going high injury crash risk (as evidenced by the high collective crash risk and 2 star KiwiRAP star rating for this section of highway). With the opening of TG in 2020, significantly greater traffic volumes are forecast to use SH58 with a consequential worsening of the crash record.

At least an additional six DSI (or two DSI/year) are estimated to occur on SH58 in the time between TG opening (est. 2020) and P2G Link Road opening (est. 2023) as a result of the increased volumes on a KiwiRAP 2 star road. The additional 2 DSi per year is in addition to the 2.6 DSI/year, which is already occurring.

The recommended safety improvement works are forecast to provide an increased KiwiRAP star rating from 2.7 to 3.5-4 stars, with a 45-66% reduction in Injury crashes per 100M VKT, which results in an estimated 12-17 DSI saved over 10 years.

### 11.1.2 Capacity

From the modelling undertaken, it is expected that there will be a capacity problem on SH58 following the opening of TG and prior to the opening of the P2G Link Road. The predicted traffic volumes using SH58 means that, for the most part, SH58 would be operating at around LOS E in the peak periods (and possibly worse on particular sections).

Once P2G Link Road opens, traffic levels on SH58 return to approximately current levels and no capacity concerns are predicted within the modelling horizon which ends in 2041.

For the period between TG and P2G Link Road, a management plan will need to be introduced. This should include:

- Travel demand management (TDM) measures
    - Traveller information, publicity and media releases (for example to travel outside of peaks)
    - Promotion of alternative modes including Park & Ride facilities (at Porirua and Tawa)
    - ITS measures, to allow informed route choice at key decision points (for example to stay on SH1 or SH2)
- Small scale capacity improvements: if the TDM measures are not effective and additional capacity is required. For example, the modelling has shown a particular problem eastbound in the AM peak approaching SH2/58 interchange – at this location there would be value in testing whether the dual lane approach to the interchange should be extended back further and then this included into the detailed design works for the safety improvements on the corridor.

Should the P2G Link Road not progress, then it would be necessary to provide significant extra capacity on SH58 when volumes increase after the opening of TG, with four laning being required. Further, if the lag time between TG and P2G Link Road increases beyond a few years, more significant measures to address capacity issues may be needed.

### 11.1.3 Travel Time Reliability

This is linked to both safety and capacity but presented separately for clarity.

Travel time reliability is, at the present, only affected by safety – with delays and closures caused by crashes. With the reduction in serious and fatal crashes that the improvements are predicted to deliver, there is an associated travel time reliability benefit through reducing the number of occasions when delays and closures occur due to serious crashes.

Travel time reliability due to capacity is not currently an issue. The average route travel speed is 80km/h with minimal variation throughout the day or by direction, despite the existing 100 km/h posted speed limit, suggesting speeds are constrained more so by geometry than congestion. Based on Austroads metrics (described in Section 2.2) travel time reliability is not currently an issue along the corridor.

With significant increases in traffic in the period after TG but prior to P2G Link Road, it is expected that travel time reliability will worsen (based on using reduced LoS increased V/C ratios as a proxy for reliability). With the P2G Link Road in place, traffic levels and LoS returns to current levels and it is therefore predicted that travel time reliability based on capacity will return to the current state (i.e. no capacity related reliability issues)

### 11.1.4 P2G Link Road

The assessments undertaken clearly demonstrate how essential the P2G Link Road provision is to the future operation of SH58, once TG opens.

Should P2G Link Road not occur, or be delayed for an extended period beyond the three year lag currently expected between TG opening, then TDM measures or minor capacity improvements are expected to gradually become less effective.

The SH58 safety improvements will provide a step change in terms of safety outcomes, however major capacity issues will eventuate without the P2G Link Road. If the safety improvements are implemented, and then a decision is made later to four lane SH58 (because the P2G Link Road project had been abandoned), then the majority of the cost of the SH58 safety improvements is expected to be a sunk cost. This is because the current alignment is not conducive to four laning and a new offline route is likely to be needed.

## 11.2 Next Steps

### 11.2.1 Internal NZ Transport Agency SAR Approval

The general process to be followed by for the Transport Agency for the SAR / SAR Addendum approval, and the subsequent project stages, is summarised below:

- Transport Agency review of SAR.
- Feedback and revision by Consultant.
- Final SAR.
- Transport Agency internally socialise findings of SAR.
- Transport Agency write paper recommending the approval of the SAR and prioritisation of sub-projects.
- RMT approval (approx. 1 month after SAR finalised).
- CHLT approval (approx. 6 weeks after SAR finalised).
- VAC approval (approx. 2 months after SAR finalised).
- P&I approval (approx. 2 months after SAR finalised).
- Request funding for consenting/design (depends on prioritisation and business case) – with VAC/P&I approvals.
- Public communication of strategy.
- Consenting/design commences approx. 2017.
- Lodge consents (if required) end 2017.
- Commence construction (depends on whether consents required and what the prioritisation is) in approximately 2018.

### 11.2.2 For Consenting

The work undertaken to date is not sufficiently advanced to allow consent applications to be developed and submitted for either a Notice of Requirement for an alteration to the designation, or for resourcing consenting.

Additional work will need to be undertaken prior to consent applications. It is recommended that these additional works are undertaken urgently and prior to the detailed design phase of works. These works can be accelerated and be commenced immediately, whereas to package with detailed design would delay commencement due for the need to produce RFT documents and undertake a tendering process. The works will help inform the detailed design, thereby de-risking some aspects, but will also allow the consenting process to start earlier which is considered to be a critical path item for delivery. The works detailed below should be commenced as early as possible:

- Geotechnical testing and interpretation: An initial PGAR was undertaken for this SAR but that did not include any on site invasive testing or lab work. Given the topography and expected size and nature of the earthworks, more geotechnical assessment is required along the corridor. Additional geotechnical testing recommendations are contained within the PGAR. In addition to volumes of earthworks and cut slope profiles, the construction of the realignment of the Scour Site improvements highlighted the considerable subgrade variability in pavement construction – additional testing and analysis should be undertaken to better define pavement design requirements.
- Stormwater management: No hydrology or stormwater design has been undertaken for the project. The management of stormwater and discharge requirements, will need to be advanced prior to lodging consents. Stormwater management and the need for drainage swales, detention ponds, attenuation and culvert sizing will need to be defined for the consenting processes. This issue was highlighted during the consenting process for the Scour Site works where in effect the regional council required an understanding of the completed detailed design for stormwater management before issuing consents.
- Bridge design: The bridge / structural works to be undertaken as part of the corridor improvements have only been subject to a brief and very high level overview. A hydrology assessment will be required in advance of any concept level bridge design work that will be needed for the consenting process.

The additional work noted above could be undertaken prior to, or as part of, the detailed design works for the project. During the detailed design, this would allow any additional work to be accurately targeted and could limit the need to incorporate an unnecessary level of conservatism in testing or evaluation. If the additional work is undertaken prior to detailed design, sufficient flexibility and conservatism will need to be built into any work noting the detailed design will not have commenced, however, this will allow programme acceleration (i.e. consents could be lodged earlier than if grouped with the detailed design phase).

### 11.2.3 For Land Acquisition

In Rev4 of the SAR, indicative land requirement plans were developed and these plans were used in the landowner consultation process undertaken in 2014. These plans are indicative and used to commence the initial discussions with landowners in terms of the general project proposals, however they are not sufficiently developed to allow land acquisition to commence. Principally, this is because there are aspects of the design that require further work (as detailed above) prior to being able to confirm land requirements with a level of confidence. Therefore, it is not recommended that the land acquisition process is advanced until the additional design work necessary for consenting is either completed, or at least well advanced.

When this design work is completed, the indicative land requirement plans can be updated to take account of the more advanced design work undertaken, as well as any changes to the project works since late 2014, and then used for further landowner engagement and land acquisition.

## 11.3 Recommendations

The following recommendations are made from this SAR Addendum:

A. Progress the implementation of the P2G Link Road which is critical to the medium to longer term operation of SH58.

B. Seek internal NZ Transport Agency approval of the SAR (and Addendum), and seek approval to move to the next stage of design.

C. Provide formal feedback to the public and landowners as to the results (and project updates) following the public consultation in late 2014 and the NZ Transport Agency's current timelines.

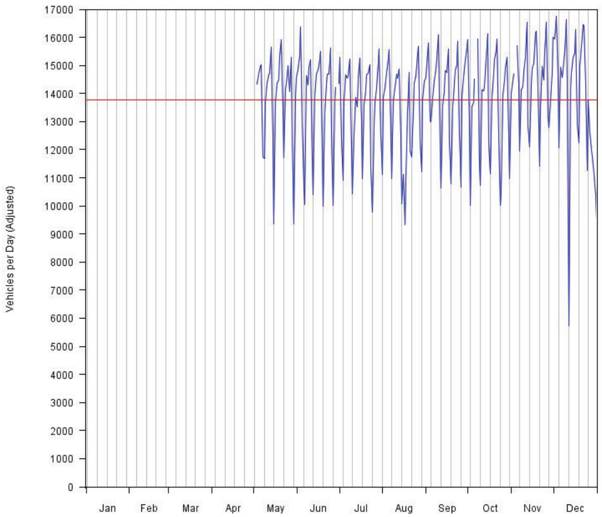
D. Progress implementation of the 80km/h speed reduction.

E. Progress the SH58 safety improvements to the next phase of design and subsequently to construction, as follows:

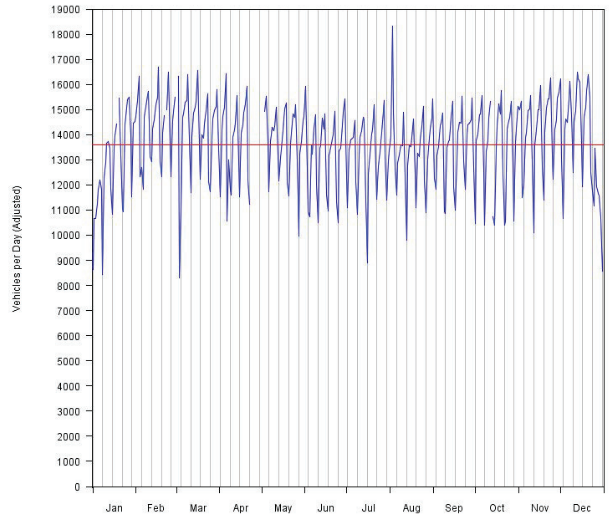
- Accelerate the works needed for consenting and accurate definition of land requirement in advance of undertaking detailed design to facilitate a more condensed detailed design programme. Given the proposed opening of TG in 2020, any methods that support accelerated delivery of the SH58 improvements should be progressed.
- Engage a property consultant to validate and update property costs / estimates (to help refine the project estimate). In addition, a property consultant can provide a first contact point for landowners seeking an update on project progress and timeframes.
- Commence land acquisition process when design work is sufficiently advanced. Similarly, submit for Notice of Requirement and resource consents when the design is ready to do so, given these processes are expected to be protracted.
- Develop a procurement strategy and timeline for design (pre-implementation) and construction (implementation), noting the alternative staging strategies and phasing options. For example, if a staged approach over a number of years is favoured, then a D&C type arrangement may be less suitable. In conjunction with the procurement strategy for design and construction, develop a detailed management plan for the period after TG, but prior to the P2G Link Road opening.

# Appendix A Traffic Data

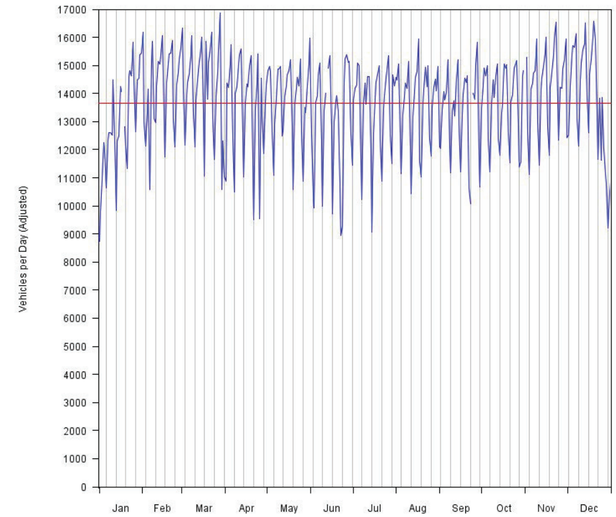
## A.1 Traffic Volume Data



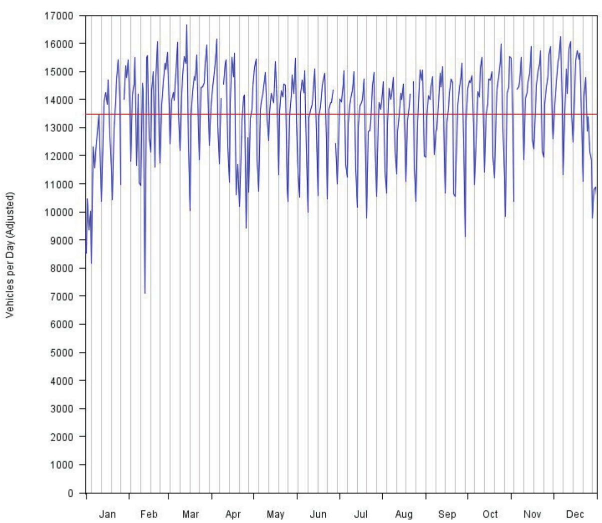

2011
Site 05800000 (West of SH2 (Haywards))
AADT: 13760 Unadjusted: 13760
Missing Data - Estimated Values using last years daily flow



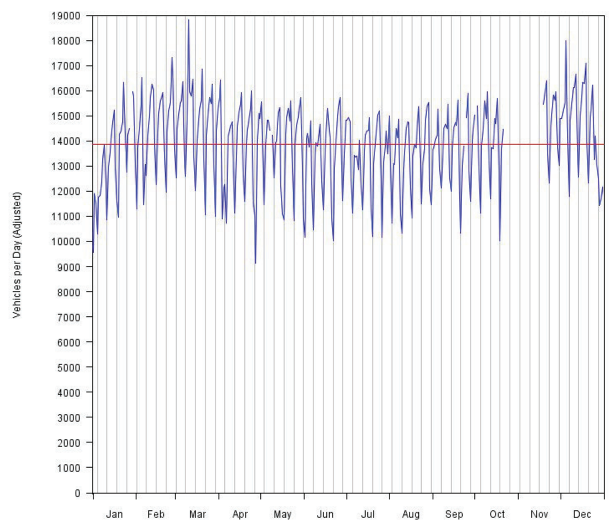

2012
Site 05800000 (West of SH2 (Haywards))
AADT: 13594 Unadjusted: 13594
Missing Data - Estimated Values using last years daily flow



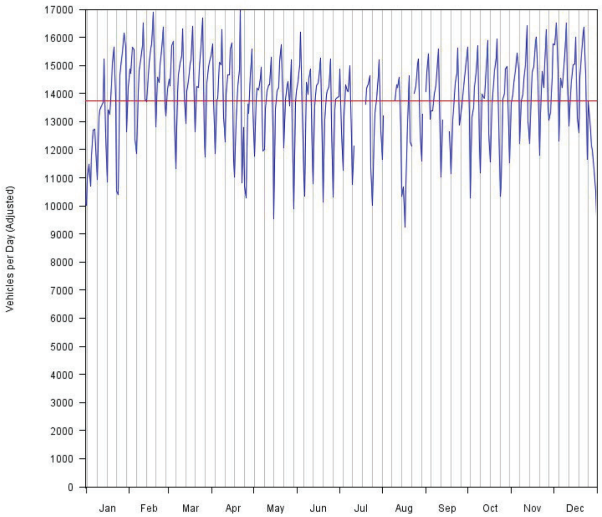

2013
Site 05800000 (West of SH2 (Haywards))
AADT: 13642 Unadjusted: 13642
Missing Data - Estimated Values using last years daily flow



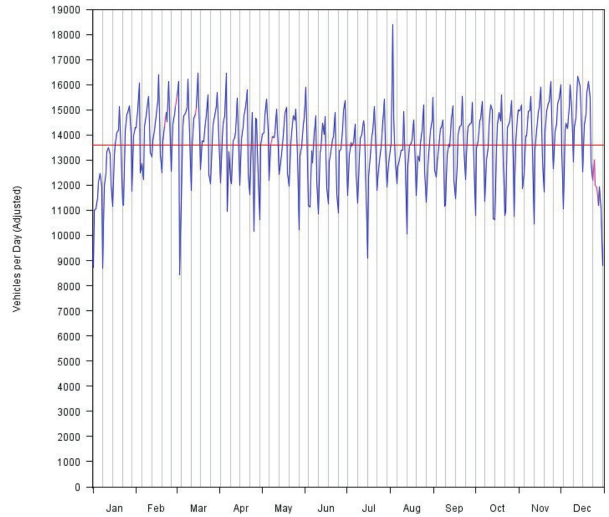

2014
Site 05800000 (West of SH2 (Haywards))
AADT: 13470 Unadjusted: 13470
Missing Data - Estimated Values using last years daily flow



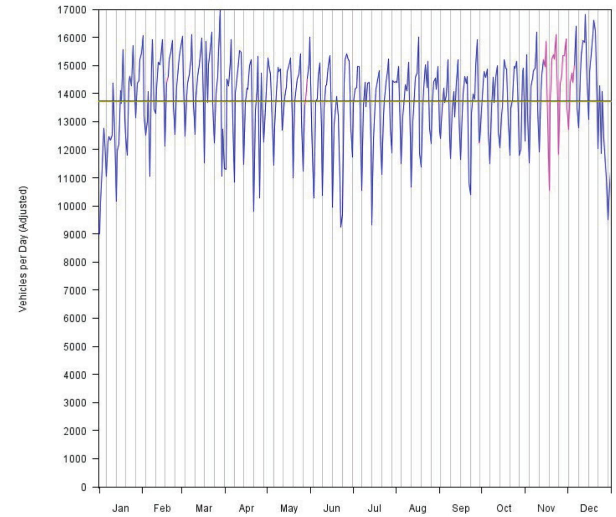

2015
Site 05800000 (West of SH2 (Haywards))
AADT: 13858 Unadjusted: 13858
Missing Data - Estimated Values using last years daily flow



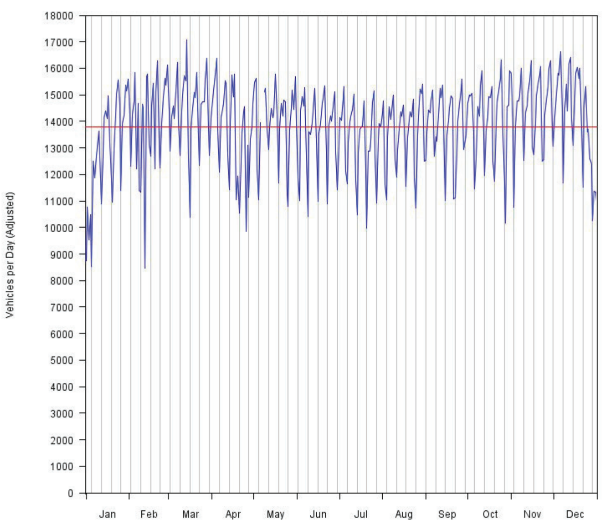

2011
Site 05800009 (PAUATAHUNUI EAST - Telemetry Site 73)
AADT: 13753 Unadjusted: 13753
Missing Data - Estimated Values using last years daily flow



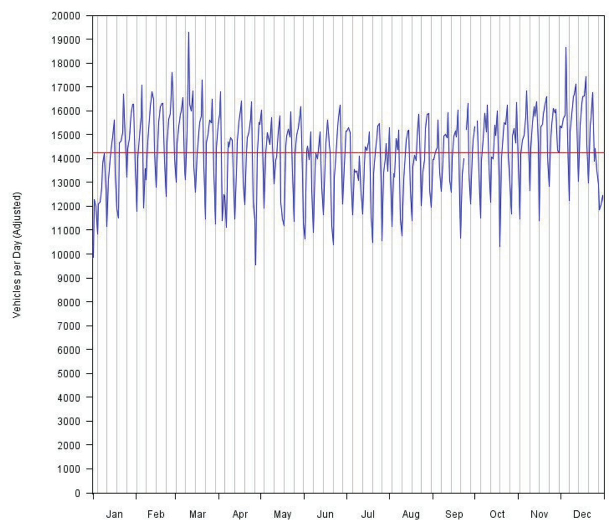

2012
Site 05800009 (PAUATAHUNUI EAST - Telemetry Site 73)
AADT: 13605 Unadjusted: 13605
Missing Data - Estimated Values using last years daily flow



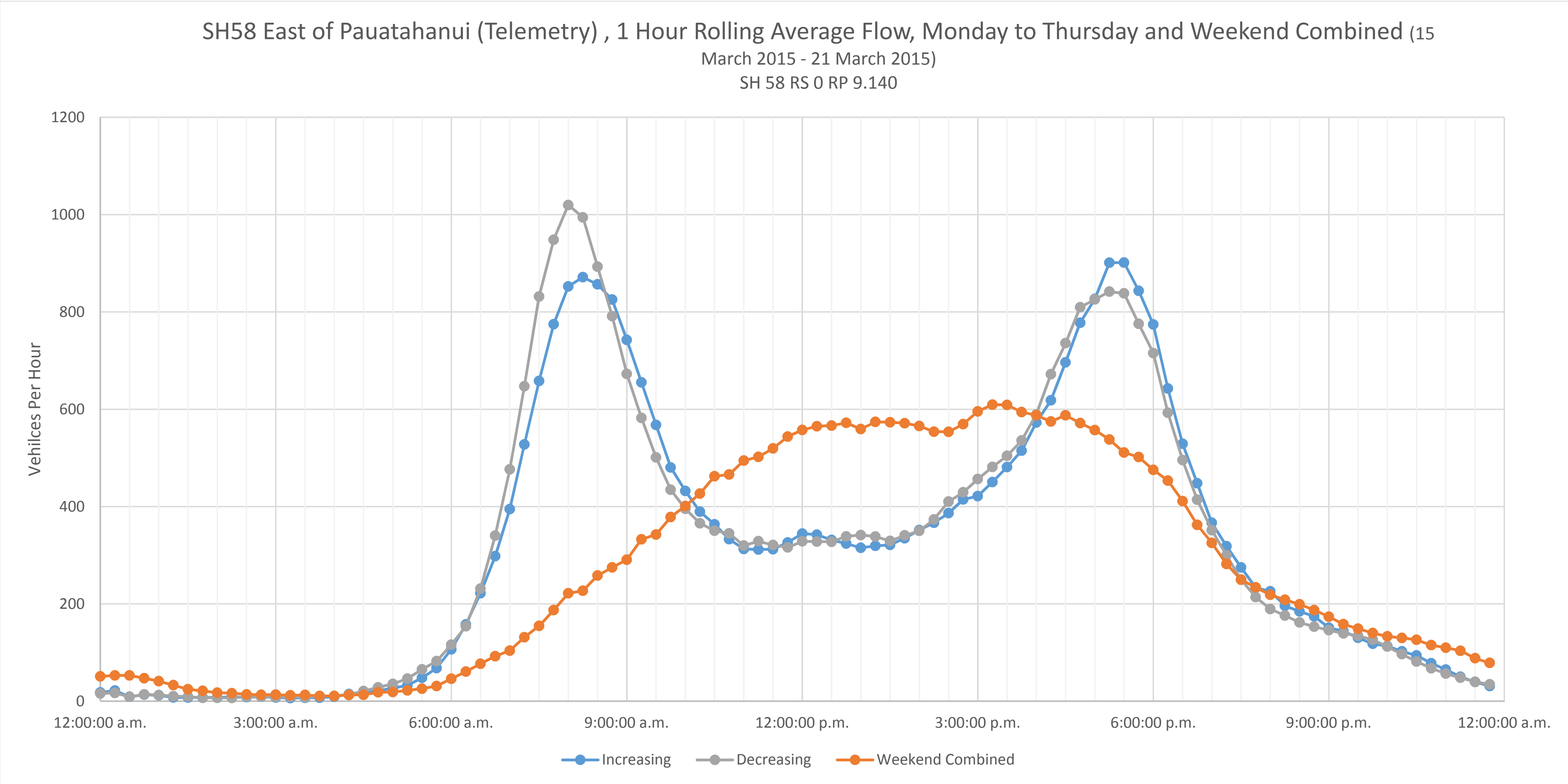

2013
Site 05800009 (PAUATAHUNUI EAST - Telemetry Site 73)
AADT: 13745 Unadjusted: 13704
Missing Data - Estimated Values using last years daily flow

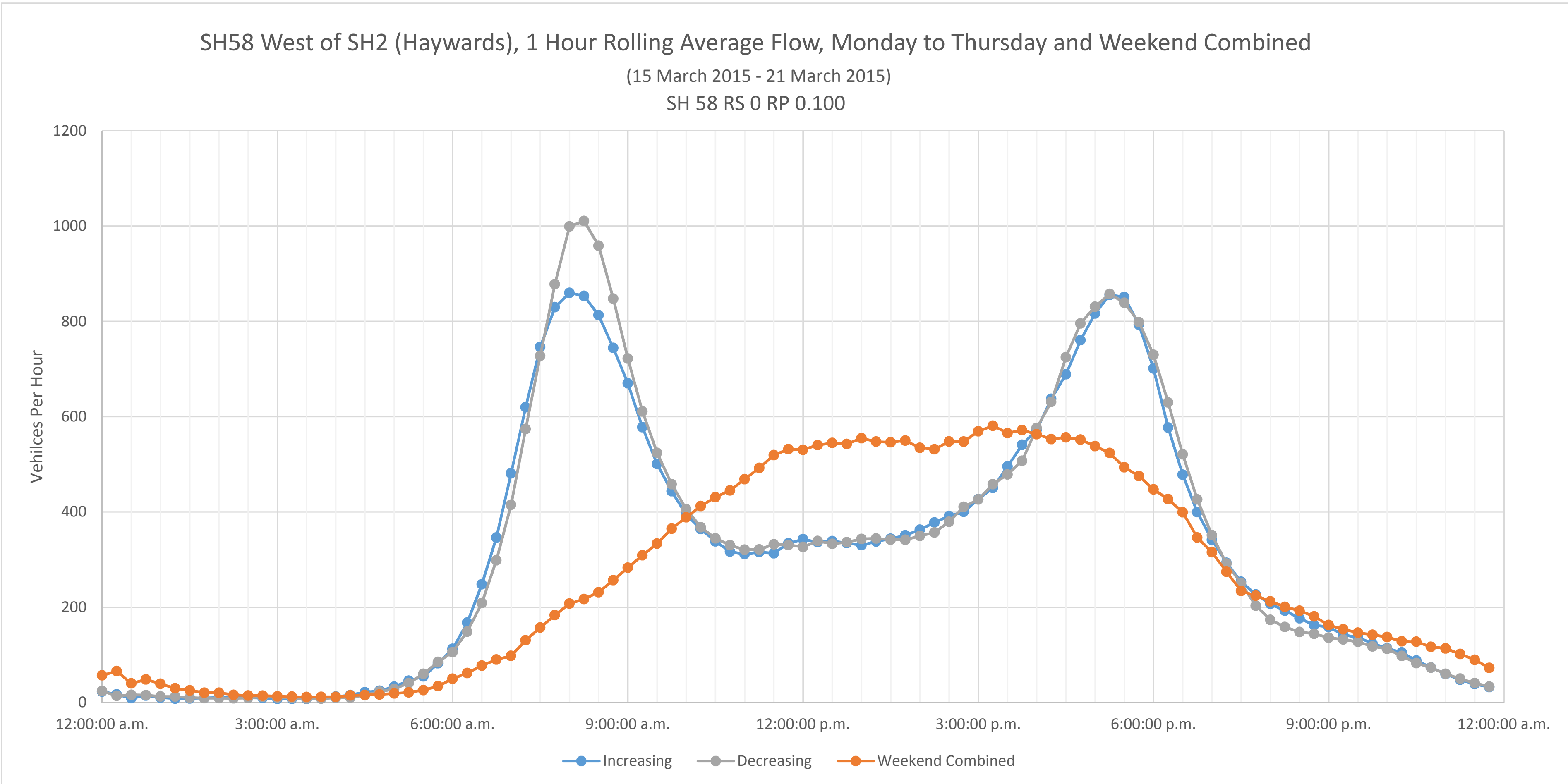



2014
Site 05800009 (PAUATAHUNUI EAST - Telemetry Site 73)
AADT: 13805 Unadjusted: 13805
Missing Data - Estimated Values using last years daily flow




2015
Site 05800009 (PAUATAHUNUI EAST - Telemetry Site 73)
AADT: 14254 Unadjusted: 14254
Missing Data - Estimated Values using last years daily flow

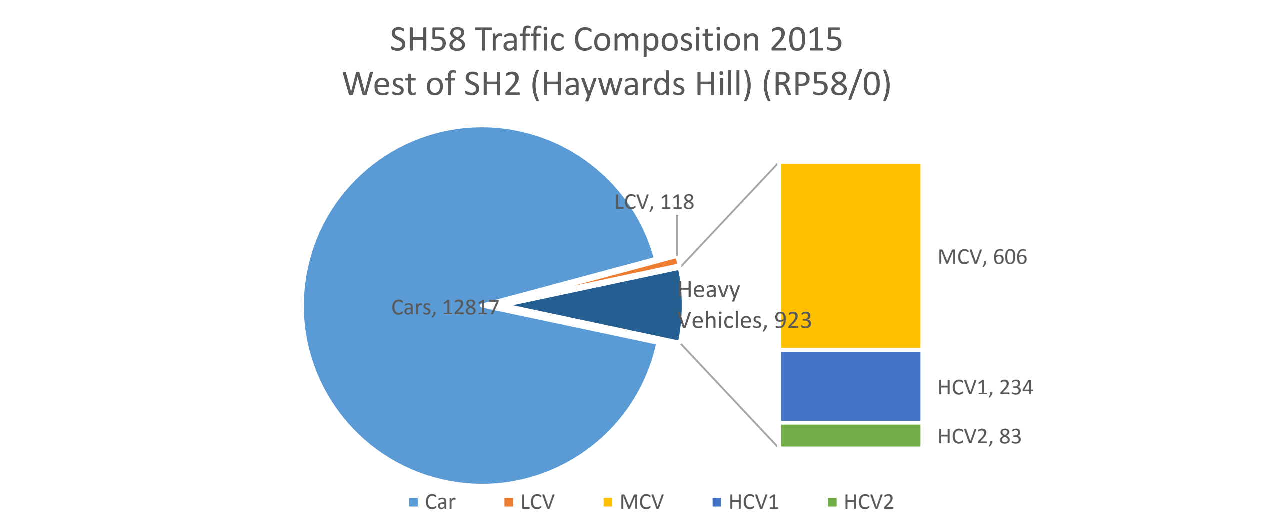

SH58 East of Pauatahanui (Telemetry) , 1 Hour Rolling Average Flow, Monday to Thursday and Weekend Combined (15 March 2015 - 21 March 2015)
SH 58 RS 0 RP 9.140
Vehilces Per Hour
1200
1000
800
600
400
200
0
12:00:00 a.m.
3:00:00 a.m.
6:00:00 a.m.
9:00:00 a.m.
12:00:00 p.m.
3:00:00 p.m.
6:00:00 p.m.
9:00:00 p.m.
12:00:00 a.m.
Increasing
Decreasing
Weekend Combined

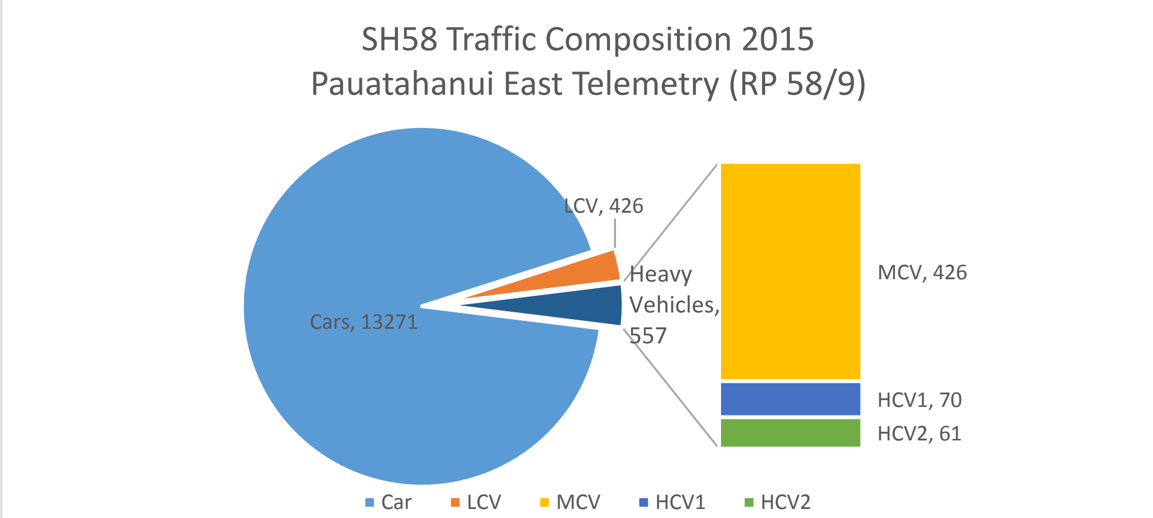

SH58 West of SH2 (Haywards), 1 Hour Rolling Average Flow, Monday to Thursday and Weekend Combined
(15 March 2015 - 21 March 2015)
SH 58 RS 0 RP 0.100
Vehilces Per Hour
1200
1000
800
600
400
200
0
12:00:00 a.m.
3:00:00 a.m.
6:00:00 a.m.
9:00:00 a.m.
12:00:00 p.m.
3:00:00 p.m.
6:00:00 p.m.
9:00:00 p.m.
12:00:00 a.m.
Increasing
Decreasing
Weekend Combined

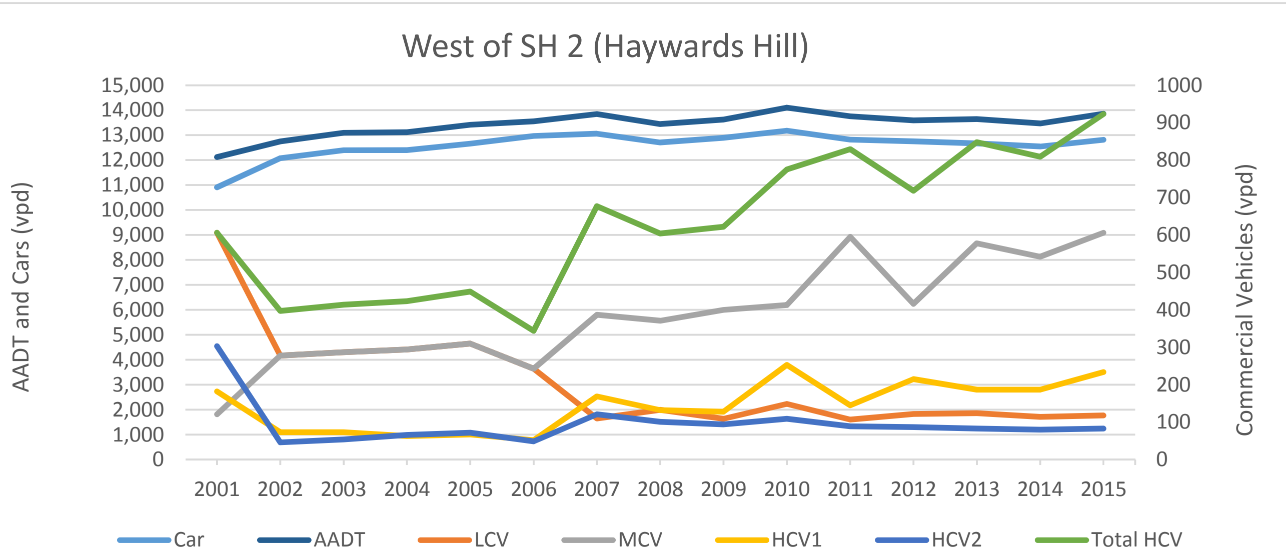
## A.2 Traffic Growth Data

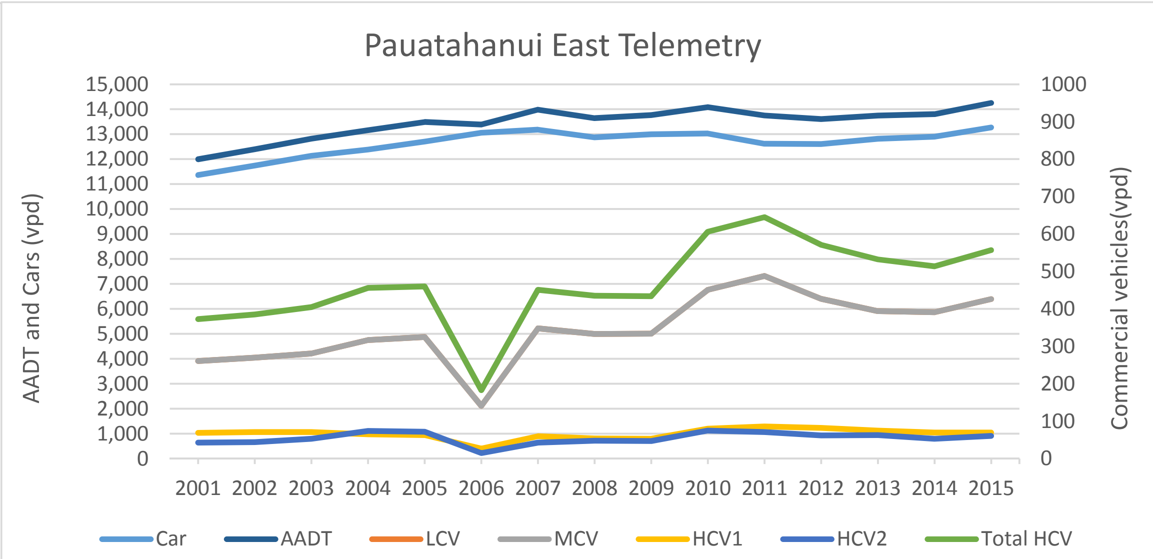
| Site | | 0.5-5.5<br>Short | 5.5-11<br>Light | 5.5-11<br>Medium | 11-17<br>Long | 17-25<br>V.Long | | |
|---|---|---|---|---|---|---|---|---|
| West of SH 2 (Haywards Hill) | | | | | | | | |
| West of SH 2 (Haywards Hill) | Year | Car | LCV | MCV | HCV1 | HCV2 | Total HCV | AADT |
| | | 12817 | 118 | 606 | 234 | 83 | 923 | |
| | | 92% | 1% | 4% | 2% | 1% | 7% | |
| | 2000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2001 | 10911 | 606 | 121 | 182 | 303 | 606 | 12123 |
| | 2002 | 12078 | 278 | 278 | 73 | 46 | 397 | 12753 |
| | 2003 | 12399 | 287 | 287 | 73 | 54 | 414 | 13100 |
| | 2004 | 12397 | 294 | 294 | 63 | 66 | 423 | 13114 |
| | 2005 | 12660 | 310 | 310 | 67 | 72 | 449 | 13419 |
| | 2006 | 12969 | 243 | 243 | 52 | 49 | 344 | 13556 |
| | 2007 | 13060 | 110 | 387 | 169 | 121 | 677 | 13847 |
| | 2008 | 12707 | 133 | 371 | 132 | 101 | 604 | 13444 |
| | 2009 | 12891 | 109 | 400 | 128 | 94 | 622 | 13622 |
| | 2010 | 13181 | 149 | 413 | 253 | 109 | 775 | 14105 |
| | 2011 | 12824 | 107 | 595 | 145 | 89 | 829 | 13760 |
| | 2012 | 12754 | 122 | 416 | 215 | 87 | 718 | 13594 |
| | 2013 | 12670 | 124 | 578 | 187 | 83 | 848 | 13642 |
| | 2014 | 12547 | 114 | 542 | 187 | 80 | 809 | 13470 |
| | 2015 | 12817 | 118 | 606 | 234 | 83 | 923 | 13858 |
| 2015 Composition | | 92% | 1% | 4% | 2% | 1% | 7% | 100% |

| Site | | 0.5-5.5<br>Short | 5.5-11<br>Light | 5.5-11<br>Medium | 11-17<br>Long | 17-25<br>V.Long | | |
|---|---|---|---|---|---|---|---|---|
| PAUAHATANUI EAST - Telemetry Site 73 - Opposite Timber Mill | | | | | | | | |
| PAUAHATANUI EAST - Telemetry Site 73 - Opposite Timber Mill | Year | Car | LCV | MCV | HCV1 | HCV2 | Total HCV | AADT |
| | | 13271 | 426 | 426 | 70 | 61 | 557 | |
| | | 93% | 3% | 3% | 0% | 0% | 4% | |
| | 2000 | 11113 | 255 | 256 | 56 | 50 | 362 | 11730 |
| | 2001 | 11363 | 261 | 261 | 69 | 43 | 373 | 11997 |
| | 2002 | 11743 | 270 | 270 | 71 | 44 | 385 | 12398 |
| | 2003 | 12139 | 281 | 281 | 71 | 53 | 405 | 12825 |
| | 2004 | 12387 | 317 | 317 | 65 | 74 | 456 | 13160 |
| | 2005 | 12706 | 325 | 325 | 63 | 72 | 460 | 13491 |
| | 2006 | 13061 | 141 | 141 | 27 | 15 | 183 | 13385 |
| | 2007 | 13181 | 348 | 348 | 60 | 43 | 451 | 13980 |
| | 2008 | 12874 | 333 | 333 | 54 | 48 | 435 | 13642 |
| | 2009 | 12998 | 334 | 334 | 53 | 47 | 434 | 13766 |
| | 2010 | 13029 | 451 | 451 | 80 | 75 | 606 | 14086 |
| | 2011 | 12620 | 488 | 488 | 86 | 71 | 645 | 13753 |
| | 2012 | 12607 | 427 | 427 | 82 | 62 | 571 | 13605 |
| | 2013 | 12819 | 394 | 394 | 75 | 63 | 532 | 13745 |
| | 2014 | 12900 | 391 | 391 | 70 | 53 | 514 | 13805 |
| | 2015 | 13271 | 426 | 426 | 70 | 61 | 557 | 14254 |
| 2015 Composition | | 93% | 3% | 3% | 0% | 0% | 4% | |



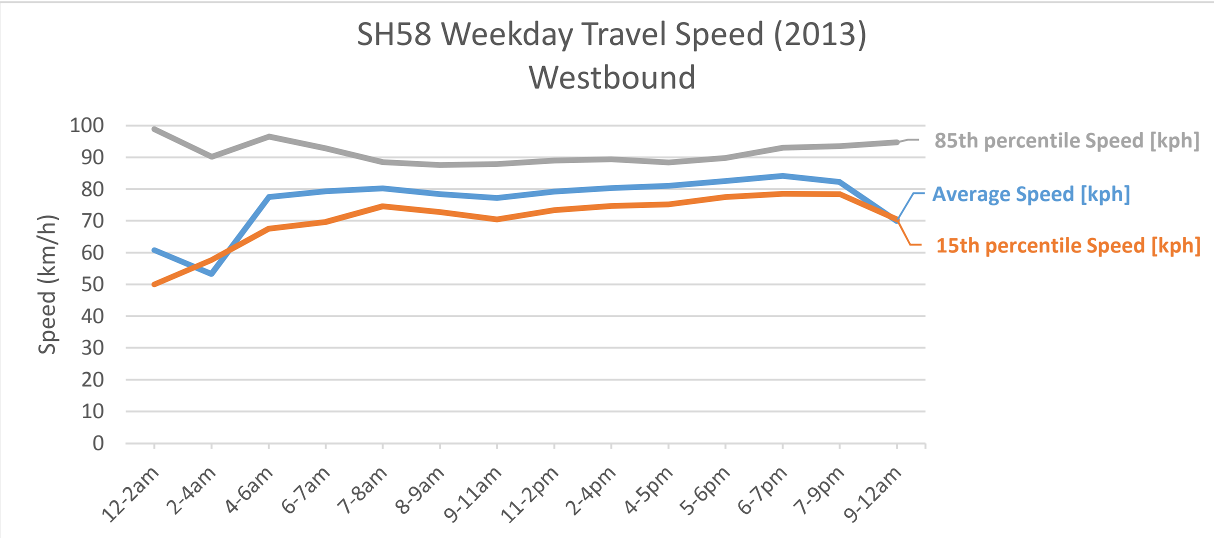



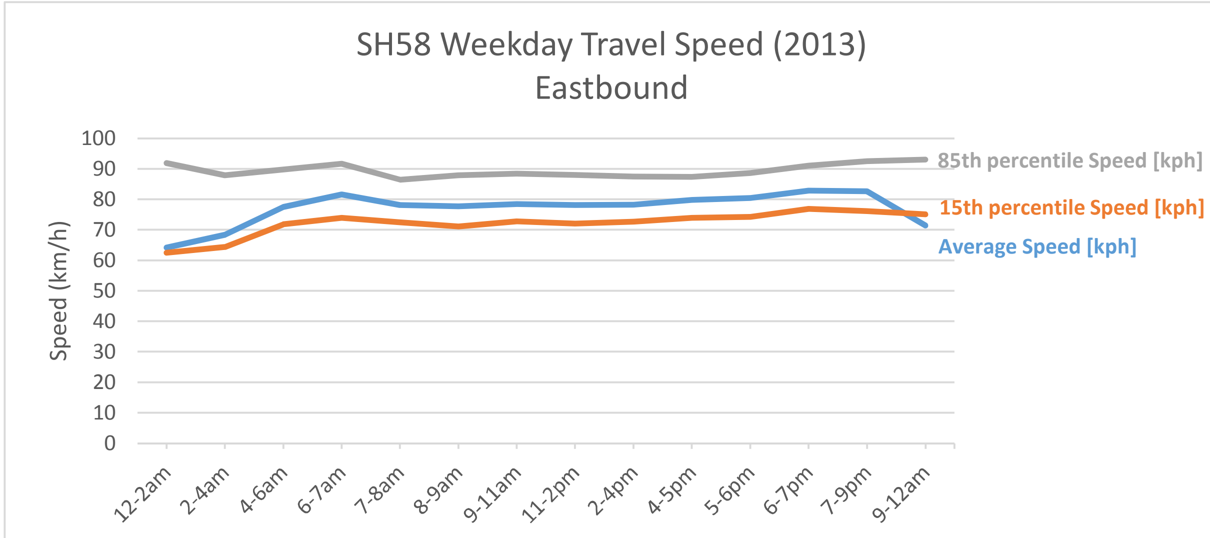



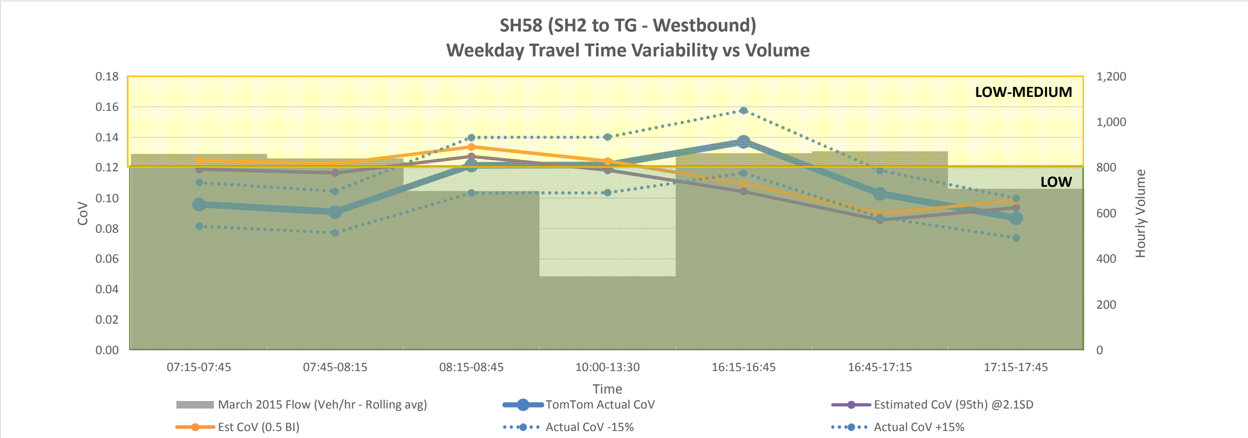
## A.3 Speed Data

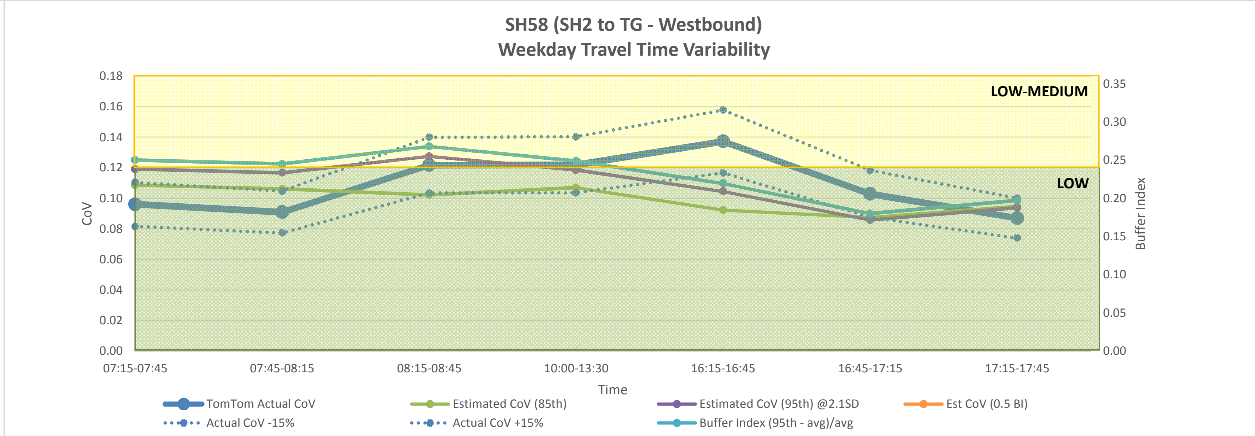
| Route | Date Range | Time Set | Covered Route Length [metres] | Sample size [avg per segment] | Average Travel Time [hh:mm:ss] | Median Travel Time [hh:mm:ss] | Average Speed [kph] | 15th percentile Speed [kph] | 85th percentile Speed [kph] | Average Travel Time ratios | 5th percentile travel time [hh:mm:ss] | 10th percentile travel time [hh:mm:ss] | Buffer Index | CoV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SH58, SH2 to TG v2 | All 2013 | 12-2am | 8,966.03 | 60.57 | 00:08:50 | 00:06:35 | 60.79 | 50.00 | 98.88 | 1.00 | 00:05:05 | 00:05:17 | 118% | 0.59 |
| SH58, SH2 to TG v2 | All 2013 | 2-4am | 8,966.03 | 66.13 | 00:10:05 | 00:07:17 | 53.31 | 57.63 | 90.15 | 1.14 | 00:05:31 | 00:05:40 | 216% | 1.08 |
| SH58, SH2 to TG v2 | All 2013 | 4-6am | 8,966.03 | 140.74 | 00:06:56 | 00:06:37 | 77.46 | 67.54 | 96.52 | 0.79 | 00:05:14 | 00:05:23 | 31% | 0.15 |
| SH58, SH2 to TG v2 | All 2013 | 6-7am | 8,966.03 | 288.41 | 00:06:47 | 00:06:37 | 79.29 | 69.65 | 92.85 | 0.77 | 00:05:34 | 00:05:42 | 25% | **0.12** |
| SH58, SH2 to TG v2 | All 2013 | 7-8am | 8,966.03 | 858.65 | 00:06:42 | 00:06:33 | 80.25 | 74.62 | 88.49 | 0.76 | 00:05:48 | 00:05:57 | 19% | **0.10** |
| SH58, SH2 to TG v2 | All 2013 | 8-9am | 8,966.03 | 1,106.17 | 00:06:51 | 00:06:36 | 78.43 | 72.80 | 87.58 | 0.78 | 00:05:55 | 00:06:02 | 22% | **0.11** |
| SH58, SH2 to TG v2 | All 2013 | 9-11am | 8,966.03 | 1,255.63 | 00:06:58 | 00:06:41 | 77.20 | 70.42 | 87.92 | 0.79 | 00:05:51 | 00:06:00 | 24% | **0.12** |
| SH58, SH2 to TG v2 | All 2013 | 11-2pm | 8,966.03 | 1,384.11 | 00:06:47 | 00:06:30 | 79.25 | 73.34 | 89.02 | 0.77 | 00:05:45 | 00:05:56 | 26% | **0.13** |
| SH58, SH2 to TG v2 | All 2013 | 2-4pm | 8,966.03 | 1,064.59 | 00:06:41 | 00:06:29 | 80.35 | 74.68 | 89.43 | 0.76 | 00:05:45 | 00:05:55 | 23% | **0.11** |
| SH58, SH2 to TG v2 | All 2013 | 4-5pm | 8,966.03 | 663.74 | 00:06:38 | 00:06:28 | 81.00 | 75.18 | 88.39 | 0.75 | 00:05:50 | 00:05:59 | 18% | **0.09** |
| SH58, SH2 to TG v2 | All 2013 | 5-6pm | 8,966.03 | 737.96 | 00:06:30 | 00:06:23 | 82.58 | 77.47 | 89.75 | 0.74 | 00:05:48 | 00:05:56 | 15% | **0.07** |
| SH58, SH2 to TG v2 | All 2013 | 6-7pm | 8,966.03 | 414.46 | 00:06:23 | 00:06:12 | 84.18 | 78.52 | 92.99 | 0.72 | 00:05:35 | 00:05:42 | 16% | **0.08** |
| SH58, SH2 to TG v2 | All 2013 | 7-9pm | 8,966.03 | 462.46 | 00:06:32 | 00:06:11 | 82.27 | 78.41 | 93.50 | 0.74 | 00:05:32 | 00:05:40 | 19% | **0.09** |
| SH58, SH2 to TG v2 | All 2013 | 9-12am | 8,966.03 | 274.80 | 00:07:41 | 00:06:21 | 69.99 | 70.42 | 94.74 | 0.87 | 00:05:21 | 00:05:32 | 19% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 12-2am | 8,963.39 | 71.71 | 00:08:22 | 00:06:45 | 64.18 | 62.48 | 91.93 | 1.00 | 00:05:33 | 00:05:42 | 164% | 0.82 |
| SH58, East of TG to SH2 | All 2013 | 2-4am | 8,963.39 | 107.75 | 00:07:52 | 00:06:29 | 68.34 | 64.38 | 87.87 | 0.94 | 00:05:55 | 00:06:03 | 57% | 0.29 |
| SH58, East of TG to SH2 | All 2013 | 4-6am | 8,963.39 | 260.02 | 00:06:56 | 00:06:34 | 77.54 | 71.88 | 89.77 | 0.83 | 00:05:38 | 00:05:49 | 24% | 0.12 |
| SH58, East of TG to SH2 | All 2013 | 6-7am | 8,963.39 | 320.96 | 00:06:35 | 00:06:20 | 81.57 | 73.91 | 91.68 | 0.79 | 00:05:37 | 00:05:45 | 23% | **0.11** |
| SH58, East of TG to SH2 | All 2013 | 7-8am | 8,963.39 | 749.25 | 00:06:53 | 00:06:41 | 78.12 | 72.43 | 86.48 | 0.82 | 00:05:57 | 00:06:06 | 20% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 8-9am | 8,963.39 | 707.40 | 00:06:55 | 00:06:37 | 77.69 | 71.11 | 87.85 | 0.83 | 00:05:55 | 00:06:02 | 30% | **0.15** |
| SH58, East of TG to SH2 | All 2013 | 9-11am | 8,963.39 | 1,311.98 | 00:06:51 | 00:06:33 | 78.41 | 72.76 | 88.43 | 0.82 | 00:05:49 | 00:05:58 | 21% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 11-2pm | 8,963.39 | 1,428.58 | 00:06:52 | 00:06:35 | 78.13 | 72.09 | 88.03 | 0.82 | 00:05:53 | 00:06:01 | 24% | **0.12** |
| SH58, East of TG to SH2 | All 2013 | 2-4pm | 8,963.39 | 1,100.71 | 00:06:52 | 00:06:37 | 78.21 | 72.66 | 87.44 | 0.82 | 00:05:58 | 00:06:04 | 21% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 4-5pm | 8,963.39 | 740.44 | 00:06:44 | 00:06:34 | 79.83 | 73.92 | 87.33 | 0.80 | 00:05:56 | 00:06:04 | 17% | **0.09** |
| SH58, East of TG to SH2 | All 2013 | 5-6pm | 8,963.39 | 704.04 | 00:06:41 | 00:06:31 | 80.40 | 74.21 | 88.67 | 0.80 | 00:05:49 | 00:05:58 | 20% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 6-7pm | 8,963.39 | 445.17 | 00:06:29 | 00:06:22 | 82.82 | 76.92 | 90.99 | 0.78 | 00:05:43 | 00:05:51 | 17% | **0.08** |
| SH58, East of TG to SH2 | All 2013 | 7-9pm | 8,963.39 | 462.38 | 00:06:30 | 00:06:22 | 82.59 | 76.13 | 92.48 | 0.78 | 00:05:32 | 00:05:40 | 20% | **0.10** |
| SH58, East of TG to SH2 | All 2013 | 9-12am | 8,963.39 | 247.65 | 00:07:32 | 00:06:23 | 71.37 | 75.11 | 93.05 | 0.90 | 00:05:33 | 00:05:40 | 23% | **0.12** |

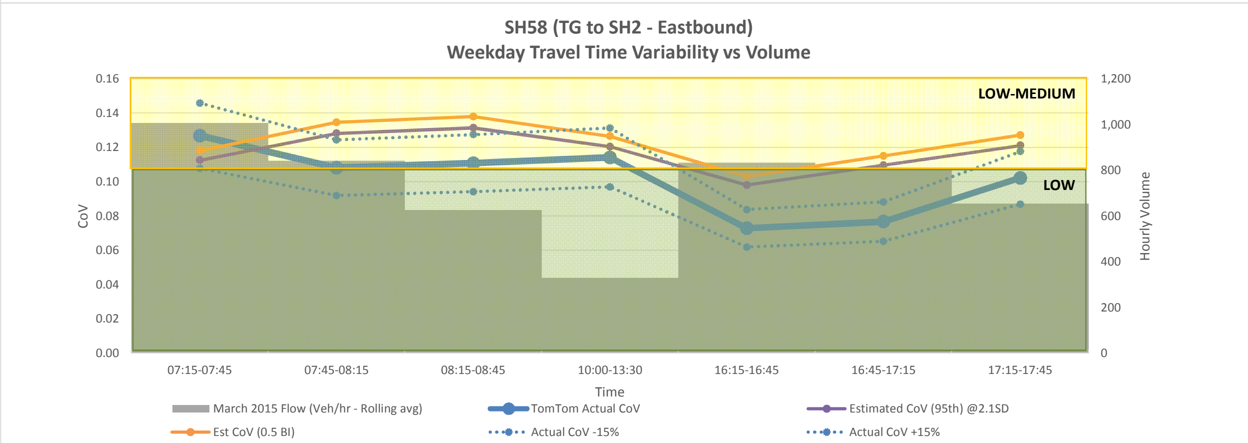


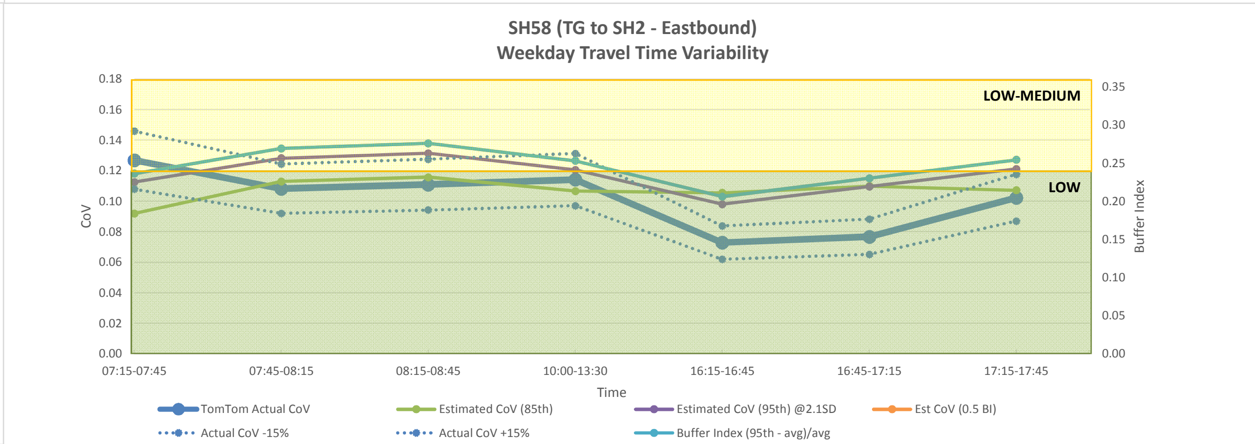



| Route | Date Range | March 2015 Flow (Veh/hr - Rolling avg) | Time Set | | Covered Route Length [metres] | Sample size [avg per segment] | Average Travel Time [hh:mm:ss] | Median Travel Time [hh:mm:ss] | Average Speed [kph] | 15th percentile Speed [kph] | 85th percentile Speed [kph] | 85th percentile travel time [hh:mm:ss] | 90th percentile travel time [hh:mm:ss] | 95th percentile travel time [hh:mm:ss] | Total Route Length [metres] | Standard Deviation (of traveltime, only full traversals) [hh:mm:ss] | TomTom Actual CoV | Estimated CoV (95th) @ 2 SD | | Estimated CoV (85th) | | 85%<br>Actual CoV - 15% | 115%<br>Actual CoV +15% | Estimated CoV (95th) @2.1SD | | Buffer Index (95th - avg)/avg | Est CoV (0.5 BI) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SH2 to TG - Full Traversal | All 2013 | 862 | M-F 07:15-07:45 | 07:15-07:45 | 8,966.03 | 232.00 | 00:06:36 | 00:06:26 | 81.41 | 73.48 | 92.28 | 00:07:19 | 00:07:37 | 00:08:15 | 8,966.03 | 00:00:38 | **0.10** | 0.13 | 130% | 0.11 | 113% | 0.08 | 0.11 | 0.12 | 124% | 0.25 | 0.13 |
| SH2 to TG - Full Traversal | All 2013 | 841 | M-F 07:45-08:15 | 07:45-08:15 | 8,966.03 | 510.00 | 00:06:36 | 00:06:27 | 81.35 | 73.59 | 92.25 | 00:07:18 | 00:07:36 | 00:08:13 | 8,966.03 | 00:00:36 | **0.09** | 0.12 | 135% | 0.11 | 117% | 0.08 | 0.10 | 0.12 | 128% | 0.24 | 0.12 |
| SH2 to TG - Full Traversal | All 2013 | 699 | M-F 08:15-08:45 | 08:15-08:45 | 8,966.03 | 374.00 | 00:06:51 | 00:06:37 | 78.49 | 71.16 | 90.76 | 00:07:33 | 00:07:54 | 00:08:41 | 8,966.03 | 00:00:50 | **0.12** | 0.13 | 110% | 0.10 | 84% | 0.10 | 0.14 | 0.13 | 105% | 0.27 | 0.13 |
| SH2 to TG - Full Traversal | All 2013 | 324 | M-F 10:00-13:30 | 10:00-13:30 | 8,966.03 | 1,332.00 | 00:06:42 | 00:06:28 | 80.18 | 72.52 | 92.28 | 00:07:25 | 00:07:44 | 00:08:22 | 8,966.03 | 00:00:49 | **0.12** | 0.12 | 102% | 0.11 | 88% | 0.10 | 0.14 | 0.12 | 97% | 0.25 | 0.12 |
| SH2 to TG - Full Traversal | All 2013 | 864 | M-F 16:15-16:45 | 16:15-16:45 | 8,966.03 | 215.00 | 00:06:41 | 00:06:27 | 80.48 | 73.65 | 91.84 | 00:07:18 | 00:07:35 | 00:08:09 | 8,966.03 | 00:00:55 | **0.14** | 0.11 | 80% | 0.09 | 67% | 0.12 | 0.16 | 0.10 | 76% | 0.22 | 0.11 |
| SH2 to TG - Full Traversal | All 2013 | 873 | M-F 16:45-17:15 | 16:45-17:15 | 8,966.03 | 287.00 | 00:06:29 | 00:06:20 | 82.83 | 76.15 | 92.43 | 00:07:03 | 00:07:17 | 00:07:39 | 8,966.03 | 00:00:40 | **0.10** | 0.09 | 88% | 0.09 | 85% | 0.09 | 0.12 | 0.09 | 83% | 0.18 | 0.09 |
| SH2 to TG - Full Traversal | All 2013 | 709 | M-F 17:15-17:45 | 17:15-17:45 | 8,966.03 | 281.00 | 00:06:31 | 00:06:22 | 82.50 | 75.35 | 92.63 | 00:07:08 | 00:07:22 | 00:07:48 | 8,966.03 | 00:00:34 | **0.09** | 0.10 | 113% | 0.09 | 109% | 0.07 | 0.10 | 0.09 | 108% | 0.20 | 0.10 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 1,007 | M-F 07:15-07:45 | 07:15-07:45 | 8,963.39 | 234.00 | 00:06:42 | 00:06:31 | 80.12 | 73.44 | 90.43 | 00:07:19 | 00:07:38 | 00:08:17 | 8,963.39 | 00:00:51 | **0.13** | 0.12 | 93% | 0.09 | 73% | 0.11 | 0.15 | 0.11 | 89% | 0.24 | 0.12 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 842 | M-F 07:45-08:15 | 07:45-08:15 | 8,963.39 | 277.00 | 00:06:56 | 00:06:40 | 77.49 | 69.64 | 89.61 | 00:07:43 | 00:08:05 | 00:08:48 | 8,963.39 | 00:00:45 | **0.11** | 0.13 | 124% | 0.11 | 104% | 0.09 | 0.12 | 0.13 | 119% | 0.27 | 0.13 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 627 | M-F 08:15-08:45 | 08:15-08:45 | 8,963.39 | 219.00 | 00:06:46 | 00:06:30 | 79.43 | 71.22 | 91.05 | 00:07:33 | 00:07:57 | 00:08:38 | 8,963.39 | 00:00:45 | **0.11** | 0.14 | 124% | 0.12 | 104% | 0.09 | 0.13 | 0.13 | 119% | 0.28 | 0.14 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 330 | M-F 10:00-13:30 | 10:00-13:30 | 8,963.39 | 1,397.00 | 00:06:43 | 00:06:29 | 79.98 | 72.31 | 91.86 | 00:07:26 | 00:07:46 | 00:08:25 | 8,963.39 | 00:00:46 | **0.11** | 0.13 | 111% | 0.11 | 93% | 0.10 | 0.13 | 0.12 | 106% | 0.25 | 0.13 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 834 | M-F 16:15-16:45 | 16:15-16:45 | 8,963.39 | 241.00 | 00:06:38 | 00:06:30 | 81.07 | 73.19 | 91.04 | 00:07:20 | 00:07:35 | 00:08:00 | 8,963.39 | 00:00:29 | **0.07** | 0.10 | 141% | 0.11 | 145% | 0.06 | 0.08 | 0.10 | 135% | 0.21 | 0.10 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 807 | M-F 16:45-17:15 | 16:45-17:15 | 8,963.39 | 329.00 | 00:06:31 | 00:06:22 | 82.51 | 74.25 | 93.60 | 00:07:14 | 00:07:30 | 00:08:01 | 8,963.39 | 00:00:30 | **0.08** | 0.12 | 150% | 0.11 | 143% | 0.07 | 0.09 | 0.11 | 143% | 0.23 | 0.12 |
| SH58 TG to SH2 - Full Traversal | All 2013 | 654 | M-F 17:15-17:45 | 17:15-17:45 | 8,963.39 | 229.00 | 00:06:41 | 00:06:29 | 80.34 | 72.60 | 91.33 | 00:07:24 | 00:07:47 | 00:08:23 | 8,963.39 | 00:00:41 | **0.10** | 0.13 | 124% | 0.11 | 105% | 0.09 | 0.12 | 0.12 | 118% | 0.25 | 0.13 |




| | Coefficient of Variation bands based on Austroads | |
|---|---|---|
| Low | less than | 0.12 |
| Low-medium | 0.12 | 0.18 |
| Medium | 0.18 | 0.24 |
| High | 0.24 | 0.30 |
| Very High | more than | 0.30 |

# Appendix B Crash Data

## B.1 Crash Data

Crash List: SH581015

## Overall Crash Statistics

| **Crash Severity** | Number | % | Social cost ($m) |
|---|---|---|---|
| Fatal | 3 | 2 | 13.98 |
| Serious | 10 | 7 | 8.87 |
| Minor Injury | 35 | 25 | 3.1 |
| Non-injury | 91 | 65 | 3.23 |
| | 139 | 100 | 29.17 |

**Crash Numbers**

| Year | Fatal | Serious | Minor | Non-inj |
|---|---|---|---|---|
| 2011 | 0 | 3 | 5 | 19 |
| 2012 | 0 | 5 | 9 | 20 |
| 2013 | 1 | 0 | 6 | 11 |
| 2014 | 1 | 0 | 3 | 11 |
| 2015 | 0 | 1 | 3 | 11 |
| TOTAL | 2 | 9 | 26 | 72 |
| Percent | 2 | 8 | 24 | 66 |

Note: Last 5 years of crashes shown

## Overall Casualty Statistics

| **Injury Severity** | Number | % all casualties |
|---|---|---|
| Death | 3 | 5 |
| Serious Injury | 11 | 17 |
| Minor Injury | 50 | 78 |
| | 64 | 100 |

**Casualty Numbers**

| Year | Fatal | Serious | Minor |
|---|---|---|---|
| 2011 | 0 | 3 | 6 |
| 2012 | 0 | 5 | 13 |
| 2013 | 1 | 1 | 6 |
| 2014 | 1 | 0 | 7 |
| 2015 | 0 | 1 | 6 |
| TOTAL | 2 | 10 | 38 |
| Percent | 4 | 20 | 76 |

Note: Last 5 years of casualties shown

## Crash Type and Cause Statistics

| **Crash Type** | All crashes | % All crashes |
|---|---|---|
| Overtaking Crashes | 13 | 9 |
| Straight Road Lost Control/Head On | 17 | 12 |
| Bend - Lost Control/Head On | 79 | 57 |
| Rear End/Obstruction | 21 | 15 |
| Crossing/Turning | 6 | 4 |
| Pedestrian Crashes | 0 | 0 |
| Miscellaneous Crashes | 3 | 2 |
| TOTAL | 139 | 100 |

| **Crash factors (*)** | All crashes | % All crashes |
|---|---|---|
| Alcohol | 10 | 7 |
| Too fast | 47 | 34 |
| Failed Giveway/Stop | 5 | 4 |
| Failed Keep Left | 4 | 3 |
| Overtaking | 7 | 5 |
| Incorrect Lane/posn | 16 | 12 |
| Poor handling | 57 | 41 |
| Poor Observation | 37 | 27 |
| Poor judgement | 23 | 17 |
| Fatigue | 7 | 5 |
| Disabled/old/ill | 4 | 3 |
| Vehicle factors | 8 | 6 |
| Road factors | 39 | 28 |
| Weather | 6 | 4 |
| Other | 14 | 10 |
| TOTAL | 284 | 206 |
| Crashes with a: | | |
| Driver factor | 217 | 158 |
| Environmental factor | 45 | 32 |

(*) factors are counted once against a crash - ie two fatigued drivers count as one fatigue crash factor.

Note: Driver/vehicle factors are not available for non-injury crashes for Northland, Auckland, Waikato and Bay of Plenty before 2007. This will influence numbers and percentages.

Note: % represents the % of crashes in which the cause factor appears

| **Number of parties in crash** | All crashes | % All crashes |
|---|---|---|

## Driver and Vehicle Statistics

Note: Driver information is not computerised for non-injury crashes

**Drivers at fault or part fault in injury crashes**

| Age | Male | % | Female | % | Total | % |
|---|---|---|---|---|---|---|
| 15-19 | 4 | 11 | 1 | 7 | 5 | 10 |
| 20-24 | 5 | 14 | 2 | 14 | 7 | 14 |
| 25-29 | 4 | 11 | 2 | 14 | 6 | 12 |
| 30-39 | 5 | 14 | 2 | 14 | 7 | 14 |
| 40-49 | 8 | 23 | 2 | 14 | 10 | 20 |
| 50-59 | 6 | 17 | 4 | 29 | 10 | 20 |
| 60-69 | 0 | 0 | 1 | 7 | 1 | 2 |
| 70+ | 3 | 9 | 0 | 0 | 3 | 6 |
| TOTAL | 35 | 100 | 14 | 100 | 49 | 100 |

**Drivers at fault or part fault in injury crashes**

| Licence | Male | Female | Total | % |
|---|---|---|---|---|
| Full | 29 | 10 | 39 | 78 |
| Learner | 2 | 0 | 2 | 4 |
| Restricted | 3 | 3 | 6 | 12 |
| Never licensed | 0 | 0 | 0 | 0 |
| Disqualified | 0 | 0 | 0 | 0 |
| Overseas | 0 | 0 | 0 | 0 |
| Expired | 0 | 2 | 2 | 4 |
| Other/Unknown | 1 | 0 | 1 | 2 |
| TOTAL | 35 | 15 | 50 | 100 |

**Vehicles involved in injury crashes**

| | No.of vehicles | % Injury crashes |
|---|---|---|
| SUV | 6 | 13 |
| Car/Stn Wagon | 48 | 67 |
| Motor Cycle | 6 | 13 |
| Bicycle | 3 | 6 |
| Truck | 2 | 4 |
| Van Or Utility | 15 | 29 |
| TOTAL | 80 | 132 |

Note: % represents the % of injury crashes in which the vehicle appears

Crash List: SH581015

## Road Environment Statistics

| **Road Type** | Local road | % | State highway | % | Total | % |
|---|---|---|---|---|---|---|
| Urban | 0 | 0 | 2 | 1 | 2 | 1 |
| Open Road | 0 | 0 | 137 | 99 | 137 | 99 |
| TOTAL | 0 | 0 | 139 | 100 | 139 | 100 |

| **Conditions** | Injury | Non-injury | Total | % |
|---|---|---|---|---|
| Light/overcast | 37 | 68 | 105 | 76 |
| Dark/twilight | 11 | 23 | 34 | 24 |
| TOTAL | 48 | 91 | 139 | 100 |

| **Conditions** | Injury | Non-injury | Total | % |
|---|---|---|---|---|
| Dry | 23 | 40 | 63 | 45 |
| Wet | 22 | 48 | 70 | 50 |
| Ice/snow | 3 | 3 | 6 | 4 |
| TOTAL | 48 | 91 | 139 | 100 |

| **Intersection/mid-block** | All crashes | % All crashes |
|---|---|---|
| Intersection | 16 | 12 |
| Midblock | 123 | 88 |
| TOTAL | 139 | 100 |

| **Objects Struck** | Injury crashes | % | Non-injury crashes | % |
|---|---|---|---|---|
| Crashes w/obj.struck | 25 | 52 | 63 | 69 |

| **Object Struck** | Injury crashes | % | Non-injury crashes | % |
|---|---|---|---|---|
| Cliff Bank | 9 | 19 | 20 | 22 |
| Debris | 1 | 2 | 2 | 2 |
| Over Bank | 1 | 2 | 6 | 7 |
| Fence | 10 | 21 | 19 | 21 |
| Guard Rail | 2 | 4 | 16 | 18 |
| Post Or Pole | 4 | 8 | 8 | 9 |
| Traffic Sign | 0 | 0 | 1 | 1 |
| Tree | 4 | 8 | 6 | 7 |
| Ditch | 3 | 6 | 4 | 4 |
| Stray Animal | 0 | 0 | 2 | 2 |
| Other | 1 | 2 | 0 | 0 |
| Water/River | 3 | 6 | 0 | 0 |
| TOTAL | 38 | | 84 | |

Note: % represents the % of crashes in which the object is struck

## Time Period Statistics

| **Day/Period** | All crashes | % All crashes |
|---|---|---|
| Weekday | 99 | 71 |
| Weekend | 40 | 29 |
| TOTAL | 139 | 100 |

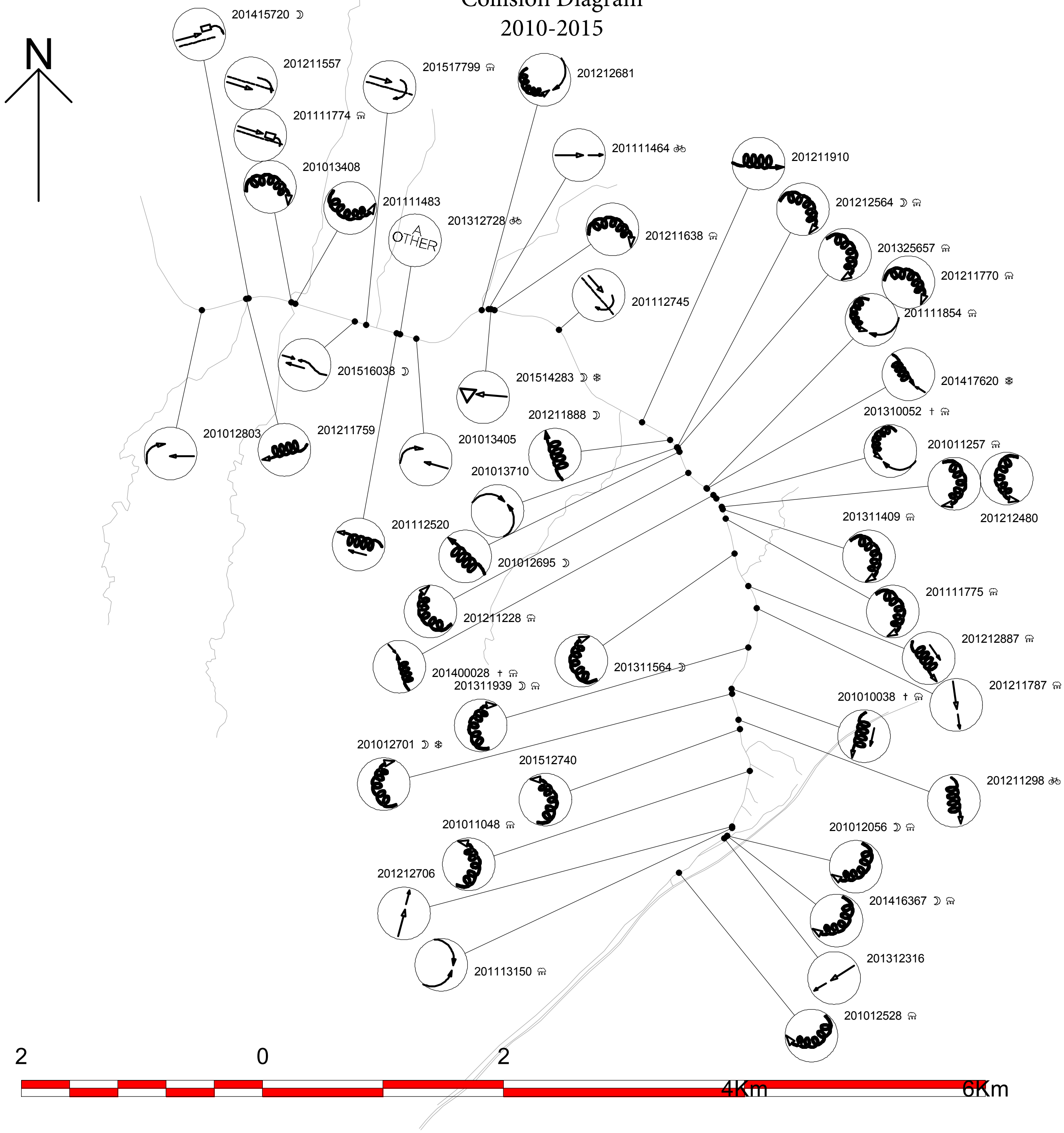
| **Day/ Period** | 0000-0259 | 0300-0559 | 0600-0859 | 0900-1159 | 1200-1459 | 1500-1759 | 1800-2059 | 2100-2400 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Weekday | 2 | 2 | 24 | 9 | 16 | 29 | 11 | 6 | 99 |
| Weekend | 1 | 3 | 3 | 9 | 9 | 9 | 3 | 2 | 39 |
| TOTAL | 3 | 5 | 27 | 18 | 25 | 38 | 14 | 8 | 138 |

Note: Weekend runs from 6 pm on Friday to 6 am on Monday

| **Day/ Period** | 0000-0259 | 0300-0559 | 0600-0859 | 0900-1159 | 1200-1459 | 1500-1759 | 1800-2059 | 2100-2400 | Total |
|---|---|---|---|---|---|---|---|---|---|
| Mon | 1 | 0 | 5 | 4 | 1 | 5 | 3 | 1 | 20 |
| Tue | 0 | 2 | 4 | 1 | 1 | 7 | 1 | 0 | 16 |
| Wed | 1 | 0 | 6 | 0 | 6 | 6 | 3 | 2 | 24 |
| Thu | 0 | 0 | 3 | 3 | 4 | 6 | 3 | 2 | 21 |
| Fri | 0 | 0 | 6 | 1 | 4 | 5 | 1 | 1 | 18 |
| Sat | 1 | 3 | 2 | 4 | 7 | 5 | 1 | 0 | 23 |
| Sun | 0 | 0 | 1 | 5 | 2 | 4 | 2 | 2 | 16 |
| TOTAL | 3 | 5 | 27 | 18 | 25 | 38 | 14 | 8 | 138 |

| **Month** | Injury | % | Non-injury | % | Total | % |
|---|---|---|---|---|---|---|
| Jan | 2 | 4 | 9 | 10 | 11 | 8 |
| Feb | 7 | 15 | 4 | 4 | 11 | 8 |
| Mar | 4 | 8 | 5 | 5 | 9 | 6 |
| Apr | 2 | 4 | 12 | 13 | 14 | 10 |
| May | 9 | 19 | 8 | 9 | 17 | 12 |
| Jun | 3 | 6 | 11 | 12 | 14 | 10 |
| Jul | 3 | 6 | 11 | 12 | 14 | 10 |
| Aug | 2 | 4 | 4 | 4 | 6 | 4 |
| Sep | 4 | 8 | 6 | 7 | 10 | 7 |
| Oct | 5 | 10 | 8 | 9 | 13 | 9 |
| Nov | 4 | 8 | 4 | 4 | 8 | 6 |
| Dec | 3 | 6 | 9 | 10 | 12 | 9 |
| TOTAL | 48 | 100 | 91 | 100 | 139 | 100 |

# SH58 Injury Crash
# Collision Diagram
# 2010-2015



| First Street | Distance DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | MVMT DIR | Veh 1 234 | Factors and Roles (A is for vehicle 1, B is for veh 2 etc) | OBJECT | CURVE | WETNES | LIGHT | WETHER | JUNCT | CONTRL | MARKSL | SPDLMT | Total Inj FATN | SEIR | MIN | PED Age | CYC Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/0.1 | 40N | HEBDEN CRESCENT | 201151771 | 05/04/2011 | Tue | 1659 | DB | 4N1 | 111A 131A 402A 801 | C | M | W | O | L | | N | R | 100 | | | | | |
| 58/0/0.1 | 100W | SH 2 | 201056475 | 11/10/2010 | Mon | 1145 | DA | 4N1 | 135A 801 901 | C | M | W | O | H | | N | P | 100 | | | | | |
| 58/0/0.14 | 80N | HEBDEN CRESCENT | 201150346 | 23/01/2011 | Sun | 1345 | DA | CW1 | 135A 806 | C | M | W | O | L | | N | R | 100 | | | | | |
| 58/0/0.15 | 150W | SH 2 | 201012528 | 15/06/2010 | Tue | 1646 | DA | VW1 | 133A | C | M | W | O | L | | N | R | 100 | | | 1 | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201531758 | 30/01/2015 | Fri | 0659 | GD | CN1C | 181A 331A | | E | D | B | F | T | G | L | 100 | | | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201051777 | 05/04/2010 | Mon | 1240 | GD | CN1C | 331A | | E | D | O | F | T | G | C | 100 | | | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201056495 | 05/11/2010 | Fri | 1341 | MC | CN1C | 372B | | E | D | B | F | T | G | L | 100 | | | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201155382 | 25/12/2011 | Sun | 1920 | GB | CN1C | 158A 175B 372B 402B | | E | D | B | F | T | G | C | 100 | | | | | |
| 58/0/0.629 HAYWARDS HILL ROAD | 270N | MCDOUGALL GROVE | 201312316 | 28/07/2013 | Sun | 1054 | FA | 4S1C | 111A 131A | | S | D | O | F | | N | C | 100 | | | 1 | | |
| 58/0/0.639 | 280N | MCDOUGALL GROVE | 201152234 | 25/04/2011 | Mon | 1928 | DA | CS1 | 101A 111A 131A | ET | E | W | DN | F | | N | L | 100 | | | | | |
| 58/0/0.659 | 300N | MCDOUGALL GROVE | 201012056 | 11/06/2010 | Fri | 2118 | DA | CS1 | 111A 632A 801 | C | S | W | DO | M | | N | C | 100 | | | 1 | | |
| 58/0/0.66 | 660N | SH 2 | 201416367 | 06/10/2014 | Mon | 2100 | DA | CS1 | 110A 131A | T | M | W | DN | H | | N | L | 100 | | | 1 | | |
| 58/0/0.696 | 240S | HUGH DUNCAN ST | 201154716 | 04/11/2011 | Fri | 1046 | DB | CN1 | 102A 135A 402A 801 | CET | M | W | O | F | | N | C | 100 | | | | | |
| 58/0/0.7 HAYWARDS HILL ROAD | 700N | WESTERN HUTT ROAD | 201254042 | 06/09/2012 | Thu | 2300 | DB | CN1 | 111A 517A | C | E | D | DO | F | | N | C | 100 | | | | | |
| 58/0/0.736 | 200S | HUGH DUNCAN ST | 201113150 | 19/11/2011 | Sat | 0720 | BC | 4N1CCV | 111A 197A 378A | | M | W | O | L | | N | L | 100 | | | 1 | | |
| 58/0/0.736 | 200S | HUGH DUNCAN ST | 201431413 | 09/02/2014 | Sun | 0920 | DA | CS1 | 131A 400A | C | M | W | ON | L | | N | C | 100 | | | | | |
| 58/0/0.746 | 190S | HUGH DUNCAN ST | 201212706 | 07/10/2012 | Sun | 1019 | FA | MN1C | 130A 181A 182B | | M | D | B | F | | N | L | 100 | | 1 | | | |
| 58/0/0.746 HAYWARDS HILL ROAD | 190S | HUGH DUNCAN ST | 201351734 | 27/05/2013 | Mon | 1831 | DA | CS1 | 130A 410A | | E | D | DN | F | | N | C | 080 | | | | | |
| 58/0/0.816 HAYWARDS HILL ROAD | 120S | HUGH DUNCAN ST | 201351963 | 10/06/2013 | Mon | 0645 | DA | CS1 | 111A 135A 801 | PT | M | W | DN | F | | N | C | 100 | | | | | |
| 58/0/1 | 1000N | WESTERN HUTT ROAD | 201539741 | 08/05/2015 | Fri | 0707 | DA | VN1 | 111A 131A | G | M | W | OF | L | | | C | 080 | | | | | |
| 58/0/1.016 | 80N | HUGH DUNCAN ST | 201051895 | 15/05/2010 | Sat | 1724 | CC | CN1 | 110A | G | R | W | DN | L | | N | C | 100 | | | | | |
| 58/0/1.2 | 1200N | WESTERN HUTT ROAD | 201539738 | 13/05/2015 | Wed | 1930 | DA | CN1C | 111A 130A | DG | M | W | DO | L | | N | C | 080 | | | | | |
| 58/0/1.236 | 300N | HUGH DUNCAN ST | 201011048 | 23/01/2010 | Sat | 1215 | DB | VN1M | 111A 135A 801 | G | E | W | O | L | | N | C | 100 | | | 1 | | |
| 58/0/1.336 | 400N | HUGH DUNCAN ST | 201052050 | 17/05/2010 | Mon | 1625 | CA | MN1 | 135A 806 | | E | W | TF | L | | N | R | 100 | | | | | |
| 58/0/1.393 HAYWARDS HILL ROAD | 100N | ATIAMURI CRESCENT | 201253532 | 22/09/2012 | Sat | 1720 | DA | VS1 | 136A 662A | F | E | D | O | F | | N | C | 100 | | | | | |
| 58/0/1.396 | I | OLD HAYWARDS ROAD | 201530703 | 17/02/2015 | Tue | 0435 | DB | VS1 | 101A 410A | G | M | D | DN | F | T | N | C | 100 | | | | | |
| 58/0/1.576 | 640N | HUGH DUNCAN ST | 201051947 | 30/04/2010 | Fri | 1624 | DA | VN1 | 111A 135A 801 | C | E | W | O | H | | N | C | 100 | | | | | |
| 58/0/1.596 | 200N | OLD HAYWARDS ROAD | 201152188 | 15/04/2011 | Fri | 1920 | DB | CN1 | 131A 804 | G | E | W | DN | L | | N | R | 100 | | | | | |
| 58/0/1.596 | 200N | OLD HAYWARDS ROAD | 201512740 | 15/05/2015 | Fri | 1315 | DB | 4N1 | 129A 330A | C | E | D | B | F | | N | N | 100 | | | 1 | | |
| 58/0/1.636 HAYWARDS HILL ROAD | 700N | HUGH DUNCAN ST | 201351558 | 11/05/2013 | Sat | 1640 | DA | CW1 | 135A 402A 403A 801 | C | E | W | O | F | | N | C | 100 | | | | | |
| 58/0/1.646 | 250N | OLD HAYWARDS ROAD | 201532754 | 07/03/2015 | Sat | 1447 | AD | CN1 | 130A 151A 901 903 | C | R | W | O | H | | | C | 100 | | | | | |
| 58/0/1.676 | 280N | OLD HAYWARDS ROAD | 201211298 | 18/02/2012 | Sat | 1018 | CA | SS1 | 330A 341A | X | R | D | B | F | | N | C | 080 | | | 1 | | 53 |
| 58/0/1.706 | 770N | HUGH DUNCAN ST | 201250023 | 01/01/2012 | Sun | 1512 | DB | CS1 | 131A 350A 800 | G | E | W | O | L | | N | C | 100 | | | | | |
| 58/0/1.706 | 770N | HUGH DUNCAN ST | 201054160 | 03/08/2010 | Tue | 1736 | QG | TS1C | 682A | D | M | D | TO | F | | N | C | 100 | | | | | |
| 58/0/1.736 | 800N | HUGH DUNCAN ST | 201535588 | 30/04/2015 | Thu | 0715 | DA | CN1 | 111A 131A | C | E | W | OF | F | | N | P | 100 | | | | | |
| 58/0/1.753 | 1200S | MOUNT CECIL ROAD | 201543264 | 14/07/2015 | Tue | 0650 | AD | CN1T | 135A 802 | G | E | I | DO | F | | | P | 080 | | | | | |
| 58/0/1.8 | 1800W | SH 2 | 201251836 | 09/06/2012 | Sat | 1059 | DA | CS1 | 134A | | E | D | B | F | | N | C | 100 | | | | | |

| First Street | Distance DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | MVMT (A is for vehicle 1, B is for veh 2 etc) | DIR VN VVV T 1 234 | Factors and Roles | OBJECT | CURVE | WETNES | LIGHT | WETHER | JUNCT | CONTRL | MARKS | SPDLMT | Total Inj FATAL | Total Inj SER | Total Inj MIN | PED Age | CYC Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/1.866 | 470N | OLD HAYWARDS ROAD | 201450396 | 01/07/2014 | Tue | 0604 | DA | CN1 | 110A 131A 801 | G | M | W | DN | L | | | R | 100 | | | | | |
| 58/0/1.9 | 1900N | SH 2 | 201012701 | 14/06/2010 | Mon | 0628 | DA | CN1 | 111A 135A 802 | C | M | I | DN | F | | N | C | 100 | | | 1 | | |
| 58/0/1.936 | 1000N | HUGH DUNCAN ST | 201153588 | 03/08/2011 | Wed | 1720 | AC | CS1C | 159A 330A | | E | D | O | F | | | C | 080 | | | | | |
| 58/0/1.94 | 1940W | SH 2 | 201010038 | 24/03/2010 | Wed | 1231 | AD | VW1C | 136A 359A 632A 801 | C | M | W | O | H | | N | R | 100 | 1 | | 2 | | |
| 58/0/2 HAYWARDS HILL | 2000N | WESTERN HUTT ROAD | 201252011 | 05/06/2012 | Tue | 1535 | DA | CS1 | 111A 332A 801 | G | E | W | O | F | | N | R | 100 | | | | | |
| 58/0/2.053 HAYWARDS HILL ROAD | 900S | MOUNT CECIL ROAD | 201253565 | 05/10/2012 | Fri | 1415 | DA | CS1 | 134A 139A | GT | E | D | O | F | | N | C | 100 | | | | | |
| 58/0/2.136 | 1200N | HUGH DUNCAN ST | 201054312 | 14/07/2010 | Wed | 0716 | DA | VW1 | 135A 802 | G | M | I | O | F | | N | C | 100 | | | | | |
| 58/0/2.153 | 800S | MOUNT CECIL ROAD | 201152692 | 15/07/2011 | Fri | 0755 | DB | CN1 | 131A | CG | E | D | B | F | | N | R | 100 | | | | | |
| 58/0/2.203 | 750S | MOUNT CECIL ROAD | 201152615 | 12/07/2011 | Tue | 1535 | DA | CS1 | 103A 134A | G | E | D | O | F | | N | R | 100 | | | | | |
| 58/0/2.216 HAYWARDS HILL | 820N | OLD HAYWARDS ROAD | 201053065 | 17/06/2010 | Thu | 1145 | DA | CS1 | 135A 806 | T | E | W | O | F | | N | C | 100 | | | | | |
| 58/0/2.296 | 900N | OLD HAYWARDS ROAD | 201050767 | 12/02/2010 | Fri | 1530 | AD | CN1 | 131A | F | E | W | O | H | | N | C | 100 | | | | | |
| 58/0/2.313 HAYWARDS HILL ROAD | 640S | MOUNT CECIL ROAD | 201311939 | 29/05/2013 | Wed | 0134 | DA | MN1 | 108A 110A 131A 402A | | E | W | DO | L | | N | C | 080 | | | 1 | | |
| 58/0/2.436 HAYWARDS HILL ROAD | 1500N | HUGH DUNCAN ST | 201352769 | 17/07/2013 | Wed | 2235 | DA | CS1 | 131A 402A | | E | D | DN | F | | N | C | 080 | | | | | |
| 58/0/2.553 HAYWARDS HILL ROAD | 400S | MOUNT CECIL ROAD | 201254508 | 06/12/2012 | Thu | 1847 | DA | CS1 | 129A 131A | T | E | W | O | F | | N | R | 100 | | | | | |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201211787 | 14/05/2012 | Mon | 0907 | FA | CS1C | 111A 181A 402A 191B 901 | | S | W | O | H | | N | L | 100 | | | 1 | | |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201442477 | 19/07/2014 | Sat | 1545 | BF | CN1C | 131A 414A | | S | D | OF | F | | N | L | 080 | | | | | |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201050543 | 03/01/2010 | Sun | 2129 | DA | 4S1 | 129A 130A 402A | FPV | E | W | DN | H | | N | C | 100 | | | | | |
| 58/0/2.853 | 100S | MOUNT CECIL ROAD | 201542715 | 09/07/2015 | Thu | 1140 | CB | CS1 | 135A 802 803 | CG | R | I | B | S | | | C | 100 | | | | | |
| 58/0/2.853 HAYWARDS HILL ROAD | 100S | MOUNT CECIL ROAD | 201212887 | 12/11/2012 | Mon | 0818 | AD | CS1 | 111A 135A 402A | PTV | E | W | O | L | | N | L | 100 | | | 1 | | |
| 58/0/3.153 HAYWARDS HILL ROAD | 200N | MOUNT CECIL ROAD | 201311564 | 06/04/2013 | Sat | 0550 | DA | CN1 | 195A | | E | D | DN | F | | N | C | 100 | | | 1 | | |
| 58/0/3.153 HAYWARDS HILL ROAD | 200N | MOUNT CECIL ROAD | 201350970 | 06/04/2013 | Sat | 0548 | EC | CN1 | 912 | W | E | D | DN | F | | N | C | 100 | | | | | |
| 58/0/3.253 | 300N | MOUNT CECIL ROAD | 201450782 | 08/12/2014 | Mon | 0644 | CB | CS1 | 410A | FP | R | D | BF | F | | N | C | 100 | | | | | |
| 58/0/3.448 | 1300S | HARRIS ROAD | 201111775 | 26/05/2011 | Thu | 1429 | DA | CS1 | 102A 110A 403A | FP | E | W | B | H | | N | L | 100 | | | 1 | | |
| 58/0/3.453 | 500N | MOUNT CECIL ROAD | 201439828 | 18/06/2014 | Wed | 1800 | CB | VN1 | 132A | | R | D | DN | F | | | L | 100 | | | | | |
| 58/0/3.533 HAYWARDS HILL ROAD | 580N | MOUNT CECIL ROAD | 201311409 | 18/03/2013 | Mon | 1720 | DA | CS1 | 111A 135A 801 | EFZ | M | W | O | F | | N | L | 100 | | | 1 | | |
| 58/0/3.553 | 600W | MOUNT CECIL ROAD | 201011257 | 10/02/2010 | Wed | 1546 | DA | CS1 | 130A | F | E | W | O | L | | N | L | 100 | | | 1 | | |
| 58/0/3.553 HAYWARDS HILL | 600N | MOUNT CECIL ROAD | 201152484 | 11/06/2011 | Sat | 1240 | DA | 4S1 | 131A 134A | FP | M | W | O | F | | N | C | 100 | | | | | |
| 58/0/3.553 HAYWARDS HILL ROAD | 600N | MOUNT CECIL ROAD | 201212480 | 21/08/2012 | Tue | 1046 | DB | VS1 | 110A 134A | C | M | D | B | F | | N | C | 080 | | | 1 | | |
| 58/0/3.553 HAYWARDS HILL ROAD | 600N | MOUNT CECIL ROAD | 201254966 | 05/12/2012 | Wed | 1804 | BB | VS14 | 111A 123A | C | M | W | O | F | | N | L | 100 | | | | | |
| 58/0/3.613 | 2680E | MOONSHINE ROAD | 201250601 | 04/03/2012 | Sun | 1120 | DA | CE1 | 111A 135A 801 | F | E | W | O | L | | N | L | 100 | | | | | |
| 58/0/3.633 | 680N | MOUNT CECIL ROAD | 201310052 | 31/10/2013 | Thu | 1642 | BF | CS1CC | 110A 116A | | M | W | O | H | | N | C | 100 | 1 | 1 | | | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201250828 | 22/01/2012 | Sun | 1633 | DA | CS1 | 111A 131A 330A | C | M | D | B | F | | N | N | 100 | | | | | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201151540 | 15/04/2011 | Fri | 1528 | DA | 4S1 | 111A 135A 801 | EF | M | W | O | F | | N | L | 100 | | | | | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201052846 | 30/04/2010 | Fri | 1732 | DA | CS1 | 111A 337A | F | M | W | DN | F | | N | L | 100 | | | | | |
| 58/0/3.653 HAYWARDS HILL ROAD | 700N | MOUNT CECIL ROAD | 201252466 | 15/07/2012 | Sun | 2105 | DA | CS1 | 110A 131A | FV | M | W | DN | L | | N | L | 100 | | | | | |
| 58/0/3.673 | 720N | MOUNT CECIL ROAD | 201400028 | 12/02/2014 | Wed | 0654 | BE | TN1VV | 129A 130A 106B 181C | | R | W | ON | L | | | L | 100 | 1 | | 2 | | |
| 58/0/3.728 HAYWARDS HILL | 1020E | HARRIS ROAD | 201254654 | 19/12/2012 | Wed | 0752 | DA | TS1 | 135A 806 | C | M | W | O | L | | N | L | 100 | | | | | |

| First Street | DIR / Distance | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | MVT / DVR (M VN VVV T 1 234) | Factors and Roles (A is for vehicle 1, B is for veh 2 etc) | OBJECT | CURVE | WETNES | LIGHT | WETHER | JUNCT | CONTRL | MARKS | SPDLMT | Total Inj FAT | Total Inj SER | Total Inj MIN | PED age | CYC age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/3.743 | 790N | MOUNT CECIL ROAD | 201430337 | 05/01/2014 | Sun | 0843 | DA CS1 | 110A 131A | E | E | W | O | F | | N | C | 100 | | | | | |
| 58/0/3.748 | 1000E | HARRIS ROAD | 201417620 | 13/11/2014 | Thu | 1600 | BE CE1C | 110A 135A 802 | | R | I | O | H | | N | C | 100 | | | 2 | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201053253 | 21/07/2010 | Wed | 1305 | FD CN1C | 331A 378A 831 | | E | D | O | F | | N | C | 100 | | | | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201111854 | 16/04/2011 | Sat | 1415 | BF CS1CVC | 111A 131A 407A 809 901 | | E | W | O | H | | N | L | 100 | | 1 | | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201211770 | 02/05/2012 | Wed | 1448 | DA VS1 | 131A 403A 800 | FZ | E | W | O | F | | N | C | 100 | | 1 | | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201531589 | 09/03/2015 | Mon | 0943 | CB TN1 | 116A 129A 817 | G | R | D | B | F | | N | C | 080 | | | | | |
| 58/0/3.753 | 800W | MOUNT CECIL ROAD | 201151415 | 16/04/2011 | Sat | 1216 | BF VS1CC | 132A 135A 801 | C | M | W | O | H | | N | L | 100 | | | | | |
| 58/0/3.753 | 800W | MOUNT CECIL ROAD | 201353464 | 04/09/2013 | Wed | 1411 | DA MS1 | 110A 131A 901 | | M | W | O | H | | N | C | 070 | | | | | |
| 58/0/3.813 HAYWARDS HILL ROAD | 860N | MOUNT CECIL ROAD | 201352104 | 20/06/2013 | Thu | 1400 | DB CN1 | 111A 134A 197A 402A 912 | F | M | D | O | L | | N | C | 100 | | | | | |
| 58/0/3.938 | 810S | HARRIS ROAD | 201437981 | 21/06/2014 | Sat | 0145 | DB CS1 | 103A 410A | F | E | D | DN | F | | N | C | 100 | | | | | |
| 58/0/3.953 | 1000W | MOUNT CECIL ROAD | 201211228 | 07/02/2012 | Tue | 1945 | DA 4N1 | 111A 131A | C | M | W | O | L | | N | C | 100 | | | 1 | | |
| 58/0/3.953 HAYWARDS HILL | 1000W | MOUNT CECIL ROAD | 201155536 | 31/12/2011 | Sat | 2040 | BF CE1C | 111A 131A 414A 132B | C | M | W | TN | F | | N | L | 100 | | | | | |
| 58/0/3.953 HAYWARDS HILL ROAD | 1000N | MOUNT CECIL ROAD | 201254485 | 16/12/2012 | Sun | 1137 | DB CE1 | 103A 131A 358A | EFP | E | D | B | F | | N | L | 100 | | | | | |
| 58/0/4.143 | 2150S | MOONSHINE ROAD | 201012695 | 25/02/2010 | Thu | 2330 | CB MN1 | 501A | | R | D | DN | F | | N | L | 100 | | 1 | | | |
| 58/0/4.173 | 1220N | MOUNT CECIL ROAD | 201325657 | 24/12/2013 | Tue | 1340 | DA CS1 | 111A 131A | F | E | W | ON | L | | N | L | 100 | | | 1 | | |
| 58/0/4.183 | 2110S | MOONSHINE ROAD | 201013710 | 09/12/2010 | Thu | 1445 | BC CN1C | 121A | FC | E | D | B | F | | N | C | 100 | | | 1 | | |
| 58/0/4.188 HAYWARDS HILL ROAD | 560S | HARRIS ROAD | 201212564 | 21/08/2012 | Tue | 1734 | DA CS1C | 111A 135A 801 | C | M | W | TF | F | | N | L | 100 | | | 1 | | |
| 58/0/4.268 HAYWARDS HILL | 480E | HARRIS ROAD | 201211888 | 21/05/2012 | Mon | 0009 | CC CN1CC | 103A 125A | | R | D | DN | F | | N | C | 100 | | 1 | 2 | | |
| 58/0/4.348 HAYWARDS HILL ROAD | 400S | HARRIS ROAD | 201253493 | 08/09/2012 | Sat | 0735 | DA CS1 | 111A 131A | CF | E | W | O | L | | N | L | 100 | | | | | |
| 58/0/4.453 | 1500N | MOUNT CECIL ROAD | 201056857 | 17/12/2010 | Fri | 0850 | DA 4S1 | 111A 131A 801 | F | E | W | O | H | | N | C | 100 | | | | | |
| 58/0/4.548 HAYWARDS HILL | 200E | HARRIS ROAD | 201211910 | 30/05/2012 | Wed | 1515 | CB CE1 | 130A 501A | FP | R | D | B | F | | N | L | 100 | | | 1 | | |
| 58/0/4.723 HAYWARDS HILL ROAD | 25S | HARRIS ROAD | 201254305 | 26/10/2012 | Fri | 1400 | AC VN1T | 159A 357A 132B 357B | | R | D | B | F | | N | N | 100 | | | | | |
| 58/0/4.878 | 130W | HARRIS ROAD | 201150550 | 02/03/2011 | Wed | 0700 | CB CE1 | 137A 402A | FP | R | W | O | L | | N | L | 100 | | | | | |
| 58/0/4.898 | 150N | HARRIS ROAD | 201446755 | 03/11/2014 | Mon | 0800 | DB CS1 | 131A 135A 806 | PS | E | W | O | F | | N | L | 100 | | | | | |
| 58/0/5.493 | 800E | MOONSHINE ROAD | 201250850 | 01/04/2012 | Sun | | QG TS1 | 131A 330A 687A | | E | D | B | F | | N | C | 100 | | | | | |
| 58/0/5.623 PAREMATA-HAYWARDS | 670E | MOONSHINE ROAD | 201112745 | 08/09/2011 | Thu | 1610 | MC CE1C | 197A 330B 372B | | M | D | O | F | | N | C | 100 | | | 2 | | |
| 58/0/5.793 | 500E | MOONSHINE ROAD | 201535981 | 14/05/2015 | Thu | 1930 | FD CE1V | 181A 330A | | R | D | B | F | | N | C | 080 | | | | | |
| 58/0/5.853 HAYWARDS HILL ROAD | 440E | MOONSHINE ROAD | 201351149 | 04/02/2013 | Mon | 1801 | BB VE1C | 110A 123A 402A | | M | W | O | F | | N | L | 100 | | | | | |
| 58/0/6.193 | 100E | MOONSHINE ROAD | 201053895 | 09/06/2010 | Wed | 0700 | DA CE1 | 111A 135A 358A 801 | F | E | W | O | L | | N | L | 100 | | | | | |
| 58/0/6.193 | 100E | MOONSHINE ROAD | 201211638 | 19/03/2012 | Mon | 1625 | DA CE1 | 111A 135A 402A 801 | FT | E | W | O | L | | N | L | 100 | | | 1 | | |
| 58/0/6.223 | 70E | MOONSHINE ROAD | 201514283 | 14/07/2015 | Tue | 0525 | EC CW1 | 137A 191A 802 | DV | E | I | DN | F | | | C | 100 | | | 1 | | |
| 58/0/6.243 | 50E | MOONSHINE ROAD | 201152923 | 10/07/2011 | Sun | 1630 | DB CN1 | 135A 801 | C | E | W | O | H | | N | L | 100 | | | | | |
| 58/0/6.243 | 50E | MOONSHINE ROAD | 201111464 | 01/02/2011 | Tue | 0752 | FA 4E1S | 129A 330A | | E | D | B | F | | N | C | 100 | | 1 | | | 37 |
| 58/0/6.293 | I | MOONSHINE ROAD | 201155694 | 17/12/2011 | Sat | 0450 | DB CW1 | 103A 111A 131A | F | E | W | DO | L | T | G | P | 100 | | | | | |
| 58/0/6.293 | I | MOONSHINE ROAD | 201056167 | 25/09/2010 | Sat | 1558 | DB CW14 | 137A 302B 382B | F | M | D | O | F | T | G | P | 100 | | | | | |
| 58/0/6.303 HAYWARDS HILL ROAD | 10W | MOONSHINE ROAD | 201212681 | 22/09/2012 | Sat | 1254 | BF CE1V | 130A 504A 505A | | E | D | B | F | T | G | C | 100 | | 1 | 2 | | |
| 58/0/6.423 | 130W | MOONSHINE ROAD | 201353874 | 04/09/2013 | Wed | 1335 | DA CE1 | 350A 402A | F | E | W | O | F | | N | C | 070 | | | | | |

| First Street | Distance | DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | MVT | DVR 1 234 | Factors and Roles (A is for vehicle 1, B is for veh 2 etc) | OBJECT | CURVE | WETNESS | LIGHT | WETHER | JUNCT | CONTRL | MARKS | SPDLMT | Total Inj FAT | Total Inj SER | Total Inj MIN | PED Age | CYC Age |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/6.593 | 300 | W | MOONSHINE ROAD | 201356498 | 26/10/2013 | Sat | 1211 | AA | CW1C | 372A | | E | D | BF | F | | N | L | 100 | | | | | |
| 58/0/6.785 | 500 | E | MULHERN ROAD | 201435617 | 26/03/2014 | Wed | 2230 | DA | CW1 | 111A 131A | E | S | D | DN | F | | | L | 080 | | | | | |
| 58/0/6.915 HAYWARDS HILL ROAD | 370 | E | MULHERN ROAD | 201252910 | 16/08/2012 | Thu | 1540 | JA | CW14 | 102B 308B 930 | | R | D | B | F | D | N | C | 100 | | | | | |
| 58/0/6.946 | 340 | E | MULHERN ROAD | 201013405 | 15/11/2010 | Mon | 1747 | JA | CW14 | 308B 378B 830 927 | | R | D | B | F | D | N | C | 100 | | | 1 | | |
| 58/0/6.946 HAYWARDS HILL ROAD | | A | JUDGEFORD GOLF CLUB | 201352218 | 28/06/2013 | Fri | 0720 | GD | VE1C | 181A 930 | | R | W | O | F | D | N | C | 100 | | | | | |
| 58/0/6.963 | 670 | W | MOONSHINE ROAD | 201150161 | 12/01/2011 | Wed | 1735 | GD | CE14 | 331A 402A 632A 927 | | R | D | B | F | D | N | C | 100 | | | | | |
| 58/0/7.036 | 250 | E | MULHERN ROAD | 201056592 | 23/11/2010 | Tue | 0745 | BA | CW14 | 129A 150A | | R | D | O | F | | N | N | 080 | | | | | |
| 58/0/7.063 | 770 | W | MOONSHINE ROAD | 201253824 | 25/10/2012 | Thu | 0715 | QG | TW1C | 680A | | R | D | O | F | | N | C | 100 | | | | | |
| 58/0/7.085 | 200 | E | MULHERN ROAD | 201312728 | 19/10/2013 | Sat | 0930 | AO | VE1S | 129A 352A | | R | D | B | F | | N | C | 100 | | | 1 | | |
| 58/0/7.116 PAREMATA-HAYWARDS | 170 | E | MULHERN ROAD | 201112520 | 29/05/2011 | Sun | 1424 | AD | MW1 | 104A 133A | | R | D | B | F | | N | L | 100 | | 1 | | | |
| 58/0/7.376 | 90 | W | MULHERN ROAD | 201517799 | 28/10/2015 | Wed | 1745 | MC | CE1C | 330B 372B | | R | W | O | L | | | C | 100 | | | 2 | | |
| 58/0/7.436 | 150 | W | MULHERN ROAD | 201054981 | 06/10/2010 | Wed | 1750 | MD | TE1V | 181A 331A 927 | | R | D | B | F | | N | C | 100 | | | | | |
| 58/0/7.473 | 550 | E | FLIGHTYS ROAD | 201516038 | 30/07/2015 | Thu | 1817 | AB | CW1CV | 101A 152A 402A 197B | GV | R | D | DN | F | | N | C | 100 | | 1 | 2 | | |
| 58/0/7.873 | 150 | E | FLIGHTYS ROAD | 201051269 | 28/01/2010 | Thu | 0730 | FD | CE1C | 331A 358A 363A 191B 902 | V | R | D | B | F | | N | C | 100 | | | | | |
| 58/0/7.986 | 2000 | E | PAEKAKARIKI HILL ROAD | 201111483 | 16/02/2011 | Wed | 1430 | DB | VE1 | 412A | TZ | E | D | O | F | | N | C | 100 | | | 1 | | |
| 58/0/8.013 | 10 | E | FLIGHTYS ROAD | 201443297 | 28/08/2014 | Thu | 1420 | MA | 4W1C | 373B | | R | D | O | F | X | S | C | 100 | | | | | |
| 58/0/8.023 | | I | FLIGHTYS ROAD | 201111774 | 04/05/2011 | Wed | 0832 | GD | CE1V | 331A 370A | | R | W | O | L | X | S | C | 100 | | | 1 | | |
| 58/0/8.023 | | I | FLIGHTYS ROAD | 201444696 | 02/10/2014 | Thu | 1740 | JA | CE1C | 301B 375B | | R | W | O | L | X | S | C | 100 | | | | | |
| 58/0/8.023 | | I | MURPHYS ROAD | 201250021 | 15/01/2012 | Sun | 1530 | GD | CE1C | 197A 331A 352A | | R | D | B | F | X | S | C | 100 | | | | | |
| 58/0/8.023 | | I | MURPHYS ROAD | 201013408 | 04/12/2010 | Sat | 1134 | DA | VE1 | 501A | FP | R | D | B | F | X | S | C | 100 | | | 1 | | |
| 58/0/8.023 HAYWARDS HILL | | I | MURPHYS ROAD | 201211557 | 26/03/2012 | Mon | 0958 | GE | CE1T | 160A 197A 353A | F | R | D | B | F | X | S | C | 100 | | | 1 | | |
| 58/0/8.384 | | I | BELMONT ROAD | 201415720 | 05/09/2014 | Fri | 1652 | GC | CE1C | 372B 381B | | R | D | TN | F | T | G | C | 100 | | | 2 | | |
| 58/0/8.404 | 20 | W | BELMONT ROAD | 201211759 | 10/01/2012 | Tue | 1610 | CA | MW1 | 130A 198A | | R | D | B | F | | N | C | 100 | | 1 | | | |
| 58/0/8.781 | 550 | S | BRADEY ROAD | 201151066 | 08/04/2011 | Fri | 0700 | GC | CE1C | 174B 372B 920 | | M | W | O | F | D | N | C | 100 | | | | | |
| 58/0/8.784 | 400 | W | BELMONT ROAD | 201012803 | 20/09/2010 | Mon | 1721 | JA | CW1C | 308B 375B 927 | | E | D | B | F | D | N | C | 100 | | | 2 | | |
| 58/0/9.113 | 100 | S | PAUATAHANUI NO7 BR | 201548054 | 15/10/2015 | Thu | 1559 | CA | CN1 | 130A 427A | CGP | R | D | B | F | | | C | 100 | | | | | |
| 58/0/9.131 HAYWARDS HILL ROAD | 200 | S | BRADEY ROAD | 201252365 | 21/06/2012 | Thu | 1033 | CB | VN1 | 406A 687A | V | R | W | O | L | | N | C | 100 | | | | | |
| 58/0/9.331 HAYWARDS HILL | | I | BRADEY ROAD | 201152182 | 01/05/2011 | Sun | 1827 | EC | CN1 | 912 | W | R | W | DF | F | T | G | C | 100 | | | | | |

| First Street | Distance / DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj F AT | Tot Inj S EI | Tot Inj M IN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/0.1 | 40N | HEBDEN CRESCENT | 201151771 | 05/04/2011 | Tue | 1659 | SUV1 NBD on SH 58 lost control turning left, SUV1 hit Cliff Bank | SUV1 too fast entering corner, lost control when turning, new driver showed inexperience ENV: road slippery (rain) | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/0.1 | 100W | SH 2 | 201056475 | 11/10/2010 | Mon | 1145 | SUV1 NBD on SH 58 lost control turning right, SUV1 hit Cliff Bank on right hand bend | SUV1 lost control due to road conditions ENV: road slippery (rain), heavy rain | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/0.14 | 80N | HEBDEN CRESCENT | 201150346 | 23/01/2011 | Sun | 1345 | CAR1 WBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 lost control due to road conditions ENV: road slippery (oil/diesel/fuel) | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/0.15 | 150W | SH 2 | 201012528 | 15/06/2010 | Tue | 1646 | VAN1 WBD on SH 58 lost control turning right, VAN1 hit Cliff Bank on right hand bend | VAN1 lost control under heavy acceleration | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201051777 | 05/04/2010 | Mon | 1240 | CAR1 NBD on SH 58 hit rear of CAR2 turning right from centre line | CAR1 failed to notice car slowing | Dry | Overcast | Fine | T Type Junction | Give Way Sign | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201531758 | 30/01/2015 | Fri | 0659 | CAR1 NBD on SH 58 hit rear of CAR2 turning right from centre line | CAR1 following too closely, failed to notice car slowing | Dry | Bright | Fine | T Type Junction | Give Way Sign | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201155382 | 25/12/2011 | Sun | 1920 | CAR1 NBD on SH 58 sideswiped by CAR2 turning left | CAR1 overtaking on left CAR2 turned left from near centre line, didnt see/look behind when changing lanes, position or direction, new driver showed inexperience | Dry | Bright | Fine | T Type Junction | Give Way Sign | | | |
| 58/0/0.359 | I | MCDOUGALL GROVE | 201056495 | 05/11/2010 | Fri | 1341 | CAR1 NBD on SH 58 hit CAR2 U-turning from same direction of travel | CAR2 didnt see/look behind when changing lanes, position or direction | Dry | Bright | Fine | T Type Junction | Give Way Sign | | | |
| 58/0/0.629 HAYWARDS HILL ROAD | 270N | MCDOUGALL GROVE | 201312316 | 28/07/2013 | Sun | 1054 | SUV1 SBD on SH 58 HAYWARDS HILL ROAD hit rear end of CAR2 stopped/moving slowly | SUV1 too fast entering corner, lost control when turning | Dry | Overcast | Fine | Unknown | Nil | | | 1 |
| 58/0/0.639 | 280N | MCDOUGALL GROVE | 201152234 | 25/04/2011 | Mon | 1928 | CAR1 SBD on SH 58 lost control turning right, CAR1 went Over Bank, Tree on right hand bend | CAR1 alcohol suspected, too fast entering corner, lost control when turning | Wet | Dark | Fine | Unknown | Nil | | | |
| 58/0/0.659 | 300N | MCDOUGALL GROVE | 201012056 | 11/06/2010 | Fri | 2118 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 too fast entering corner, worn tread on tyre ENV: road slippery (rain) | Wet | Dark | Mist | Unknown | Nil | | | 1 |
| 58/0/0.66 | 660N | SH 2 | 201416367 | 06/10/2014 | Mon | 2100 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Tree on right hand bend | CAR1 too fast for conditions, lost control when turning | Wet | Dark | Heavy Rain | Unknown | Nil | | | 1 |
| 58/0/0.696 | 240S | HUGH DUNCAN ST | 201154716 | 04/11/2011 | Fri | 1046 | CAR1 NBD on SH 58 lost control turning left, CAR1 hit Cliff Bank, Over Bank, Tree | CAR1 alcohol test below limit, lost control due to road conditions, new driver showed inexperience ENV: road slippery (rain) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/0.7 HAYWARDS HILL ROAD | 700N | WESTERN HUTT ROAD | 201254042 | 06/09/2012 | Thu | 2300 | CAR1 NBD on SH 58 HAYWARDS HILL ROAD lost control turning left, CAR1 hit Cliff Bank | CAR1 too fast entering corner, stolen vehicle | Dry | Dark | Fine | Unknown | Nil | | | |
| 58/0/0.736 | 200S | HUGH DUNCAN ST | 201113150 | 19/11/2011 | Sat | 0720 | SUV1 NBD on SH 58 swinging wide hit CAR2 head on | SUV1 too fast entering corner, suddenly swerved to avoid vehicle, didnt see/look when visibility limited by roadside features | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/0.736 | 200S | HUGH DUNCAN ST | 201431413 | 09/02/2014 | Sun | 0920 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 lost control when turning, inexperience | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/0.746 | 190S | HUGH DUNCAN ST | 201212706 | 07/10/2012 | Sun | 1019 | MOTOR CYCLE1 NBD on SH 58 hit rear end of CAR2 stopped/moving slowly | MOTOR CYCLE1 lost control, following too closely CAR2 travelling unreasonably slowly | Dry | Bright | Fine | Unknown | Nil | | 1 | |
| 58/0/0.746 HAYWARDS HILL ROAD | 190S | HUGH DUNCAN ST | 201351734 | 27/05/2013 | Mon | 1831 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right on right hand bend | CAR1 lost control, fatigue (drowsy, tired, fell asleep) | Dry | Dark | Fine | Unknown | Nil | | | |

| First Street | Distance / D I R | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj F A T | S E R | M I N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/0.816 HAYWARDS HILL ROAD | 120S | HUGH DUNCAN ST | 201351963 | 10/06/2013 | Mon | 0645 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Post Or Pole, Tree on right hand bend | CAR1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Dark | Fine | Unknown | Nil | | | |
| 58/0/1 | 1000N | WESTERN HUTT ROAD | 201539741 | 08/05/2015 | Fri | 0707 | VAN1 NBD on SH 58 lost control turning right, VAN1 hit Guard Rail on right hand bend | VAN1 too fast entering corner, lost control when turning | Wet | Overcast | Light Rain | Unknown | N/A | | | |
| 58/0/1.016 | 80N | HUGH DUNCAN ST | 201051895 | 15/05/2010 | Sat | 1724 | CAR1 NBD on SH 58 lost control; went off road to right, CAR1 hit Guard Rail | CAR1 too fast for conditions | Wet | Dark | Light Rain | Unknown | Nil | | | |
| 58/0/1.2 | 1200N | WESTERN HUTT ROAD | 201539738 | 13/05/2015 | Wed | 1930 | CAR1 NBD on SH 58 lost control turning right, CAR1 hit Debris, Guard Rail on right hand bend | CAR1 too fast entering corner, lost control | Wet | Dark | Light Rain | Unknown | Nil | | | |
| 58/0/1.236 | 300N | HUGH DUNCAN ST | 201011048 | 23/01/2010 | Sat | 1215 | VAN1 NBD on SH 58 lost control turning left, VAN1 hit Guard Rail | VAN1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/1.336 | 400N | HUGH DUNCAN ST | 201052050 | 17/05/2010 | Mon | 1625 | MOTOR CYCLE1 NBD on SH 58 lost control but did not leave the road | MOTOR CYCLE1 lost control due to road conditions ENV: road slippery (oil/diesel/fuel) | Wet | Twilight | Light Rain | Unknown | Nil | | | |
| 58/0/1.393 HAYWARDS HILL ROAD | 100N | ATIAMURI CRESCENT | 201253532 | 22/09/2012 | Sat | 1720 | VAN1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, VAN1 hit Fence on right hand bend | VAN1 lost control due to vehicle fault, suspension failure | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/1.396 | I | OLD HAYWARDS ROAD | 201530703 | 17/02/2015 | Tue | 0435 | VAN1 SBD on SH 58 lost control turning left, VAN1 hit Guard Rail | VAN1 alcohol suspected, fatigue (drowsy, tired, fell asleep) | Dry | Dark | Fine | T Type Junction | Nil | | | |
| 58/0/1.576 | 640N | HUGH DUNCAN ST | 201051947 | 30/04/2010 | Fri | 1624 | VAN1 NBD on SH 58 lost control turning right, VAN1 hit Cliff Bank on right hand bend | VAN1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/1.596 | 200N | OLD HAYWARDS ROAD | 201512740 | 15/05/2015 | Fri | 1315 | SUV1 NBD on SH 58 lost control turning left, SUV1 hit Cliff Bank | SUV1 too far left/right, inattentive | Dry | Bright | Fine | Unknown | Nil | | | 1 |
| 58/0/1.596 | 200N | OLD HAYWARDS ROAD | 201152188 | 15/04/2011 | Fri | 1920 | CAR1 NBD on SH 58 lost control turning left, CAR1 hit Guard Rail | CAR1 lost control when turning ENV: road slippery (loose material on seal) | Wet | Dark | Light Rain | Unknown | Nil | | | |
| 58/0/1.636 HAYWARDS HILL ROAD | 700N | HUGH DUNCAN ST | 201351558 | 11/05/2013 | Sat | 1640 | CAR1 WBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 lost control due to road conditions, new driver showed inexperience, driving unfamiliar vehicle ENV: road slippery (rain) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/1.646 | 250N | OLD HAYWARDS ROAD | 201532754 | 07/03/2015 | Sat | 1447 | CAR1 NBD on SH 58 lost control while overtaking, CAR1 hit Cliff Bank | CAR1 lost control, overtaking line of traffic or queue ENV: heavy rain, strong wind | Wet | Overcast | Heavy Rain | Unknown | N/A | | | |
| 58/0/1.676 | 280N | OLD HAYWARDS ROAD | 201211298 | 18/02/2012 | Sat | 1018 | CYCLIST1 (Age 53) SBD on SH 58 lost control but did not leave the road, CYCLIST1 hit Other | CYCLIST1 inattentive, obstruction on roadway | Dry | Bright | Fine | Unknown | Nil | | | 1 |
| 58/0/1.706 | 770N | HUGH DUNCAN ST | 201054160 | 03/08/2010 | Tue | 1736 | load or trailer from TRUCK1 SBD on SH 58 hit CAR2 CAR2 hit Debris | TRUCK1 load not well secured or moved | Dry | Twilight | Fine | Unknown | Nil | | | |
| 58/0/1.706 | 770N | HUGH DUNCAN ST | 201250023 | 01/01/2012 | Sun | 1512 | CAR1 SBD on SH 58 lost control turning left, CAR1 hit Guard Rail | CAR1 lost control when turning, attention diverted ENV: slippery | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/1.736 | 800N | HUGH DUNCAN ST | 201535588 | 30/04/2015 | Thu | 0715 | CAR1 NBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 too fast entering corner, lost control when turning | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/1.753 | 1200S | MOUNT CECIL ROAD | 201543264 | 14/07/2015 | Tue | 0650 | CAR1 NBD on SH 58 lost control while overtaking, CAR1 hit Guard Rail | CAR1 lost control due to road conditions ENV: road slippery (frost or ice) | Ice/ Snow | Dark | Fine | Unknown | N/A | | | |
| 58/0/1.8 | 1800W | SH 2 | 201251836 | 09/06/2012 | Sat | 1059 | CAR1 SBD on SH 58 lost control turning right on right hand bend | CAR1 lost control while returning to seal from unsealed shoulder | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/1.866 | 470N | OLD HAYWARDS ROAD | 201450396 | 01/07/2014 | Tue | 0604 | CAR1 NBD on SH 58 lost control turning right, CAR1 hit Guard Rail on right hand bend | CAR1 too fast for conditions, lost control when turning ENV: road slippery (rain) | Wet | Dark | Light Rain | Unknown | N/A | | | |

| First Street | Distance DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | SER | MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/1.9 | 1900N | SH 2 | 201012701 | 14/06/2010 | Mon | 0628 | CAR1 NBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 too fast entering corner, lost control due to road conditions ENV: road slippery (frost or ice) | Ice/ Snow | Dark | Fine | Unknown | Nil | | | 1 |
| 58/0/1.936 | 1000N | HUGH DUNCAN ST | 201153588 | 03/08/2011 | Wed | 1720 | CAR1 SBD on SH 58 changing lanes to left hit CAR2 | CAR1 cut in after overtaking, inattentive | Dry | Overcast | Fine | Unknown | N/A | | | |
| 58/0/1.94 | 1940W | SH 2 | 201010038 | 24/03/2010 | Wed | 1231 | VAN1 WBD on SH 58 lost control while overtaking, CAR2 hit Cliff Bank | VAN1 lost control due to vehicle fault, attention diverted by cell phone, worn tread on tyre ENV: road slippery (rain) | Wet | Overcast | Heavy Rain | Unknown | Nil | 1 | | 2 |
| 58/0/2 HAYWARDS HILL | 2000N | WESTERN HUTT ROAD | 201252011 | 05/06/2012 | Tue | 1535 | CAR1 SBD on SH 58 HAYWARDS HILL lost control turning right, CAR1 hit Guard Rail on right hand bend | CAR1 too fast entering corner, failed to notice bend in road ENV: road slippery (rain) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.053 HAYWARDS HILL ROAD | 900S | MOUNT CECIL ROAD | 201253565 | 05/10/2012 | Fri | 1415 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Guard Rail, Tree on right hand bend | CAR1 lost control while returning to seal from unsealed shoulder, lost control end of seal | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.136 | 1200N | HUGH DUNCAN ST | 201054312 | 14/07/2010 | Wed | 0716 | VAN1 WBD on SH 58 lost control turning right, VAN1 hit Guard Rail on right hand bend | VAN1 lost control due to road conditions ENV: road slippery (frost or ice) | Ice/ Snow | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.153 | 800S | MOUNT CECIL ROAD | 201152692 | 15/07/2011 | Fri | 0755 | CAR1 NBD on SH 58 lost control turning left, CAR1 hit Cliff Bank, Guard Rail | CAR1 lost control when turning | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/2.203 | 750S | MOUNT CECIL ROAD | 201152615 | 12/07/2011 | Tue | 1535 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Guard Rail on right hand bend | CAR1 alcohol test above limit or test refused, lost control while returning to seal from unsealed shoulder | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.216 HAYWARDS HILL | 820N | OLD HAYWARDS ROAD | 201053065 | 17/06/2010 | Thu | 1145 | CAR1 SBD on SH 58 HAYWARDS HILL lost control turning right, CAR1 hit Tree on right hand bend | CAR1 lost control due to road conditions ENV: road slippery (oil/diesel/fuel) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.296 | 900N | OLD HAYWARDS ROAD | 201050767 | 12/02/2010 | Fri | 1530 | CAR1 NBD on SH 58 lost control while overtaking, CAR1 hit Fence | CAR1 lost control when turning | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/2.313 HAYWARDS HILL ROAD | 640S | MOUNT CECIL ROAD | 201311939 | 29/05/2013 | Wed | 0134 | MOTOR CYCLE1 NBD on SH 58 HAYWARDS HILL ROAD lost control turning right on right hand bend | MOTOR CYCLE1 drugs suspected, too fast for conditions, lost control when turning, new driver showed inexperience | Wet | Dark | Light Rain | Unknown | Nil | | | 1 |
| 58/0/2.436 HAYWARDS HILL ROAD | 1500N | HUGH DUNCAN ST | 201352769 | 17/07/2013 | Wed | 2235 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right on right hand bend | CAR1 lost control when turning, new driver showed inexperience | Dry | Dark | Fine | Unknown | Nil | | | |
| 58/0/2.553 HAYWARDS HILL ROAD | 400S | MOUNT CECIL ROAD | 201254508 | 06/12/2012 | Thu | 1847 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Tree on right hand bend | CAR1 too far left/right, lost control when turning | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201211787 | 14/05/2012 | Mon | 0907 | CAR1 SBD on SH 58 hit rear end of CAR2 stopped/moving slowly | CAR1 too fast entering corner, following too closely, new driver showed inexperience CAR2 suddenly braked ENV: heavy rain | Wet | Overcast | Heavy Rain | Unknown | Nil | | | 1 |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201442477 | 19/07/2014 | Sat | 1545 | CAR1 NBD on SH 58 lost control on curve and hit CAR2 head on | CAR1 lost control when turning, fatigue due to working long hours before driving | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/2.653 | 300S | MOUNT CECIL ROAD | 201050543 | 03/01/2010 | Sun | 2129 | SUV1 SBD on SH 58 lost control turning right, SUV1 hit Fence, Post Or Pole, Ditch on right hand bend | SUV1 too far left/right, lost control, new driver showed inexperience | Wet | Dark | Heavy Rain | Unknown | Nil | | | |
| 58/0/2.853 | 100S | MOUNT CECIL ROAD | 201542715 | 09/07/2015 | Thu | 1140 | CAR1 SBD on SH 58 lost control; went off road to left, CAR1 hit Cliff Bank, Guard Rail | CAR1 lost control due to road conditions ENV: road slippery (frost or ice), road slippery (snow or hail) | Ice/ Snow | Bright | Snow | Unknown | N/A | | | |
| 58/0/2.853 HAYWARDS HILL ROAD | 100S | MOUNT CECIL ROAD | 201212887 | 12/11/2012 | Mon | 0818 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control while overtaking, CAR1 hit Post Or Pole, Tree, Ditch | CAR1 too fast entering corner, lost control due to road conditions, new driver showed inexperience | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |

| First Street | Distance / D I R | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | Tot Inj SER | Tot Inj MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/3.153 HAYWARDS HILL ROAD | 200N | MOUNT CECIL ROAD | 201311564 | 06/04/2013 | Sat | 0550 | CAR1 NBD on SH 58 HAYWARDS HILL ROAD lost control turning right on right hand bend | CAR1 suddenly swerved to avoid animal | Dry | Dark | Fine | Unknown | Nil | | | 1 |
| 58/0/3.153 HAYWARDS HILL ROAD | 200N | MOUNT CECIL ROAD | 201350970 | 06/04/2013 | Sat | 0548 | CAR1 NBD on SH 58 HAYWARDS HILL ROAD hit obstruction, CAR1 hit Stray Animal | ENV: farm animal straying | Dry | Dark | Fine | Unknown | Nil | | | |
| 58/0/3.253 | 300N | MOUNT CECIL ROAD | 201450782 | 08/12/2014 | Mon | 0644 | CAR1 SBD on SH 58 lost control; went off road to left, CAR1 hit Fence, Post Or Pole | CAR1 fatigue (drowsy, tired, fell asleep) | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/3.448 | 1300S | HARRIS ROAD | 201111775 | 26/05/2011 | Thu | 1429 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Fence, Post Or Pole on right hand bend | CAR1 alcohol test below limit, too fast for conditions, driving unfamiliar vehicle | Wet | Bright | Heavy Rain | Unknown | Nil | | | 1 |
| 58/0/3.453 | 500N | MOUNT CECIL ROAD | 201439828 | 18/06/2014 | Wed | 1800 | VAN1 NBD on SH 58 lost control; went off road to left | VAN1 lost control under heavy braking | Dry | Dark | Fine | Unknown | N/A | | | |
| 58/0/3.533 HAYWARDS HILL ROAD | 580N | MOUNT CECIL ROAD | 201311409 | 18/03/2013 | Mon | 1720 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 went Over Bank, Fence, Water/River on right hand bend | CAR1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Fine | Unknown | Nil | | | 1 |
| 58/0/3.553 | 600W | MOUNT CECIL ROAD | 201011257 | 10/02/2010 | Wed | 1546 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 lost control | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/3.553 HAYWARDS HILL | 600N | MOUNT CECIL ROAD | 201152484 | 11/06/2011 | Sat | 1240 | SUV1 SBD on SH 58 HAYWARDS HILL lost control turning right, SUV1 hit Fence, Post Or Pole on right hand bend | SUV1 lost control when turning, lost control while returning to seal from unsealed shoulder | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/3.553 HAYWARDS HILL ROAD | 600N | MOUNT CECIL ROAD | 201212480 | 21/08/2012 | Tue | 1046 | VAN1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning left, VAN1 hit Cliff Bank | VAN1 too fast for conditions, lost control while returning to seal from unsealed shoulder | Dry | Bright | Fine | Unknown | Nil | | | 1 |
| 58/0/3.553 HAYWARDS HILL ROAD | 600N | MOUNT CECIL ROAD | 201254966 | 05/12/2012 | Wed | 1804 | VAN1 SBD on SH 58 HAYWARDS HILL ROAD cutting corner hit SUV2 head on, VAN1 hit Cliff Bank | VAN1 too fast entering corner, cutting corner on bend | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/3.613 | 2680E | MOONSHINE ROAD | 201250601 | 04/03/2012 | Sun | 1120 | CAR1 EBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/3.633 | 680N | MOUNT CECIL ROAD | 201310052 | 31/10/2013 | Thu | 1642 | CAR1 SBD on SH 58 lost control on curve and hit CAR2 head on | CAR1 too fast for conditions, too fast at temporary speed limit | Wet | Overcast | Heavy Rain | Unknown | Nil | 1 | 1 | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201052846 | 30/04/2010 | Fri | 1732 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 too fast entering corner, failed to notice warning sign | Wet | Dark | Fine | Unknown | Nil | | | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201151540 | 15/04/2011 | Fri | 1528 | SUV1 SBD on SH 58 lost control turning right, SUV1 went Over Bank, Fence on right hand bend | SUV1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/3.653 | 700N | MOUNT CECIL ROAD | 201250828 | 22/01/2012 | Sun | 1633 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 too fast entering corner, lost control when turning, inattentive | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/3.653 HAYWARDS HILL ROAD | 700N | MOUNT CECIL ROAD | 201252466 | 15/07/2012 | Sun | 2105 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Fence, Ditch on right hand bend | CAR1 too fast for conditions, lost control when turning | Wet | Dark | Light Rain | Unknown | Nil | | | |
| 58/0/3.673 | 720N | MOUNT CECIL ROAD | 201400028 | 12/02/2014 | Wed | 0654 | TRUCK1 NBD on SH 58 lost control on straight and hit VAN2 head on | TRUCK1 too far left/right, lost control VAN2 alcohol not suspected, tested and -ve (MoT use only) VAN3 following too closely | Wet | Overcast | Light Rain | Unknown | N/A | 1 | | 2 |
| 58/0/3.728 HAYWARDS HILL | 1020E | HARRIS ROAD | 201254654 | 19/12/2012 | Wed | 0752 | TRUCK1 SBD on SH 58 HAYWARDS HILL lost control turning right, TRUCK1 hit Cliff Bank on right hand bend | TRUCK1 lost control due to road conditions ENV: road slippery (oil/diesel/fuel) | Wet | Overcast | Light Rain | Unknown | Nil | | | |

| First Street | Distance D I R | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | SEI | MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/3.743 | 790N | MOUNT CECIL ROAD | 201430337 | 05/01/2014 | Sun | 0843 | CAR1 SBD on SH 58 lost control turning right, CAR1 went Over Bank on right hand bend | CAR1 too fast for conditions, lost control when turning | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/3.748 | 1000E | HARRIS ROAD | 201417620 | 13/11/2014 | Thu | 1600 | CAR1 EBD on SH 58 lost control on straight and hit CAR2 head on | CAR1 too fast for conditions, lost control due to road conditions ENV: road slippery (frost or ice) | Ice/ Snow | Overcast | Heavy Rain | Unknown | Nil | | | 2 |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201531589 | 09/03/2015 | Mon | 0943 | TRUCK1 NBD on SH 58 lost control; went off road to left, TRUCK1 hit Guard Rail | TRUCK1 too fast at temporary speed limit, too far left/right ENV: road surface under construction or maintenance | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201211770 | 02/05/2012 | Wed | 1448 | VAN1 SBD on SH 58 lost control turning right, VAN1 hit Fence, Water/River on right hand bend | VAN1 lost control when turning, driving unfamiliar vehicle ENV: slippery | Wet | Overcast | Fine | Unknown | Nil | | 1 | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201053253 | 21/07/2010 | Wed | 1305 | CAR1 NBD on SH 58 hit rear end of CAR2 stop/slow for queue | CAR1 failed to notice car slowing, didnt see/look when visibility limited by roadside features ENV: visibility limited by curve | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/3.753 | 800N | MOUNT CECIL ROAD | 201111854 | 16/04/2011 | Sat | 1415 | CAR1 SBD on SH 58 lost control on curve and hit CAR2 head on | CAR1 too fast entering corner, lost control when turning, driver over-reacted ENV: road slippery (surface bleeding / defective), heavy rain | Wet | Overcast | Heavy Rain | Unknown | Nil | | 1 | |
| 58/0/3.753 | 800W | MOUNT CECIL ROAD | 201151415 | 16/04/2011 | Sat | 1216 | VAN1 SBD on SH 58 lost control on curve and hit CAR2 head on, CAR3 hit Cliff Bank | VAN1 lost control under heavy braking, lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/3.753 | 800W | MOUNT CECIL ROAD | 201353464 | 04/09/2013 | Wed | 1411 | MOTOR CYCLE1 SBD on SH 58 lost control turning right on right hand bend | MOTOR CYCLE1 too fast for conditions, lost control when turning ENV: heavy rain | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/3.813 HAYWARDS HILL ROAD | 860N | MOUNT CECIL ROAD | 201352104 | 20/06/2013 | Thu | 1400 | CAR1 NBD on SH 58 HAYWARDS HILL ROAD lost control turning left, CAR1 hit Fence | CAR1 too fast entering corner, lost control while returning to seal from unsealed shoulder, suddenly swerved to avoid vehicle, new driver showed inexperience ENV: farm animal straying | Dry | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/3.938 | 810S | HARRIS ROAD | 201437981 | 21/06/2014 | Sat | 0145 | CAR1 SBD on SH 58 lost control turning left, CAR1 hit Fence | CAR1 alcohol test above limit or test refused, fatigue (drowsy, tired, fell asleep) | Dry | Dark | Fine | Unknown | Nil | | | |
| 58/0/3.953 | 1000W | MOUNT CECIL ROAD | 201211228 | 07/02/2012 | Tue | 1945 | SUV1 NBD on SH 58 lost control turning right, SUV1 hit Cliff Bank on right hand bend | SUV1 too fast entering corner, lost control when turning | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/3.953 HAYWARDS HILL | 1000W | MOUNT CECIL ROAD | 201155536 | 31/12/2011 | Sat | 2040 | CAR1 EBD on SH 58 HAYWARDS HILL lost control on curve and hit CAR2 head on, CAR1 hit Cliff Bank | CAR1 too fast entering corner, lost control when turning, fatigue due to working long hours before driving CAR2 lost control under heavy braking | Wet | Twilight | Fine | Unknown | Nil | | | |
| 58/0/3.953 HAYWARDS HILL ROAD | 1000N | MOUNT CECIL ROAD | 201254485 | 16/12/2012 | Sun | 1137 | CAR1 EBD on SH 58 HAYWARDS HILL ROAD lost control turning left, CAR1 went Over Bank, Fence, Post Or Pole | CAR1 alcohol test above limit or test refused, lost control when turning, attention diverted by cigarette etc | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/4.143 | 2150S | MOONSHINE ROAD | 201012695 | 25/02/2010 | Thu | 2330 | MOTOR CYCLE1 NBD on SH 58 lost control; went off road to left | MOTOR CYCLE1 illness with no warning (eg heart attack) | Dry | Dark | Fine | Unknown | Nil | | 1 | |
| 58/0/4.173 | 1220N | MOUNT CECIL ROAD | 201325657 | 24/12/2013 | Tue | 1340 | CAR1 SBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 too fast entering corner, lost control when turning | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/4.183 | 2110S | MOONSHINE ROAD | 201013710 | 09/12/2010 | Thu | 1445 | CAR1 NBD on SH 58 swinging wide hit CAR2 head on, CAR1 hit Fence, CAR2 hit Cliff Bank | CAR1 swung wide on bend | Dry | Bright | Fine | Unknown | Nil | | | 1 |

| First Street | Distance DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | SER | MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/4.188 HAYWARDS HILL ROAD | 560S | HARRIS ROAD | 201212564 | 21/08/2012 | Tue | 1734 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Cliff Bank on right hand bend | CAR1 too fast entering corner, lost control due to road conditions ENV: road slippery (rain) | Wet | Twilight | Fine | Unknown | Nil | | | 1 |
| 58/0/4.268 HAYWARDS HILL | 480E | HARRIS ROAD | 201211888 | 21/05/2012 | Mon | 0009 | CAR1 NBD on SH 58 HAYWARDS HILL lost control; went off road to right | CAR1 alcohol test above limit or test refused, failed to keep left on straight | Dry | Dark | Fine | Unknown | Nil | | 1 | 2 |
| 58/0/4.348 HAYWARDS HILL ROAD | 400S | HARRIS ROAD | 201253493 | 08/09/2012 | Sat | 0735 | CAR1 SBD on SH 58 HAYWARDS HILL ROAD lost control turning right, CAR1 hit Cliff Bank, Fence on right hand bend | CAR1 too fast entering corner, lost control when turning | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/4.453 | 1500N | MOUNT CECIL ROAD | 201056857 | 17/12/2010 | Fri | 0850 | SUV1 SBD on SH 58 lost control turning right, SUV1 hit Fence on right hand bend | SUV1 too fast entering corner, lost control when turning ENV: road slippery (rain) | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/4.548 HAYWARDS HILL | 200E | HARRIS ROAD | 201211910 | 30/05/2012 | Wed | 1515 | CAR1 EBD on SH 58 HAYWARDS HILL lost control; went off road to left, CAR1 hit Fence, Post Or Pole | CAR1 lost control, illness with no warning (eg heart attack) | Dry | Bright | Fine | Unknown | Nil | | | 1 |
| 58/0/4.723 HAYWARDS HILL ROAD | 25S | HARRIS ROAD | 201254305 | 26/10/2012 | Fri | 1400 | VAN1 NBD on SH 58 HAYWARDS HILL ROAD changing lanes to left hit TRUCK2 | VAN1 cut in after overtaking, emotionally upset/road rage TRUCK2 lost control under heavy braking, emotionally upset/road rage | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/4.878 | 130W | HARRIS ROAD | 201150550 | 02/03/2011 | Wed | 0700 | CAR1 EBD on SH 58 lost control; went off road to left, CAR1 hit Fence, Post Or Pole | CAR1 lost control avoiding another vehicle, new driver showed inexperience | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/4.898 | 150N | HARRIS ROAD | 201446755 | 03/11/2014 | Mon | 0800 | CAR1 SBD on SH 58 lost control turning left, CAR1 hit Post Or Pole, Traffic Sign | CAR1 lost control when turning, lost control due to road conditions ENV: road slippery (oil/diesel/fuel) | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/5.493 | 800E | MOONSHINE ROAD | 201250850 | 01/04/2012 | Sun | | load or trailer from TRUCK1 SBD on SH 58 | TRUCK1 lost control when turning, inattentive, load too heavy | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/5.623 PAREMATA-HAYWARDS | 670E | MOONSHINE ROAD | 201112745 | 08/09/2011 | Thu | 1610 | CAR1 EBD on SH 58 PAREMATA-HAYWARDS hit CAR2 U-turning from same direction of travel | CAR1 suddenly swerved to avoid vehicle CAR2 inattentive, didnt see/look behind when changing lanes, position or direction | Dry | Overcast | Fine | Unknown | Nil | | | 2 |
| 58/0/5.793 | 500E | MOONSHINE ROAD | 201535981 | 14/05/2015 | Thu | 1930 | CAR1 EBD on SH 58 hit rear end of VAN2 stop/slow for queue | CAR1 following too closely, inattentive | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/5.853 HAYWARDS HILL ROAD | 440E | MOONSHINE ROAD | 201351149 | 04/02/2013 | Mon | 1801 | VAN1 EBD on SH 58 HAYWARDS HILL ROAD cutting corner hit CAR2 head on | VAN1 too fast for conditions, cutting corner on bend, new driver showed inexperience | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/6.193 | 100E | MOONSHINE ROAD | 201211638 | 19/03/2012 | Mon | 1625 | CAR1 EBD on SH 58 lost control turning right, CAR1 hit Fence, Tree on right hand bend | CAR1 too fast entering corner, lost control due to road conditions, new driver showed inexperience ENV: road slippery (rain) | Wet | Overcast | Light Rain | Unknown | Nil | | | 1 |
| 58/0/6.193 | 100E | MOONSHINE ROAD | 201053895 | 09/06/2010 | Wed | 0700 | CAR1 EBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 too fast entering corner, lost control due to road conditions, attention diverted by cigarette etc ENV: road slippery (rain) | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/6.223 | 70E | MOONSHINE ROAD | 201514283 | 14/07/2015 | Tue | 0525 | CAR1 WBD on SH 58 hit obstruction, CAR1 hit Debris, Ditch | CAR1 lost control avoiding another vehicle, suddenly braked ENV: road slippery (frost or ice) | Ice/ Snow | Dark | Fine | Unknown | N/A | | | 1 |
| 58/0/6.243 | 50E | MOONSHINE ROAD | 201152923 | 10/07/2011 | Sun | 1630 | CAR1 NBD on SH 58 lost control turning left, CAR1 hit Cliff Bank | CAR1 lost control due to road conditions ENV: road slippery (rain) | Wet | Overcast | Heavy Rain | Unknown | Nil | | | |
| 58/0/6.243 | 50E | MOONSHINE ROAD | 201111464 | 01/02/2011 | Tue | 0752 | SUV1 EBD on SH 58 hit rear end of CYCLIST2 (Age 37) stopped/moving slowly | SUV1 too far left/right, inattentive | Dry | Bright | Fine | Unknown | Nil | | 1 | |

| First Street | Distance | D I R | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | Tot Inj SER | Tot Inj MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/6.293 | | I | MOONSHINE ROAD | 201056167 | 25/09/2010 | Sat | 1558 | CAR1 WBD on SH 58 lost control turning left, CAR1 hit Fence | CAR1 lost control avoiding another vehicle SUV2 failed to give way at give way sign, misjudged speed etc of vehicle coming from another dirn with right of way | Dry | Overcast | Fine | T Type Junction | Give Way Sign | | | |
| 58/0/6.293 | | I | MOONSHINE ROAD | 201155694 | 17/12/2011 | Sat | 0450 | CAR1 WBD on SH 58 lost control turning left, CAR1 hit Fence | CAR1 alcohol test above limit or test refused, too fast entering corner, lost control when turning | Wet | Dark | Light Rain | T Type Junction | Give Way Sign | | | |
| 58/0/6.303 HAYWARDS HILL ROAD | 10 | W | MOONSHINE ROAD | 201212681 | 22/09/2012 | Sat | 1254 | CAR1 EBD on SH 58 HAYWARDS HILL ROAD lost control on curve and hit VAN2 head on | CAR1 lost control, medical illness (not sudden eg flu), mental illness (eg depression) | Dry | Bright | Fine | T Type Junction | Give Way Sign | | 1 | 2 |
| 58/0/6.423 | 130 | W | MOONSHINE ROAD | 201353874 | 04/09/2013 | Wed | 1335 | CAR1 EBD on SH 58 lost control turning right, CAR1 hit Fence on right hand bend | CAR1 attention diverted, new driver showed inexperience | Wet | Overcast | Fine | Unknown | Nil | | | |
| 58/0/6.593 | 300 | W | MOONSHINE ROAD | 201356498 | 26/10/2013 | Sat | 1211 | CAR1 WBD on SH 58 changing lanes/overtaking to right hit CAR2 | CAR1 didnt see/look behind when changing lanes, position or direction | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/6.785 | 500 | E | MULHERN ROAD | 201435617 | 26/03/2014 | Wed | 2230 | CAR1 WBD on SH 58 lost control turning right, CAR1 went Over Bank on right hand bend | CAR1 too fast entering corner, lost control when turning | Dry | Dark | Fine | Unknown | N/A | | | |
| 58/0/6.915 HAYWARDS HILL ROAD | 370 | E | MULHERN ROAD | 201252910 | 16/08/2012 | Thu | 1540 | CAR1 WBD on SH 58 HAYWARDS HILL ROAD hit SUV2 turning right onto SH 58 HAYWARDS HILL ROAD from the left | SUV2 alcohol test below limit, failed to give way at driveway ENV: entering or leaving other non-commercial | Dry | Bright | Fine | Driveway | Nil | | | |
| 58/0/6.946 | 340 | E | MULHERN ROAD | 201013405 | 15/11/2010 | Mon | 1747 | CAR1 WBD on SH 58 hit SUV2 turning right onto SH 58 from the left | SUV2 failed to give way at driveway, didnt see/look when visibility limited by roadside features ENV: visibility limited, entering or leaving other commercial | Dry | Bright | Fine | Driveway | Nil | | | 1 |
| 58/0/6.946 HAYWARDS HILL ROAD | | A | JUDGEFORD GOLF CLUB | 201352218 | 28/06/2013 | Fri | 0720 | VAN1 EBD on SH 58 HAYWARDS HILL ROAD hit rear of CAR2 turning right from centre line | VAN1 following too closely ENV: entering or leaving other non-commercial | Wet | Overcast | Fine | Driveway | Nil | | | |
| 58/0/6.963 | 670 | W | MOONSHINE ROAD | 201150161 | 12/01/2011 | Wed | 1735 | CAR1 EBD on SH 58 hit rear of SUV2 turning right from centre line | CAR1 failed to notice car slowing, new driver showed inexperience, worn tread on tyre ENV: entering or leaving other commercial | Dry | Bright | Fine | Driveway | Nil | | | |
| 58/0/7.036 | 250 | E | MULHERN ROAD | 201056592 | 23/11/2010 | Tue | 0745 | CAR1 WBD on SH 58 hit SUV2 headon on straight | CAR1 too far left/right, overtaking | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/7.063 | 770 | W | MOONSHINE ROAD | 201253824 | 25/10/2012 | Thu | 0715 | load or trailer from TRUCK1 WBD on SH 58 hit CAR2 | TRUCK1 load | Dry | Overcast | Fine | Unknown | Nil | | | |
| 58/0/7.085 | 200 | E | MULHERN ROAD | 201312728 | 19/10/2013 | Sat | 0930 | VAN1 EBD on SH 58 overtaking CYCLIST2 | VAN1 too far left/right, attention diverted by scenery or persons outside vehicle | Dry | Bright | Fine | Unknown | Nil | | | 1 |
| 58/0/7.116 PAREMATA-HAYWARDS | 170 | E | MULHERN ROAD | 201112520 | 29/05/2011 | Sun | 1424 | MOTOR CYCLE1 WBD on SH 58 PAREMATA-HAYWARDS lost control while overtaking | MOTOR CYCLE1 alcohol test result unknown, lost control under heavy acceleration | Dry | Bright | Fine | Unknown | Nil | | 1 | |
| 58/0/7.376 | 90 | W | MULHERN ROAD | 201517799 | 28/10/2015 | Wed | 1745 | CAR1 EBD on SH 58 hit CAR2 U-turning from same direction of travel | CAR2 inattentive, didnt see/look behind when changing lanes, position or direction | Wet | Overcast | Light Rain | Unknown | N/A | | | 2 |
| 58/0/7.436 | 150 | W | MULHERN ROAD | 201054981 | 06/10/2010 | Wed | 1750 | TRUCK1 EBD on SH 58 hit VAN2 doing driveway manoeuvre | TRUCK1 following too closely, failed to notice car slowing ENV: entering or leaving other commercial | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/7.473 | 550 | E | FLIGHTYS ROAD | 201516038 | 30/07/2015 | Thu | 1817 | CAR1 WBD on SH 58 overtaking hit CAR2 head on, CAR1 hit Guard Rail, CAR2 hit Ditch | CAR1 alcohol suspected, overtaking deliberately in the face of oncoming traffic, new driver showed inexperience CAR2 suddenly swerved to avoid vehicle | Dry | Dark | Fine | Unknown | Nil | | 1 | 2 |

| First Street | Distance / DIR | Second street or landmark | Crash Number | Date DD/MM/YYYY | Day DDD | Time HHMM | Description of Events | Crash Factors (ENV = Environmental factors) | Road | Natural Light | Weather | Junction | Cntrl | Tot Inj FAT | Tot Inj SER | Tot Inj MIN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 58/0/7.873 | 150E | FLIGHTYS ROAD | 201051269 | 28/01/2010 | Thu | 0730 | CAR1 EBD on SH 58 hit rear end of CAR2 stop/slow for queue, CAR1 hit Ditch | CAR1 failed to notice car slowing, attention diverted by cigarette etc, attention diverted by driver dazzled by sun/lights CAR2 suddenly braked ENV: dazzling sun | Dry | Bright | Fine | Unknown | Nil | | | |
| 58/0/7.986 | 2000E | PAEKAKARIKI HILL ROAD | 201111483 | 16/02/2011 | Wed | 1430 | VAN1 EBD on SH 58 lost control turning left, VAN1 hit Tree, Water/River | VAN1 fatigue due to lack of sleep | Dry | Overcast | Fine | Unknown | Nil | | | 1 |
| 58/0/8.013 | 10E | FLIGHTYS ROAD | 201443297 | 28/08/2014 | Thu | 1420 | SUV1 WBD on SH 58 hit CAR2 parking/unparking | CAR2 didnt see/look behind when pulling out from parked position | Dry | Overcast | Fine | X Type Junction | Stop Sign | | | |
| 58/0/8.023 | I | FLIGHTYS ROAD | 201444696 | 02/10/2014 | Thu | 1740 | CAR1 EBD on SH 58 hit CAR2 turning right onto SH 58 from the left | CAR2 failed to give way at stop sign, didnt see/look when required to give way to traffic from another direction | Wet | Overcast | Light Rain | X Type Junction | Stop Sign | | | |
| 58/0/8.023 | I | FLIGHTYS ROAD | 201111774 | 04/05/2011 | Wed | 0832 | CAR1 EBD on SH 58 hit rear of VAN2 turning right from centre line | CAR1 failed to notice car slowing, did not see or look for other party until too late | Wet | Overcast | Light Rain | X Type Junction | Stop Sign | | | 1 |
| 58/0/8.023 | I | MURPHYS ROAD | 201250021 | 15/01/2012 | Sun | 1530 | CAR1 EBD on SH 58 hit rear of CAR2 turning right from centre line | CAR1 suddenly swerved to avoid vehicle, failed to notice car slowing, attention diverted by scenery or persons outside vehicle | Dry | Bright | Fine | X Type Junction | Stop Sign | | | |
| 58/0/8.023 | I | MURPHYS ROAD | 201013408 | 04/12/2010 | Sat | 1134 | VAN1 EBD on SH 58 lost control turning right, VAN1 hit Fence, Post Or Pole on right hand bend | VAN1 illness with no warning (eg heart attack) | Dry | Bright | Fine | X Type Junction | Stop Sign | | | 1 |
| 58/0/8.023 HAYWARDS HILL | I | MURPHYS ROAD | 201211557 | 26/03/2012 | Mon | 0958 | CAR1 EBD on SH 58 HAYWARDS HILL overtaking hit TRUCK2 turning right, CAR1 hit Fence | CAR1 overtaking vehicle signaling right turn, suddenly swerved to avoid vehicle, attention diverted by other traffic | Dry | Bright | Fine | X Type Junction | Stop Sign | | | 1 |
| 58/0/8.384 | I | BELMONT ROAD | 201415720 | 05/09/2014 | Fri | 1652 | CAR1 EBD on SH 58 hit rear of CAR2 turning right from left side | CAR2 didnt see/look behind when changing lanes, position or direction, misjudged speed, etc of vehicle coming from behind or alongside | Dry | Twilight | Fine | T Type Junction | Give Way Sign | | | 2 |
| 58/0/8.404 | 20W | BELMONT ROAD | 201211759 | 10/01/2012 | Tue | 1610 | MOTOR CYCLE1 WBD on SH 58 lost control but did not leave the road | MOTOR CYCLE1 lost control, suddenly swerved to avoid object or for unknown reason | Dry | Bright | Fine | Unknown | Nil | | 1 | |
| 58/0/8.781 | 550S | BRADEY ROAD | 201151066 | 08/04/2011 | Fri | 0700 | CAR1 EBD on SH 58 hit rear of CAR2 turning right from left side | CAR2 turned right from left side of road, didnt see/look behind when changing lanes, position or direction ENV: entering or leaving land use | Wet | Overcast | Fine | Driveway | Nil | | | |
| 58/0/8.784 | 400W | BELMONT ROAD | 201012803 | 20/09/2010 | Mon | 1721 | CAR1 WBD on SH 58 hit CAR2 turning right onto SH 58 from the left | CAR2 failed to give way at driveway, didnt see/look when required to give way to traffic from another direction ENV: entering or leaving other commercial | Dry | Bright | Fine | Driveway | Nil | | | 2 |
| 58/0/9.113 | 100S | PAUATAHANUI NO7 BR | 201548054 | 15/10/2015 | Thu | 1559 | CAR1 NBD on SH 58 lost control but did not leave the road, CAR1 hit Cliff Bank, Guard Rail, Post Or Pole | CAR1 lost control, foot slipped or got caught under pedal | Dry | Bright | Fine | Unknown | N/A | | | |
| 58/0/9.131 HAYWARDS HILL ROAD | 200S | BRADEY ROAD | 201252365 | 21/06/2012 | Thu | 1033 | VAN1 NBD on SH 58 HAYWARDS HILL ROAD lost control; went off road to left, VAN1 hit Ditch | VAN1 inexperienced at towing trailer / other vehicle, load too heavy | Wet | Overcast | Light Rain | Unknown | Nil | | | |
| 58/0/9.331 HAYWARDS HILL | I | BRADEY ROAD | 201152182 | 01/05/2011 | Sun | 1827 | CAR1 NBD on SH 58 HAYWARDS HILL hit obstruction, CAR1 hit Stray Animal | ENV: farm animal straying | Wet | Dark | Fine | T Type Junction | Give Way Sign | | | |

## B.2 Crash Risk – Intersection

### B.2.1 Crash Risk: SH58/Moonshine Road Intersection

In terms of collective crash risk for the T intersection of SH58/Moonshine Road intersection, there are two methods of calculation:

- Reported F&S Crashes: Over the five year assessment period: there have been two F&S crashes reported within 50 m of the intersection, with two DSI.
- Estimated DSI Equivalents: The second method involves the estimation of the death and serious injury equivalents ($DSI_{EQ}$) that have occurred at an intersection using all injury crashes that have occurred during the crash period. This method takes into account the crash movement type, intersection form and control, and collision speed on crash severity outcomes. The estimated collective crash risk is calculated at 1.05 $DSI_{EQ}$ for a 5-year period. This is presented in the table below:

Table B-1: Estimation of DSIEQ Collective Risk Using Severity Index SH58/Moonshine Road Intersection

| Crash Type | Number of Reported Injury Crashes | Adjusted $DSI_{EQ}$ / All injury crashes[84] | Estimated Number of $DSI_{EQ}$ |
|---|---|---|---|
| Head-on (B Type) | 1 | 0.61 | 0.61 |
| Cornering (D Type) | 1 | 0.34 | 0.34 |
| Rear End (F Type) | 1 | 0.10 | 0.10 |
| **Total** | **3** | | **1.05** |

Therefore, according to HRIG[85] this intersection is considered 'Medium' risk when quantifying collective risk.

When considering personal risk; a calculation is performed which considers the major and minor road traffic volumes to determine the product of flow to standardise the number of potential conflicts that could occur at an intersection. The SH58 / Moonshine intersection is calculated as having a personal risk value of 75. According to HRIG[86], this results in a 'High' personal risk level.

The Level of Safety Service (LoSS)[87] for this intersection is on the cusp of the category III[88] and category IV boundary and demonstrates an worse than average safety performance on a five point scale, when compared to other intersections with similar characteristics.

As this intersection does not have a collective risk of more than three fatal or serious crashes in the five year period, or have more than 1.1 $DSI_{EQ}$ this intersection is not considered to be high risk.

Therefore although this intersection has not resulted in high-risk classification (based on collective and personal risk), the HRIG recommended safety improvement strategy is between 'Safety Management' or

'Safe System Transformation Works'. However, due to the worse than average LoSS, further investigation and/or larger cost treatments may be justifiable on safety grounds.

### B.2.2 Crash Risk: SH58 and Flightys/Murphys Road Intersection

In terms of collective crash risk for the crossroads intersection of SH58 and Flightys/Murphys Road, there are two methods of calculation:

For Collective Crash Risk:

- Reported F&S Crashes: Over the 5 year assessment period, there have been no F&S crashes.
- Estimated DSI Equivalents: The estimated collective crash risk is calculated at 1.1 $DSI_{EQ}$ for a 5-year period. This is presented in the table below:

Table B-2: Estimation of F&S Collective Risk Using Severity Index SH58 and Flightys/Murphys Road Intersection

| Crash Type | Number of Reported Injury Crashes | Adjusted $DSI_{EQ}$ / All injury crashes | Estimated Number of $DSI_{EQ}$ |
|---|---|---|---|
| Cornering (D Type) | 2 | 0.30 | 0.60 |
| Loss Control Bend (G Type) | 2 | 0.25 | 0.50 |
| **Total** | **4** | | **1.1** |

Therefore, according to HRIG, using Estimated DSI Equivalents method the intersection is 'Medium High' risk.

The SH58 and Flightys/Murphys Road Intersection is calculated as having a personal risk value of 77 $DSI_{EQ}$ per 100M vkt, according to HRIG, this results in a 'High' personal risk level.

The Level of Safety Service (LoSS) for this intersection is category IV and demonstrates a worse than average safety performance on a five point scale, when compared to other intersections with similar characteristics.

As this intersection has a collective risk of more than 1.1 $DSI_{EQ}$, and this intersection has a personal risk greater than 16 it is considered to be high risk.

The HRIG recommended safety improvement strategy is 'Safe System Transformation Works'.

# APPENDIX B: Crash Risk

**ROUTE: SH58 (Haywards Hill) to Lanes Flat (TG) (SH58 0/0.5-9.3)**

17500 12350

| | | | | |
|---|---|---|---|---|
| | | | per year | |
| **Length** | 8.80 | km | | |
| **AADT** | 14250 | length weighted average | | |
| **Length of Crash History** | 5 | years | | |
| **Number of F+S** | 12 | Section is High Risk Road | 2.4 | |
| **Total Injury** | 43 | | 8.6 | |
| **DSI** | 13 | | 2.6 | |

**KiwiRAP extent Star Rating**

| | | **Injury crashes/yr** | **DSI/yr** *(assume 1.2 DSI per F&S)* | **Inj/5yr** | **DSi/5y** |
|---|---|---|---|---|---|
| **current** | **2.7** | | | | |
| Injury crash rate per 100M VKT | 31.4 | 14.4 | | 72 | 0 |
| High severity crash rate per 100M VKT | 9.4 | 4.3 | 5.2 | 22 | 26 |
| **Future** | **4.0** | **star** | | | |
| Injury crash rate per 100M VKT | 10.69947 | 4.9 | | 24 | 0 |
| High severity crash rate per 100M VKT | 3.209842 | 1.5 | 1.8 | 7 | 9 |

| | Per year | 5 year period |
|---|---|---|
| **Reduction (injury crashes)** | **9.5** | 47 |
| **Reduction (high severity crashes)** | **2.8** | 14 |
| **DSI** | **3.4** | 17 |

**Collective Risk** = (Fatal crashes + serious crashes) / number of years of data
Length of road section

**Collective Risk** = 0.27 = Use Figure 4-1 from the HRRRG to determine the collective risk band

Value from Figure 4-1 = HIGH

**Personal Risk** = Fatal crashes + serious crashes
(length of road in km x number of years of data x 365 days x AADT) / 10^8

**Personal Risk** = 5.24 = Use Figure 4-2 from the HRRRG to determine the personal risk band

Value from Figure 4-2 = MEDIUM

**Injury Crash Rate per 100m VKT** 18.8

**HRRRG Treatment Philosophy** **Safer Corridors / SSTW** (see HRRRG fig 4-6)

| Note: | *3 year* | 5 year | 10 Year |
|---|---|---|---|
| To be classified as a HRRR | | | |
| Collective Risk & Personal Risk | *2 or more high severity crashes* | 3 or more high severity crashes | 5 or more high severity crashes |

# Appendix C Option Evaluation

## C.1 Modelling Outputs

### C.1.1 WTSM

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

# FILE NOTE


DATE 8 June 2016

AUTHOR John Pell, Christoph Gerds


SUBJECT SH58 Four Lane WTSM Testing

## 1. Introduction

This note summarises the following tests undertaken using WTSM 2011:

- Do Minimum with existing number of lanes on SH58 between Transmission Gully (TG) and the Haywards Interchange – referred to as 'Do Min'
- Do Minimum with the Petone to Grenada Link Road (P2G) in place and existing number of lanes on SH58 between Transmission Gully (TG) and the Haywards Interchange) – referred to as 'Do Min with P2G'
- SH58 four laning Option between TG and Haywards interchange – referred to as 'Option'
- SH58 four laning Option between TG and Haywards interchange with the P2G in place – referred to as 'Option with P2G'

This study is understood to be undertaken in parallel and as a potential alternative to the P2G scheme. Due to this, the 2011 version of the WTSM model has been used rather than the 2013 version to be consistent with the P2G analysis to date.

Traffic volumes and levels of service are provided for 2031 within this note with other forecast year results attached as appendices. Commentary is also provided relating to modal shift and potential trip re-distribution.

## 2. Traffic volumes

Traffic volumes are shown in **Table 1** and **Table 2** for the AM and PM 2031 2 hour peak periods respectively. These tables show that the four laning of SH58 has minimal effect on the volume of traffic on SH58 and the adjacent roads. The P2G link road however does have a significant effect, reducing volumes by around a third (from ~3,000 to 2,000 vehicles) in the peak direction in 2031.

Table 1: 2031 AM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| Do Min | 1846 | 2912 | 1457 | 2607 | 1666 | 2342 | 3148 | 3662 | 2480 | 3991 |
| Do Min with P2G | 1318 | 1957 | 1437 | 2594 | 1252 | 2179 | 3189 | 3696 | 2346 | 3424 |
| Option | 1894 | 2996 | 1462 | 2632 | 1688 | 2366 | 3191 | 3674 | 2495 | 4011 |
| Option with P2G | 1328 | 2060 | 1436 | 2602 | 1274 | 2126 | 3189 | 3699 | 2327 | 3500 |

Table 2: 2031 PM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| Do Min | 2984 | 1888 | 2400 | 1297 | 2262 | 1871 | 3644 | 3471 | 3954 | 2654 |
| Do Min with P2G | 1976 | 1270 | 2415 | 1295 | 2036 | 1395 | 3710 | 3485 | 3513 | 2549 |
| Option | 3019 | 1941 | 2409 | 1304 | 2291 | 1879 | 3665 | 3484 | 3969 | 2678 |
| Option with P2G | 2019 | 1283 | 2421 | 1295 | 2025 | 1406 | 3716 | 3491 | 3539 | 2545 |

Volumes for 2011, 2021, 2031 and 2041 are included in Appendix A

## 3. Levels of service

Volume to Capacity ratio results from 2031 are shown for the AM in **Table 3** and in **Table 4** for the PM 2 hour peak period. The Do Min scenario exceeds capacity in the eastbound direction for the AM and the westbound direction for the PM period. With P2G in place SH58, under the do min scenario, is at around 70% capacity for the peak direction. Under the option SH58 is at around 40% and 30% capacity with and without P2G respectively.

Table 3: 2031 AM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| Do Min | 66% | 104% | 20% | 36% | 23% | 33% | 44% | 51% | 34% | 55% |
| Do Min with P2G | 47% | 70% | 20% | 36% | 17% | 30% | 44% | 51% | 33% | 48% |
| Option | 26% | 42% | 20% | 37% | 23% | 33% | 44% | 51% | 35% | 56% |
| Option with P2G | 18% | 29% | 20% | 36% | 18% | 30% | 44% | 51% | 32% | 49% |

Table 4: 2031 PM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | WB | EB | NB | SB | NB |
| Do Min | 107% | 67% | 33% | 18% | 31% | 26% | 51% | 48% | 55% | 37% |
| Do Min with P2G | 71% | 45% | 34% | 18% | 28% | 19% | 52% | 48% | 49% | 35% |
| Option | 42% | 27% | 33% | 18% | 32% | 26% | 51% | 48% | 55% | 37% |
| Option with P2G | 28% | 18% | 34% | 18% | 28% | 20% | 52% | 48% | 49% | 35% |

Level of Service comparisons for 2011, 2021, 2031 and 2041 are included in Appendix B.

## 4. Modal shift and trip re-distribution

This section compares the car and PT demand matrices to give an idea of the modal shift to or from public transit as well as any trip redistribution as a result of the SH58 four laning option.

For the tables in this section, where the absolute difference is more than 30 vehicles, the value is highlighted orange and where the absolute difference is more than 50 vehicles, the value is highlighted red.

### 4.1 Car Demands

**Table 5** and **Table 6** compare the Do Min and Option demands without P2G for the AM and PM peaks respectively. Trips internal to the Wellington City area show the highest change in both the AM and PM periods, however this is insignificant as it represents a percentage change of around 0.1%. Similarly the AM peak Porirua to Lower Hutt movement, which shows an increase of 27 trips, represents a percentage difference change of 1%.

**Table 5: Option vs Do Min Demands Comparison without P2G – AM Peak Car Demand**

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | -50 | -4 | -1 | -4 | 1 | 3 |
| Porirua | -2 | -8 | -2 | 27 | 16 | 6 |
| Kapiti | -3 | -3 | -3 | 17 | 7 | 3 |
| Lower Hutt | 9 | 12 | 4 | -15 | -4 | 3 |
| Upper Hutt | 5 | 9 | 2 | -2 | -10 | 8 |
| Wairarapa | 1 | 1 | 0 | 0 | 1 | 1 |

**Table 6: Option vs Do Min Demands Comparison without P2G – PM Peak Car Demand**

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | -38 | -5 | -2 | 12 | 5 | 0 |
| Porirua | -4 | -11 | -2 | 13 | 10 | 1 |
| Kapiti | -1 | -2 | -3 | 5 | 3 | 0 |
| Lower Hutt | -6 | 13 | 7 | -14 | -2 | -1 |
| Upper Hutt | 0 | 8 | 3 | -4 | -11 | -1 |
| Wairarapa | 0 | 2 | 1 | -2 | -2 | -1 |

The same comparison is made for demands with P2G in **Table 7** for the AM period and **Table 8** for the PM period. A high difference is seen again for the internal Wellington City trips, which again is insignificant as this only equates to a change of around 0.1%.

Table 7: Option vs Do Min Demands Comparison with P2G – AM Peak Car Demand

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | -68 | -4 | -1 | -13 | -3 | -4 |
| Porirua | -4 | 1 | -1 | 6 | 9 | 0 |
| Kapiti | -2 | -1 | -1 | 7 | 4 | 0 |
| Lower Hutt | 2 | 3 | 1 | 1 | -3 | -7 |
| Upper Hutt | 0 | 3 | 0 | 0 | -2 | -13 |
| Wairarapa | -1 | 0 | 0 | -1 | -1 | 0 |

Table 8: Option vs Do Min Demands Comparison with P2G – PM Peak Car Demand

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | -45 | -3 | -1 | -1 | -1 | 0 |
| Porirua | -3 | -2 | -1 | 3 | 4 | 1 |
| Kapiti | -1 | -1 | -1 | 1 | 1 | 0 |
| Lower Hutt | -9 | 4 | 4 | 0 | -1 | 0 |
| Upper Hutt | -3 | 7 | 2 | -2 | -2 | 0 |
| Wairarapa | -1 | 2 | 1 | -1 | 0 | 2 |

Car Demand Comparisons for 2021, 2031 and 2041 are included in Appendix C

### 4.2 PT Demands

The PT demands are compared between the Option and Do Min scenarios without P2G in Table 9 for the AM and Table 10 for the PM peak periods. The same comparison is made with P2G in Table 11 and Table 12 for the AM and PM peak periods respectively. In all of these comparisons, the largest change is for internal Wellington City trips and, as with the car demands, this difference is insignificant as it equates to a percentage difference of less than 1% in all instances. It should be noted that only a single bus service operates over SH58 and this service is in the peak direction only.

**Table 9: Option vs Do Min Demands Comparison without P2G – AM Peak PT Demand**

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | 99 | -1 | 1 | 6 | 1 | -1 |
| Porirua | -18 | -1 | 1 | 0 | 0 | 0 |
| Kapiti | -12 | 0 | 1 | 0 | 0 | 0 |
| Lower Hutt | 6 | 0 | 0 | -2 | 0 | -2 |
| Upper Hutt | 3 | 0 | 0 | 0 | -1 | -1 |
| Wairarapa | 0 | 0 | 0 | -1 | 0 | -1 |

**Table 10: Option vs Do Min Demands Comparison without P2G – PM Peak PT Demand**

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| **Origins** | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | 88 | -14 | -9 | 6 | 2 | -1 |
| Porirua | -1 | 0 | 0 | 0 | 0 | 0 |
| Kapiti | 0 | 0 | 1 | 0 | 0 | 0 |
| Lower Hutt | 5 | 0 | 0 | 0 | 0 | -1 |
| Upper Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| Wairarapa | -2 | -1 | 0 | -2 | -1 | 0 |

Table 11: Option vs Do Min Demands Comparison with P2G – AM Peak PT Demand

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| Origins | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | 106 | -1 | 2 | 7 | 1 | 2 |
| Porirua | -7 | -1 | 1 | 0 | 0 | 0 |
| Kapiti | -6 | 0 | 1 | 0 | 0 | 0 |
| Lower Hutt | 0 | 0 | 0 | -1 | 0 | 1 |
| Upper Hutt | 1 | 0 | 0 | 0 | -1 | 2 |
| Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

Table 12: Option vs Do Min Demands Comparison with P2G – PM Peak PT Demand

| | Destinations | | | | | |
|---|---|---|---|---|---|---|
| Origins | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Wellington | 92 | -6 | -4 | 1 | 1 | 1 |
| Porirua | 0 | 0 | 0 | 0 | 0 | 0 |
| Kapiti | 1 | 0 | 0 | 0 | 0 | 0 |
| Lower Hutt | 6 | 0 | 0 | -1 | 0 | 1 |
| Upper Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| Wairarapa | 3 | 0 | 0 | 2 | 2 | 0 |

PT Demand Comparisons for 2021, 2031 and 2041 are included in Appendix C.

# 5. Summary

This analysis has shown that volumes do not significantly differ as a result of widening the SH58 corridor to four lanes. SH58 does come under pressure if P2G is not constructed, the peak direction indicating capacity being exceeded in 2031 and beyond. The four laning of SH58 would provide sufficient capacity if P2G was not constructed.

Trip redistribution has been looked at and found to not occur as a result of four laning SH58. There is also no indication of modal shift occurring under the scenarios tested.

It is recommended, if not already done so, that these scenarios be assessed in the NWSM Saturn model. This will provide a better understanding of how traffic may react to the proposed schemes.

**APPENDIX A - AM VOLUMES**

2011 AM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | |
|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 1511 | 1537 | | | | |
| Option (with P2G), SH58 as is | | | | | | |
| DoMin (noP2G), SH58 4-Laning | | | | | | |
| Option (with P2G), SH58 4-Laning | | | | | | |

2021 AM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | |
|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 1766 | 2416 | 1364 | 2355 | 1335 | 2160 |
| Option (with P2G), SH58 as is | 1260 | 1702 | 1343 | 2339 | 1079 | 1981 |
| DoMin (noP2G), SH58 4-Laning | 1802 | 2488 | 1366 | 2371 | 1359 | 2180 |
| Option (with P2G), SH58 4-Laning | 1272 | 1775 | 1342 | 2345 | 1089 | 1941 |

2031 AM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | |
|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 1846 | 2912 | 1457 | 2607 | 1666 | 2342 |
| Option (with P2G), SH58 as is | 1318 | 1957 | 1437 | 2594 | 1252 | 2179 |
| DoMin (noP2G), SH58 4-Laning | 1894 | 2996 | 1462 | 2632 | 1688 | 2366 |
| Option (with P2G), SH58 4-Laning | 1328 | 2060 | 1436 | 2602 | 1274 | 2126 |

2041 AM Volumes

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | |
|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 1809 | 2996 | 1577 | 2624 | 1782 | 2345 |
| Option (with P2G), SH58 as is | 1296 | 1959 | 1558 | 2609 | 1362 | 2199 |
| DoMin (noP2G), SH58 4-Laning | 1835 | 3002 | 1579 | 2634 | 1790 | 2358 |
| Option (with P2G), SH58 4-Laning | 1302 | 2043 | 1556 | 2614 | 1374 | 2142 |

| SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|
| NB | SB | NB | SB |
| 2126 | 3721 | 1938 | 3504 |
| | | | |

| SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|
| NB | SB | NB | SB |
| 2696 | 3635 | 2225 | 3751 |
| 2710 | 3656 | 2038 | 3363 |
| 2718 | 3645 | 2230 | 3780 |
| 2716 | 3658 | 2032 | 3415 |

| SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|
| NB | SB | NB | SB |
| 3148 | 3662 | 2480 | 3991 |
| 3189 | 3696 | 2346 | 3424 |
| 3191 | 3674 | 2495 | 4011 |
| 3189 | 3699 | 2327 | 3500 |

| SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|
| NB | SB | NB | SB |
| 3139 | 3572 | 2469 | 3984 |
| 3187 | 3615 | 2365 | 3382 |
| 3149 | 3584 | 2474 | 4001 |
| 3183 | 3616 | 2353 | 3454 |

APPENDIX B _ VOLUME TO CAPACITY RATIOS

Capacities in the WTSM model are as follows:

- Existing SH58 has a capacity of 1,400 veh / lane / hour
- For the Option we have assumed improved geometry (plus to ensure model is unconstrained) so have a capacity of 1,800 veh/lane/hour

2011 AM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 54% | 55% | | | | | 30% | 52% | 27% | 49% |
| Option (with P2G), SH58 as is | | | | | | | | | | |
| DoMin (noP2G), SH58 4-Laning | | | | | | | | | | |
| Option (with P2G), SH58 4-Laning | | | | | | | | | | |

2021 AM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 63% | 86% | 19% | 33% | 19% | 30% | 37% | 50% | 31% | 52% |
| Option (with P2G), SH58 as is | 45% | 61% | 19% | 32% | 15% | 28% | 38% | 51% | 28% | 47% |
| DoMin (noP2G), SH58 4-Laning | 25% | 35% | 19% | 33% | 19% | 30% | 38% | 51% | 31% | 53% |
| Option (with P2G), SH58 4-Laning | 18% | 25% | 19% | 33% | 15% | 27% | 38% | 51% | 28% | 47% |

2031 AM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 66% | 104% | 20% | 36% | 23% | 33% | 44% | 51% | 34% | 55% |
| Option (with P2G), SH58 as is | 47% | 70% | 20% | 36% | 17% | 30% | 44% | 51% | 33% | 48% |
| DoMin (noP2G), SH58 4-Laning | 26% | 42% | 20% | 37% | 23% | 33% | 44% | 51% | 35% | 56% |
| Option (with P2G), SH58 4-Laning | 18% | 29% | 20% | 36% | 18% | 30% | 44% | 51% | 32% | 49% |

2041 AM Volume/Capacity

| Scenario | SH 58 | | TG, North of SH58 | | TG, South of SH58 | | SH2, North of SH58 | | SH2, South of SH58 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | WB | EB | NB | SB | NB | SB | NB | SB | NB | SB |
| DoMin (noP2G), SH58 as is | 65% | 107% | 22% | 36% | 25% | 33% | 44% | 50% | 34% | 55% |
| Option (with P2G), SH58 as is | 46% | 70% | 22% | 36% | 19% | 31% | 44% | 50% | 33% | 47% |
| DoMin (noP2G), SH58 4-Laning | 25% | 42% | 22% | 37% | 25% | 33% | 44% | 50% | 34% | 56% |
| Option (with P2G), SH58 4-Laning | 18% | 28% | 22% | 36% | 19% | 30% | 44% | 50% | 33% | 48% |

**APPENDIX C - CAR & PT DEMANDS**

## Option vs Do Min Comparison - No P2G

Car AM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -60 | -5 | -1 | -5 | 1 | 0 |
| | Porirua | -4 | -4 | -2 | 19 | 11 | 3 |
| | Kapiti | -3 | -2 | -2 | 12 | 5 | 2 |
| | Lower Hutt | 9 | 9 | 3 | -11 | -3 | -1 |
| | Upper Hutt | 3 | 6 | 1 | -1 | -6 | 0 |
| | Wairarapa | 0 | 1 | 0 | 0 | 0 | 1 |

Car IP Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -14 | -1 | -1 | 1 | 1 | 0 |
| | Porirua | -2 | -5 | -1 | 5 | 4 | 1 |
| | Kapiti | -1 | -1 | -1 | 2 | 1 | 0 |
| | Lower Hutt | 1 | 4 | 2 | -6 | -1 | 0 |
| | Upper Hutt | 1 | 3 | 1 | -1 | -4 | 0 |
| | Wairarapa | 0 | 1 | 0 | 0 | 0 | 0 |

Car PM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -63 | -7 | -3 | -9 | -1 | 0 |
| | Porirua | -5 | -7 | -2 | 7 | 6 | 1 |
| | Kapiti | -1 | -1 | -2 | 3 | 2 | 0 |
| | Lower Hutt | -8 | 16 | 9 | -12 | -3 | -1 |
| | Upper Hutt | 1 | 11 | 4 | -3 | -7 | 0 |
| | Wairarapa | 0 | 2 | 1 | -1 | -1 | -1 |

PT AM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 104 | -2 | 1 | 7 | 1 | 0 |
| | Porirua | -11 | 0 | 0 | 0 | 0 | 0 |
| | Kapiti | -9 | 0 | 1 | 0 | 0 | 0 |
| | Lower Hutt | 2 | 0 | 0 | -1 | 0 | 0 |
| | Upper Hutt | 2 | 0 | 0 | 0 | -1 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

PT IP Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 20 | -1 | 0 | 1 | 0 | 0 |
| | Porirua | -1 | 0 | 0 | 0 | 0 | 0 |
| | Kapiti | 0 | 0 | 0 | 0 | 0 | 0 |
| | Lower Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| | Upper Hutt | 0 | 0 | 0 | 0 | 0 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

PT PM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 92 | -9 | -7 | 4 | 1 | 0 |
| | Porirua | -1 | 0 | 0 | 0 | 0 | 0 |
| | Kapiti | 0 | 0 | 1 | 0 | 0 | 0 |
| | Lower Hutt | 5 | 0 | 0 | -1 | 0 | 0 |
| | Upper Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

## Option vs Do Min Comparison - With P2G

Car AM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -62 | -5 | -1 | -12 | -1 | 0 |
| | Porirua | -2 | 2 | -1 | 3 | 5 | 1 |
| | Kapiti | -1 | -1 | 0 | 4 | 2 | 1 |
| | Lower Hutt | 2 | 3 | 1 | 3 | -1 | 0 |
| | Upper Hutt | 0 | 2 | 0 | 0 | -2 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

Car IP Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -15 | -1 | 0 | -2 | 0 | 0 |
| | Porirua | -1 | -1 | 0 | 1 | 2 | 0 |
| | Kapiti | 0 | 0 | -1 | 1 | 0 | 0 |
| | Lower Hutt | -1 | 1 | 1 | 0 | -1 | 0 |
| | Upper Hutt | 0 | 2 | 0 | 0 | -1 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

Car PM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | -43 | -2 | -1 | -1 | 0 | 0 |
| | Porirua | -4 | -1 | 0 | 2 | 3 | 0 |
| | Kapiti | -1 | -1 | 0 | 1 | 1 | 0 |
| | Lower Hutt | -8 | 3 | 3 | 2 | 0 | 0 |
| | Upper Hutt | -1 | 4 | 1 | -1 | -2 | 0 |
| | Wairarapa | 0 | 1 | 0 | 0 | 0 | 0 |

PT AM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 101 | -1 | 2 | 7 | 1 | 0 |
| | Porirua | -6 | 0 | 1 | 0 | 0 | 0 |
| | Kapiti | -4 | 0 | 1 | 0 | 0 | 0 |
| | Lower Hutt | -2 | 0 | 0 | -1 | 0 | 0 |
| | Upper Hutt | 0 | 0 | 0 | 0 | -1 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

PT IP Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | Destination / Origin | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 19 | -1 | 0 | 2 | 0 | 0 |
| | Porirua | -1 | 0 | 0 | 0 | 0 | 0 |
| | Kapiti | 0 | 0 | 0 | 0 | 0 | 0 |
| | Lower Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| | Upper Hutt | 0 | 0 | 0 | 0 | 0 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

PT PM Demand

| | | Destinations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Wellington | Porirua | Kapiti | Lower Hutt | Upper Hutt | Wairarapa |
| Origins | Wellington | 88 | -5 | -3 | 0 | 0 | 0 |
| | Porirua | -1 | 0 | 0 | 0 | 0 | 0 |
| | Kapiti | 1 | 0 | 0 | 0 | 0 | 0 |
| | Lower Hutt | 6 | 0 | 0 | 0 | 0 | 0 |
| | Upper Hutt | 1 | 0 | 0 | 0 | 0 | 0 |
| | Wairarapa | 0 | 0 | 0 | 0 | 0 | 0 |

### C.1.2 HCM 2010

Federal Highways Authority (FHA) Highway Capacity Manual 2010 (HCM2010) LOS analysis using a metric spreadsheet conversion tool based on HCM 2010 chapter 15. The Analysis considers:

- AM peak Only,
- Both IRP and DRP directions,
- Traffic volumes for 5 years: 2011,2021, 2021+25%, 2031 without P2G, and 2031 with P2G (Transmission Gully).
- The existing route, and option 5.

**OUTPUT SH58 Decreasing RP**

**Categories**

- A
- B
- C
- D
- E
- F

SENSITIVITY

| | LOS Existing Route - Eastbound (DRP) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Section | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2011 | E | E | D | D | C | | E | | D |
| 2021 with TG | F | E | E | E | D | | E | | E |
| 2021+25% with TG | F | F | E | F | F | | E | | E |
| 2031 No P2G | | | | | | | | | |
| 2031+P2G | | | | | | | | | |

| | LOS Option 5 - Eastbound (DRP) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Section | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2011 | | | | | | | | | |
| 2021 with TG | F | E | E | E | D | | E | | E |
| 2021+25% with TG | F | F | E | F | F | | E | | E |
| 2031 No P2G | F | F | E | F | E | | E | | E |
| 2031+P2G | E | E | E | E | C | | E | | E |

**OUTPUT SH58 Increasing RP**

**Categories**

- A
- B
- C
- D
- E
- F

SENSITIVITY

| | LOS Existing Route - Westbound | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Section | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2011 | E | D | D | D | D | | D | | D |
| 2021 | E | E | E | E | E | | E | | E |
| 2021+25% | E | E | E | E | E | | E | | E |
| 2031 | | | | | | | | | |
| 2031+P2G | | | | | | | | | |

| | LOS Option 5 - Westbound | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Section | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2011 | | | | | | | | | |
| 2021 | E | E | E | E | E | | E | | E |
| 2021+25% | E | E | E | E | E | | E | | E |
| 2031 | E | E | E | E | E | | E | | E |
| 2031+P2G | E | D | D | D | E | | E | | E |

### C.1.3 NWSM

**NWSM modelling outputs provided by JACOBS**

| KEY | |
|---|---|
| **LOS** | **Average Delay** |
| A | <10 |
| B | 10 to 20 |
| C | 20 to 35 |
| D | 35 to 55 |
| E | 55 to 80 |
| F | >80 |

| | | | | | | AM Peak | | | PM Peak | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | SH58 LoS and AADT AM Peak | | | SH58 LoS and AADT PM Peak | | |
| | | | | | | East of Moonshine Road | | | East of Moonshine Road | | |
| | | | | | | SB | NB | AADT | SB | NB | AADT |
| 2021 | BASE - With P2G, TG, SH58 @ 80k | No Scheme | | Avg Delay (s) | B1a | 34 | 12 | 14200 | 8 | 16 | 14200 |
| | | | | LoS | | C | B | | A | B | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S1a | 21 | 17 | 14100 | 4 | 20 | 14100 |
| | | | | LoS | | C | B | | A | B | |
| | | | 20sec RAB | Avg Delay (s) | S1b | 20 | 22 | 13900 | 4 | 25 | 13900 |
| | | | | LoS | | C | C | | A | C | |
| | BASE - With P2G, TG, SH58 @ 100k | No Scheme | | Avg Delay (s) | B4a | 42 | 11 | 15200 | 6 | 18 | 15200 |
| | | | | LoS | | D | B | | A | B | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S3a | 24 | 16 | 15100 | 3 | 20 | 15100 |
| | | | | LoS | | C | B | | A | B | |
| | | | 20sec RAB | Avg Delay (s) | S3b | 23 | 21 | 15100 | 3 | 24 | 15100 |
| | | | | LoS | | C | C | | A | C | |
| | WORST CASE (NO P2G, high growth) | No Scheme | | Avg Delay (s) | B6a | 115 | 44 | 19500 | 40 | 79 | 19500 |
| | | | | LoS | | F | D | | D | E | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S2a | 90 | 39 | 19700 | 24 | 61 | 19700 |
| | | | | LoS | | F | D | | C | E | |
| | | | 20sec RAB | Avg Delay (s) | S2b | 90 | 44 | 19600 | 24 | 65 | 19600 |
| | | | | LoS | | F | D | | C | E | |
| 2031 | BASE - With P2G, TG, SH58 @ 80k | No Scheme | | Avg Delay (s) | B1a | 55 | 14 | 16500 | 11 | 34 | 16500 |
| | | | | LoS | | E | B | | B | C | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S1a | 35 | 18 | 16300 | 6 | 32 | 16300 |
| | | | | LoS | | C | B | | A | C | |
| | | | 20sec RAB | Avg Delay (s) | S1b | 34 | 23 | 16100 | 6 | 36 | 16100 |
| | | | | LoS | | C | C | | A | D | |
| | BASE - With P2G, TG, SH58 @ 100k | No Scheme | | Avg Delay (s) | B4a | 69 | 13 | 17400 | 10 | 41 | 17400 |
| | | | | LoS | | E | B | | A | D | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S3a | 42 | 17 | 17300 | 5 | 33 | 17300 |
| | | | | LoS | | D | B | | A | C | |
| | | | 20sec RAB | Avg Delay (s) | S3b | 40 | 22 | 17200 | 5 | 37 | 17200 |
| | | | | LoS | | D | C | | A | D | |
| | WORST CASE (NO P2G, high growth) | No Scheme | | Avg Delay (s) | B6a | 115 | 52 | 24300 | 67 | 115 | 24300 |
| | | | | LoS | | F | D | | E | F | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S2a | 94 | 45 | 24900 | 39 | 168 | 24900 |
| | | | | LoS | | F | D | | D | F | |
| | | | 20sec RAB | Avg Delay (s) | S2b | 94 | 48 | 24800 | 39 | 173 | 24800 |
| | | | | LoS | | F | D | | D | F | |
| 2041 | BASE - With P2G, TG, SH58 @ 80k | No Scheme | | Avg Delay (s) | B1a | 60 | 13 | 16800 | 11 | 40 | 16800 |
| | | | | LoS | | E | B | | B | D | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S1a | 38 | 18 | 16700 | 6 | 35 | 16700 |
| | | | | LoS | | D | B | | A | D | |
| | | | 20sec RAB | Avg Delay (s) | S1b | 37 | 23 | 16500 | 6 | 40 | 16500 |
| | | | | LoS | | D | C | | A | D | |
| | BASE - With P2G, TG, SH58 @ 100k | No Scheme | | Avg Delay (s) | B4a | 75 | 13 | 17600 | 10 | 48 | 17600 |
| | | | | LoS | | E | B | | B | D | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S3a | 45 | 17 | 17600 | 5 | 37 | 17600 |
| | | | | LoS | | D | B | | A | D | |
| | | | 20sec RAB | Avg Delay (s) | S3b | 45 | 22 | 17600 | 5 | 41 | 17600 |
| | | | | LoS | | D | C | | A | D | |
| | WORST CASE (NO P2G, high growth) | No Scheme | | Avg Delay (s) | B6a | 115 | 54 | 24300 | 60 | 115 | 24300 |
| | | | | LoS | | F | D | | E | F | |
| | | With Scheme | 10sec RAB | Avg Delay (s) | S2a | 94 | 47 | 24900 | 36 | 99 | 24900 |
| | | | | LoS | | F | D | | D | F | |
| | | | 20sec RAB | Avg Delay (s) | S2b | 94 | 53 | 24800 | 39 | 173 | 24800 |
| | | | | LoS | | F | D | | D | F | |

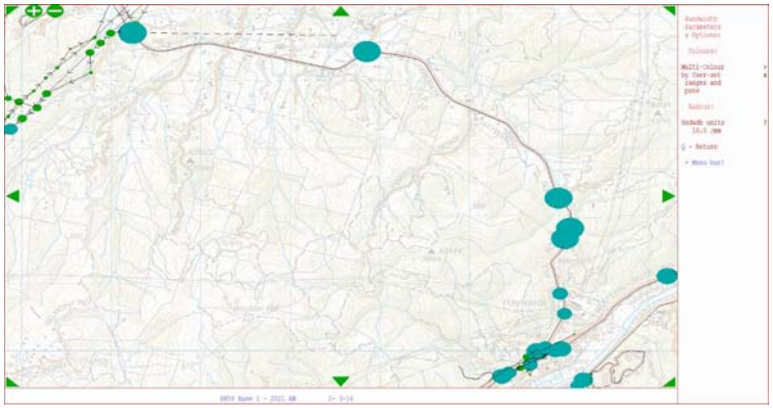
**NWSM Intersection Performance**

The following bands for the V/C jpgs were applied, In addition, the greater the circle the higher the number.

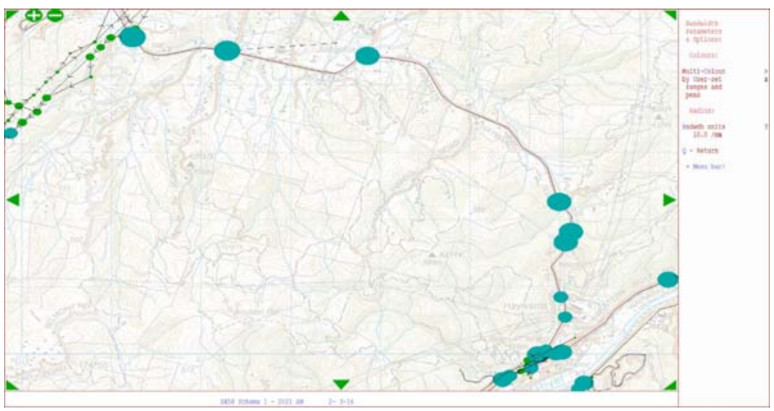
| Colour | V/C |
|---|---|
| Green | <=30% |
| Cyan | <=70% |
| Red | <=90% |
| Purple | <=100% |
| Brown | >100% |

**2021 AM**

Base 1 (with P2G) – B1A

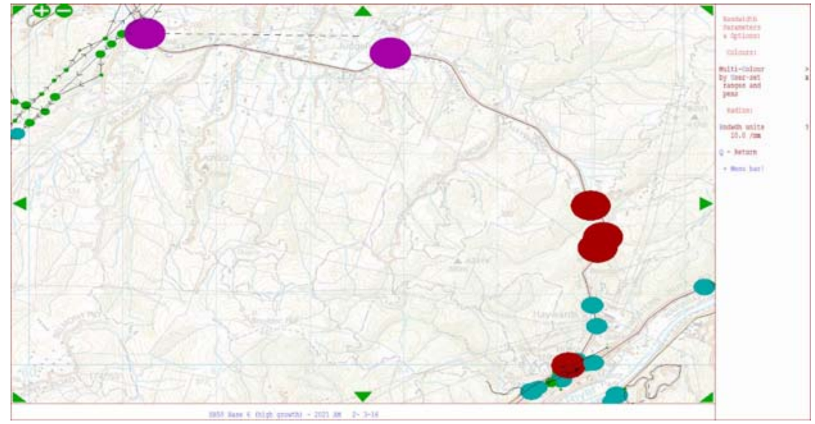


Scheme Base 1 (with P2G) – S1b (20sec RAB)

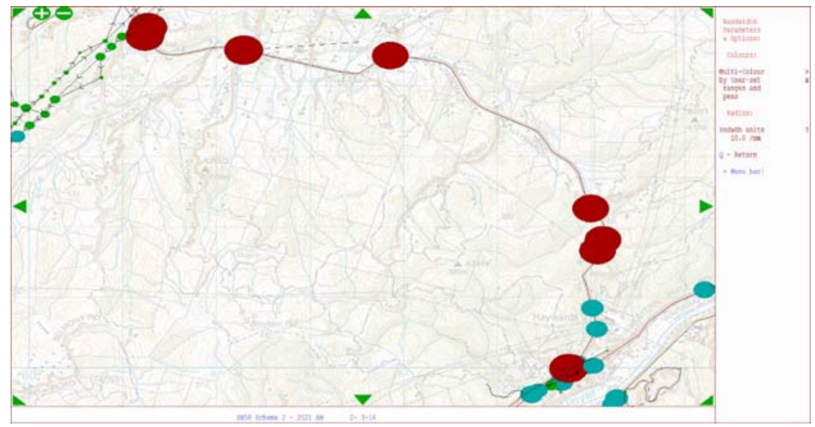


**2021 AM**

Base 6 (no P2G, high growth) – B6a

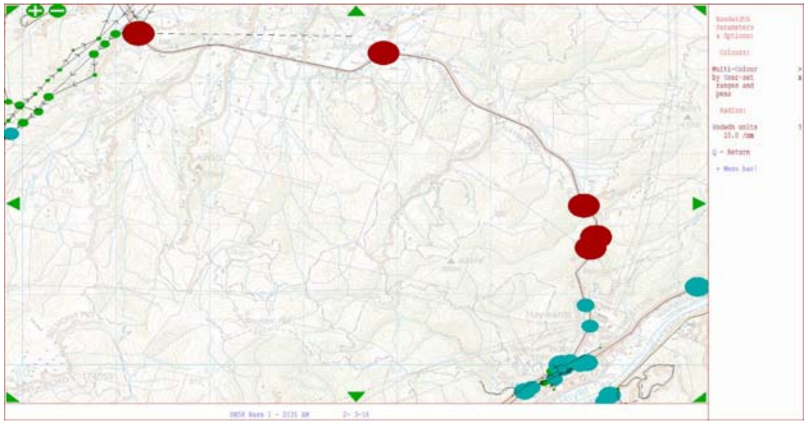


Scheme Base 6 (no P2G, high growth) – 20sec RAB (S2b)

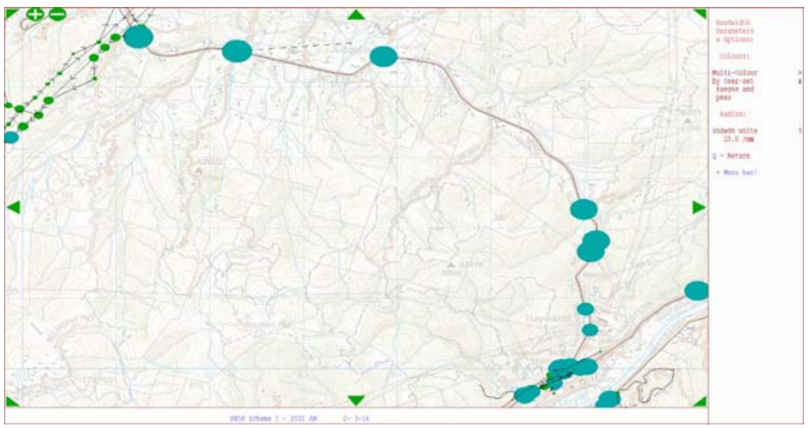


**2031 AM**

Base 1 (with P2G) – b1a

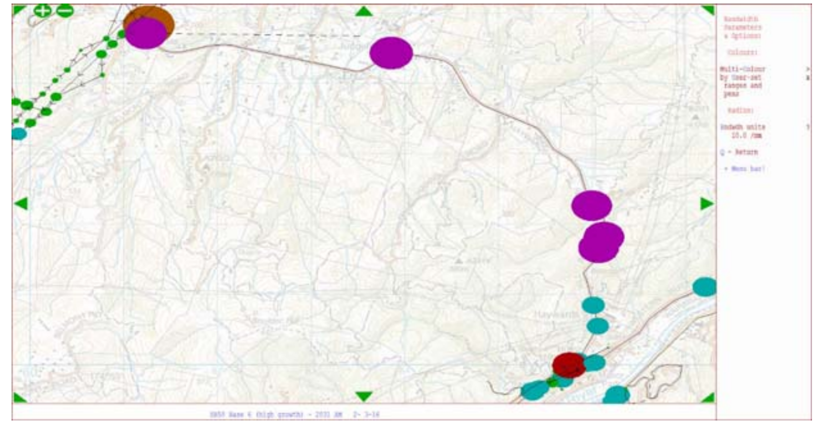


Scheme Base 1 (with P2G) – S1b (20sec RAB)

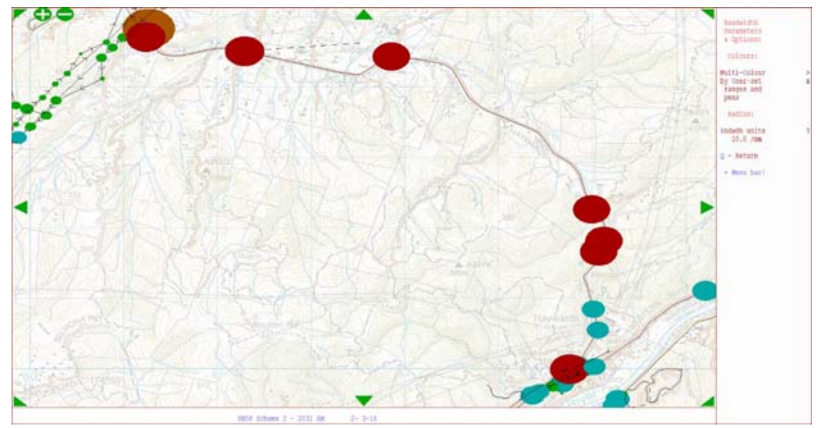


**2031 AM**

Base 6 (no P2G, high growth) B6a

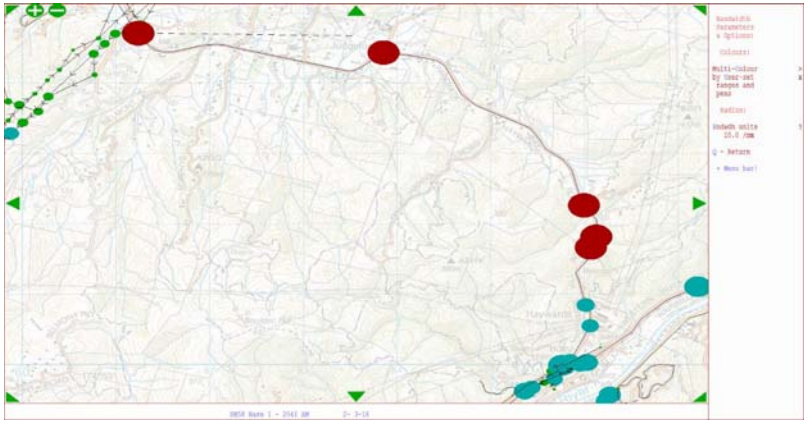


Scheme Base 6 (no P2G, high growth) – 20sec RAB (S2b)

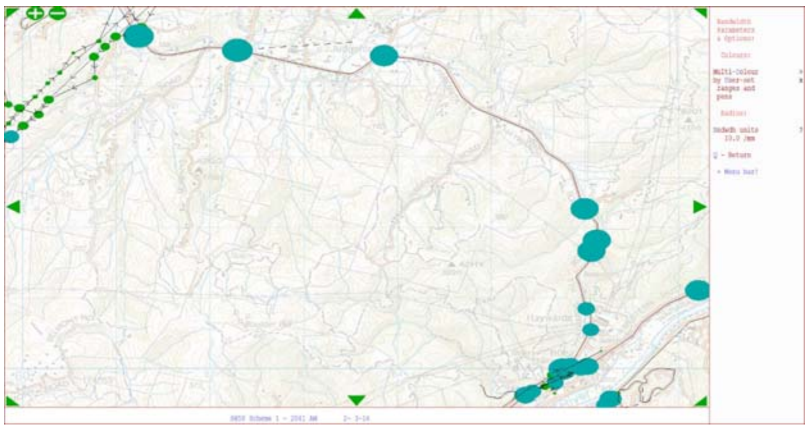


**2041 AM**

Base 1 (with P2G) – b1a

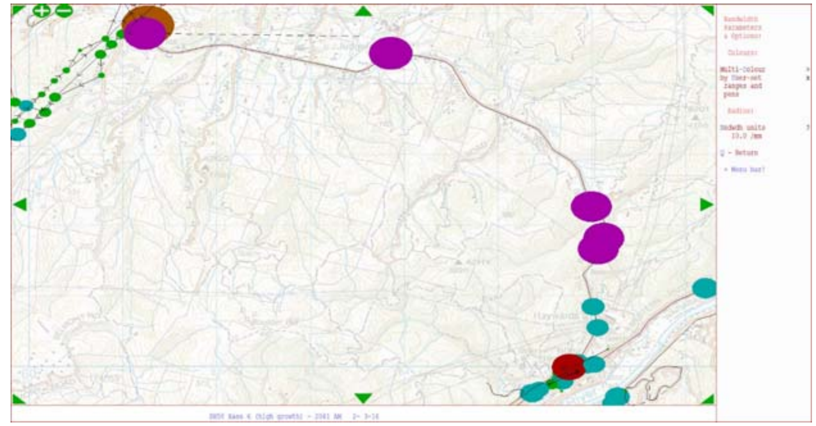


Scheme Base 1 (with P2G) – S1b (20sec RAB)

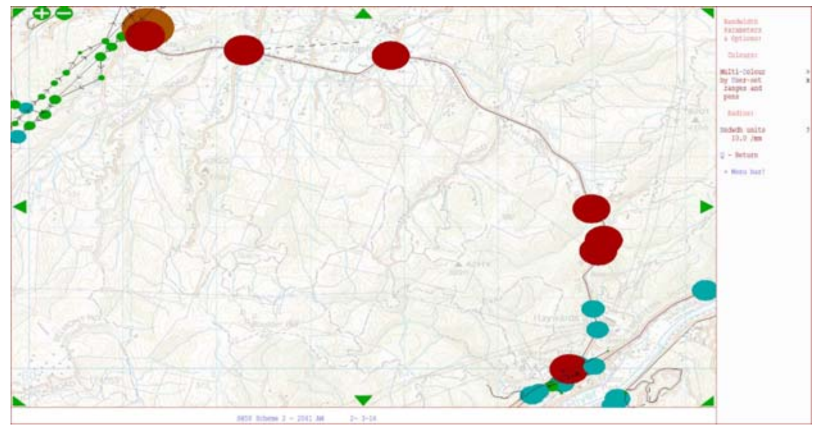


**2041 AM**

Base 6 (no P2G, high growth) B6a

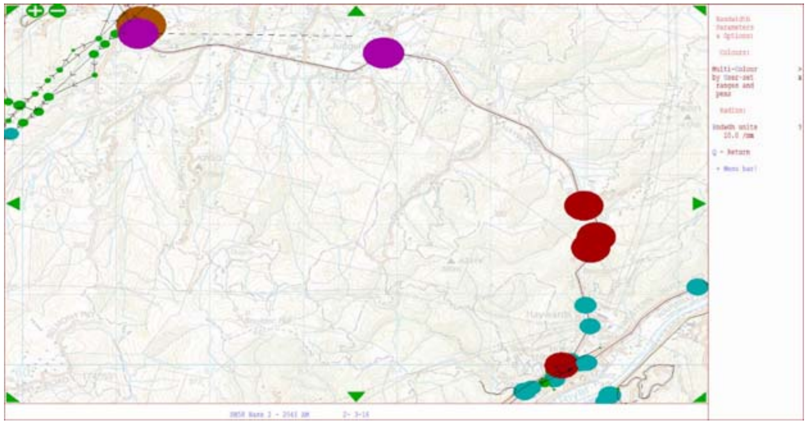


Scheme Base 6 (no P2G, high growth) – 20sec RAB (S2b)



**2041 AM**

Base 2 (no P2G) B2a



## C.2 Speed Limit Change

**SH58 - Crash Reduction due to reducing the posted speed limit from 100km/h to 80km/h**

**Based on the High Risk Rural Road Guide methodology (Figures D-1 and 2-3)**

| **Existing speeds** | | | **Source** |
|---|---|---|---|
| Existing posted speed limit | 100 | km/h | Existing PSL |
| Existing mean speed | 80 | km/h | TomTom 2013 data - note 2013 data was used as temporary speed limits were put in place due to the fatal crashes in 13/14. |
| Existing 85th %tile speed | 90 | km/h | |
| Proposed posted speed limit | 80 | km/h | Proposed Do-Minimum PSL |

| **% Change in mean speed** | | |
|---|---|---|
| Change in mean speed from 20km/h reduction in PSL | -2.50 % | using the equation from Figure D-1, HRRRG |
| Predicted option mean speed | 78 km/h | |

| **% Change in casualties (Figure 2-3) based on -2.50%** | Base | *Sensitivity (6.3% red = 75km/h)* |
|---|---|---|
| Deaths | **11%** | *25%* |
| Serious injuries | **8%** | *18%* |
| Minor injuries | **5%** | *9%* |

| **DSI/Crashes HRRRG ratio** | HRRRG Typical | SH58 % of Crashes (08'12) | **SH58 % of Crashes (10'14)** |
|---|---|---|---|
| Run off Road | 1.10 | 62% | **64%** |
| Head On | 1.6 | 8% | **11%** |
| Intersection | 1.3 | 11% | **10%** |
| Other (assumed as 1.1) | 1.1 | 19% | **14%** |
| **weighted factor** | **1.16** DSI per F&S crash | | |

| **% Change in crashes (using weighting factor of 1.16)** | Base | | *Sensitivity (75km/h)* |
|---|---|---|---|
| Deaths | **9.5%** | input in economics worksheets(s) | *21.5%* |
| Serious injuries | **6.9%** | input in economics worksheets(s) | *15.5%* |
| Minor injuries | **4.3%** | input in economics worksheets(s) | *7.7%* |
| Assume non-injuries reduction = minor injury red. | **4.3%** | input in economics worksheets(s) | *7.7%* |

**These reductions will apply to the 5 year crash history at 100 km/h.**

FIGURE D-1 Relationship between change in speed limit and change in mean speed [96]

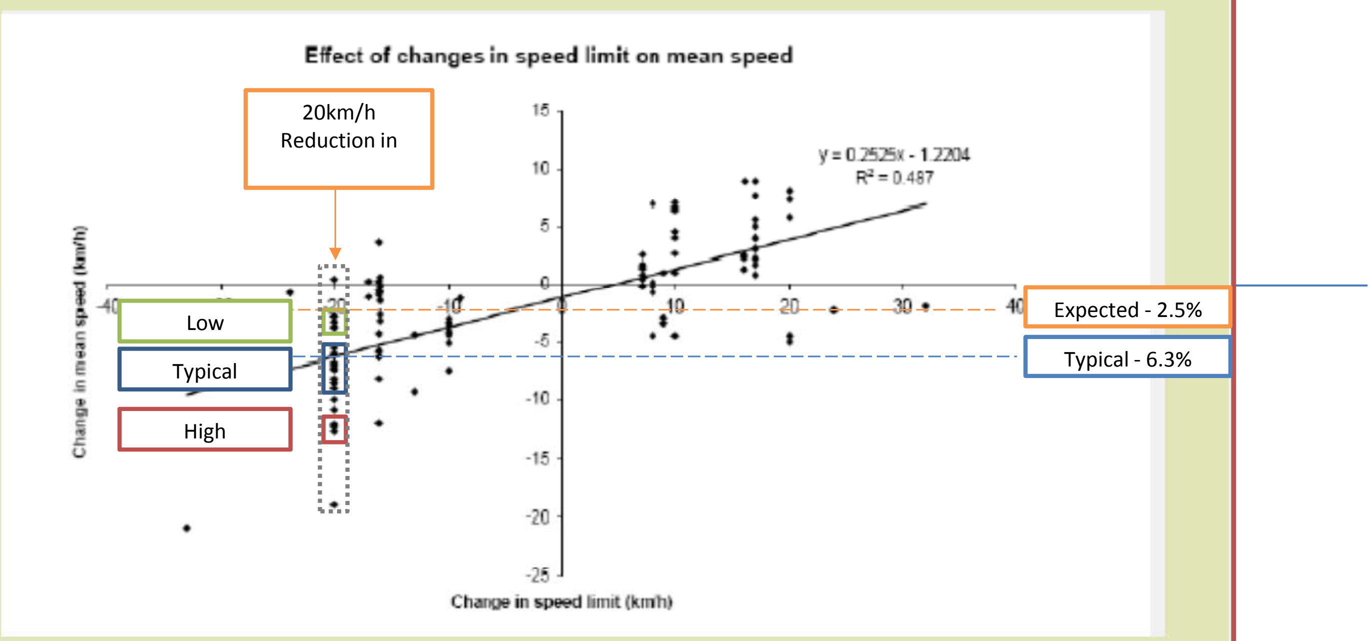
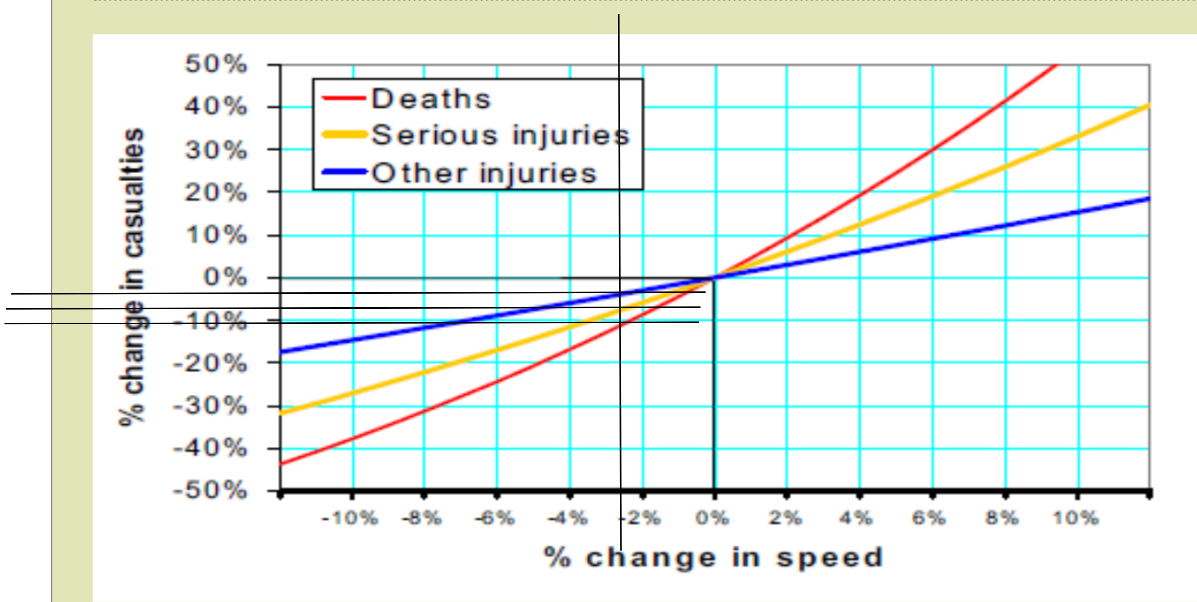



FIGURE 2-3 Relationship between change of mean speed and casualties on rural roads




Source [118 - figure 6]

Spreadsheet problems?

Email: eem@nzta.govt.nz

## SP3 General road improvements

Spreadsheet v3 (27-March-2014)

**Worksheet 1 - Evaluation summary**

Worksheet 1 provides a summary of the general data used for the evaluation as well as the results of the analysis.
The information required is a subset of the information entered into Transport Investment Online.

| | | |
|---|---|---|
| **1** | Evaluator(s) | Dhimantha Ranatunga (MWH) |
| | Reviewer(s) | Phil Peet (MWH) |
| **2** | Activity/package details | |
| | Approved organisation name | NZ Transport Agency |
| | Activity/package name | SH58 Safety Improvements: Phase 1 |
| | Your reference | 80501811/80508704 |
| | Activity description | Posted Speed Limit Reduction from 100km/h to 80km/h |
| | Describe the issues to be addressed | Reduce the severity and the number of crashes |
| **3** | Location | |
| | Brief description of location | SH58 Haywards Hill to Bradey Road (TG) (RP 0.5 to 9.3) |
| **4** | Alternatives and options | |
| | Describe the do-minimum | Retain existing 100km/h Posted Speed Limit |
| | Summarise the options assessed | Reduce Posted Speed Limit to 80km/h with associated signage |
| **5** | Timing | |
| | Time zero (assumed construction start date) | 1 July 2016 |
| | Expected duration of construction (months) | 1 |
| **6** | Economic efficiency | |
| | Date economic evaluation completed (mm/yyyy) | Jun-16 |
| | Base date for costs and benefits | 1 July 2015 |
| | AADT at time zero | 14,250 |
| | Traffic growth rate at time zero (%) | 1.5 |
| | Existing roughness IRI or NAASRA | Length of road before works 8.80 km |
| | Predicted roughness IRI or NAASRA | Length of road after works 8.80 km |
| | Existing traffic speed | 80 km/h |
| | Predicted traffic speed | 78 km/h |
| **7** | PV cost of do-minimum | $ 0 **A** |
| **8** | PV cost of the preferred option | $ 28,440 **B** |
| **9** | Benefit values from worksheet 4, 5, 6 | |

| | $ | | Update factor | | = $ | |
|---|---|---|---|---|---|---|
| PV travel time cost savings | $ | -5,969,602 | **C** x Update factor $^{TTC}$ | 1.44 | = $ -8,596,226 | **W** |
| PV VOC and $CO_2$ savings | $ | 1,666,251 | **D** x Update factor $^{VOC}$ | 1.00 | = $ 1,666,251 | **Y** |
| PV crash cost savings | $ | 7,438,146 | **E** x Update factor $^{AC}$ | 1.00 | = $ 7,438,146 | **Z** |

**10** $BCR_N = \dfrac{\text{PV net benefits}}{\text{PV net costs}} = \dfrac{\mathbf{W + Y + Z}}{\mathbf{B - A}} = \dfrac{508{,}170}{28{,}440} = 17.9$

**11** $FYRR = \dfrac{\text{PV 1}^{st}\text{ year benefits}}{\text{PV net costs}} = \dfrac{[(\mathbf{W} + \mathbf{Y}) / DF^{VOC} + (\mathbf{Z} / DF^{AC})] \times 0.94}{\mathbf{B - A}} = 276$ %

| | Option | PV Costs (**B**) |
|---|---|---|
| SP3-3 (1) | Speed Limit Reduction to | 28,440 |
| SP3-3 (2) | 0 | 0 |
| SP3-3 (3) | 0 | 0 |
| | **$79,793.05** | **$0.08** |

| | Annual Costs | | | 40 year Updated ($M) |
|---|---|---|---|---|
| | Not Updated | Updated | Annual Updated ($M) | |
| | -$341,082 | -$491,158 | -$0.49 | -$8,596,226 |
| | $91,542 | $91,542 | $0.09 | $1,666,251 |
| | $479,409 | $479,409 | $0.48 | $7,438,146 |
| **Net Total** | **$229,869** | **$79,793** | **$0.08** | **$508,170** |

Spreadsheet problems?

Email: eem@nzta.govt.nz

# SP3 General road improvements

Spreadsheet v3 (27-March-2014)

## Worksheet 1 - Evaluation summary

Worksheet 1 provides a summary of the general data used for the evaluation as well as the results of the analysis.
The information required is a subset of the information entered into Transport Investment Online.

**1** Evaluator(s): Dhimantha Ranatunga (MWH)

Reviewer(s): Phil Peet (MWH)

**2** Activity/package details

Approved organisation name: NZ Transport Agency

Activity/package name: SH58 Safety Improvements: Phase 1

Your reference: 80501811/80508704

Activity description: Posted Speed Limit Reduction from 100km/h to 80km/h

Describe the issues to be addressed: Reduce the severity and the number of crashes

**3** Location

Brief description of location: SH58 Haywards Hill to Bradey Road (TG) (RP 0.5 to 9.3)

**4** Alternatives and options

Describe the do-minimum: Retain existing 100km/h Posted Speed Limit

Summarise the options assessed: eReduce Posted Speed Limit to 80km/h with associated signage
(ASSUME 75km/h - SENSITIVITY ONLY)

**5** Timing

Time zero (assumed construction start date): 1 July 2016

Expected duration of construction (months): 1

**6** Economic efficiency

Date economic evaluation completed (mm/yyyy): Jun-16

Base date for costs and benefits: 1 July 2015

AADT at time zero: 14,250

Traffic growth rate at time zero (%): 1.5

| | | | | | |
|---|---|---|---|---|---|
| Existing roughness | IRI or NAASRA | | Length of road before works | 8.80 | km |
| Predicted roughness | IRI or NAASRA | | Length of road after works | 8.80 | km |
| Existing traffic speed | | 80 | km/h | | |
| Predicted traffic speed | | 75 | km/h | | |

**7** PV cost of do-minimum: $ 0 **A**

**8** PV cost of the preferred option: $ 28,440 **B**

**9** Benefit values from worksheet 4, 5, 6

| | | | | | |
|---|---|---|---|---|---|
| PV travel time cost savings | $ -15,520,964 | **C** x Update factor TTC | 1.44 | = $ -22,350,188 | **W** |
| PV VOC and $CO_2$ savings | $ 4,165,627 | **D** x Update factor VOC | 1.00 | = $ 4,165,627 | **Y** |
| PV crash cost savings | $ 16,287,248 | **E** x Update factor AC | 1.00 | = $ 16,287,248 | **Z** |

**10** $BCR_N = \frac{\text{PV net benefits}}{\text{PV net costs}} = \frac{\mathbf{W+Y+Z}}{\mathbf{B-A}} = \frac{-1,897,314}{28,440} = -66.7$

**11** $FYRR = \frac{\text{PV 1}^{st}\text{ year benefits}}{\text{PV net costs}} = \frac{[(\mathbf{W}+\mathbf{Y}) / DF^{VOC} + (\mathbf{Z} / DF^{AC})] \times 0.94}{\mathbf{B-A}} = 36$ %

| | Option | PV Costs (**B**) |
|---|---|---|
| SP3-3 (1) | Speed Limit Reduction to | 28,440 |
| SP3-3 (2) | 0 | 0 |
| SP3-3 (3) | 0 | 0 |
| | **$1,602.30** | **$0.00** |

| | Annual Costs | | | 40 year Updated ($M) |
|---|---|---|---|---|
| | Not Updated | Updated | Annual Updated ($M) | |
| | -$886,813 | -$1,277,011 | -$1.28 | -$22,350,188 |
| | $228,855 | $228,855 | $0.23 | $4,165,627 |
| | $1,049,758 | $1,049,758 | $1.05 | $16,287,248 |
| **Net Total** | **$391,800** | **$1,602** | **$0.00** | **-$1,897,314** |

## C.3 Costs

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves**
**Option 5 Region A**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | 18,400 | 2,800 | 4,600 |
| | **Investigation and Reporting** | | | |
| | - Consultancy Fees | Nil | Nil | Nil |
| | - NZTA-Managed Costs | Nil | Nil | Nil |
| B | **Total Investigation and Reporting** | Nil | Nil | Nil |
| | **Design and Project Documentation** | | | |
| | - Consultancy Fees | 113,341 | 17,000 | 28,300 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| C | **Total Design and Project Documentation** | 113,341 | 17,000 | 28,300 |
| | **Construction** | | | |
| | **MSQA** | | | |
| | - Consultancy Fees | 121,054 | 18,160 | 30,300 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| | - Consent Monitoring Fees | 0 | 0 | 0 |
| | **Sub Total Base MSQA** | 121,054 | 18,160 | 30,300 |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 156,000 | 23,400 | 39,000 |
| D2 | Earthworks | 631,225 | 189,400 | 315,600 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 24,200 | 3,600 | 6,100 |
| D5 | Pavement and Surfacing | 281,775 | 42,300 | 70,400 |
| D6 | Bridges / Structures | 0 | 0 | 0 |
| D7 | Retaining Walls | 45,000 | 6,800 | 11,300 |
| D8 | Traffic Services | 170,150 | 25,500 | 42,500 |
| D9 | Service Relocations | 80,500 | 12,100 | 20,100 |
| D10 | Landscaping | 135,700 | 20,400 | 33,900 |
| D11 | Traffic Management and Temporary Works | 350,000 | 52,500 | 87,500 |
| D12 | Preliminary and General | 268,000 | 40,200 | 67,000 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | 2,142,550 | 416,200 | 693,400 |
| D | **Total Construction & MSQA** | 2,263,604 | 434,360 | 723,700 |
| E | **Project Base Estimate** (A+B+C+D) | 2,395,345 | | |
| F | **Contingency** (Assessed / Analysed) (A+B+C+D) | | 454,160 | |
| G | **Project Expected Estimate** (E+F) | | 2,849,505 | |
| | Project Property Cost Expected Estimate | | 21,200 | |
| | Investigation and Reporting Expected Estimate | | Nil | |
| | Design and Project Documentation Expected Estimate | | 130,341 | |
| | Construction Expected Estimate | | 2,697,964 | |
| H | **Funding Risk** (Assessed / Analysed) (A+B+C+D) | | | 756,600 |
| I | **95$^{th}$ Percentile Project Estimate** (G+H) | | | 3,606,105 |
| | Project Property Cost 95th Percentile Estimate | | | 25,800 |
| | Investigation and Reporting 95th Percentile Estimate | | | Nil |
| | Design and Project Documentation 95th Percentile Estimate | | | 158,641 |
| | Construction 95th Percentile Estimate | | | 3,421,664 |

| | | |
|---|---|---|
| **Base Date of Estimate** | 8 Mar 2016 | **Cost Index** |
| **Estimate prepared by:** | Graeme Corin | **Signed** |
| **Estimate internal peer review by:** | Jamie Povall | **Signed** |
| **Estimate external peer review by:** | | **Signed** |
| **Estimate approved by NZTA Project Manager:** | | **Signed** |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves Option 5 Region B**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | 80,800 | 12,100 | 20,200 |
| | **Investigation and Reporting** | | | |
| | - Consultancy Fees | Nil | Nil | Nil |
| | - NZTA-Managed Costs | Nil | Nil | Nil |
| B | **Total Investigation and Reporting** | Nil | Nil | Nil |
| | **Design and Project Documentation** | | | |
| | - Consultancy Fees | 661,779 | 99,270 | 165,400 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| C | **Total Design and Project Documentation** | 661,779 | 99,270 | 165,400 |
| | **Construction** | | | |
| | **MSQA** | | | |
| | - Consultancy Fees | 706,815 | 106,020 | 176,700 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| | - Consent Monitoring Fees | 0 | 0 | 0 |
| | **Sub Total Base MSQA** | 706,815 | 106,020 | 176,700 |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 948,000 | 142,200 | 237,000 |
| D2 | Earthworks | 5,375,000 | 1,612,500 | 2,687,500 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 1,026,150 | 153,900 | 256,500 |
| D5 | Pavement and Surfacing | 1,529,850 | 229,500 | 382,500 |
| D6 | Bridges / Structures | 0 | 0 | 0 |
| D7 | Retaining Walls | 11,250 | 1,700 | 2,800 |
| D8 | Traffic Services | 819,500 | 122,900 | 204,900 |
| D9 | Service Relocations | 350,750 | 52,600 | 87,700 |
| D10 | Landscaping | 250,500 | 37,600 | 62,600 |
| D11 | Traffic Management and Temporary Works | 660,000 | 99,000 | 165,000 |
| D12 | Preliminary and General | 1,539,000 | 230,900 | 384,800 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | 12,510,000 | 2,682,800 | 4,471,300 |
| D | **Total Construction & MSQA** | 13,216,815 | 2,788,820 | 4,648,000 |
| E | **Project Base Estimate** (A+B+C+D) | 13,959,394 | | |
| F | **Contingency** (Assessed / Analysed) (A+B+C+D) | | 2,900,190 | |
| G | **Project Expected Estimate** (E+F) | | 16,859,584 | |
| | Project Property Cost Expected Estimate | | 92,900 | |
| | Investigation and Reporting Expected Estimate | | Nil | |
| | Design and Project Documentation Expected Estimate | | 761,049 | |
| | Construction Expected Estimate | | 16,005,635 | |
| H | **Funding Risk** (Assessed / Analysed) (A+B+C+D) | | | 4,833,600 |
| I | **95th Percentile Project Estimate** (G+H) | | | 21,693,184 |
| | Project Property Cost 95th Percentile Estimate | | | 113,100 |
| | Investigation and Reporting 95th Percentile Estimate | | | Nil |
| | Design and Project Documentation 95th Percentile Estimate | | | 926,449 |
| | Construction 95th Percentile Estimate | | | 20,653,635 |

| | | |
|---|---|---|
| **Base Date of Estimate** | 8 Mar 2016 | Cost Index |
| **Estimate prepared by:** | Graeme Corin | Signed |
| **Estimate internal peer review by:** | Jamie Povall | Signed |
| **Estimate external peer review by:** | | Signed |
| **Estimate approved by NZTA Project Manager:** | | Signed |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

**Region C - Scour Site**

Region C (SH58 Scour Site Realignment) has been constructed to practical completion. **The forecasted cost at completion is $2.7M**. As such no elemental breakdown of work items has been included for Region C

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves Option 5 Region D**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | **38,400** | **5,800** | **9,600** |
| | **Investigation and Reporting** | | | |
| | **- Consultancy Fees** | **Nil** | **Nil** | **Nil** |
| | **- NZTA-Managed Costs** | **Nil** | **Nil** | **Nil** |
| B | **Total Investigation and Reporting** | **Nil** | **Nil** | **Nil** |
| | **Design and Project Documentation** | | | |
| | **- Consultancy Fees** | **144,496** | **21,670** | **36,100** |
| | **- NZTA-Managed Costs** | **0** | **0** | **0** |
| C | **Total Design and Project Documentation** | **144,496** | **21,670** | **36,100** |
| | **Construction** | | | |
| | **MSQA** | | | |
| | **- Consultancy Fees** | **154,330** | **23,150** | **38,600** |
| | **- NZTA-Managed Costs** | **0** | **0** | **0** |
| | **- Consent Monitoring Fees** | **0** | **0** | **0** |
| | **Sub Total Base MSQA** | **154,330** | **23,150** | **38,600** |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 204,000 | 30,600 | 51,000 |
| D2 | Earthworks | 426,375 | 127,900 | 213,200 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 491,100 | 73,700 | 122,800 |
| D5 | Pavement and Surfacing | 474,850 | 71,200 | 118,700 |
| D6 | Bridges / Structures | 0 | 0 | 0 |
| D7 | Retaining Walls | 0 | 0 | 0 |
| D8 | Traffic Services | 227,550 | 34,100 | 56,900 |
| D9 | Service Relocations | 160,425 | 24,100 | 40,100 |
| D10 | Landscaping | 61,200 | 9,200 | 15,300 |
| D11 | Traffic Management and Temporary Works | 350,000 | 52,500 | 87,500 |
| D12 | Preliminary and General | 336,000 | 50,400 | 84,000 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | **2,731,500** | **473,700** | **789,500** |
| D | **Total Construction & MSQA** | **2,885,830** | **496,850** | **828,100** |
| E | **Project Base Estimate** (A+B+C+D) | **3,068,726** | | |
| F | **Contingency** (Assessed / Analysed) **(A+B+C+D)** | | **524,320** | |
| G | **Project Expected Estimate** **(E+F)** | | **3,593,046** | |
| | Project Property Cost Expected Estimate | | **44,200** | |
| | Investigation and Reporting Expected Estimate | | **Nil** | |
| | Design and Project Documentation Expected Estimate | | **166,166** | |
| | Construction Expected Estimate | | **3,382,680** | |
| H | **Funding Risk** (Assessed / Analysed) **(A+B+C+D)** | | | **873,800** |
| I | **95th Percentile Project Estimate** **(G+H)** | | | **4,466,846** |
| | Project Property Cost 95th Percentile Estimate | | | **53,800** |
| | Investigation and Reporting 95th Percentile Estimate | | | **Nil** |
| | Design and Project Documentation 95th Percentile Estimate | | | **202,266** |
| | Construction 95th Percentile Estimate | | | **4,210,780** |

| | | |
|---|---|---|
| **Base Date of Estimate** | **8 Mar 2016** | **Cost Index** |
| **Estimate prepared by:** | **Graeme Corin** | **Signed** |
| **Estimate internal peer review by:** | **Jamie Povall** | **Signed** |
| **Estimate external peer review by:** | | **Signed** |
| **Estimate approved by NZTA Project Manager:** | | **Signed** |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves**
**Option 5 Region E**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | **52,800** | **7,900** | **13,200** |
| | **Investigation and Reporting** | | | |
| | - Consultancy Fees | Nil | Nil | Nil |
| | - NZTA-Managed Costs | Nil | Nil | Nil |
| B | **Total Investigation and Reporting** | **Nil** | **Nil** | **Nil** |
| | **Design and Project Documentation** | | | |
| | - Consultancy Fees | 226,749 | 34,010 | 56,700 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| C | **Total Design and Project Documentation** | **226,749** | **34,010** | **56,700** |
| | **Construction** | | | |
| | **MSQA** | | | |
| | - Consultancy Fees | 242,179 | 36,330 | 60,500 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| | - Consent Monitoring Fees | 0 | 0 | 0 |
| | **Sub Total Base MSQA** | **242,179** | **36,330** | **60,500** |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 338,000 | 50,700 | 84,500 |
| D2 | Earthworks | 701,325 | 210,400 | 350,700 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 650,113 | 97,500 | 162,500 |
| D5 | Pavement and Surfacing | 861,025 | 129,200 | 215,300 |
| D6 | Bridges / Structures | 0 | 0 | 0 |
| D7 | Retaining Walls | 0 | 0 | 0 |
| D8 | Traffic Services | 348,500 | 52,300 | 87,100 |
| D9 | Service Relocations | 230,000 | 34,500 | 57,500 |
| D10 | Landscaping | 86,400 | 13,000 | 21,600 |
| D11 | Traffic Management and Temporary Works | 540,000 | 81,000 | 135,000 |
| D12 | Preliminary and General | 531,000 | 79,700 | 132,800 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | **4,286,363** | **748,300** | **1,247,000** |
| D | **Total Construction & MSQA** | **4,528,542** | **784,630** | **1,307,500** |
| E | **Project Base Estimate** (A+B+C+D) | **4,808,091** | | |
| F | **Contingency** (Assessed / Analysed) (A+B+C+D) | | **826,540** | |
| G | **Project Expected Estimate** (E+F) | | **5,634,631** | |
| | Project Property Cost Expected Estimate | | **60,700** | |
| | Investigation and Reporting Expected Estimate | | **Nil** | |
| | Design and Project Documentation Expected Estimate | | **260,759** | |
| | Construction Expected Estimate | | **5,313,172** | |
| H | **Funding Risk** (Assessed / Analysed) (A+B+C+D) | | | **1,377,400** |
| I | **95th Percentile Project Estimate** (G+H) | | | **7,012,031** |
| | Project Property Cost 95th Percentile Estimate | | | **73,900** |
| | Investigation and Reporting 95th Percentile Estimate | | | **Nil** |
| | Design and Project Documentation 95th Percentile Estimate | | | **317,459** |
| | Construction 95th Percentile Estimate | | | **6,620,672** |

| | | |
|---|---|---|
| **Base Date of Estimate** | **8 Mar 2016** | **Cost Index** |
| **Estimate prepared by:** | **Graeme Corin** | **Signed** |
| **Estimate internal peer review by:** | **Jamie Povall** | **Signed** |
| **Estimate external peer review by:** | | **Signed** |
| **Estimate approved by NZTA Project Manager:** | | **Signed** |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves**
**Option 5 Region F**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | **19,200** | **2,900** | **4,800** |
| | **Investigation and Reporting** | | | |
| | - Consultancy Fees | Nil | Nil | Nil |
| | - NZTA-Managed Costs | Nil | Nil | Nil |
| B | **Total Investigation and Reporting** | **Nil** | **Nil** | **Nil** |
| | **Design and Project Documentation** | | | |
| | - Consultancy Fees | 126,579 | 18,990 | 31,600 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| C | **Total Design and Project Documentation** | **126,579** | **18,990** | **31,600** |
| | **Construction** | | | |
| | **MSQA** | | | |
| | - Consultancy Fees | 135,193 | 20,280 | 33,800 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| | - Consent Monitoring Fees | 0 | 0 | 0 |
| | **Sub Total Base MSQA** | **135,193** | **20,280** | **33,800** |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 183,000 | 27,500 | 45,800 |
| D2 | Earthworks | 712,300 | 213,700 | 356,200 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 108,500 | 16,300 | 27,100 |
| D5 | Pavement and Surfacing | 359,990 | 54,000 | 90,000 |
| D6 | Bridges / Structures | 0 | 0 | 0 |
| D7 | Retaining Walls | 0 | 0 | 0 |
| D8 | Traffic Services | 193,000 | 29,000 | 48,300 |
| D9 | Service Relocations | 138,000 | 20,700 | 34,500 |
| D10 | Landscaping | 64,000 | 9,600 | 16,000 |
| D11 | Traffic Management and Temporary Works | 350,000 | 52,500 | 87,500 |
| D12 | Preliminary and General | 284,000 | 42,600 | 71,000 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | **2,392,790** | **465,900** | **776,400** |
| D | **Total Construction & MSQA** | **2,527,983** | **486,180** | **810,200** |
| E | **Project Base Estimate** (A+B+C+D) | **2,673,761** | | |
| F | **Contingency** (Assessed / Analysed) (A+B+C+D) | | **508,070** | |
| G | **Project Expected Estimate** (E+F) | | **3,181,831** | |
| | Project Property Cost Expected Estimate | | 22,100 | |
| | Investigation and Reporting Expected Estimate | | Nil | |
| | Design and Project Documentation Expected Estimate | | 145,569 | |
| | Construction Expected Estimate | | 3,014,163 | |
| H | **Funding Risk** (Assessed / Analysed) (A+B+C+D) | | | **846,600** |
| I | **95th Percentile Project Estimate** (G+H) | | | **4,028,431** |
| | Project Property Cost 95th Percentile Estimate | | | 26,900 |
| | Investigation and Reporting 95th Percentile Estimate | | | Nil |
| | Design and Project Documentation 95th Percentile Estimate | | | 177,169 |
| | Construction 95th Percentile Estimate | | | 3,824,363 |

| | | |
|---|---|---|
| **Base Date of Estimate** | **8 Mar 2016** | **Cost Index** |
| **Estimate prepared by:** | **Graeme Corin** | **Signed** |
| **Estimate internal peer review by:** | **Jamie Povall** | **Signed** |
| **Estimate external peer review by:** | | **Signed** |
| **Estimate approved by NZTA Project Manager:** | | **Signed** |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

# Project Estimate - Form C

**Project Name: SH58 Haywards Substation Curves Option 5 Region G**

SE

Scheme Estimate

| Item | Description | Base Estimate | Contingency | Funding Risk |
|---|---|---|---|---|
| A | **Nett Project Property Cost** | 108,000 | 16,200 | 27,000 |
| | **Investigation and Reporting** | | | |
| | - Consultancy Fees | Nil | Nil | Nil |
| | - NZTA-Managed Costs | Nil | Nil | Nil |
| B | **Total Investigation and Reporting** | Nil | Nil | Nil |
| | **Design and Project Documentation** | | | |
| | - Consultancy Fees | 513,265 | 76,990 | 128,300 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| C | **Total Design and Project Documentation** | 513,265 | 76,990 | 128,300 |
| | **Construction** | | | |
| | **MSQA** | | | |
| | - Consultancy Fees | 548,194 | 82,230 | 137,000 |
| | - NZTA-Managed Costs | 0 | 0 | 0 |
| | - Consent Monitoring Fees | 0 | 0 | 0 |
| | **Sub Total Base MSQA** | 548,194 | 82,230 | 137,000 |
| | **Physical Works** | | | |
| D1 | Environmental Compliance | 718,000 | 107,700 | 179,500 |
| D2 | Earthworks | 1,078,875 | 323,700 | 539,400 |
| D3 | Ground Improvements | 0 | 0 | 0 |
| D4 | Drainage | 1,350,400 | 202,600 | 337,600 |
| D5 | Pavement and Surfacing | 1,731,188 | 259,700 | 432,800 |
| D6 | Bridges / Structures | 1,320,000 | 660,000 | 330,000 |
| D7 | Retaining Walls | 0 | 0 | 0 |
| D8 | Traffic Services | 965,590 | 144,800 | 241,400 |
| D9 | Service Relocations | 460,000 | 69,000 | 115,000 |
| D10 | Landscaping | 218,500 | 32,800 | 54,600 |
| D11 | Traffic Management and Temporary Works | 700,000 | 105,000 | 175,000 |
| D12 | Preliminary and General | 1,160,000 | 174,000 | 290,000 |
| D13 | Extraordinary Construction Costs | 0 | 0 | 0 |
| | **Sub Total Base Physical Works** | 9,702,553 | 2,079,300 | 2,695,300 |
| D | **Total Construction & MSQA** | 10,250,747 | 2,161,530 | 2,832,300 |
| E | **Project Base Estimate** (A+B+C+D) | 10,872,012 | | |
| F | **Contingency** (Assessed / Analysed) (A+B+C+D) | | 2,254,720 | |
| G | **Project Expected Estimate** (E+F) | | 13,126,732 | |
| | Project Property Cost Expected Estimate | | 124,200 | |
| | Investigation and Reporting Expected Estimate | | Nil | |
| | Design and Project Documentation Expected Estimate | | 590,255 | |
| | Construction Expected Estimate | | 12,412,277 | |
| H | **Funding Risk** (Assessed / Analysed) (A+B+C+D) | | | 2,987,600 |
| I | **95th Percentile Project Estimate** (G+H) | | | 16,114,332 |
| | Project Property Cost 95th Percentile Estimate | | | 151,200 |
| | Investigation and Reporting 95th Percentile Estimate | | | Nil |
| | Design and Project Documentation 95th Percentile Estimate | | | 718,555 |
| | Construction 95th Percentile Estimate | | | 15,244,577 |

| | | |
|---|---|---|
| **Base Date of Estimate** | 8 Mar 2016 | Cost Index |
| **Estimate prepared by:** | Graeme Corin | Signed |
| **Estimate internal peer review by:** | Jamie Povall | Signed |
| **Estimate external peer review by:** | | Signed |
| **Estimate approved by NZTA Project Manager:** | | Signed |

Note: (1) These estimates are exclusive of escalation and GST.
(2) I&R Project Phase Estimates are set to Nil as these are now sunk costs.

## C.4 Economic Evaluation

MWH.

# SH58 Safety Improvements Economic Evaluation

## EVALUATION SUMMARY — WORKSHEET 1

**1 Evaluator(s)** Dhimantha Ranatunga
**Reviewer(s)** Phil Peet, David Wanty

**2 Project / Package Details**

| | |
|---|---|
| Approved Organisation Name | NZTA |
| Project / Package Name | SH58 Safety Improvements: SH2 to Lanes Flat |
| Your Reference | 80501811 |
| Project Description | Safety Improvements |
| Describe the problem to be addressed | Reduce high severity crashes |

**3 Location**
Brief description of location: State Highway 58, from Haywards Hill to Bradey Road RP0/0.5 to RP0/9.3

**4 Alternatives and Options**
Describe the Do Minimum: Continued Maintenance, Tranmission Gully and Petone to Grenada Constructed by 2021.
Summarise the options assessed: Option 5: Curve realignment of 5 sites, 1.5 full extent shoulder widening, central 2.0m median WRB , edge guardrail and ATP (including roundabouts at Moonshine Road and Flightys/Murphys intersection)

**5 Timing**

| | |
|---|---|
| Time Zero | 1 July 2016 |
| Expected duration of construction (years) | 3.00 |
| End construction | 31 December 2020 |

**6 Economic Efficiency**

| | | |
|---|---|---|
| Date economic evaluation completed (mm/yyyy) | Aug-13 | updated Feb 2014 following peer review |
| Base date for costs | 1 July 2016 | |
| AADT at Time Zero | 14,325 | |
| Traffic Growth Rate at Time Zero (%) | 0.5%-1.5% | Based on 2021/2031 Modelling outputs |

| | | | | | | |
|---|---|---|---|---|---|---|
| Existing Roughness | 3.10 | IRI or NAASRA | Existing Traffic Speed | 80-85 | km/hr | (surv) |
| Predicted Roughness | 3.10 | IRI or NAASRA | Predicted Traffic Speed | 80 | km/hr | |
| Length of curves Before Improvements | 1.49 | km | Posted Speed Limit | 80 | km/hr | DM/OPTION |
| Length of curves After Improvements | 1.46 | km | Road Type | Rural Strategic | | |
| | | | Gradient Before Improvements | 0- 7% | | |
| | | | Gradient After Improvements | 0- 7% | | |

**7 PV Cost of Do Minimum** — **Cost $** $1,320,440 **A**

**8 PV Cost of the Option** — **Cost $** $43,270,811 **B**

**9 Benefit values from Worksheet 4, 5 or 6**

| | | | | | | |
|---|---|---|---|---|---|---|
| PV Travel Time Cost savings: **$** | $85,899 | **C** | x Update Factor[TT] | 1.44 | = $ | $123,695 **W** |
| PV VOC & CO2 savings: **$** | -$3,194,450 | **D** | x Update Factor[VOC] | 1.07 | = $ | -$3,418,062 **Y** |
| PV Accident Cost savings: **$** | $45,579,539 | **E** | x Update Factor[AC] | 1.24 | = $ | $56,518,628 **Z** |

**10 B/C Ratio** = $\frac{W + Y + Z}{B - A}$ = $\frac{\text{BENEFITS}}{\text{COSTS}}$ = $\frac{123695 + -3418062 + 56518628}{43270811 - 1320440}$ = **1.3**

## SH58 Safety Improvements Economic Evaluation

## Benefit Cost Analysis of the Option

1

| Project Options | Do Min | Option 5 | | Option 5 |
|---|---|---|---|---|
| ***Costs*** | | | | ***Net Costs of the Option*** |
| Capital Costs | 0 | 40,304,246 | | 40,304,246 |
| Maintenance Costs | 1,320,440 | 2,966,565 | | 1,646,125 |
| Total Costs | | | | **41,950,371** |
| ***Benefits*** | | | | ***Net Benefits of the Option*** |
| Travel Time Costs | 133,090,992 | 132,967,297 | | $123,695 |
| Vehicle Operating Costs | 152,628,026 | 155,923,350 | | -$3,295,324 |
| Carbon Dioxide | 6,022,038 | 6,144,775 | | -$122,737 |
| Crash Costs | 108,502,669 | 51,984,040 | | $56,518,628 |
| Tangible Benefits | | | | **$53,224,262** |
| **B/C Ratio** | | | | **1.3** |

ACTIVE variable from input sheet

| | | | |
|---|---|---|---|
| | ***Scenario*** | ***3 (Do Min)*** | ***0.5% to 2021, TG+P2G in 2021 step change in volume, 1.3% Growth from 2021, 2031-> 0.1%*** |
| | Option Speed | 80 | |
| 1 | Crash Sensitivity | 67% | |
| | Analysis period | 40 | |

**SH58 Safety Improvements Economic Evaluation**
**Capital Costs**

| **Option 4** | Curve realignment, shoulder widening and wire rope median barrier | |
|---|---|---|
| ***Component*** | ***Comment*** | |
| ***A*** | ***Project Property Costs*** | ***389,000*** |
| ***B*** | ***Investigation and Reporting (sunk cost)*** | ***0*** |
| ***C*** | ***Design and Project Documentation*** | ***2,177,000*** |
| ***D*** | ***Construction & MSQA*** | ***45,379,000*** |
| | | |
| ***Total*** | ***SH58 Safety Improvements: SH2 to Lanes Flat*** | ***47,945,000*** |

# Appendix D MCA

## Option 1: 1.5m sealed shoulders and 4 realignment sites

This option widens the sealed shoulders on each side and realigns four horizontal curves. No median barrier is proposed.

### Table D-1: Summary for Option 1

| Criteria Summary | Rating |
|---|---|
| **Enhanced Safety**<br>Safety is improved with wider shoulders, realignments and edge barriers | +1 |
| **Maintain or improve journey times & reliability**<br>No journey time or reliability benefits are likely to be achieved. Roundabout considered to have minimal negative impact on individual vehicles. | - |
| **Enhanced resilience**<br>Realignment of Site 1 offers resilience benefits and no median barrier provides greater flexibility in keeping traffic moving after an earthquake or landslide. | +2 |
| **Balance the needs of local & state highway traffic**<br>No median barrier ensures more convenient local access but doesn't not provide a high standard solution for regional traffic. | +1 |
| **Cost effective roading solution**<br>Based on the BCR calculations, option achieves a reasonable level of cost effectiveness. | +2 |
| **Consistency with ONRC Regional Highway standard**<br>Improved level of consistency with the ONRC levels of service. | +1 |
| **Total Score** | **7** |

## Option 2: 1.5m sealed shoulders, 2m flush median and 4 realignment sites

This option widens the sealed shoulders on each side and realigns four horizontal curves. No median barrier is proposed but a 2m flush median is provided.

### Table D-2: Summary for Option 2

| Criteria Summary | Rating |
|---|---|
| **Enhanced Safety**<br>Safety is improved with wider shoulders, flush median realignments and edge barriers | +1 |
| **Maintain or improve journey times & reliability**<br>No journey time or reliability benefits are likely to be achieved. Roundabout considered to have minimal negative impact on individual vehicles. | - |
| **Enhanced resilience**<br>Realignment of Site 1 offers resilience benefits and no median barrier provides greater flexibility in keeping traffic moving after an earthquake or landslide. | +2 |
| **Balance the needs of local & state highway traffic**<br>No median barrier ensures more convenient local access but doesn't not provide a high standard solution for regional traffic | +1 |

| | |
|---|---|
| **Cost effective roading solution**<br>Based on the BCR calculations, option achieves a reasonable level of cost effectiveness. | +2 |
| **Consistency with ONRC Regional Highway standard**<br>Improved level of consistency with the ONRC levels of service. | +1 |
| **Total Score** | **7** |

## Option 3: 1.5m sealed shoulders, 2m flush median with median barrier and 4 realignment sites

This option widens the sealed shoulders on each side and realigns four horizontal curves. A 2m median is proposed including median barrier.

**Table D-3: Summary for Option 3**

| Criteria Summary | Rating |
|---|---|
| **Enhanced Safety**<br>Safety is improved considerably with the addition of the median barrier, in addition to the other measures from Options 1 and Option 2. | +2 |
| **Maintain or improve journey times & reliability**<br>Reliability expected to be improved as delays and closures from major crashes reduced due to median barrier in conjunction with curve realignments. Roundabout considered to have minimal negative impact on individual vehicles. | +1 |
| **Enhanced resilience**<br>Realignment of Site 1 offers resilience benefits but median barrier could restrict traffic flow following an earthquake or landslide. | +1 |
| **Balance the needs of local & state highway traffic**<br>Median barrier creates inconvenience for local users but delivers a higher standard for regional traffic. | +1 |
| **Cost effective roading solution**<br>Based on the BCR calculations, option achieves a reasonable level of cost effectiveness. | +2 |
| **Consistency with ONRC Regional Highway standard**<br>Good level of consistency with the ONRC levels of service. | +1 |
| **Total Score** | **8** |

## Option 4: 1.5m sealed shoulders, 2m flush median with median barrier and 3 realignment sites, 80km/h do-min speed

This option widens the sealed shoulders on each side and realigns three horizontal curves. Site 1 Realignment has been removed from the project. A 2m median is proposed including median barrier. The do-minimum and option speed for the project is set to 80km/h.

**Table D-4: Summary for Option 4**

| Criteria Summary | Rating |
|---|---|

| | |
|---|---|
| **Enhanced Safety**<br>Safety is improved considerably with the addition of the median barrier, in addition to the other measures from Options 1 and Option 2. Safety is still considered high despite the removal of Realignment Site 1. | +2 |
| **Maintain or improve journey times & reliability**<br>Reliability expected to be improved as delays and closures from major crashes reduced due to median barrier in conjunction with curve realignments. Roundabout considered to have minimal negative impact on individual vehicles. | +1 |
| **Enhanced resilience**<br>No realignment of Site 1 removes the opportunity to improve resilience here and median barrier could restrict traffic flow following an earthquake or landslide. | - |
| **Balance the needs of local & state highway traffic**<br>Median barrier creates inconvenience for local users but delivers a higher standard for regional traffic. | +1 |
| **Cost effective roading solution**<br>Based on the BCR calculations, option achieves a reasonable level of cost effectiveness. | +2 |
| **Consistency with ONRC Regional Highway standard**<br>Good level of consistency with the ONRC levels of service. | +1 |
| **Total Score** | **7** |

## Option 5: 1.5m sealed shoulders, 2m flush median with median barrier and 5 realignment sites, 80km/h do-min speed, bridge improvements and an additional roundabout

This option widens the sealed shoulders on each side and realigns five horizontal curves. Site 1 Realignment has been re-introduced to the project, and a further realignment site has been added. A 2m median is proposed including median barrier. The do-minimum and option speed for the project is set to 80km/h. Bridge improvements are proposed in a number of locations and an additional roundabout is proposed at the intersection of Murphys Road/Flightys Road with SH58.

### Table D-5: Summary for Option 5

| Criteria Summary | Rating |
|---|---|
| **Enhanced Safety**<br>Safety benefits are considered greatest in this option with 5 realignment sites, in addition to other measures being proposed. | +2 |
| **Maintain or improve journey times & reliability**<br>Reliability expected to be improved as delays and closures from major crashes reduced due to median barrier in conjunction with curve realignments. Roundabouts considered to have minimal negative impact on individual vehicles. | +1 |
| **Enhanced resilience**<br>Realignment of Site 1 offers resilience benefits but median barrier could restrict traffic flow following an earthquake or landslide. | +1 |
| **Balance the needs of local & state highway traffic**<br>Median barrier creates inconvenience for local users but this is reduced with an additional roundabout provided at Flightys / Murphys Road. Median barrier delivers a higher standard for regional traffic. | +2 |

| | |
|---|---|
| **Cost effective roading solution**<br>Based on the BCR calculations, option achieves a lesser level of cost effectiveness. | +1 |
| **Consistency with ONRC Regional Highway standard**<br>Excellent level of consistency with the ONRC levels of service. Consistent curve radii and speeds throughout. | +2 |
| **Total Score** | **9** |

# Appendix E Staging Assessment

## Staging: Safety Programme

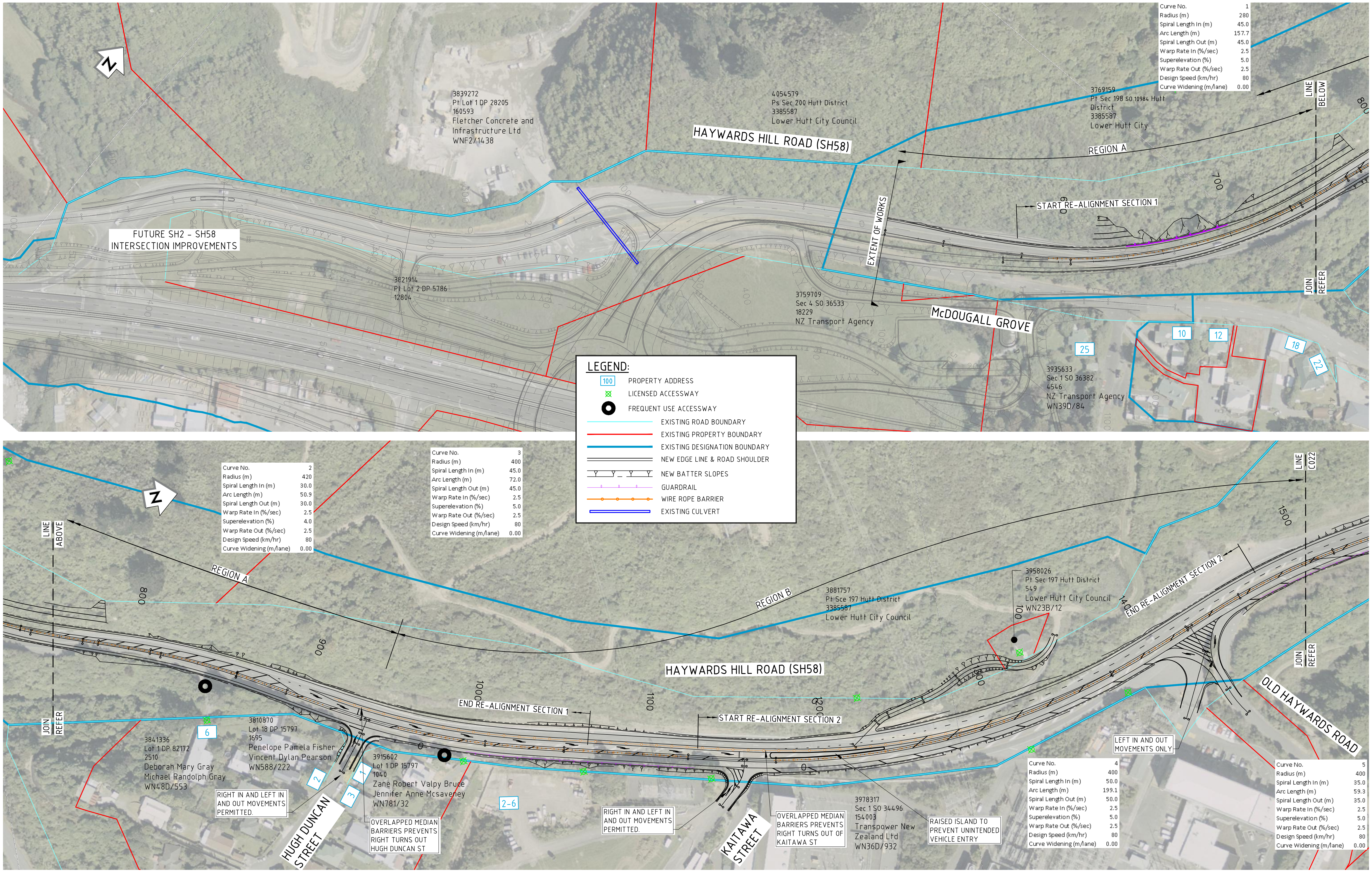
| | Regions | Works Description & Staging Justification | Risks | Expected Cost | Indicative BCR |
|---|---|---|---|---|---|
| Stage Zero | • Scour Site Realignment (C) 12.5 injury crashes per Km | • Realignment of scour site section between Mount Cecil Road and scour site at RP, due to high density of crashes at this location plus need to mitigate undermining of road from stream | • Large amount of corridor benefits are realised in short section of works, reducing economic efficiency of wider corridor<br>• Crash migration | $2.7M | 8.6 |
| Stage 1 | • East of Hugh Duncan Street to SH2/58 extent (A) 20.0<br>• Moonshine Roundabout (F) 0.5 | • Short section of improvement but very high cost due to significant cuts for realignment. Works to connect into 2/58 interchange works. This section is very high cost but extremely high injury crash proliferation here. Addressed early due to higher standard improvements from 2/58 leading immediately into very poor alignment with extremely high injury crash rate.<br>• The roundabout at Moonshine is provided in Stage 1 to cater for some turning movements in later stages. This also recognises the need for the roundabout early should the Winstones cleanfill site proposals eventuate. | • Major delays to customers in close proximity to the 2/58 works that will have already caused traveller disruption.<br>• All service relocations / protections undertaken but then parts of scheme may be omitted from project in future (for reasons unknown at this stage) meaning unnecessary cost outlay | $6.0M | 2.5 |
| Stage 2 | • West of Scour Site to Harris (D) 7.8<br>• TG to Moonshine Road (G) 3.5 | • West of scour site to Harris Road completed in Stage 2 due to large number of injury crashes on this section, providing a completed length from west of Hugh Duncan Street to Harris Road. Informal turnarounds will take place at Harris and Mount Cecil intersections (despite challenging grades), with formal facilities at Moonshine Road and 2/58.<br>• TG extent (or Pauatahanui Roundabout if TG interchange not complete) also undertaken due to high injury crash numbers. This section includes a new roundabout at Flightys/Murphys. Turning is well catered for with this new roundabout, plus Moonshine and TG at either end of this section. | • Major delays to customers<br>• Crash migration<br>• Unsafe turning manoeuvres at intersections when not suitable to do so (such as with large vehicles), or U-turning around barrier itself on SH58 which is even less desirable | $16.7M | 0.0 |
| Stage 3 | • West of Hugh Duncan to Mount Cecil (B) 3.5<br>• West of Harris to Moonshine Roundabout (E) 3.1 | • The section west of Hugh Duncan to Mount Cecil Road is targeted last despite the high number of loss of control crashes, as the injury crash rate per Km is low. This section is very high cost due to the three realignment sections with large scale earthworks. Median barrier provision along this section has little to no effect on access as Hugh Duncan Street and Mount Cecil Road are fully accessible and right turns in to Transpower are accommodated, with right turns out using 2/58 interchange.<br>• Remaining 1.3km length between Harris and Moonshine to be undertaken as final stage due to low numbers of injury crashes. | • Major delays to customers<br>• Crash migration to these two untreated sections is a probable outcome and will need to be proactively addressed. | $22.5M | 0.9 |

<table>
<tr><th colspan="6">Staging: Economic Efficiency Programme</th></tr>
<tr><th></th><th>Regions</th><th>Works Description & Staging Justification</th><th>Risks</th><th>Expected Cost</th><th>Indicative BCR</th></tr>
<tr><td>Stage Zero</td><td>• Scour Site Realignment (C)</td><td>• Realignment of scour site section between Mount Cecil Road and scour site at RP, due to high density of high severity crashes at this location plus need to mitigate undermining of road from stream</td><td>• None – project complete</td><td>$2.7M</td><td>8.6</td></tr>
<tr><td>Stage 1</td><td>• Moonshine Roundabout (F)<br>• East of Hugh Duncan Street to SH2/58 extent (A)</td><td>• Moonshine Roundabout required to facilitate turning movements for future stages so undertaken early.<br>• For F, roundabout creates major delays to state highway traffic so large travel time cost disbenefits, and VOC disbenefits also.<br>• For F, significant crash benefits are achieved on this section with new roundabout and mid block improvements (section length is 500m)<br>• East of Hugh Duncan is high cost but delivers significant crash cost benefits as well as travel time benefits through the curve. Only minimal VOC disbenefits from speed increases</td><td rowspan="4">This approach is purely theoretical and based on indicative BCRs for each region & stage. This should not be considered a viable staging strategy in isolation</td><td>$6.0M</td><td>2.5</td></tr>
<tr><td>Stage 2</td><td>• West of Hugh Duncan to Mount Cecil (B)</td><td>• Very high cost section due to multiple high cost realignments and large earthworks. Benefits are derived through significant travel time savings and crash cost savings, but some disbenefits from wire rope barrier (inconvenience for turning in terms of TTC and VOC)</td><td>$16.9M</td><td>1.2</td></tr>
<tr><td>Stage 3</td><td>• West of Scour Site to Harris (D)</td><td>• No realignment result sin no travel time savings and median barrier has some travel time and VOC disbenefits<br>• Benefits are all derived from mid block crash cost savings</td><td>$3.6M</td><td>1.1</td></tr>
<tr><td>Stage 4</td><td>• West of Harris to Moonshine Roundabout (E)<br>• TG to Moonshine Road (G)</td><td>• For E, median barrier creates some disbenefits for both travel time and VOC. Some minor mid-block crash savings are offset the costs and so E is marginally into a non-negative BCR.<br>• For G, major travel time costs result, due to the presence of the new roundabout at Flightys/Murphys. The roundabout also creates large VOC disbenefits (due to decelerating / accelerating)<br>• For G, this is a long section and so median barrier also results in travel time and VOC disbenefits due to detours for access.<br>• Benefits of G are all gained through crash cost savings.<br>• Overall, total section costs for E and G significantly outweigh the predicted benefits</td><td>$18.8M</td><td>-0.2</td></tr>
</table>

## Staging: Community Acceptability Programme

| | Regions | Works Description & Staging Justification | Risks | Expected Cost | Indicative BCR |
|---|---|---|---|---|---|
| Stage Zero | • Scour Site Realignment | • Realignment of scour site section between Mount Cecil Road and scour site at RP, due to high profile high severity crashes at this location (so public acceptance of need) and limited direct impact on one adjacent landowner, and limited effect on turning provisions to private accessways. | • Works now complete so limited risks to public acceptability<br>• Crash migration | $2.7M | 8.6 |
| Stage 1 | • Moonshine Roundabout (F)<br>• West of Scour Site to Harris (D)<br>• Service relocations and protections | • Moonshine intersection upgraded to roundabout to facilitate turnarounds (from both the Stage 1 works and also for following stages). Moonshine intersection has also been subject to serious injury crashes and does not limit turning arrangements into properties.<br>• West of scour site to Harris undertaken early in programme given short length of works and limited number of dwellings affected by land purchase and private accessway turning restrictions (due to presence of median barrier). Section length of 1.8km between median barrier breaks. Right turns into and out of property will not be available and expected that smaller vehicles will use break in barrier at Harris and Mount Cecil to turn, with larger vehicles using Moonshine Roundabout and 2/58 as suitable facilities.<br>• Service relocations and protections could be undertaken stage-by-stage or for the entire corridor during Stage 1 and this will need to be reviewed during detailed design to determine the best approach (in terms of minimising disruption and maximising cost effectiveness). | • Risk that with median barrier installed between Mount Cecil Road and Harris Road, larger vehicles choose to turn at the end of the median barrier where it is unlikely to be suitable to do so (instead of using 2/58 or Moonshine Roundabout<br>• Crash migration<br>• Major disruption to entire corridor if services relocation / protections are undertaking for the entire corridor length during Stage 1 | $6.8M | 1.0 |
| Stage 2 | • TG to Moonshine Road (G) | • Longer section length of 2.6km and multiple properties and side roads affected – however turnaround facilities at roundabouts are provided very regularly (at Pauatahanui as part of TG, at Flightys/Murphys) and at Moonshine Road<br>• Limited land acquisition required, and scale of earthworks is not significant. No realignment should ensure programme for implementation is not prolonged | • Despite reasonable turning facilities being available with the 3 roundabout facilities, potential for major public and median dissatisfaction due to median barrier inconvenience along this section. Many residents and businesses effected – including numerous businesses with heavy plant.<br>• Longer section length means duration of effect is prolonged for residents and businesses on this section, as well as other customers | $13.1M | -0.3 |
| Stage 3 | • West of Hugh Duncan to Mount Cecil (B) | • Limited access implications as very few access demands along this section of highway. Right turns into Transpower are still permitted., with only right turns out restricted (which is already encouraged by Transpower), with turning advised to be undertaken using 2/58 interchange.<br>• Significant physical works required due to major sections of realignment which will impede customers using SH58 for a prolonged period – works duration expected to be longest phase and greatest disruption to customers. | • Most challenging section of route in terms of physical works and maintaining traffic flow. Expected to require significant night working due to the level of disruption to traffic.<br>• Also major visual and environmental challenges with undertaking this section of works which may further complicate. | $16.9M | 1.2 |
| Stage 4 | • East of Hugh Duncan Street to SH2/58 extent (A)<br>• West of Harris to Moonshine Roundabout (E) | • East of Hugh Duncan Street has very little effect on property access as no accessways situated along this length. However scale of cut is significant with this section having potential to create considerable delays for customers using SH58, and also impact the operation of the SH2/58 interchange.<br>• West of Harris Road to Moonshine Road Roundabout serves a fairly large number of properties on a small section length that will be inconvenienced by the median barrier. This section is likely to prove very unpopular with residents not least because the crashes along this section length are low in comparison to the rest of the project length and residents may question the need given the commensurate level of inconvenience it will create for their travel. | • Levels of customer satisfaction and frustration will already be heightened following the Stage 3 works west of Hugh Duncan Street. Additional and intrusive works here with extensive temporary traffic management in place will exacerbate any tensions. | $8.5M | 1.4 |

# Appendix F Scheme Drawings

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| SURVEYED | | |
| DESIGNED | Graeme Corin | 03/16 |
| DRAWN | PJ Cook | 03/16 |
| CAD REVIEW | | |
| DESIGN CHECK | | |
| DESIGN REVIEW | | |
| APPROVED | | |
| PROF REGISTRATION: | | |

NOT APPROVED

MWH

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

CONCEPT PLAN - REGION A & B
OPTION 5

Status Stamp: WORKING PLOT
Date Stamp
Scales 1 : 1000
Drawing No. 80501811-01-005-C021
Rev. B



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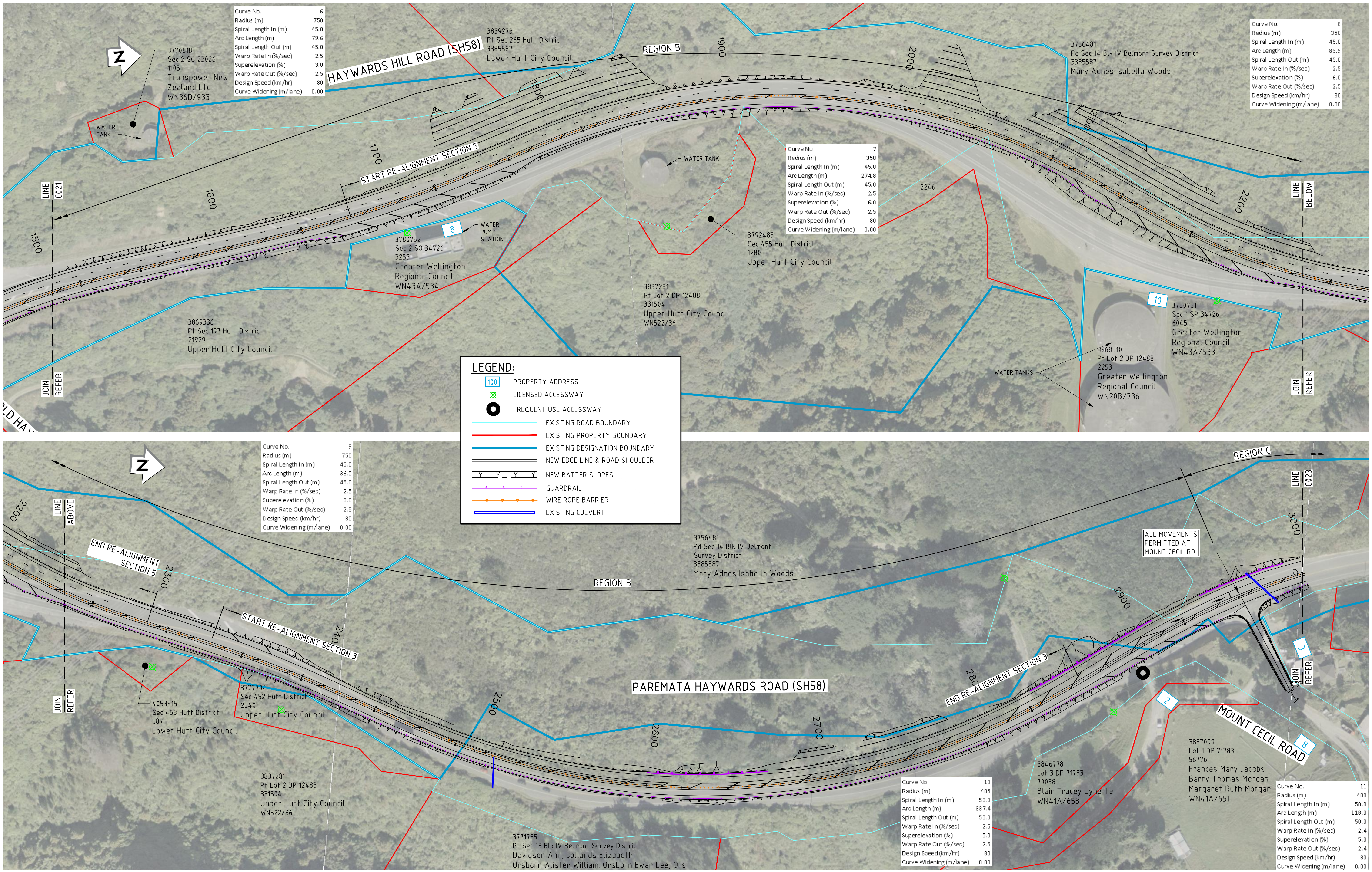


DO NOT SCALE - IF IN DOUBT, ASK

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| DESIGNED | Graeme Corin | 03/16 |
| DRAWN | PJ Cook | 03/16 |
| CAD REVIEW | | |
| DESIGN CHECK | | |
| DESIGN REVIEW | | |
| APPROVED | NOT APPROVED | |
| PROF REGISTRATION: | | |

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

CONCEPT PLAN - REGION B & C
OPTION 5

Status Stamp: **DRAFT FOR CLIENT**

Date Stamp: **2016-06-09**

Scales: 1 : 1000

Drawing No. 80501811-01-005-C022

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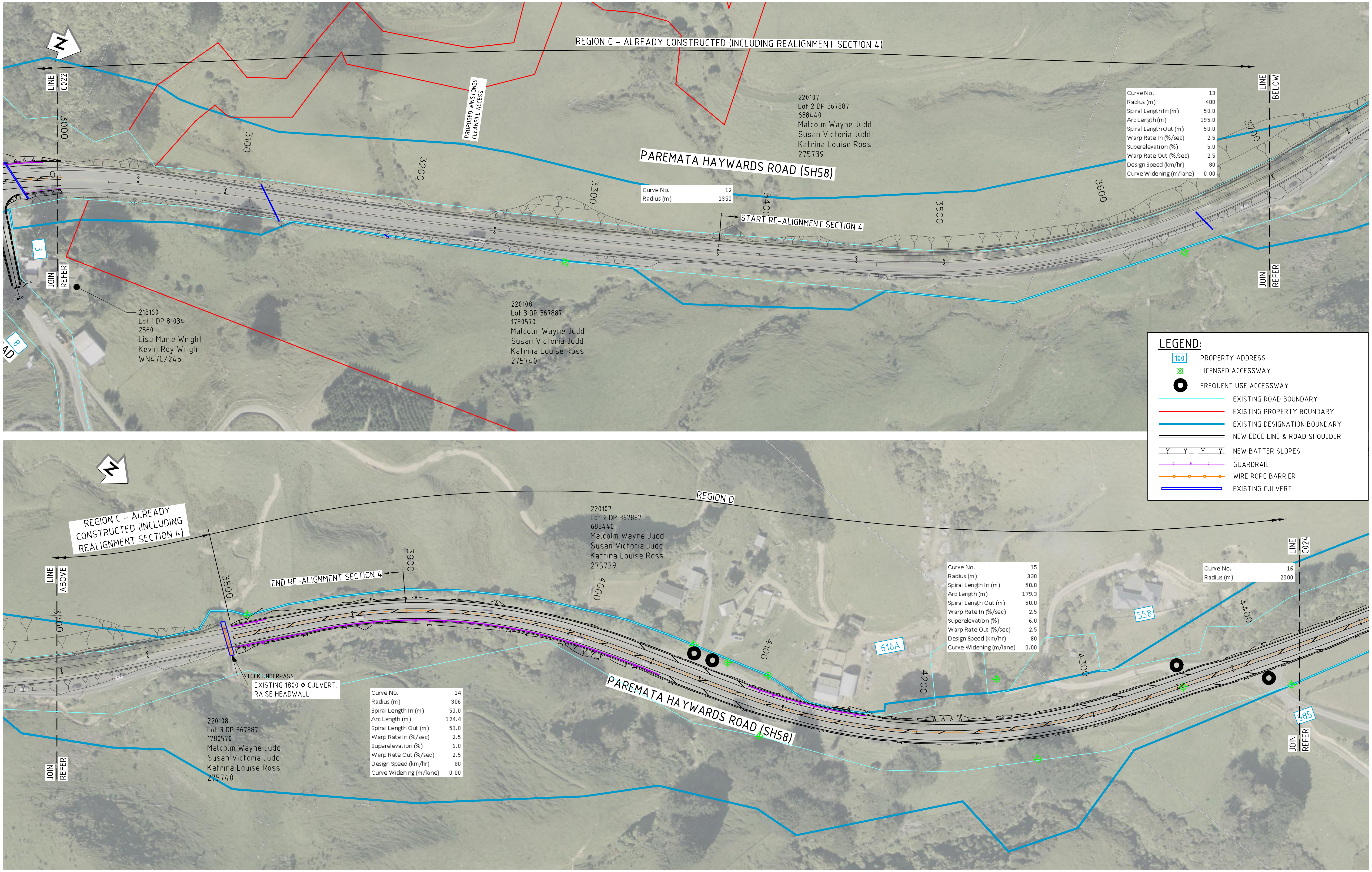


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| | | | | | | DRAWN | PJ Cook | 03/16 | |
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| | | | | | | DESIGN CHECK | | | |
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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

CONCEPT PLAN - REGION C & D
OPTION 5

Status Stamp: DRAFT FOR CLIENT
Date Stamp: 2016-06-09
Scales: 1 : 1000
Drawing No.: 80501811-01-005-C023
Rev.: A

ORIGINAL SIZE A1

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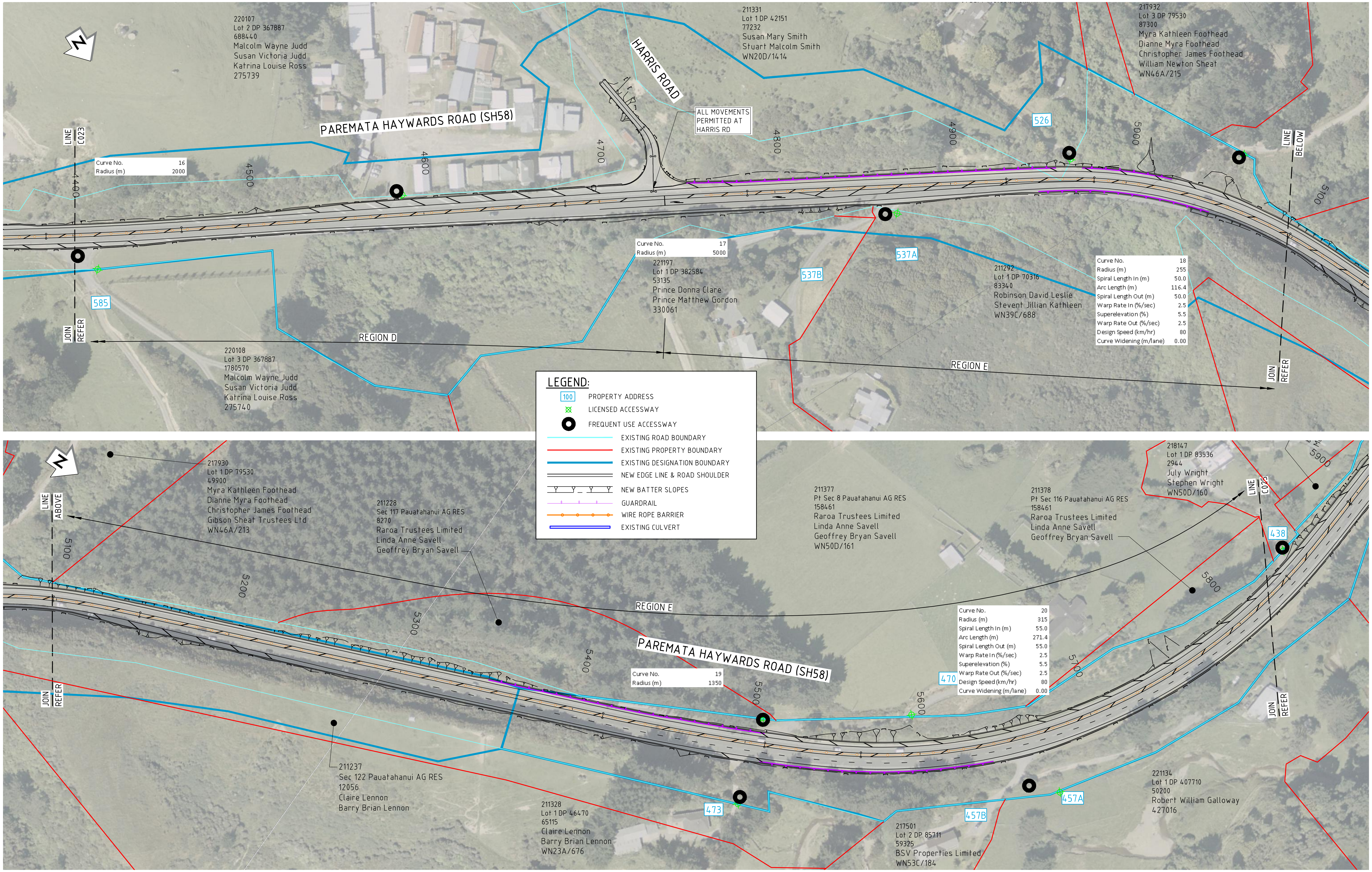


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| SURVEYED | | |
| DESIGNED | Graeme Corin | 03/16 |
| DRAWN | PJ Cook | 03/16 |
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| DESIGN CHECK | | |
| DESIGN REVIEW | | |
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| PROF REGISTRATION: | | |

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NZ TRANSPORT AGENCY
WAKA KOTAHI

# SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

## CONCEPT PLAN - REGION D & E
OPTION 5

Status Stamp: **DRAFT FOR CLIENT**

Date Stamp: **2016-06-09**

Scales: 1 : 1000

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Rev.: A



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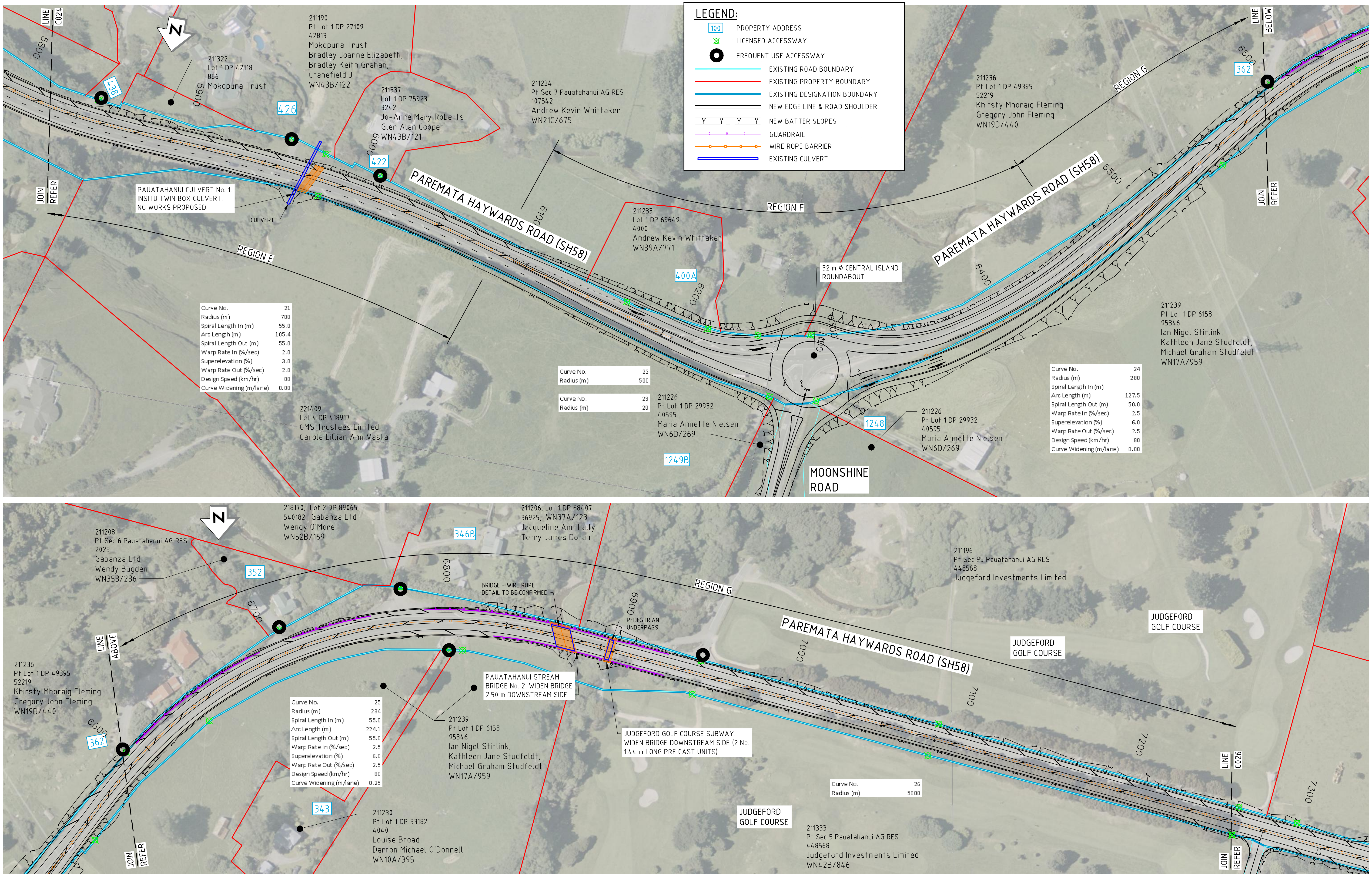


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| SURVEYED | | |
| DESIGNED | Graeme Corin | 03/16 |
| DRAWN | PJ Cook | 03/16 |
| CAD REVIEW | | |
| DESIGN CHECK | | |
| DESIGN REVIEW | | |
| APPROVED | | |
| PROF REGISTRATION: | | |

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MWH

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

# SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

## CONCEPT PLAN - REGION E, F & G
OPTION 5

Status Stamp: **DRAFT FOR CLIENT**

Date Stamp: **2016-06-09**

Scales: 1 : 1000

Drawing No.: 80501811-01-005-C025

Rev.: A



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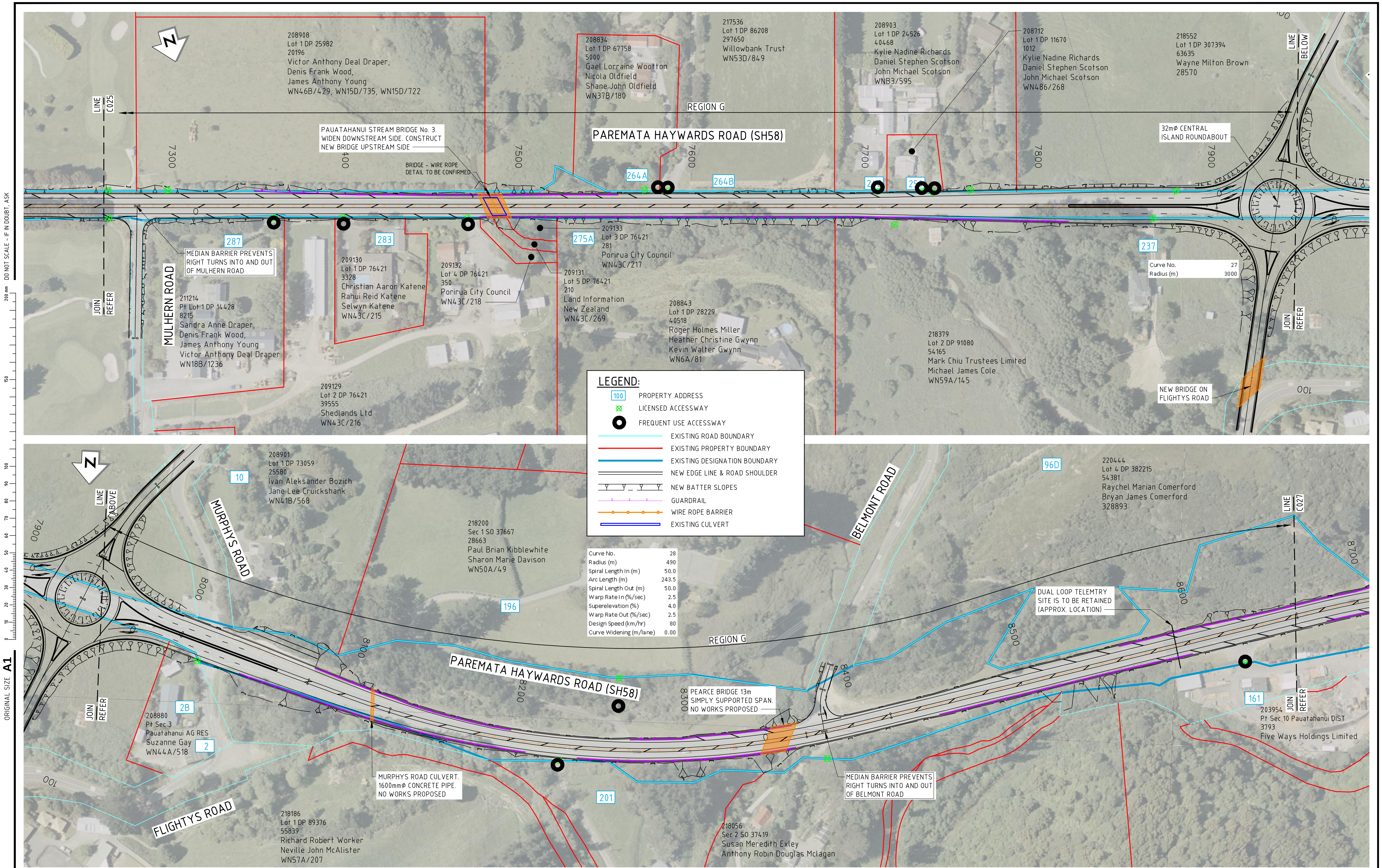


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| DRAWN | PJ Cook | 03/16 |
| CAD REVIEW | | |
| DESIGN CHECK | | |
| DESIGN REVIEW | | |
| APPROVED | | |
| PROF REGISTRATION: | | |

NOT APPROVED

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| A | FOR CLIENT REVIEW | PJC | JP | | 06/16 |

MWH

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

CONCEPT PLAN - REGION G
OPTION 5

Status Stamp: **DRAFT FOR CLIENT**

Date Stamp: **2016-06-09**

Scales: 1 : 1000

Drawing No. 80501811-01-005-C026

Rev. A



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LEGEND:

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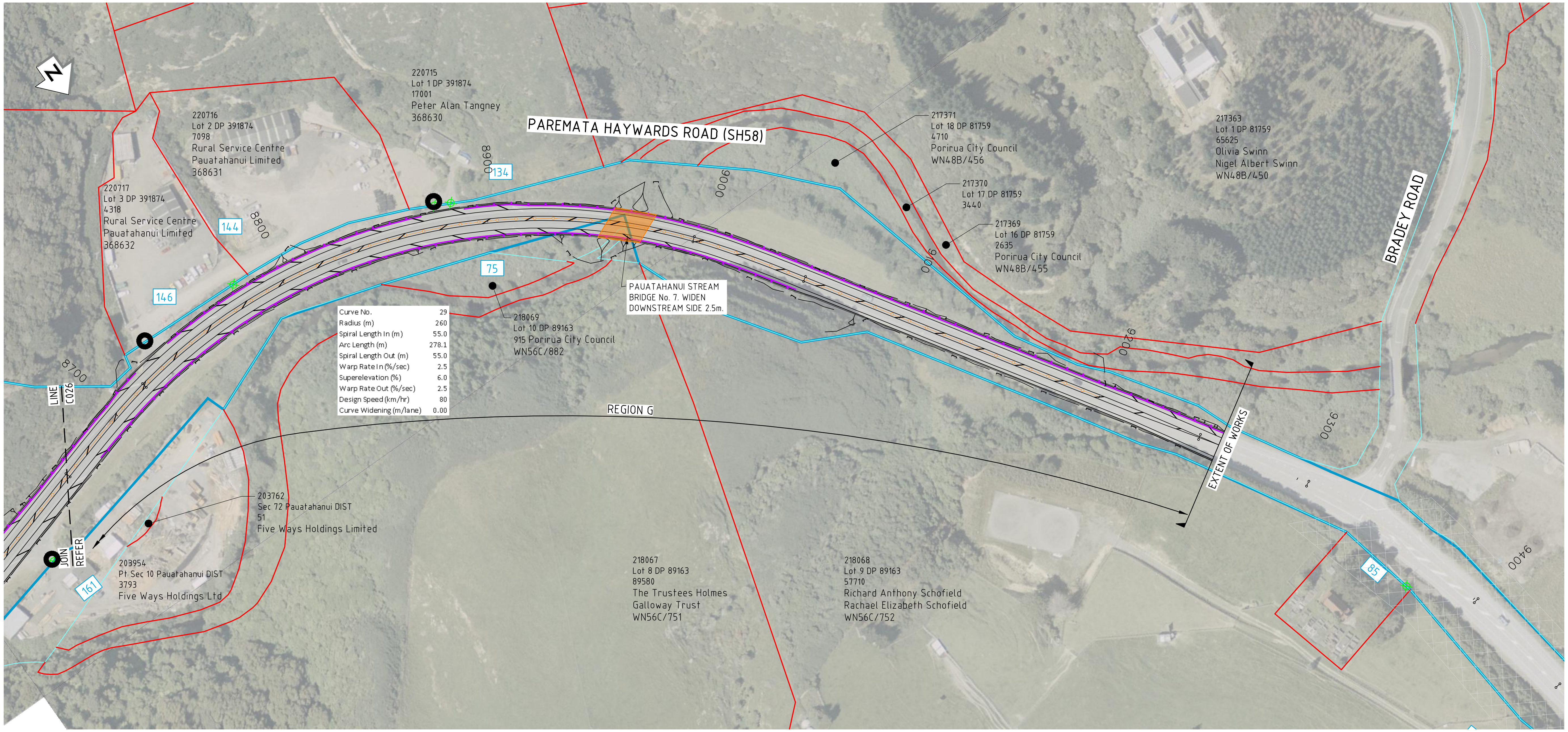
- LICENSED ACCESSWAY
- FREQUENT USE ACCESSWAY
- EXISTING ROAD BOUNDARY
- EXISTING PROPERTY BOUNDARY
- EXISTING DESIGNATION BOUNDARY
- NEW EDGE LINE & ROAD SHOULDER
- NEW BATTER SLOPES
- GUARDRAIL
- WIRE ROPE BARRIER
- EXISTING CULVERT

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| DESIGNED | Graeme Corin | 03/16 |
| DRAWN | PJ Cook | 03/16 |
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MWH

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

SH58 HAYWARDS CURVES
RP58/0/0.535 - 58/0/9.800

CONCEPT PLAN - REGION G
OPTION 5

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Date Stamp: 2016-06-09

Scales: 1 : 1000

Drawing No. 80501811-01-005-C027 Rev. A



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# Appendix G Risk Register

# SH58 Haywards Substation Curves Realignment

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|---|---|
| **Activity** | **SH58 Haywards Substation Curves Realignment** |
| **Contract No.** | **630PN** |
| **Date** | **Mar-16** |

| | |
|---|---|
| **Analysts Name(s)** | **Alix Newman v1 Jamie Povall Update (March 2016)** |
| **Reviewers Name(s)** | |
| **Sources of Information** | **PFR Register, I&R development team** |

| Phase | No. | Name | Description | Status | Threat / Opp | Existing Controls | Consequence | | Likelihood | | Score | Risk Treatment/Mitigation Actions | P.I.G | Risk Owner/ Organisation | Treatment Action Owner | Treatm't Status | Date Raised | Date Updated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Description | Rating ( C) | Description | Rating (L) | = C x L[1] | | | | | | | |
| **Project Property** | | | | | | | | | | | | | | | | | | |
| | A1 | Land acquisition problem | Difficulty in aquiring land. Caused by obstructive landowner or excessive cost demands. | L | T | RMA and PWA acquisition processes | Cost - Minor: Land purchase costs higher than anticipated. Delay - Substantial: Construction delay may be 18mnth if using PWA | 70 | Unlikely | 3 | 210 | Consultation - Engage landowners as early as possible to understand consequence and likelihood status. | 19 | Povall - MWH | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| | A2 | Extent of land reqd underestimated | Updated design requires additional land subsequent to initial NoR and cost estimates | L | T | RMA and PWA acquisition processes | Cost - Minor: Only small land areas likely Delay - Medium: Estimate maximum delay of 6 months | 10 | Unusual | 2 | 20 | Design - Allow adequate flexibility within designation footprint to accommodate minor design changes; designate only after thorough review of design | 10 | Povall - MWH | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| **Investigation and Reporting** | | | | | | | | | | | | | | | | | | |
| | B8 | Project objectives not achieved | Investigations indicate that constraints or conditions will not allow full achievement of project intentions and objectives (e.g. inadequate width for median barrier). | L | T | Standards review processes | Cost - Major: Potential operational efficiency costs from sub-standard design. H&S - Medium: Compromise on safety standards may have higher injury rate. | 40 | Likely | 5 | 200 | Design - Maximum accommodation of safety in design, and efficiency of traffic flow. | 18 | Povall - MWH | Povall - MWH | L | 3-Jul-13 | 15-Mar-16 |
| | B11 | Change in scope of works | Updated project scope (Opt 5) deemed unaffordable and project delayed / abandoned | E | T | NZTA Budgeting Process | Cost - Medium: Additional I&R fees for redesign and additional physical works fees Delay - Major: Anticipated delay 1+ year Reputation - Medium: Public expectation of the works | 200 | Rare | 1 | 200 | Physical works not currently programmed in NLTP; adequate funding can be allocated as design advances | 13 | NZTA - Client | NZTA - Client | L | 15-Mar-16 | 15-Mar-16 |
| | B13 | Project Economics | Early delivery of scour site realignmet has realised many of the corridor crash cost savings - so project loses prioritisation of regional importance, but fatal and serious crashes persist | E | T | Economic Evaluation | Cost - Medium: No physical works costs but actual crash costs persist Delay - Major: Anticipated delay 1+ year Reputation - Medium: Public expectation of the works | 70 | Unusual | 2 | 140 | SAR to consider project costs and benefits holistically and consider scour site work as first phase only (not standalone) | 6 | NZTA - Client | NZTA - Client | P | 15-Mar-16 | 15-Mar-16 |
| | B7 | Construction cost changes significantly different from I&R | Scope is for a 'light' SAR. With no geotechnical testing, stormwater design or bridge design, there is the chance that basic construction costs will be significantly underestimated. LiDAR data may also lead to inaccurate quantities estimates | L | T | Cost estimate tolerance schedules | Reputation - Medium: Public expectation of the works | 40 | Unlikely | 3 | 120 | Cost Estimation - Custom application of estimate bounds (FE/OE/SE…) | 15 | Povall - MWH | Povall - MWH | L | 3-Jul-13 | 15-Mar-16 |
| | B3 | Limited consultation | Stakeholders respond that they are not adequately consulted & project has since changed | L | T | Consultation Plan. | Delay - Minor: Delay to delivery / acceptance of SAR for additional consultation actions | 40 | Unlikely | 3 | 120 | Consultation - Ensure ongoing engagement of all landowners, record engagements. | 5 | Povall - MWH | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| | C3a | Change in scope of works | Change during I&R delays delivery of agreed timeframe | L | T | Variation processes | Cost - Minor: Additional I&R fees Delay - Minor: Anticipated maximum delay 2 months | 10 | Unlikely | 3 | 30 | Client Liaison - Maintain a high level of dialogue with the client, regularly pointing out issues & risks | 10 | Povall - MWH | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| | B12 | Consenting programme | Insufficient design detail at SAR level (geotech, structures, drainage) delays consent applications and construction programme | L | T | Programme management | Delay - Medium: Estimated maximum delay of 6 months | 40 | Unusual | 2 | 80 | Accurate programming with adequate time allocation for design detail development prior to scheduled consent submissions | 6 | Povall - MWH | Povall - MWH | | 15-Mar-16 | 15-Mar-16 |
| **Design and Project Documentation** | | | | | | | | | | | | | | | | | | |
| | B4 | Appeals to Environment Court | Project taken to Environment Court | L | T | n/a | Delay - Major: consider possibly up to a year for completion of process. Cost - Minor: small cost relative to project | 40 | Likely | 5 | 200 | Statutory Planning & Consultation - Early, and pre-lodgement engagement with Council(s) and engagement with stakeholders to reassess risk. | 14 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | B6a | Cost rates | Rates increase over and above current escalation | L | T | Cost estimate tolerance schedules | Cost - Medium: Depending on market at time of tendering - considered up to $2.5M difference in price is Med risk | 10 | Quite Common | 4 | 40 | Cost Estimation - Follow Cost Estimation Procedures to analyses expected and 95%ile costs and update rates. Peer Review. | 12 | NZTA - D&PD Consultant | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| | B1 | Consents not achieved | Consent not granted | L | T | n/a | Delay - Medium: Est up to 6 months for re-design and resubmission. Cost - Minor: Relatively low cost for rework | 40 | Unusual | 2 | 80 | Statutory Planning - Early, and pre-lodgement engagement with Council(s). | 11 | NZTA - D&PD Consultant | Povall - MWH | L | 30-Sep-09 | 15-Mar-16 |
| | B2 | Onerous consent conditions | Consent conditions impose substantial changes to project | L | T | n/a | Delay - Medium: Est up to 6 months for re-design and resubmission. Cost - Minor: Relatively low cost for rework | 40 | Unusual | 2 | 80 | Statutory Planning - Early, and pre-lodgement engagement with Council(s) and good recommendations for conditions in AEE applications | 11 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | C1 | Errors in contract documents | Items missing or incorrectly stated in contract documents impacting on quantities and costs | L | T | NZS 3910 and Contract form | Cost - Medium: May use contingency quickly or add some cost. | 10 | Unlikely | 3 | 30 | Contract Preparation - Follow correct procedures for preparing and collating contract documents. Check and review | 10 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |

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| **Reviewers Name(s)** | |
| **Sources of Information** | **PFR Register, I&R development team** |

| Phase | No. | Name | Description | Status | Threat / Opp | Existing Controls | Consequence | | Likelihood | | Score | Risk Treatment/Mitigation Actions | P.I.G | Risk Owner/ Organisation | Treatment Action Owner | Treatm't Status | Date | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Description | Rating ( C) | Description | Rating (L) | = C x L[1] | | | | | | Raised | Updated |
| | C3b | Change in scope of works | Change during D&PD delays delivery of agreed timeframe | L | T | Variation processes | Cost - Minor: Additional D&PD fees Delay - Minor: Anticipated maximum delay 2 months | 10 | Unlikely | 3 | **30** | Client Liaison - Maintain a high level of dialogue with the client, regularly pointing out issues & risks | 10 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | C4 | Safety Audit | Proposed works are not safe to deliver, design standards not met | L | T | Standards review processes | Cost - Minor: Re-design of some element. | 1 | Likely | 5 | **5** | Design - Design to standards as much as possible (see risk B8). Respond as appropriate to safety audit issues raise. | 9 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | B5 | Designation rejected | Designation not granted, requiring rework and resubmission | L | T | n/a | Delay - Major: consider possibly up to a year for reapplication and process. Cost - Minor: small cost relative to | 40 | Rare | 1 | **40** | Statutory Planning - Early, and pre-lodgement engagement with Council(s). | 4 | NZTA - D&PD Consultant | | I | 30-Sep-09 | 15-Mar-16 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Description | Rating ( C) | Description | Rating (L) | = C x L[1] | | | | | | | |
| **MSQA, NZTA** | | | | | | | | | | | | | | | | | | |
| **NZTA Managed Costs** | 1a | Excessive claims by contractor | Contractor may over-claim either in error or to front-load payments. Potential for loss if contractor declares bankruptcy (re SH4 Papatawa) | E | T | Constract supervision, measure and value processes. | Cost - Medium: Overall may be excessive payments to contractor. | 40 | Quite Common | 4 | **160** | Supervision: Peer Review design and keep good relationship with contractor. Robust measure and value/claims process | 17 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 1c | Funding rejected | Construction costs as tendered are in excess of anticpated, and project funding is declined. | E | T | n/a | Delay - Major: Could see protracted delay (consider up to a year) | 40 | Unlikely | 3 | **120** | Estimates: Check and review of estimates and rates during design using most up-to-date information. | 15 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 1d | Conctractor not adequately skilled for job. | Local terrain and working conditions will challenge contractors, hence need adequately skilled contractors for the work. | E | T | Pre-qualification and tendering process criteria | Cost - Major: Poor construction capability could cost (est max $5M) Delay - Medium: Consider maximum delay of up to 6 months to resolve contractor capabilities | 40 | Unlikely | 3 | **120** | Tendering - Use contractor prequalification and ensure Non-price tendering attributes cover track record work in similar environments | 15 | NZTA - MS&QA Consultant | | I | 3-Jul-13 | 15-Mar-16 |
| | B6b | Cost rates | Tender response rates are increased over and above current escalation | E | T | Cost estimate tolerance schedules | Cost - Medium: Depending on market at time of tendering - considered up to $2.5M difference in price is Med risk | 10 | Quite Common | 4 | **40** | Cost Estimation - Follow Cost Estimation Procedures to analyses expected and 95%ile costs and update rates. Peer Review. | 12 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 1b | Issues raised that cause redesign | Construction activity may encounter conditions that require some elements to be redesigned | E | T | n/a | Cost - Minor Delay - Minor: Consider maximum delay of 2 months. | 1 | Quite Common | 4 | **4** | Supervision: On-site review of issues and analysis by all parties before re-design agreed. Contractor to re-programme. | 7 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Environmental Compliance** | 2a | Failure to comply with consent conditions on site | The contractor's practices on site have caused a breach of consent conditions | E | T | Consent compliance checks | Image - Medium: Possibly regional media. Environment - Medium: Possible impact on regional park values Delays - Minor: Unlikely to affect progress of project | 10 | Unusual | 2 | **20** | Supervision - Ensure supervision checks consent condition compliance. | 6 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 2b | Finding items of archaelogical interest | Finding items of archaelogical interest | E | T | Accidental discovery protocols | Delays - Medium | 10 | Rare | 1 | **10** | Consult with local iwi & obtain HPT approval first | 2 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Earthworks** | 3a | Geotech conditions | Inaccuracies in current geotechnical knowledge of site with actual conditions | E | T | n/a | Cost - Medium | 10 | Quite Common | 4 | **40** | Further geotech investigation needed | 12 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 3c | Soft material in earthworks footprint | Soft material in earthworks footprint greater than anticipated | E | T | n/a | Cost - Medium | 10 | Quite Common | 4 | **40** | Further geotech investigation needed | 12 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 3d | Additional earthworks required | Current cost estimate/design does not allow for adequate earthworks | E | T | n/a | Cost - Medium | 10 | Quite Common | 4 | **40** | Site Survey needed | 12 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 3b | Large proportion of rock | Larger proportion of rock material than envisaged | E | T | n/a | Cost - Medium | 10 | Unlikely | 3 | **30** | Further geotech investigation needed | 10 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Ground Improvements** | 4a | Contaminated land encountered | Contaminated land encountered | E | T | n/a | Cost - Medium | 10 | Rare | 1 | **10** | Further investigation needed | 2 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Drainage** | 5a | n/a | n/a | | | | | | | | **0** | | | | | I | 30-Sep-09 | 15-Mar-16 |
| **Pavement and Surfacing** | 6a | Poor pavement design | Poor pavement design results in rutting/uneven road surface | E | T | n/a | Image - Medium Cost - Major | 40 | Unusual | 2 | **80** | Peer review design | 10 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| | 6b | Underslippage of existing road | Underslippage of existing road | E | T | n/a | Delays - Medium Cost - Medium | 10 | Unusual | 2 | **20** | Further geotech investigation needed | 6 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Traffic Services** | 9a | n/a | n/a | n/a | | | | | | | **0** | | | | | I | 30-Sep-09 | 15-Mar-16 |
| **Service Relocations** | 10a | Unknown/unrecorded services found | Unknown/unrecorded services found that cause re-design | E | T | n/a | Delays - Minor Cost - Minor | 1 | Unusual | 2 | **2** | Further investigation needed | 3 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **Traffic Management and Temporary** | 12a | Major delays during works | Major delays during works | E | T | n/a | Image - Medium Delays - Medium Cost - Minor | 10 | Unusual | 2 | **20** | Peer review design and Constant dialogue with client and contractor | 6 | NZTA - MS&QA Consultant | | I | 30-Sep-09 | 15-Mar-16 |
| **CLOSED RISKS** | | | | | | | | | | | | | | | | | | |
| **D&PD Phase** | C2 | Change in SAR personnel | Change in design personnel | C | T | n/a | | | | | **0** | Closed - not considered a relevant risk at 3 Jul 13 update. | | | | | 30-Sep-09 | 15-Mar-16 |
| **MS&QA Phase** | | | | | | | | | | | | | | | | | 30-Sep-09 | 15-Mar-16 |
| **Preliminary and General** | 13a | Lack of adequate supervision by contractor | Lack of adequate supervision by contractor | C | T | n/a | | | | | **0** | Closed - not clearly understood as risk at 3 Jul 13 update. | | | | | 30-Sep-09 | 15-Mar-16 |
| **Bridges** | 7a | Bridges built and then collapse | Bridges built and then collapse | C | T | n/a | | | | | **0** | Closed - no current intentions for bridges on the project, as of 3 July review | | | | | 30-Sep-09 | 15-Mar-16 |
| **Retaining Walls** | 8a | Retaining wall build and then collapse | Retaining wall build and then collapse | C | T | n/a | | | | | **0** | Closed - no current intentions for retaining walls on the project, as of 3 July review | | | | | 30-Sep-09 | 15-Mar-16 |
| **Traffic Management and Temporary Works** | 12c | Vandalism of TM equipment | Vandalism of TM equipment results in lane closure traffic signals not working | C | T | n/a | | | | | **0** | Closed - not considered a relevant risk at 3 July review. Falls within standard site security processes, where there are some. | | | | | 30-Sep-09 | 15-Mar-16 |
| **Landscaping & urban design** | 11a | Newly planted trees/shrubs destroyed | Storm event destroys newly planted trees/shrubs | C | T | n/a | | | | | **0** | Closed - not considered a relevant risk at 3 July review. | | | | | 30-Sep-09 | 15-Mar-16 |