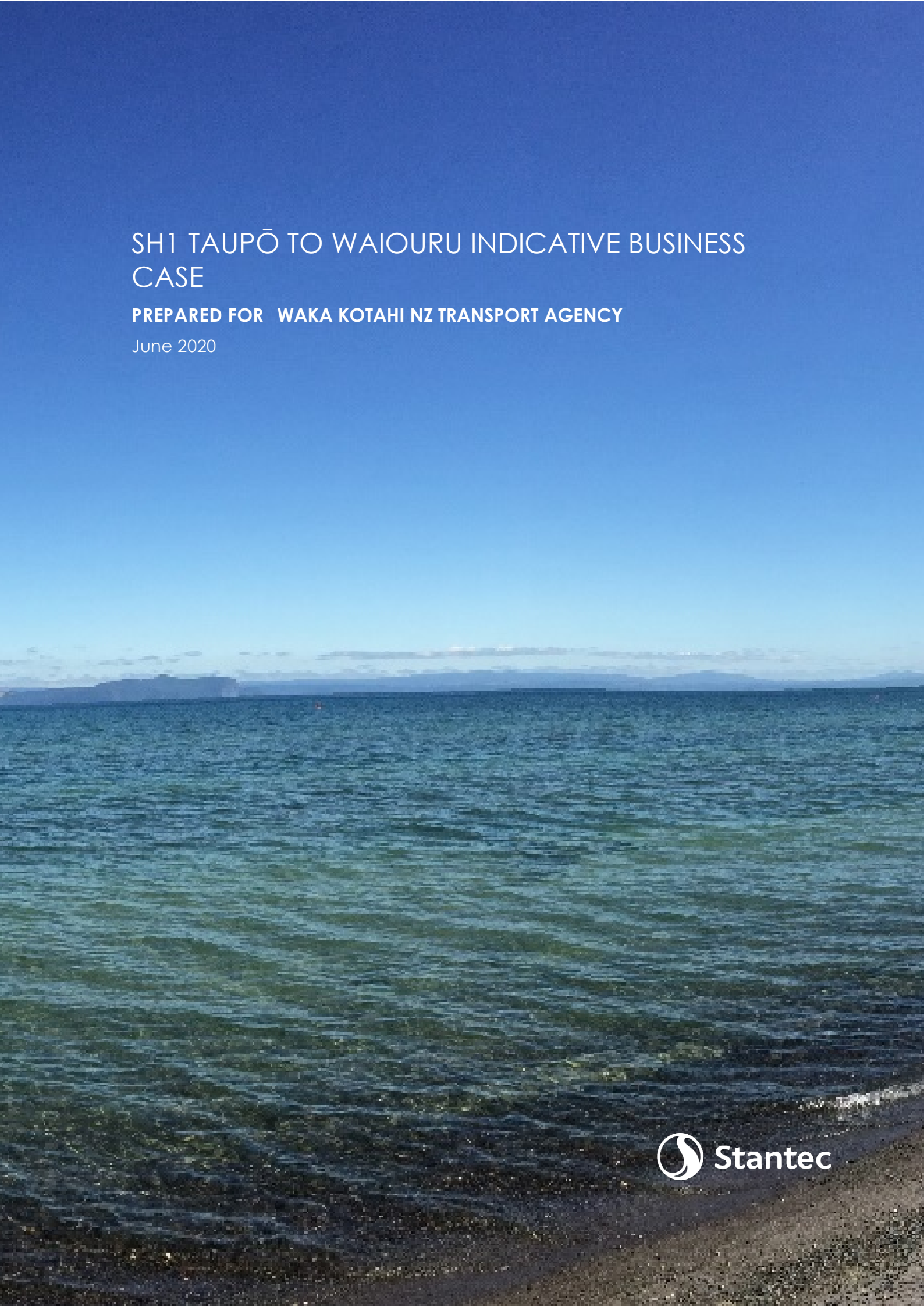
SH1 TAUPŌ TO WAIOURU INDICATIVE BUSINESS CASE

PREPARED FOR WAKA KOTAHI NZ TRANSPORT AGENCY

June 2020



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Executive Summary

Overview

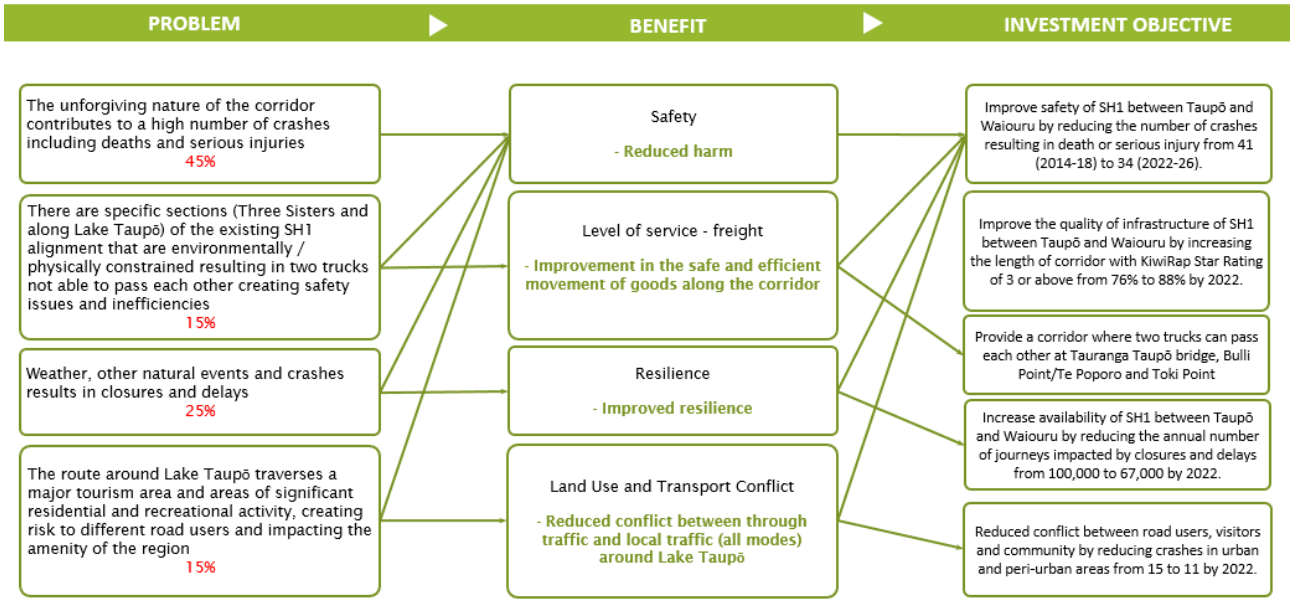
State Highway 1 between Taupō and Waiouru is nationally significant connection for people and freight moving between the upper and lower North Island, supporting regional economies and local communities. In 2016, a 30 year strategy for the corridor was endorsed by the Transport Agency Board, through a Programme Business Case; which confirmed the need for safety, resilience, journey and community improvements on the existing corridor in the short term, noting that other infrastructure improvements and non-infrastructure activities need to be progressed separately.

This report presents the Indicative Business Case for these shorter term online investments. Part A discusses the problems, benefits, investment objectives and opportunities that were identified and discussed by the study team and key stakeholders at the Problem Definition workshop. It examines the available evidence in support of the case of change and makes evidence-based recommendations. Part B presents the process used to identify the recommended option and provides a technical assessment and details of the preferred option. Part C presents an implementation plan and considers risks, costs and funding opportunities.

This business case has not been completed fully particularly in relation to the recommended option design and iwi engagement but there has been sufficient work to identify improvements for delivery in the short term. Further work will be needed once funding becomes available to re-start this project.

Problems and Investment Objectives

A review of the evidence, as well as the programme business case (PBC) problems and investment objectives, confirmed that there is still a case for change. Specifically focussing on the scope of the shorter term online business case, four problems, four benefits, and five investment objectives were identified at a facilitated Investment Logic Mapping workshop with help from stakeholders; these are shown below[1].



These problems are backed up by evidence as presented in Part A.

[1] Note the crash figures have been updated to 2014-2018.

Option Development

Part B documents the optioneering process that undertaken. This 107km stretch of SH1 is complex and exhibits multiple problems, constraints and opportunities. The optioneering process as part of this business case has been equally challenging to ensure sufficient depth of analysis along its full length to understand the problems before considering options for improvement.

Interventions were initially identified though stakeholder workshops. These were collated into options for different sections of the corridor before being combined to give options for the entire corridor. At each stage of the process, the options and interventions were assessed by a number of technical specialists against the investment objectives and a number of agreed assessment criteria using a Multi-Criteria Analysis. From this long-list assessment a short list of five corridor options was identified and presented to key stakeholders:

- Speed management plus current planned resilience works at Te Poporo/Bulli Point
- Safety – focus on delivering mainly safety outcomes
- Benefits – focus on delivering multiple outcomes
- Effects – focus on delivering multiple outcomes but without significant adverse effects
- Balanced – focus on delivering multiple outcomes with a balance between providing benefits and mitigating effects.

Due to the differing environment along the full corridor, the recommend option includes a different response for each of three sectors. The recommended option was chosen based on a wide range of criteria including the investment objectives, social and environmental impacts, cost and benefit cost ratio but has been heavily influenced by the significant number of cultural and archaeological sites alongside Lake Taupō. Our engagement with Tūwharetoa Maori Trust Board over the past four years has told us that their desire is to see SH1 to be realigned away from the Lake (identified as the Hatepe to Motuoapa Realignment in the PBC Preferred Programme) and therefore they are not willing to accept impacts from the shorter term online improvements as being discussed through this business case.

Consideration of deliverability in the shorter term has also influenced the decision around recommended option. Our stakeholders have told us that this is really important.

Recommended Option

The recommended option has slightly different characteristics on the rural stretches depending on the area sector through which the road traverses. The balanced option was recommended for the section between Taupō and Hatepe with effects option recommended for the rest of the corridor.

A consistent urban design style is proposed in Waitahanui, Motutere, Te Rangiita, Motuoapa, and Turangi with increased road widths and better facilities for walking and cycling.

The recommended option for the corridor includes:

- Reallocated road space to provide flush medians, lower speed limits and better facilities for pedestrians and cyclists including wider paths and pedestrian refuges through communities of Waitahanui, Motutere, Te Rangiita, Motuoapa and Turangi
- Wide centreline, intersection improvements and targeted roadside barrier from Taupo Airport Roundabout through to Hatepe
- Reduced speed limit with limited physical works alongside Lake Taupo from Hatepe to Motutere. Infrastructure works to support current speed limits outside townships, lakeside and three sisters
- Minor widening and slip stabilisation at Te Poporo/Bulli Point, delivered through parallel Transport Agency project for completion in 2019
- Access improvements at selected rest area locations
- Wide centreline, audio tactile pavement markers, targeted roadside barriers, wider shoulders, intersection improvements and rockfall protection (where there is space without significant works outside the road reserve)
- Roundabout at Turangi

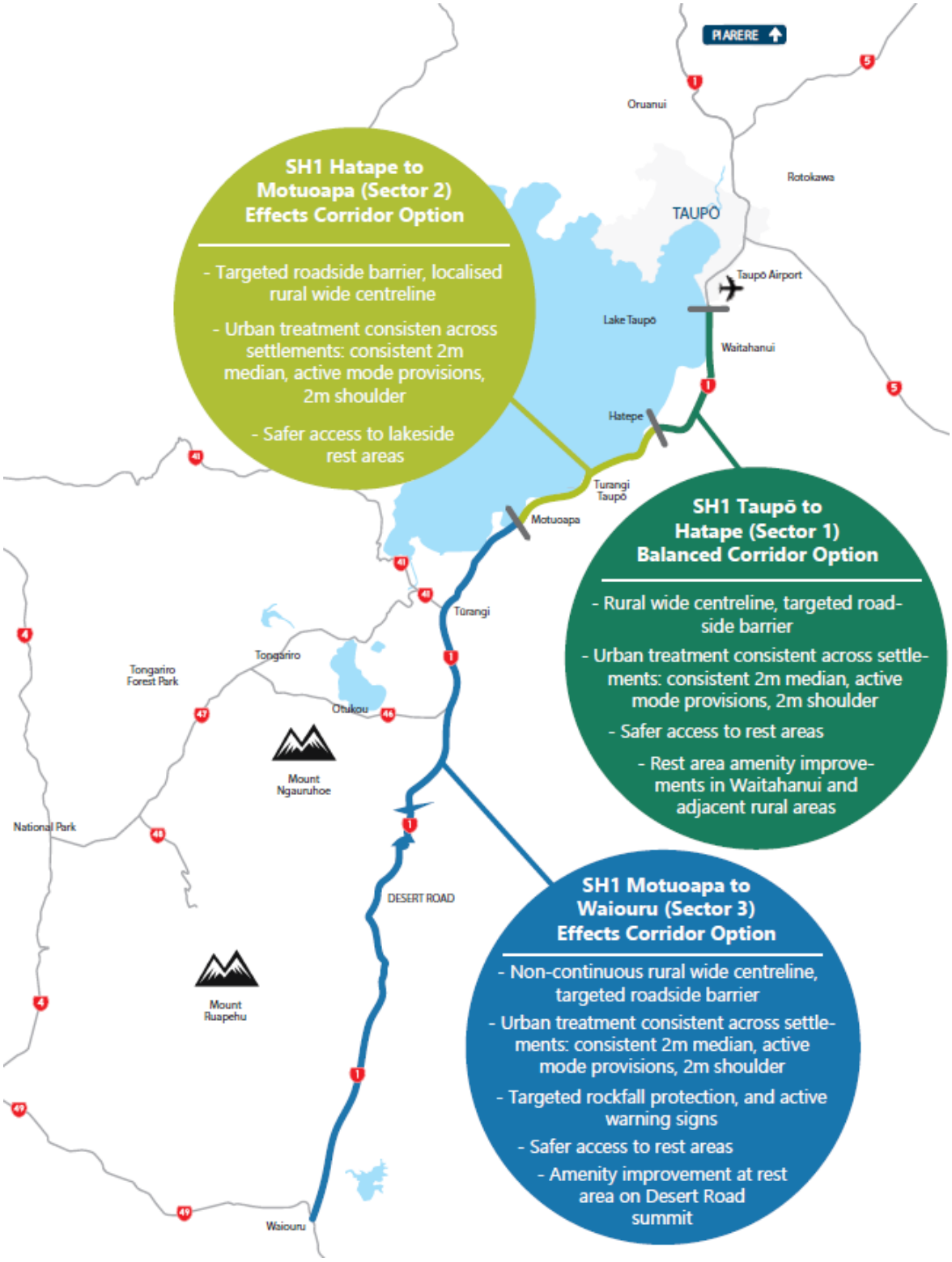
- Corridor wide vegetation/earthworks retreating, signage and active warning signage

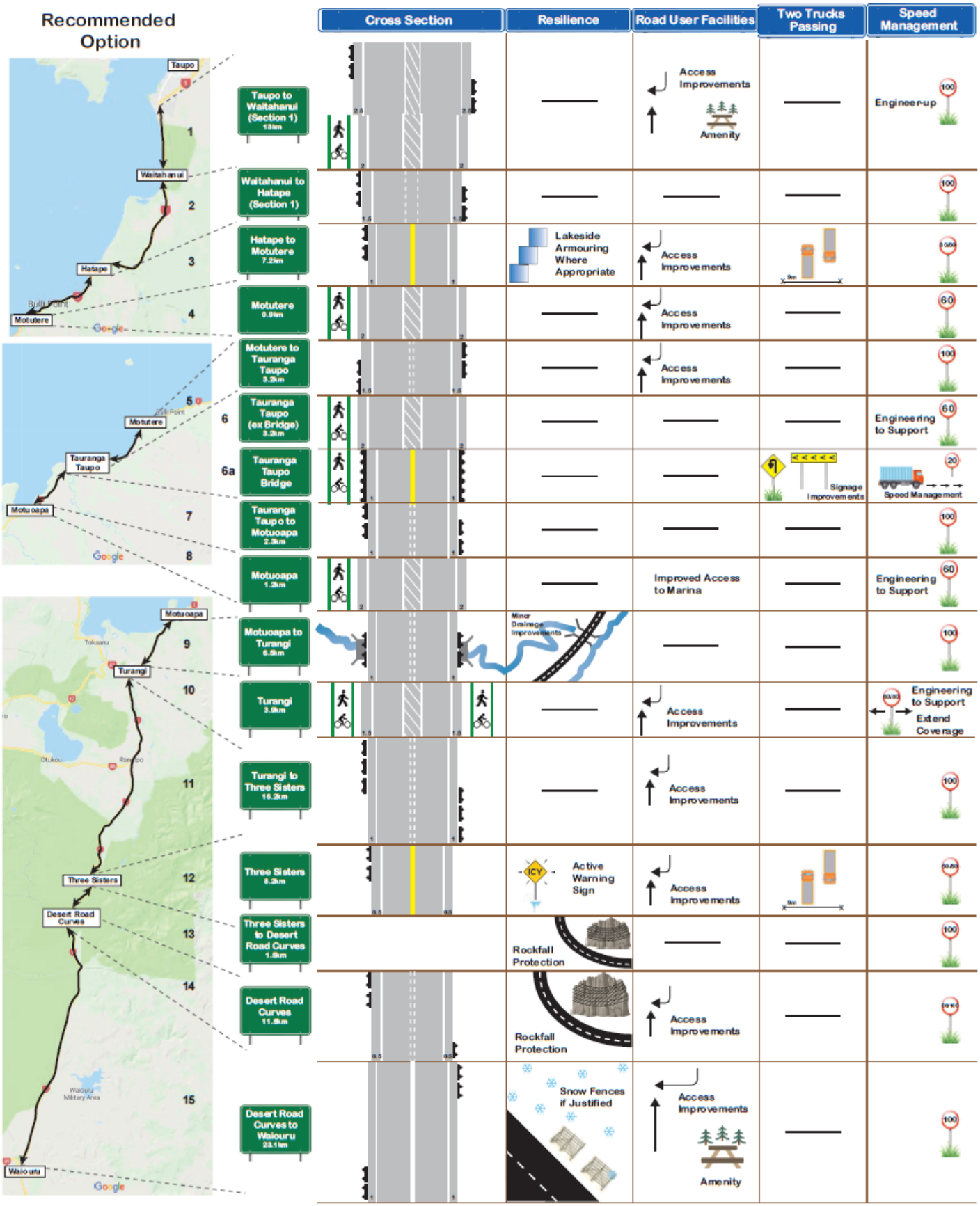
The recommended options specifically excludes:

- New bridge realignment at Tauranga-Taupo
- Clip-on structures within Waitahanui and Turangi
- Additional passing lanes
- Inter-town active travel (other than wider shoulders where feasible)

The recommended option does not currently include median barrier, however it is noted that a new guideline is being developed which recommends median barrier on all state highways with traffic volumes in excess of 6,000 vpd, and posted speed limit of in excess 80km/h. Sector 1 is the best candidate for a median barrier treatment (it has high enough traffic volumes and also has relatively more physical space for widening than the other Sectors). Sector 2, and the northern end of Sector 3, are more likely to be candidates for speed limit reductions and potentially shorter sections of median barrier. The efficacy of these treatments, including the use shorter sections of median barrier, should be considered during the detailed business case stages for the respective Sector DBCs.

A parallel speed management review is currently being completed for the Taupō to Turangi section of State Highway 1 by Waka Kotahi. Urban speed management treatments form a part of the IBC recommended option however the final form of the parallel speed management review may differ to those of the IBC recommend option. If the parallel speed management review is approved then those treatments should be form part of the considerations of each Sector option for the relevant proposed Detailed Business Cases.


PIARERE
Oruanui
Rotokawa
TAUPŌ
Taupō Airport
Lake Taupō
Waitahanui
Hatepe
Turangi Taupō
Motuoapa
Tūrangi
Topgariro
Tongariro Forest Park
Otukou
Mount Ngauruhoe
National Park
DESERT ROAD
Mount Ruapehu
Waiouru
SH1 Hatape to Motuoapa (Sector 2) Effects Corridor Option
- Targeted roadside barrier, localised rural wide centreline
- Urban treatment consisten across settlements: consistent 2m median, active mode provisions, 2m shoulder
- Safer access to lakeside rest areas
SH1 Taupō to Hatape (Sector 1) Balanced Corridor Option
- Rural wide centreline, targeted road-side barrier
- Urban treatment consistent across settle-ments: consistent 2m median, active mode provisions, 2m shoulder
- Safer access to rest areas
- Rest area amenity improve-ments in Waitahanui and adjacent rural areas
SH1 Motuoapa to Waiouru (Sector 3) Effects Corridor Option
- Non-continuous rural wide centreline, targeted roadside barrier
- Urban treatment consistent across settle-ments: consistent 2m median, active mode provisions, 2m shoulder
- Targeted rockfall protection, and active warning signs
- Safer access to rest areas
- Amenity improvement at rest area on Desert Road summit


Recommended Option
Cross Section
Resilience
Road User Facilities
Two Trucks Passing
Speed Management
Taupo
Waitahanui
Hatape
Motutere
Taupo to Waitahanui (Section 1) 13km
Waitahanui to Hatape (Section 1)
Hatape to Motutere 7.2km
Motutere 0.9km
Motutere to Tauranga Taupo 3.2km
Tauranga Taupo (ex Bridge) 3.3km
Tauranga Taupo Bridge
Tauranga Taupo to Motuoapa 2.3km
Motuoapa 1.2km
Motuoapa to Turangi 6.5km
Turangi 3.9km
Turangi to Three Sisters 16.2km
Three Sisters 8.3km
Three Sisters to Desert Road Curves 1.9km
Desert Road Curves 11.6km
Desert Road Curves to Waiouru 23.1km
Motuoapa
Turangi
Three Sisters
Desert Road Curves
Waiouru
1
2
3
4
5
6
6a
7
8
9
10
11
12
13
14
15
Access Improvements
Amenity
Engineer-up
Lakeside Armouring Where Appropriate
Engineering to Support
Signage Improvements
Speed Management
Improved Access to Marina
Minor Drainage Improvements
Extend Coverage
Active Warning Sign
Rockfall Protection
Snow Fences if Justified

It should be recognised that with the exception of stakeholder workshops, no community consultation has been undertaken throughout the process, and that consultation with iwi has not been completed.

The cost of the recommend option has been estimated to be $59m, with a benefit cost ratio of 1. It is estimated that the investment will result in :

- seven fewer deaths and serious injuries every five years.
- a halving of the proportion of KiwiRAP 2 star road
- improvement at sites where two trucks cannot currently pass
- a one-third reduction in the number of journeys impacted every year due to crashes and natural events
- four fewer crashes per year in townships
- improved amenity and active mode facilities in townships
- improved rest areas along the route

A more detailed explanation of the recommended option is provided below.

Rural Safety

The recommended option would improve rural road safety whilst also maintaining speeds close to the current operating speeds for much of the road. The safety improvements include wider shoulder, wider medians (ranging from 1.5m to 0.8), simple curve easing within the existing road designation, channelised right turns bays, targeted roadside barriers at high risk locations, visibility improvements and improved signage and road markings.

Because all the improvements are online, the Recommended Option does not seek to make a step-change in traffic speeds, even through the more constrained sections of the route, such as Hatepe to Motutere and Three Sisters. The PBC identified longer term works for these sections and therefore the current recommended option includes a series of online safety measures such as guardrail, vegetation/earthworks retreating, signage, active warning signage and lower speed limits.

Urban Safety

All townships receive similar treatment that seeks to reinforce lower speeds; all speed limits would be reset to 60kmh with Waitahanui also having a 40kmh school speed zone. Most towns would have their speed limit areas extended back to allow for the slow reduction in speed that is often observed in these townships. New gated threshold treatments will be installed to provide a narrowing effect on the entrance to townships.

Pedestrian improvements such as new or widened footpaths and conspicuous pedestrian crossings complete with median refuge and buildouts are intended to serve a dual purpose; providing physical infrastructure to improve facilities for vulnerable road users but also to help reinforce the change in environment between rural and urban sections.

Flush medians will be installed wherever reallocated space can the accommodate the changes. The purpose of the flush median is to assist right turns into property access and help provide a visual narrowing of the lanes and provide an even transition between pedestrian refuges.

A roundabout is proposed at the entrance to Turangi township (Pihanga Road) to support lower speeds, provide safer at-grade pedestrian crossing and reduce the current intersection risk.

Resilience

Two areas along the corridor contribute to the majority of road closures and delays due to environmental effects. These are the sections adjacent to Lake Taupō and the section between and including the Three Sisters and Desert Road Curves. The recommended option looks to address areas of environmental resilience concern along the lakeside by providing retaining/shoring to areas identified as risk from erosion and removal/reinforcement of unstable slopes where there is a history of rock falls or slips.

The Three Sisters to Desert Road Curves section has a number of existing catch fences, this typical containment treatment will be replicated in other area with a high risk of rockfall. Additionally, preventative measures will be employed with loose, weathered and overhanging material removed from exposed cut slopes.

Road User Facilities

Changes to rest areas will be mostly limited to improved entry/egress by way of improved visibility or channelised intersections. Information boards or cultural information relevant to the people and area has been briefly discussed with Tūwharetoa, who have expressed interest in the idea. It is expected that during the design stage this would be further developed and incorporated as part of this project.

No additional passing lanes are proposed under this option. Inherently dangerous right turns from existing passing lanes will be resolved by moving the start of one passing lane and shortening another. Alternatively, the accesses will be moved; however, further consultation with effected parties in needed.

Active Modes

Local trips within townships will be supported through wider paths re-designated as shared paths and lower speeds. In rural sections there is currently considered to be a supressed demand for sports cycling between Turangi and Taupo due to the area's status as a key multi-sport and road cycling destination. This option provides improvement by way of wider shoulders in many rural areas; however, the existing primary restriction between Hatepe and Motuoapa will remain. This will continue to limit cycle numbers and present those that do use the route with a high risk section of road to navigate. As such the improvements in shoulder width elsewhere are likely to do little to support growth in inter-township active travel.

Love Taupo and Bike Taupo have previously proposed a mainly off-road ride between Turangi and Taupo, the Recommend Option will provide infrastructure support if this project comes to fruition in the short term by way of re-considering the clip-on structures at Waitahanui and Turangi.

Quick Wins

A series of improvement projects has been developed for consideration through the bulk funding mechanisms, such as Safer Networks, Mass Action Treatments (Boost programme), Low Cost Low Risk or included into the Network Outcomes Contract (NOC) as safety maintenance.

The quick win projects have been chosen to treat a number of issues directly related to the Investment Objectives.

In implementing any quick wins treatments that require physical infrastructure or change in road formation consideration will need to be given to incorporating future widening. Prioritising the quick wins should focus on projects that deliver the best outcome against its associated issue. Consideration should also be given to projects that can proceed without significant consultation.

Next Steps

Implementation of the corridor improvements is currently assumed to some years away. In part due to lack of funding but also because there are several consultation activities that need to be finalised to the satisfaction of stakeholders. This business case has highlighted that due to the number of sensitive environments that this is likely to a protracted process. To implement improvements, it is recommended that the focus is shifted to the townships and the quick win list.

In this period full investigation of the Hatepe to Motuoapa bypass should be completed and the outstanding consultation activities completed. Outstanding consultation activates include, but are not limited to, Tūwharetoa and Heritage New Zealand, Waikato Regional Council, public engagement.

Township improvements

The townships along the route should all be prioritised for improvements to reinforce the speed limit reductions to 60kph. Whilst the conflict between state highway traffic and local function will always remain efforts need to be made to reduce their impact. The proposed speed reduction to 60kph are very unlikely to be observed without further works that will continue to endanger vulnerable road users and lower amenity through elevated road noise and vibration. The township improvements are intended to be constructed within the current road reserve with very little change in seal width, as such the works do not require land purchase. Full community engagement with drop in sessions is recommended to garner local ideas and feedback prior to moving into the design stages.

Quick wins

The developed list of Quick Wins, tabulated in Appendix O, is intended for implementation either as part of the corridor improvements or as individual sites. Given the high capital costs involved in widening the corridor, lack of committed future funds and conflicting demands from other national projects it is

anticipated that implementation of the corridor works is some years in the future. In the meantime, there is an on-going risk of future accidents and significant stakeholder frustration that nothing tangible has been implemented to address the inherent dangers to road users. As such the sites identified as eligible for low cost low risk funding should be considered for implementation in the short term. Prior to finalising the quick win list, the police have indicated they would like to pass share their knowledge of the high-risk sites, these should be included into the list as appropriate.

A separate parallel project to this business case has been undertaken for Bulli Point/Te Poporo aimed at addressing identified resilience issues, allowing two trucks to pass, and alleviating safety issues. The recommended option from that project involves a realignment of State Highway 1 approximately 200m east of Bulli Point and it is consistent with this business case. It is recommended that that this project proceed to detailed design after further discussions with iwi and key stakeholders.

Waka Kotahi NZ Transport Agency

SH1 Taupō to Waiouru indicative Business Case

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Appendix I2: Safety in Design Register

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1. Introduction

State Highway 1 (SH1) is New Zealand's premier highway. It is the main route for domestic, tourist and commercial users to travel the length of the North and South Islands. In the North Island it is essential for efficient movement of people and goods between the two main centres of Auckland and Wellington. With its status as the principal highway in New Zealand, road users expect that the overall standard of the highway will be high over its full length. They also expect a high level of route availability.

1.1 Work to Date

In 2016 a Programme Business Case (PBC) was completed for Taupō to Waiouru, between the intersection of SH1 and SH5 at Wairakei, and the intersection of SH1 and SH49 at Waiouru.

Through engagement with key stakeholders, the PBC confirmed the problems and benefits of investing in the corridor. Multiple improvement programmes were developed and tested, and a preferred programme agreed. An overview of the preferred programme is outlined below:

- Online short-term safety improvements.
- Online short to medium term resilience and reliability improvements.
- Longer term improvements.
    - Hatepe Hill - Motuoapa realignment
    - Rangipo - Desert Road realignment or viaduct
- Improved amenities for travellers and communities.
- Improved maintenance regimes.
- Improved emergency response and incident management.
- Improved traveller information.

The PBC was considered by the Transport Agency Board in 2017. It was decided that for this Indicative Business Case (IBC), the scope would focus on short to medium term improvements and exclude longer term improvements. This affects some of the objectives that were determined for the PBC, specifically in terms of what can be achieved through the IBC. Subsequently it was also agreed that improvements to maintenance, which will improve resilience, will be a separate, but connected, business case.

1.2 Purpose of this Report

This report presents the additional investigations into the Taupō to Waiouru corridor and outlines the recommended option for investment. Due to a lack of forward funding, the investigations were cut short. Accordingly, no design development was undertaken of the recommended option and therefore what is presented here should be considered to be at an Indicative Business Case level of detail.

Nevertheless, this report clearly articulates the recommended option, the outcomes that it would achieve and the actions that would need to be taken to progress this project when it is re-established.

2. Context

The Programme Business Cases provide a detailed assessment of the context of the route. The context has been reviewed and there have been no significant changes since the PBC was written. A high-level summary is provided below.

This section of National State Highway is 107 km long, commencing at Taupō at the intersection of SH1 and SH5 (Napier-Taupō Road) and traversing along the south eastern shoreline of Lake Taupō, through Turangi before passing through Tongariro National Park and on to the intersection with SH29 at Waiouru.

The carriageway is generally one lane in each direction with no median, and some passing opportunities. The road is windy and narrow in places where it runs alongside Lake Taupō foreshore but then straightens out through the Rangipo Desert. It passes through a number of small settlements alongside the lake including a campground that straddles SH1. The town of Turangi is located just south of the Lake, and SH1

runs through the eastern side of the town. South of Turangi SH1 rises gradually to become the highest state highway in New Zealand at around 1000 metres above sea level. The highway between Rangipo and the Desert Road summit is very windy through the Three Sisters and then has a large number of curved and undulating sections in what is known as the Desert Road curves. Mean speeds are much lower than the current speed limit.

The volumes of traffic on this part of the corridor are relatively low, and significantly less than further north. Between Turangi and Waiouru traffic volumes increase by approximately 20% between 2011 and 2017, with the more significant increase occurring between 2013 and 2017. This likely reflects the increasing tourism and economic activity in the region. Freight vehicles make up 25% of the traffic stream, which is high. Whilst SH1 performs the role of the key north-south spine, its use by tourists and visitors is evidenced by the fluctuation in traffic flows at weekends and holiday periods. The route is used by some cyclists, for recreation and event training, mostly around Lake Taupō.

Part of the route passes through the Tongariro National Park, acknowledged as a cultural and natural World Heritage Site. There are active volcanoes; Ruapehu, Ngauruhoe, and Tongariro along with a number of culturally significant Maori sites. The Tongariro Crossing is rated the best 1-day walk in New Zealand and in the 'Top 10' one day walks in the world by National Geographic. The weather along this section of SH1 can be harsh and unpredictable. The route is affected by snow and ice, resulting in closures, warnings and changing conditions, especially in winter. The alternative routes within the region are also likely to be affected by similar conditions.

The most common employment category in the Taupō district is the accommodation and food services industries - indicating the importance of tourism in the area. Agriculture, forestry and fishing industries, retail industry, and construction industry also employ large numbers of people. In the Ruapehu district, agriculture, forestry, and fishing are the most significant employment sectors.

Ruapehu has a higher than average unemployment rate and lower than average per capita GDP. The Manawatū-Whanganui Growth Study (2015) identified Ruapehu as having major growth potential from increased tourism activity. The study stated 'if the level of international visitors was raised to that of domestic visitors, $460m pa would be added to the regional economy, together with 520 jobs. This would boost regional employment by 0.5% and sub regional employment, if concentrated in a place like Ruapehu district, by 11%.'

The likely remaining lifespan of SH1 is highly variable as a result of a number of factors including erosion, geotechnical conditions, physical constraints (i.e. lakes, rivers and cliffs) and other environmental factors impacting the existing SH1 corridor. Due to these conditions there is an ongoing and real risk of failure and/or closure of the most vulnerable sections of SH1 corridor, which would have adverse impacts on the network, local and interregional transport movements.

The Northern Explorer (passenger train service) links goes from Auckland to Wellington; however, the rail line passes to the west of the Mount Ruapehu with the nearest station to this section of SH1 at Ohakune[2] (about 30km from Waiouru).

3. Problem Statements

Problem statements were identified as part of the Programme Business Case. The problem statements reflect the issues and/or deficiencies identified with the route, based on input from stakeholders and a review of the evidence during the PBC phase. The PBC made it clear that, based on the evidence, there was a clearly identified need to act now, to improve both safety and resilience on this National State Highway.

As explained above, the business cases have a focus on short-medium term improvements and exclude any major realignments. Because of this narrowing in scope, two of the four problem statements have been adjusted as shown in red below.

[2] https://www.greatjourneysofnz.co.nz/northern-explorer/plan/northern-explorer-stations/ohakune-railway-station/

No weightings were assigned to the problems at the Programme Business Case stage however weightings have now been assigned and are shown in brackets.

Problem 1: The unforgiving nature of the corridor contributes to a high number of crashes including deaths and serious injuries. (45%).

Problem 2: There are specific sections (Three Sisters and along Lake Taupō) of the existing SH1 alignment that are environmentally / physically constrained resulting in two trucks being unable to pass each other creating safety issues and inefficiencies ~~unreliable and inefficient movement of goods and people~~. (15%).

Problem 3: Weather, other natural events and crashes result in closures and delays. (25%).

Problem 4: The route around Lake Taupō traverses a major tourism area and areas of residential and significant recreational activity, ~~coupled with competing functions (national, inter-regional and local) of the road corridor~~ creating risk to different road users and impacting the amenity of the region. (15%).

Problem 2 has been reworded to reflect a specific issue raised by stakeholders. There are locations on the route where two trucks cannot pass one another. Truck drivers are in constant communication to co-ordinate their arrival times.

Problem 4 has also been made more specific, with a focus on conflicts where the road is adjacent to Lake Taupō only and amended to reflect the fact that the problem also relates to residents.

3.1 Presentation of Evidence

The problems are reviewed in the following sections, by considering the evidence in more detail to test whether the problems have changed since the PBCs were completed. The subsequent sections provide evidence for each of the problem statements. Each problem is assessed in the following manner:

- The **cause** of the problem – what are the main causes which contribute to the problem?
- The **effect** of the problem – to road users, efficiency, commercial activity, the surrounding environment etc.
- The **consequence** of the problem – what are the health, environmental and economic effects created by the problem?

The cause is then explained in more detail, and evidence presented.

4. Problems

4.1 Problem Area 1 – SAFETY

4.1.1 Problem Statements

The unforgiving nature of the corridor [between Taupō and Waiouru] contributes to a high number of crashes including deaths and serious injuries (45%).

Cause: Inconsistent and unforgiving road environment/nature of environment and road user mistakes.

Effect: High number of crashes.

Consequence: High number of deaths and serious injuries.

4.1.2 Cause

Over the years some sections of SH1 have been improved with intersection improvements, passing lane provision and widening works. However, these higher quality sections are interspersed with lower standard older sections which make the highway inconsistent. This is demonstrated by the KiwiRAP Star ratings for the corridor:

- 20% (of sections that have a rating) is below 3 star

- 67% is 3 star
- 13% is 4 star

A high 3 or 4 star is the recommended Customer Level of Service for a National road.

Star rating decreases with traffic growth, as traffic volumes form part of the rating process. Growth in the Waikato may result in downgrading of star ratings unless there are infrastructure improvements.

The following features are common along parts of the corridor and contribute to the inconsistent and unforgiving road environment.

- **Roadside hazards**: Roadside fences, trees and power poles are prevalent throughout the route, with roadside drop-offs, ditches and banks being limited to discreet locations. For the majority of the project corridor, there is limited or no roadside protection from these hazards, with the issue compounded by minimal shoulder recovery space. In combination with the winding alignment, this type of hazard exacerbates the unforgiving nature of the road environment. The severity of injury to vehicle occupants resulting from crashes into these hazards is likely to be high.
- **Inconsistent shoulders**: Roadside shoulders provide recovery space when drivers leave their lane. The narrower the available shoulder, the greater the likelihood of errant vehicles not recovering and crashing with potentially fatal or serious injury consequences. Ideally, a National Road would have sealed shoulders of at least 1.5m (with a desirable minimum of 2.5m where it is a recognised cyclist route, which this is not, but cyclists use SH1 lakeside for training and events). Sealing of the shoulder provides a smooth and stable surface which improves the ability to regain control of a vehicle, thereby reducing the risk of driver over-correction; over-correction can result vehicles crossing the centreline into opposing lanes of traffic. Between Piarere and Taupo, the shoulder is less than 1m wide for 75% of the route. Between Taupo and Waiouru the shoulder is less than 1m wide for 71% of the route.
- **Out of context curves (alignment)**: 'Out of Context Curves' include rural curves that require a reduction in operating speed greater than what is safe when assessed against the other geometric features. They are ranked according to the Personal Risk they present to vehicle occupants negotiating the curve. The key predictors of crash risk on a curve are the difference between approach speed and curve speed, readability of curve, traffic volume, the skid resistance, available side friction and approach gradient over 100m prior to the curve. Out of context curves are evident throughout the majority of the route between Tirau and Waiouru.
- **Undivided Carriageway**: The corridor is currently undivided, with two-way traffic generally separated by a narrow painted centreline. Roads with higher traffic volumes and curvilinear alignments mean there is a greater likelihood of errant vehicles crossing the median colliding with an oncoming vehicle with a high potential for fatal or serious injury consequences. At around 6,000 AADT, the head-on risk can be expected to start outweighing the run-off road risk. Therefore, the northern part of the corridor is considered to have high traffic volumes. For a road with a high traffic volume to achieve a KiwiRAP four star rating it must be median divided. At speeds greater than 70 km/h, the likelihood of vehicle occupants surviving a head-on crash reduces significantly.
- **Safe and Appropriate Speed**: The inconsistent and unforgiving nature of the road environment affects the speed at which the corridor can be safely driven. Speed is a significant factor in the survivability of crashes and parts of the corridor are unable to be safely driven at the posted speed limit (e.g. due to horizontal alignment). This is seen by a number of curves on the corridor with advisory speeds. The Transport Agency's Speed Management Guide defines Safe and Appropriate Speeds (SAAS) as travel speeds that are appropriate for the road function, design, safety and use. An SAAS assessment in accordance the Speed Management Guide completed in August 2017 identified sections where the current posted speed is not considered appropriate for the current road form.
- **Road User Facilities**: Fatigue was noted as a factor in nine fatal or serious injury crashes during the period 2012 to 2016. This may be partly a result of inadequate provision of rest areas. For example, for southbound vehicles there is a gap of 62km north of Waiouru. The NZ Stopping Places strategy suggests stopping places should generally be located every 50km.

4.1.3 Evidence

4.1.3.1 Crash History

The original Part A for this document was written utilising 2013-2017 crash data. Based on a review of latest crash statistics, the same trends are also present over the last two years. Accordingly, no updates were made to the Part A, as any conclusions can be considered to still be valid. Depending on the period between the completion of the business case and when this project is re-activated it is recommended that a crash review be undertaken to check whether the same trends are still present.

Whilst Part A has not been updated to reflect the latest crash data (with the exception of the Figure immediately below), the assessment of the shortlisted options for crash reduction and benefit cost has been conducted using the latest data.

Figure 4-1 shows crash totals and severity each year between 2007 and 2019. Overall crash totals, as well as injury crash totals for the 5-year period between 2013 -2017 were lower than for the preceding five years, but latest data sees a slight increase. The cause of this is not clear. Nationally crash totals were decreasing during the period 2010-2013 but increased from 2014 onwards.

Serious and fatal injury crash totals were fluctuating around 10 per year between 2008 and 2011. They were lower for the 2012 to 2014 period but have returned to around 10 or above since 2015.

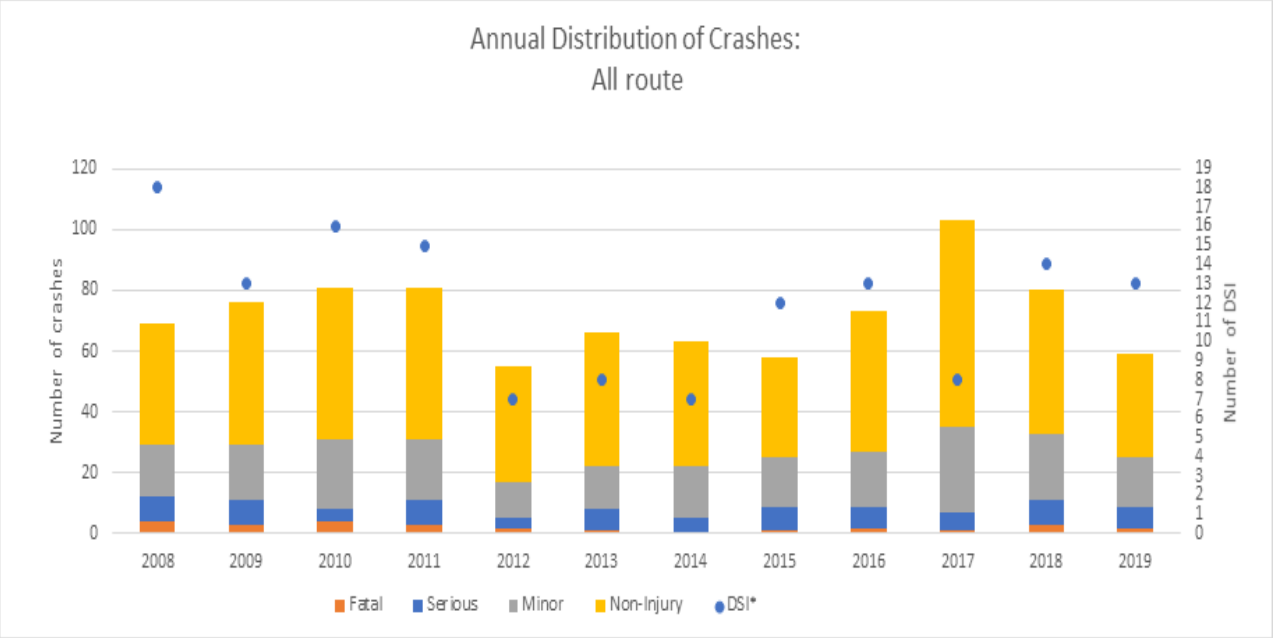


Figure 4-1: Taupo to Waiouru - 10 year crash history (2008-19 (note 2019 data not yet complete)

A summary of the crash record is provided in the table below and injury crash locations are identified in Figure 4-2.

Table 4-1: Fatal and Serious Crash and Casualty Totals (casualty in brackets)

Crash Type	2008 - 2012	2013 - 2017	2008 - 2017
Run-off Road	20 (22)	20 (23)	40 (45)
Head-on	19 (39)	10 (16)	29 (55)
Intersection	2 (2)	3 (4)	5 (6)
Other	6 (7)	3 (3)	9 (10)
Total	47 (70)	36 (46)	83 (116)

Loss of control (53%), driving too fast (36%) and inexperienced drivers (36%) were frequent causes of fatal and serious crashes within the recent five years (2013-2017). Loss of control (59%), driving too fast (35%) and slippery road conditions (28%) were frequent causes of all reported injury crashes in the recent five years. Crashes related to lost control/ too fast when cornering appeared to be focused on the winding

section of the Desert Road and a few scattered around the lake. Crashes related to lost control due to road conditions and slippery due to frost or ice appeared to be focused on the Desert Road.

The reason of the significant reduction in head-on crash totals, from 19 (2008-12) to 10 (2013-17) is not known.

Intersection type crashes are not significantly high overall or concentrated on this corridor. An intersection needs to have 3 fatal or serious crashes over five years, 5 fatal or serious crashes over ten years of a Collective Risk above 1.1 to be considered high risk in accordance with the Transport Agency's High Risk Intersection Guide. There has not been a significant number of fatal or serious crashes at any intersection along the corridor and no intersection can be classified as a high risk intersection. The Five Mile Bay access, Tawhaa Street and Otene Road, at the north end of the corridor has had two injury crashes between 2013 and 2017.

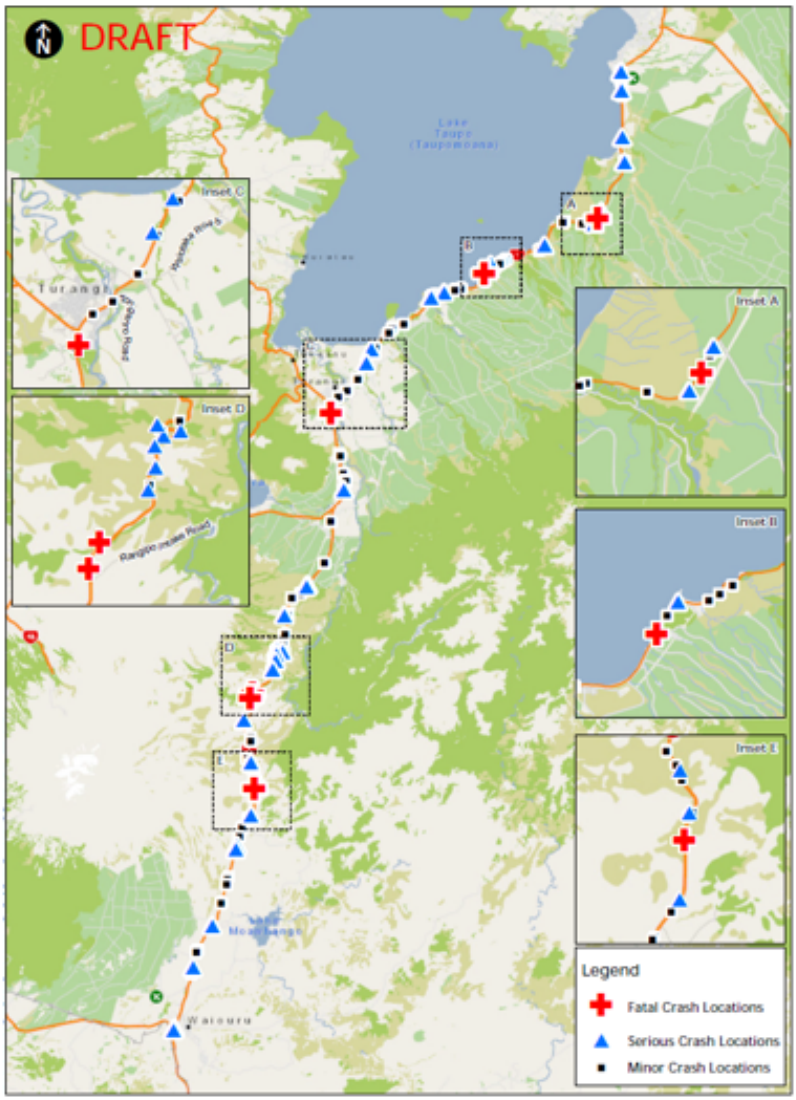


Figure 4-2: Crash Locations (2008-17)

4.1.3.2 KiwiRAP Classification

The KiwiRAP star rating over the corridor averages 3.4 stars. There is a section at the beginning of the route that has no KiwiRAP data available. Over 14km of the route is rated 2 star (based on 5km averages) due to a combination of alignment, intersections and roadside hazards, particularly through the 'Three Sisters' and winding sections of the Desert Road and lakeside sections along the route. These characteristics result in an unforgiving and inconsistent road environment. The ratings are shown in Figure 4-3, along with a table showing star rating by length of corridor, and the locations rated 2 star.

Two Star Locations (from north to south on map):

- Between Toki Point and Motutere, south of Hatepe
- Through Turangi
- Three Sisters (Desert Road)

Breakdown of star rating against length of corridor:

Star Rating	Total Length (km)
2	14.1 (17%)
3	64.9 (77%)
4	5 (6%)
5	0
N/A	16.2

Figure 4-3: KiwiRAP Star Rating.

4.1.3.3 Run-off Road RPS

Run-off road RPS is a component of the KiwiRAP star rating and is a measure of the risk (both likelihood and severity) of fatal and serious injury from a vehicle leaving the road. This risk is based on the road's design elements, such as:

- Number of lanes and median separation
- Roadside hazard risk
- Lane and sealed shoulder width
- Horizontal and vertical alignment
- Standard of delineation

This corridor has 15.1 km, or approximately 7% of either side of the corridor (either left or right side), measured as high risk (run-off road RPS ≥ 5).

Figure 4-4 shows the run-off road risk (KiwiRAP run-off road protection score (RPS)) associated with hazards on the left and right hand side of the project corridor. It demonstrates that, on the Three Sisters section of the Desert Road (763/9.6 to 777/2.6), the risk associated with run-off crashes is typically medium or

medium-high (RPS score of 2.25 to 12.5). There are sections near Turangi and the lakeside section with medium risk and isolated pockets of medium-low and medium-high.

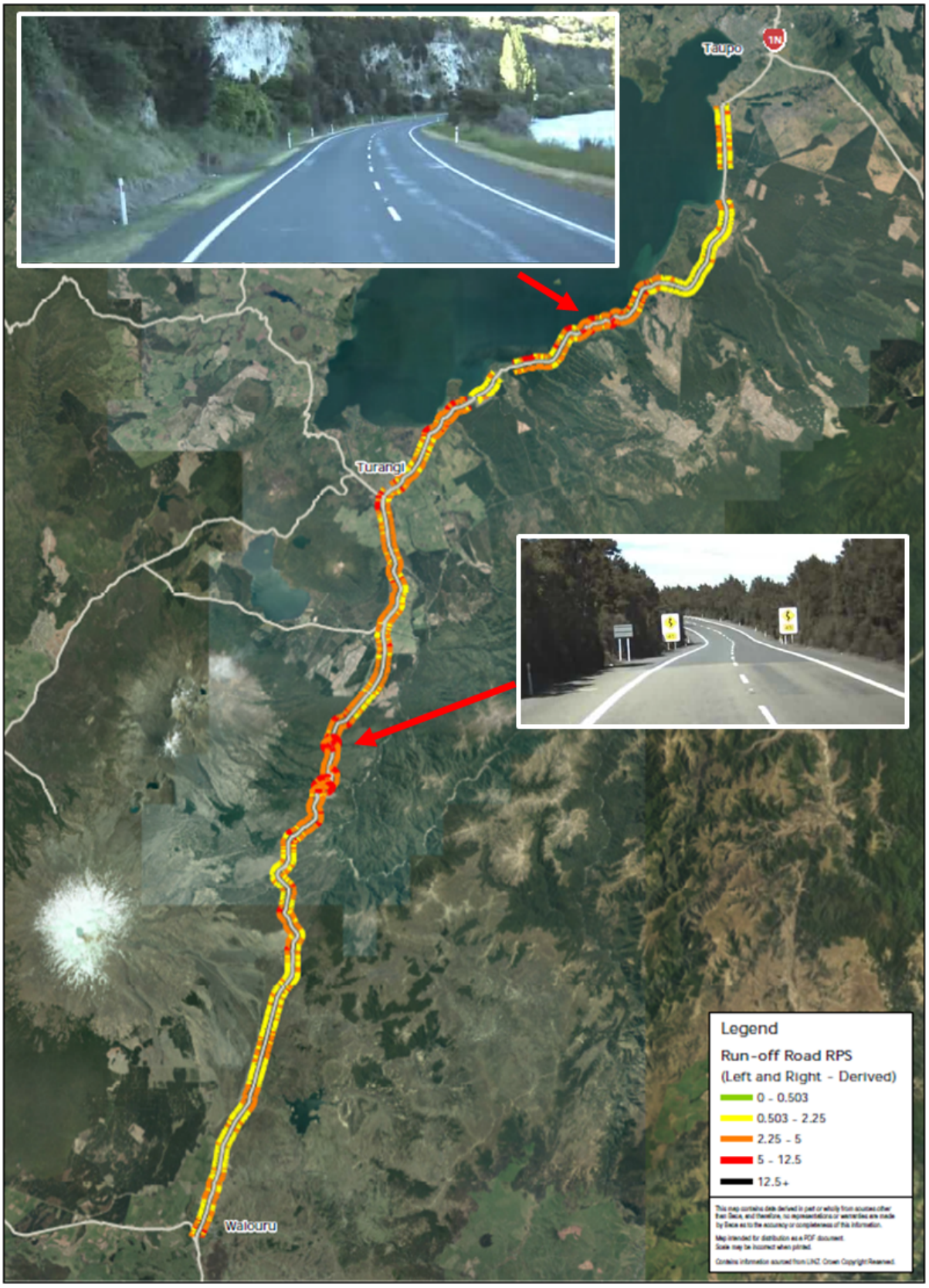


Figure 4-4: Run-off Road risk (Source: Road Protection Score)

4.1.3.4 Head-on RPS

Head-on RPS is a component of the KiwiRAP star rating and is a measure of the risk (both likelihood and severity) of fatal and serious injury from two vehicles colliding head-on. This risk is based on the road's design elements, such as.

- Number of lanes and median separation
- Lane and sealed shoulder width
- Horizontal and vertical alignment
- Standard of delineation

Approximately 55km of the corridor, or 64% of its length is measured as high risk (head-on RPS ≥ 10). The high head-on risk is attributed to the following characteristics:

- Minimal separation between opposing traffic
- Narrow shoulder widths
- Moderate traffic volumes
- Winding sections of road

The high head-on risk is reflected in the crash record for the corridor which indicates that, between 2012 and 2016, head-on crashes result in 24% of the fatal and serious injury crashes and 35% of the deaths and serious injuries for the period.

4.1.3.5 Inconsistent Shoulders

Ideally this corridor would have sealed shoulders of a least 1.5m (2.0m if it is a recognised cyclist route). However shoulder widths on this part of the corridor currently vary between 0.0m and 2.4m, as shown in Table 4-2.

Table 4-2: Corridor Shoulder Widths (Source: KiwiRAP data)

Shoulder Width	Length (km)	% of Route
0-0.5m	24.9	24%
0.6-1.0m	48.2	47%
1.1-2.0m	25.4	25%
>2.0m	4.2	4%

4.1.3.6 Out of Context Curves

The 'Out of Context Curves' are those included in the RAMM database. They include rural curves with a radius less than 400m which are ranked according to the Personal Risk they present to vehicles entering the curve. The key predictors of crash risk on a curve are the curve speed, the difference between approach speed and curve speed, the curve length, traffic volume, the skid resistance on the curve and the average approach gradient over 100m prior to the curve.

Figure 4-5 shows the location of out of context curves along the corridor route. It demonstrates that the out of context curves are evident in particular sections between Taupō and Waiouru. There are two concentrated areas with high risk curves on this corridor and these are at the following locations:

- A cluster of curves between Motuoapa and Turangi
- The windy section of Desert Road, including the Three Sisters

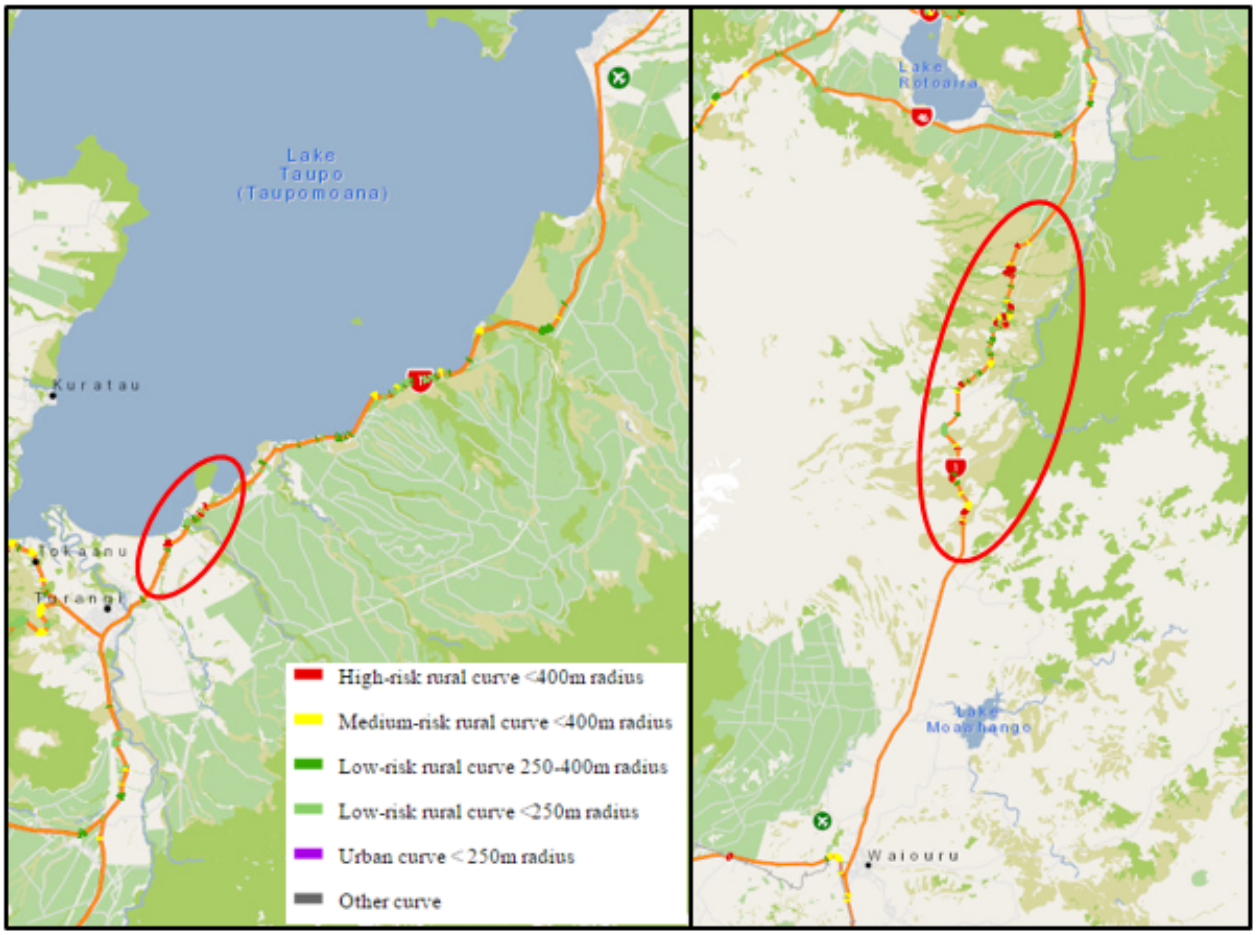


Figure 4-5: Out of Context Curve Locations

4.1.3.7 Safe and Appropriate Speed (SAAS)

A SAAS assessment in accordance the Speed Management Guide (as shown in the Safer Journeys Risk Assessment Tool) identified the following sections where the current posted speed is not considered appropriate for the current road form:

- Taupo Airport to Waitahanui (713/0.0 to 713/6.5)
- Mission Bay to Motuoapa (726/9.6 to 744/0.1)

These sections of the corridor are not considered safe and appropriate at their current posted speed limit due to the:

- Curved and winding alignment
- Narrow shoulders
- Moderate roadside hazard severity

Since the project start in 2017 a greater emphasis has been placed on speed management with the Transport Agency and local authorities assessing their networks in line with the Speed Management Guidelines. As part of these assessments two sections on the Southern section have been identified for speed management measures, these are:

- The rural lakeside communities – engineer down, speed management to lower speed through communities
- Three sisters – engineer down to support lower speeds and safety measures to make road-side environment more forgiving

4.1.3.8 Customer Levels of Service

This corridor has a One Network Road Classification (ONRC) of National road, with an AADT ranging between 6,000 and 3,500, of which 15 to 23% are heavy vehicles respectively.

The relevant Customer Levels of Service for a High Volume National ONRC relating to this corridor problem are:

- Safety: A high KiwiRAP 3 or 4-star standard, or equivalent, with consistent and predictable alignment. User hazards mostly mitigated. Active road users (if present) are mostly provided with separate space or are physically separated. Some lower standards and/or winding sections may require lower speeds and extra care. High level of road user safety guidance provided.
- Optimal speeds (safety and efficiency): Higher speeds depending on assessed level of risk. Lower if mixed use, high intersection density, schools, shopping and concentrations of active road users.

The consequence of the nature of the road and the high crash risk is a high number of serious and fatal injury crashes on both sections of the corridor.

4.1.3.9 Collective Risk Rating

Based on the 2013-2017 crash history, the Collective Risk for the full corridor is medium/medium-high (calculated as 0.066 fatal or serious crashes per year per km which is on the boundary between medium and medium-high collective risk). Considering the corridor in smaller increments, the Collective Risk ranges from low to high, as illustrated in Figure 4-6 below. Each of the five risk bands represents approximately 20% of rural road scores across the country.

Areas which have a medium-high Collective Risk are:

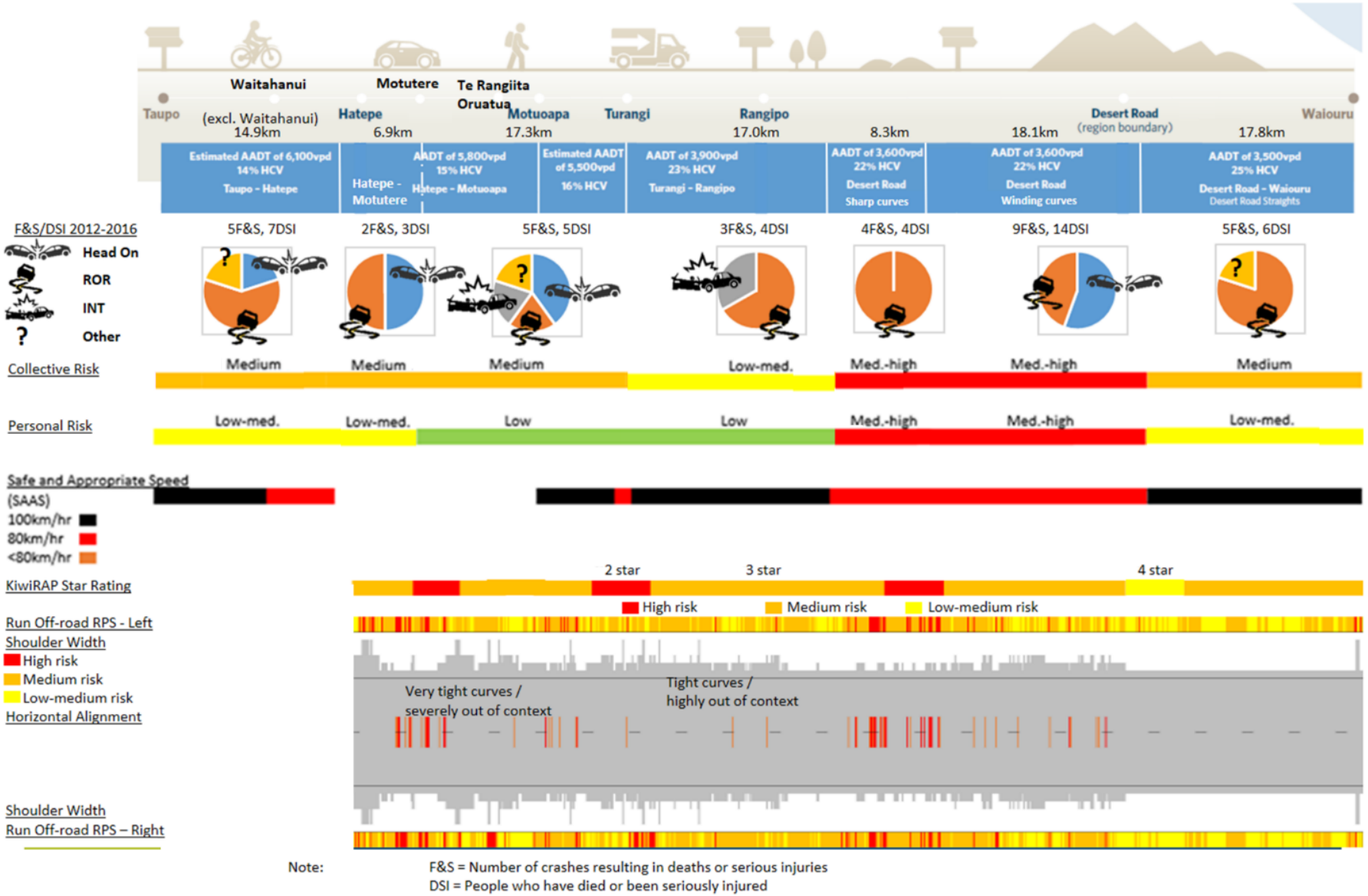
- Windy section of Desert Road

This is consistent with the areas of low KiwiRAP rating and high crash frequency.

4.1.3.10 Summary

The unforgiving nature of the corridor between Taupō and Waiouru contributes to a high number of crashes including deaths and serious injuries. This is demonstrated by the two to three KiwiRAP star rating, medium to medium-high Collective Risk, differences between posted speed and safe and appropriate speed, and a high number of death and serious injury crashes for the corridor. The corridor does not meet the ONRC Customer Levels of Service for a National State Highway because the KiwiRAP rating is lower than 4 star and active road users are not well provided for. The evidence indicates a need to act now to prevent further causalities and fatalities on this National State Highway, which is clearly below the appropriate infrastructure standard for the role that it plays in the network. Figure 4-6 shows these metrics summarised for the corridor.

Crashes are occurring due to loss of control, driving too fast, and inexperience, but the specific aspects of the road environment contributing to the problem include the minimal separation between opposing traffic lanes, curved and winding alignment, narrow shoulders; and moderate to high risk road side hazards.



Note: F&S = Number of crashes resulting in deaths or serious injuries
DSI = People who have died or been seriously injured

Figure 4-6: Taupō to Waiouru Safety Summary

4.2 Problem Area 2 – ROUTE AVAILABILITY

4.2.1 Problem Statements

Weather, other natural events and crashes result in closures and delays (25%), and

There are specific sections (Three Sisters and along Lake Taupō) of the existing SH1 alignment that are environmentally / physically constrained resulting in two trucks being unable to pass each other creating safety issues and inefficiencies (15%)

Cause:	Planned and reactive maintenance, crashes and truck rollovers, weather and environmental events, rockfalls and volcanic eruptions cause disruption to route availability. Permanent localised geometric constraints means two trucks cannot pass.
Effect:	Road closed or partially closed for periods, where two trucks cannot pass this causes delays, inefficiencies and risk.
Consequence:	Delays, lost productivity, traffic forced to use alternative routes, safety issues, poor customer experience.

4.2.2 Cause

There are two types of event which can lead to a closure:

- Low probability higher impact events. For the section between Rangipo and Waiouru this includes volcanic events. The road passes close to two active volcanoes, Mt Tongariro (erupted 2012) and Mt Ruapehu (erupted 2007). As a result, the Transport Agency resilience prioritisation score for this section of road is 'high resilience prioritisation[3].

Between Taupō and Rangipo (north of the Desert Road) the score is 'low resilience prioritisation'.

- High frequency lower impact events. These events are a result of:
    - Weather conditions on the route which can include snow and ice, strong winds which can cause trees to fall and block the road, and heavy and/or prolonged rainfall, resulting in flooding.
    - Environmental incidents which result from the rock type, topography and erosion, and include rockfalls, slips, and washouts.
    - Traffic incidents, including crashes and truck rollovers resulting from a range of factors.
    - Maintenance, which can be planned or reactive. Maintenance is not part of this IBC and is being consider separately.

Route availability also refers to the ease of use by trucks and other larger vehicles. The following are locations[3] where two trucks are unable or find it difficult to pass each other:

- Just north of Tauranga Taupō Bridge on the 35km/h curve
- Series of curves between Hallets Bay/Pākā Bay and Bulli Point/Te Poporo

The road alignment and geometry in these locations is in some cases constrained by topography (e.g. steep cliff on one side, drop off to Lake Taupō on the other) however in other locations, such as the Tauranga Taupō bridge, a combination of a very narrow deck width and tight horizontal approach geometry present unacceptable elements for a strategic route of this nature.

[3] Series of curves at the Three Sisters and Desert Road Curves were also initially identified in this list, however following consultation during this business case these locations were removed.

4.2.3 Evidence – High Frequency Low Impact Events

TREIS has been used to collate information on high frequency low impact events[4]. Using this data, a level of service gap analysis and high frequency low impact event analysis has been completed for both sections of the corridor. The results are presented below.

For this section of highway, route reliability and travel times have, on average, been affected by 7-8 closures per annum (2011-17). Each year, there are around 104 hours when part of the route is closed.

The regional average road closure duration is 3 hours. Based on data from 2011-17, the average duration on this corridor exceeds this value considerably on all sections. The average duration of closure for the corridor overall is around 13 hours, noting that the Desert Road can be closed for days at a time.

The One Network Road Classification (ONRC) defines Customer Levels of Service for all road classes. It sets a 'resilience' standard for each class of road. Table 4-3 shows how the road compares to the standard. It indicates that there is a significant gap for both sections of road in Customer Levels of Service relating to mobility, both in terms of reliable travel time and resilience.

Table 4-3: Customer Level of Service Gap Analysis (Red Shading indicates significant gap).

Road Class	Customer Levels of Service – Mobility	Customer Levels of Service – Mobility
	Travel Time Reliability	Resilience
National	The majority of road users experience consistent travel times with some exceptions in urban heavy peak, holiday or during major events.	Route is always available during major weather or emergency events and viable alternatives exist. Rapid clearance of incidents affecting road users. Road users are generally advised in advance of issues and incidents.
Taupō to Waiouru Assessment	Route reliability and travel times have, on average, been affected by 7-8 closures per annum (2011-17). Each year, there are around 104 hours when part of the route is closed.	At least one part of this route has not been available for, on average, 7-8 occasions per annum (2011-17). The shortest duration of closure in the seven year period was 3 minutes, and the longest was 64 hours. Clearance is not always rapid. Some signage, but no comprehensive system in place to alert users of network performance issues. There are a number of alternative routes however these are constrained for High Productivity Motor Vehicles (estimated at 50% of the traffic stream)

4.2.4 Two Trucks Passing

The effect of two trucks or larger vehicles being unable to pass each other at certain points leads to a lower level of service for these customers, who expect infrastructure that supports commercial activity. There is a need for constant communication between drivers. The effect is inefficient truck movement and safety issues. Trucks slowing down and waiting for an oncoming truck to pass results in braking / accelerating, reducing fuel efficiency and holding up other road users. To achieve efficient freight movements, consistent speeds between 84 and 88 km/h are required.

It is also likely that drivers of boats with trailers and campervans will experience trouble at these locations, which adds to risk, because they will not be as prepared for this as truck drivers, or able to easily communicate with others coming the other way in larger vehicles. The curves are likely to be challenging to drivers of regular motor vehicles also. For example, observations at the Tauranga Taupō Bridge curve showed vehicles were not always able to position themselves safely or correctly. Figure 4-7 shows images of that curve and examples of common vehicle positioning.

[4] The TREIS data has been further interrogated and there are some issues with accuracy. However the outputs have been adjusted manually to provide the information presented in this report. Refer to Resilience Technical Note 2017 for more information.

Figure 4-7: Curve north of Tauranga Taupō Bridge, where two larger vehicles are unable to pass each other and which drivers find difficult to negotiate

The consequence of two trucks being unable to pass is that the efficiency of the route is lowered and access is restricted. Drivers must communicate with another to avoid a crash or other incident. These sections of road are very demanding for all motorists to negotiate safely, with little margin for error. The route is already open for High Productivity Motor Vehicles and 50 MAX vehicles. The safety impacts are showing up in the data for the following locations:

- Tauranga Taupō Bridge 35km/h curve – there has been one crash within 30m of this curve in the last five years (2013-17). The crash was the result of the drivers' loss of control negotiating the bend from driving too fast. This resulted in a minor injury crash. In 2018-2019 a non-injury crash occurred within 30m of the curve.
- Curves between Halletts Bay and Bulli Point/Te Poporo – there are three curves on this stretch of road. Crashes for this stretch of road in the last five years have been either at or in the vicinity of each curve, as shown in Figure 4-8. There were 13 crashes in total, three minor injury crashes and 10 non-injury crashes. Five were a result of loss of control on the bend. This is also a landslip prone area, and there is no buffer zone to protect contamination of Lake Taupō in the event of a spill or crash.

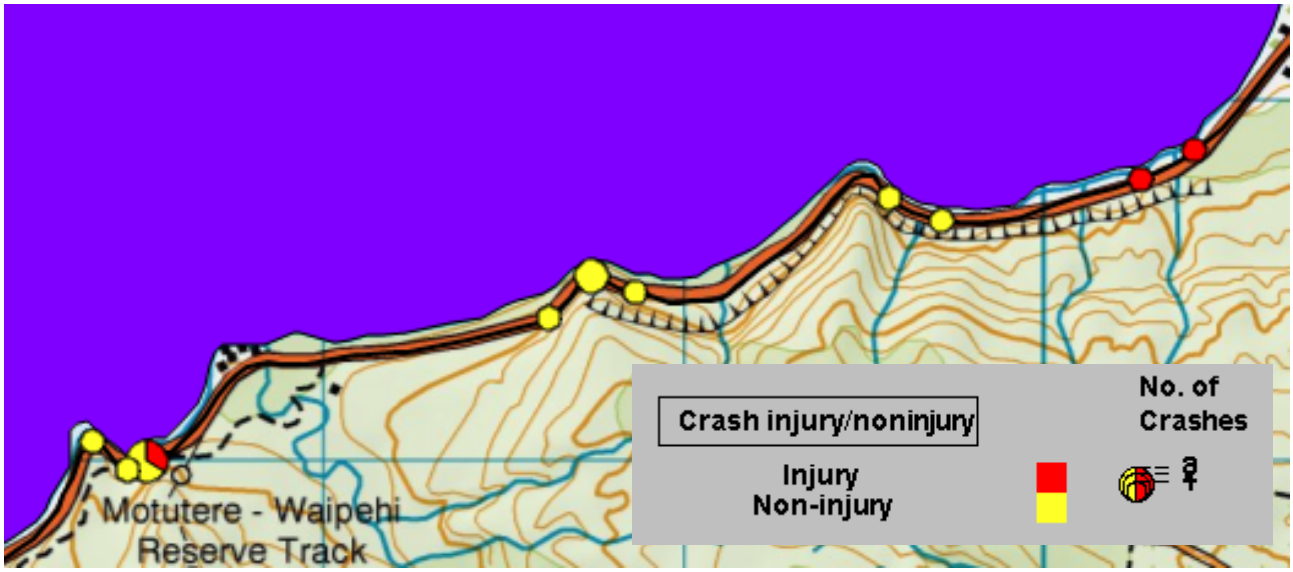


Figure 4-8: Crashes between Hallets Bay/Pākā Bay and Bulli Point/Te Poporo (2013-17)

- Three Sisters and Desert Road curves – crashes for this stretch of road in the last five years have been either at or in the vicinity of these curves, as shown in Figure 4-9. Three Sisters is the set of curves to the north in the map, and Desert Road curves are further south. There were 72 crashes in total, with five resulting in serious injuries, and 14 resulting in minor injuries. The majority of crashes were caused by loss of control on curves, with a significant number noting fatigue and speed as contributory factors. Five of the crashes involved motorcyclists, of these four resulted in injury – three serious and one minor injurie.

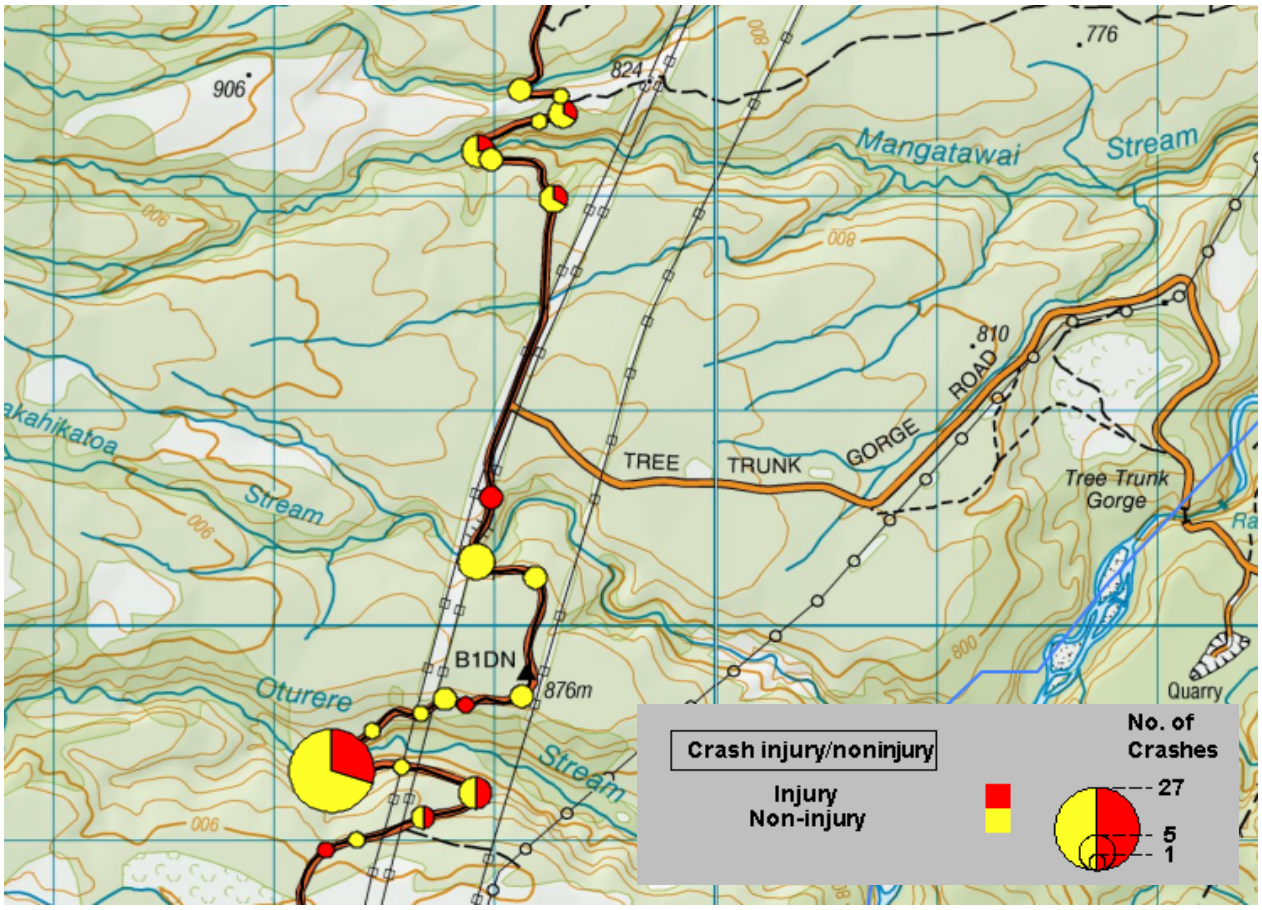


Figure 4-9: Crashes – Three Sisters and Desert Road Curves (2013-17)

In summary, the evidence shows:

- Events in the Taupō – Waiouru are split principally between weather events and crashes. Two stretches stand out as being susceptible to longer and more frequent closures:
  - Hatepe to Motutere - due to crashes and slips
  - Rangipo to Waiouru - due to crashes, snow/ice and fallen trees
- For a national route, sections of the corridor are closed more frequently than desirable, and urgent action is required to reduce the frequency and duration of closures on the corridor, based on the resilience tool assessment.
- There are locations on the corridor where two trucks cannot pass, causing inefficiencies and safety risk for all.
- Between Taupō and Waiouru, the average duration of closures is 13 hours, which is more than four times the regional average (figures based on average 2011-17).
- Many alternative routes are not accessible for heavy vehicles and/or High Productivity Motor Vehicles. Diversions are lengthy and have high economic impact.
- There is no comprehensive system to notify people of closures and delays.

- Closures are resulting in poor user experience and cost to the economy of increased travel times and fuel use. For a nationally significant corridor the availability of the corridor is restricted and recovery from incidents is slow. To support the economy, there is a need to invest in the corridor now to ensure this level of service is improved in the future.
- The results are consistent with the findings of the programme business cases.

4.3 Problem Area 3 – COMPETING INTERESTS

4.3.1 Problem Statement

The route around Lake Taupō traverses a major tourism area and areas of residential and significant recreational activity, creating risk to different road users and impacting the amenity of the region.

Cause: A high speed route around Lake Taupō with a large proportion of freight (15% at Hallets Bay/Pākā Bay) bisects major tourism, recreation and smaller residential areas and results in a more complex road environment

Effect: Risk and delays for through traffic and local traffic (all modes) as a result of:

- Tourists and residents walking and crossing the road, particularly where there are no crossing facilities, high vehicle speeds and high percentage of freight
- On-street parking and manoeuvring
- Turns in and out of side roads and access ways
- People cycling on the highway where there is no shoulder, speeds are high and there is a high percentage of freight

Consequence: Risk of crashes, poor connectivity, delays, poor user experience both on the highway and within communities and recreation areas

- Risk of crashes from lack of pedestrian and cycle facilities
- Parking on highway can be a hazard for through traffic and create delays
- It can be difficult to turn out of side streets on to highway and with higher speeds and trucks present the consequences can be more severe if a mistake is made
- cyclists on highway can cause delays and create a hazard
- severance can put people off stopping in small communities and will be a problem for people living alongside SH1.

4.3.2 Cause

Tourist attractions and recreational activities are located adjacent to the stretch of SH1 by Lake Taupō, and the highway also bisects some small communities.

The tourism industry is estimated to be worth $22bn to the New Zealand economy. From 2009, visitor expenditure in the Waikato region has increased by 2.1% p.a. The Regional Tourism Organisations for Lake Taupō and Ruapehu comprised around 3% of market share (2015) generating $600m in tourism expenditure. The corridor is part of the 'Thermal Explorer' route.

The lake is a destination for international and domestic visitors, who come for the high scenic value as well as recreational opportunities such as swimming, fishing, boating, mountain biking, cycling and walking. In general, the location of the highway adjacent to Lake Taupō erodes the potential for peaceful enjoyment of the lake and scenery and constrains the space available for recreation by the lakeside. In many locations there is just a narrow strip of land between the lake and highway.

The MBIE tourism flows model shows the following tourism journeys per year:

- Putaruru to Lake Taupō 5-10 million journeys
- Turangi South 1-5 million journeys

Taupō has become a hub for multi-sports, and there are a number of major sporting events including cycling and triathlons that use sections of the route. As a result, competitors use the highway for weeks in advance of an event for training purposes. In addition, some of the events use SH1 as part of their route e.g. Lake Taupō Cycle Challenge. There are no consistent facilities for cyclists adjacent to the lake.

For the small communities along the route the effect of the highway is to cause severance. It can be challenging to cross the road particularly for young and older age groups, and it can be difficult and risky

to turn out of side streets, particularly where through traffic speeds are high and there are large numbers of trucks. Severance has a negative effect on community wellbeing. However, the presence of the highway with through traffic can bring economic benefits to the community in passing trade.

For through traffic the small communities present multiple hazards and potential delays. The speed limit through most peri-urban lakeside communities is 70km/h. All vehicles must slow down, and there are issues on the exit from townships due to different acceleration rates for light and heavy vehicles. Intersection movements, parking and pedestrians crossing all add to the complexity and safety of the road environment through these communities. On the other hand, they can provide useful stopping areas and facilities for drivers to take a break.

A high percentage of freight in the traffic stream can add to the actual and perceived risk in small communities. On SH1 by Lake Taupō, 15% of vehicles are trucks (at Hallets Bay/Pākā Bay), meaning that one in every six/seven vehicles is a truck.

4.3.3 Evidence

The effect at particular locations is shown in Table 4-4.

Table 4-4: Land Use and Transport User Conflicts

Location	Land Use	Transport	Known Issues
Waitahanui	Housing both sides of highway. Lake access and fishing spot.	70km/h speed limit, very few crossing facilities.	Severance, speed, safety, difficulty crossing and making turns out of side roads.
Hatepe and Hallets Bay/Pākā Bay	Lake access, fishing spot.	100km/h speed limit.	Speed, safety
Bulli Point/Te Poporo	Lake access, rest area, popular for swimming. Destination Great Lake Taupo future aspirations to enhance and build visitor numbers.	100km/h speed limit. Close to 25km/h curve.	Cars park adjacent to SH1 and sometimes partially on live traffic lane, creating a hazard.
Motutere	Motor camp straddles highway (see Figure 4-10), lake access, rest area, wharf, fishing spot and swimming.	100km/h speed limit, no crossing facilities, children crossing warning signs.	Clear pedestrian desire line over highway, high speed environment.
Waitetoko/ Mission Bay/ Ōtaiātoa Bay	Lake access, rest area, boat ramp, swimming, first view of Lake Taupō travelling north on SH1.	100km/h speed limit, no crossing facilities, particularly at Mission Bay	Severance, high speed environment.
Te Rangiita (Tauranga Taupō)	Fishing spot, boat ramp.	70km/h speed limit, 35km/h curve on approach to bridge, no crossing facilities, children crossing warning signs. (Figure 4-10).	Severance
Motouapa	Scenic Lookout, lake access, marina, rest area, and fishing.	70km/h speed limit, no crossing facilities, children crossing warning signs.	Severance, high speeds at night resulting in complaints.

Figure 4-10: Motutere – Caravan Park Straddles highway (above); typical pedestrian crossing signs at Te Rangiita (Tauranga Taupō)(below)

Although specific locations have been identified in Table 4-4 there is also an issue along the corridor with people wanting to access the lake for recreational purposes, which can mean that people try and stop at any location along the lake, even if it is not designed for stopping. Traffic turning into tourist and recreational areas requires heavy vehicles to reduce speed or stop due to the narrow carriageway.

There is a more general issue with use of the road corridor for recreational activities such as cycling. The shoulder is of variable width and in some places, there is no shoulder. In those locations, cyclists must use the live traffic lane, and if there is traffic in both directions this can lead to safety issues where motorists must slow down and overtake. In some places it is likely that the forward visibility is so poor that drivers may need to wait behind a cyclist or group of cyclists for some length of time, leading to delays and increasing the likelihood of risk taking.

There is seasonal variation in traffic volumes on the corridor, with high numbers of recreational users and tourists during long weekends and holiday periods. Monthly averages recorded at Hallets Bay show volumes rising to 7-8,000vpd the summer months and falling to around 5,000vpd in winter.

The ONRC defines expected customer levels of service for active road users, and expectations for land use access, on National Roads. A gap analysis is provided in Table 4-5 which demonstrates the road is not meeting the customer levels of service for active road users in many sections, particularly where there is a narrow or no shoulder, and where there is crossing demand but no facilities provided.

Table 4-5: Customer Levels of Service for Land Use Access and Active Modes (red = significant gap)

Road Class	Customer Levels of Service Safety (extract)	Customer Levels of Service Accessibility (extract)
National	Active road users (if present) are mostly provided with separate space or are physically separated.	Land use access for road users infrequent and highly restricted in rural areas, and often restricted in urban areas. Infrequent connections. Network access and journey continuity for active road users (if present) mostly provided by separate space or physical separation.
Taupō to Turangi	In some places there are footpaths, but between settlements and within many townships pedestrian walk on the shoulder or verge, and crossing facilities are rare. Warning signs of pedestrians crossing are the only safety measure. Cyclists can use the shoulder in some sections, where it is wide enough. In other sections there is no shoulder and they must share the carriageway.	Land use access is common and appears unrestricted in rural and urban areas. There are frequent connections to lower order roads such as local roads and access ways. There is a shoulder on some sections, but still many sections around Lake Taupō where the width is constrained and there is no shoulder or separate cycling facility. Pedestrian numbers would tend to be low in these locations, but cyclist numbers can be high at times.

Clearly the high speed environment, high percentage of freight vehicles in the traffic stream, and lack of facilities for pedestrians and cyclists results in risk to these vulnerable road users. However, as yet the risk is not reflected in crash data, as there were no recorded pedestrian or cycle crashes in the townships on the route between 2012 and 2016. However, with growing traffic volumes, the risk will continue to increase. Similarly intersection crashes made up a small but increasing percentage (12%) of total crashes. Figure 4-11 shows the number of crashes per year that occurred either mid-block or at an intersection. Service stations have been noted as a particular risk for turning movements and conflict.

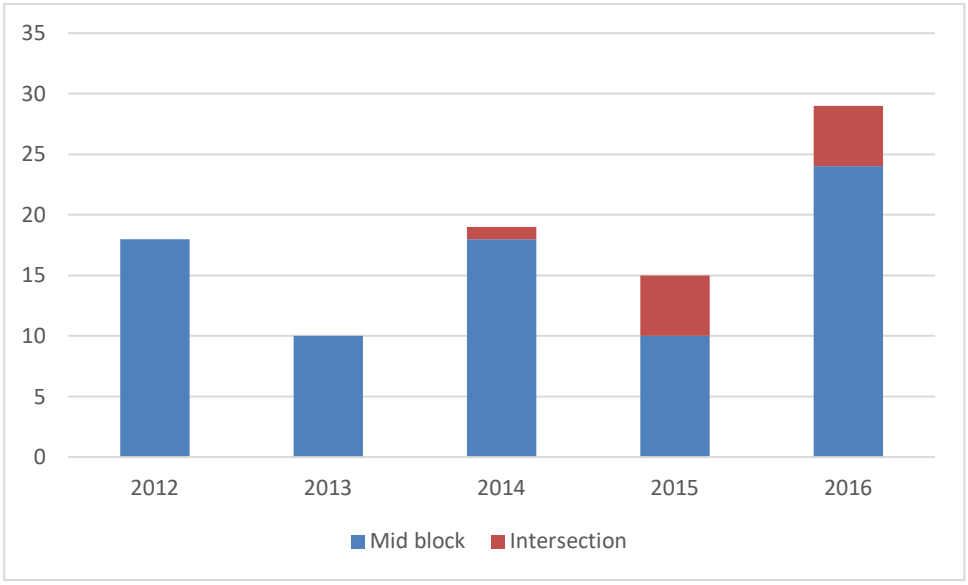


Figure 4-11: Total crashes per annum SH1 (south of and not including intersection with ANZAC Memorial Drive, Taupō to Motuoapa)

In summary, the evidence shows:

Specific locations have been identified where the highway has a negative impact on local communities and visitors, and vice versa. This issue is most frequent alongside Lake Taupo.

- There are inadequate pedestrian crossing facilities at specific sites with crossing demand such as Waitahanui, Motutere, Te Rangiita, Motuoapa.
- Parking management is required at Bulli Point/Te Poporo.
- Speeds are high at some locations adding to perception of risk and complaints.
- Signage is lacking in some locations which can lead to drivers slowing down to look for parking or trying to find destinations.

- Use of highway for cycle training ahead of events, with no consistent shoulder for cyclists to use.
- Highway is not meeting ONRC expectations for active road users and land use access.
- Despite the risks, actual crashes involving pedestrians and cyclists remain low. However, the intersection crash totals are rising as traffic volumes rise.

5. Benefits and Opportunities

5.1 Problem and Benefit Map

The evidence shows that the problems have not changed since the PBC was completed. No further changes have been made to the problem statements as a result of the review of the evidence. The evidence still supports the need to invest now, particularly to prevent further deaths and serious injuries on the corridor, to improve the resilience of the corridor, and to bring the route in line with the ONRC expectations for Level of Service for a National State Highway carrying a high proportion of freight and tourist traffic.

An Investment Logic Map has been developed and is shown in Figure 5-1. This illustrates the links between the problems, benefits and Investment Objectives. The Investment Objectives are discussed further below.[5]

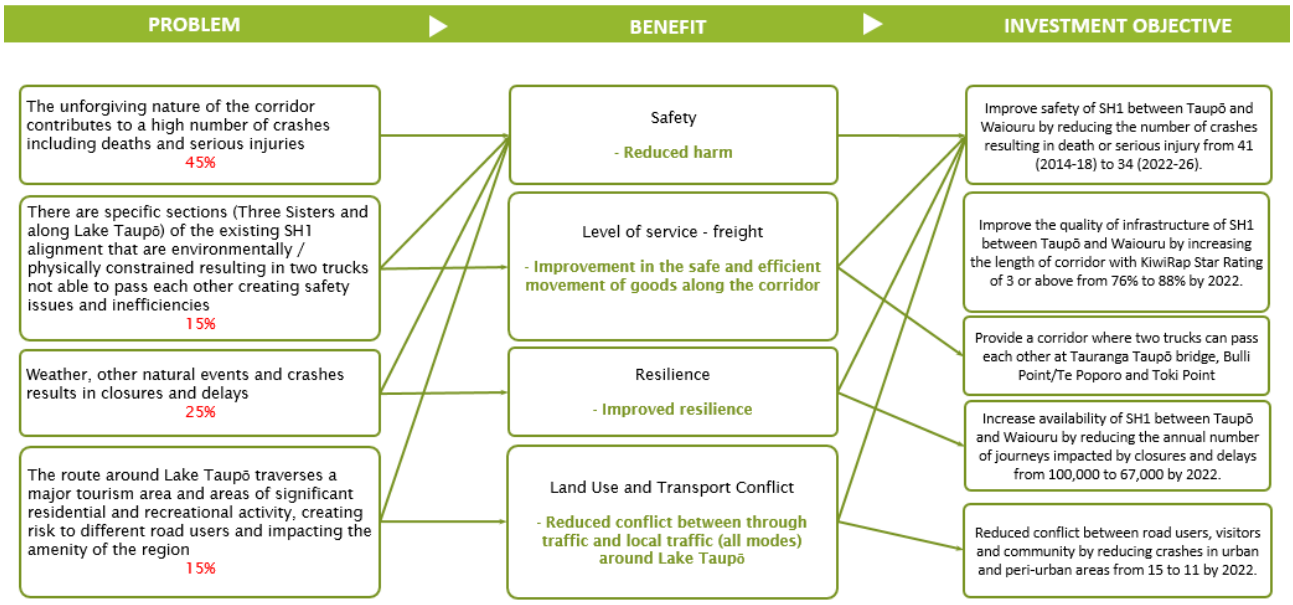


Figure 5-1: Taupō to Waiouru Investment Logic Map

5.2 Benefits

The benefits were determined at the PBC stage and reviewed for this business case. A minor change was made, which was to add a benefit relating to improved level of service for freight. The benefit statements are shown below:

- Safety – through improvements to infrastructure, reduced risk to road users, and a reduced number of fatal and serious injuries.
- Level of service – freight – through ensuring two trucks can pass one another at locations where this is not currently possible. This will offer an improved level of service to the freight industry and also bring safety benefits for all users. This part of the state highway network will be closer to the expected standard of a National Road.

[5] At this point, realistic targets for the Investment Objectives have not been identified, and XXX is used to highlight this.

- Resilience – through reducing the frequency and duration of road closures, which will result in more efficient movement of people and goods, as delays are fewer, and when they do occur, they affect they network for a shorter period of time. This will increase the resilience of the road network.
- Land use and transport conflict – through addressing the issues at conflict points, safety, community wellbeing and user experience will be improved.

5.3 Opportunities

This section describes the opportunities of investing in improvements to address the problems on the corridor.

5.3.1 Achieve ONRC Aspirations for the Route

One of the main opportunities is to create a higher standard of highway, to better meet the customer level of service aspirations for high volume and national roads. The SH1 route between Auckland and Wellington is the primary north-south route for the North Island.

There are several aspects to this, which largely reflect the benefit statements:

- Address the known safety issues and improve the standard of the infrastructure to the appropriate safety rating
- Reduce the frequency and duration of road closures and knock on impacts to road users such as delays, and provide appropriate communications when there are road closures/delays
- Provide a corridor where two trucks can pass each other
- Provide suitable facilities for active mode users, who should be provided with space separate from the traffic lane and with appropriate speed environment and pedestrian crossing facilities.

5.3.2 Improve Visitor Experience

Another opportunity is to improve the visitor experience, through providing better customer facilities such as rest areas, user information, clear signage, and passing lanes. With the high value to the economy of tourism in this area, and the number of jobs which rely on tourism in the region, providing a positive travelling experience is paramount.

A high quality, safe and consistent road environment, with reliable journey times where closures are at a minimum and cleared quickly will contribute positively to the overall visitor experience for international and domestic tourists alike.

- There is an opportunity to further develop tourism and attract additional visitors through the following community aspirations:
- Improvements at Bulli Point/Te Poporo, where Destination Great Lake Taupo are investigating provision of a walking track, interpretation area, diving/jumping area, toilets and associated parking and pedestrian underpass or crossing point, or realignment of SH1.
- Construction of a cycleway alongside Lake Taupō between Turangi and Taupō, adjacent to SH1, to become part of the NZ Cycle Trail.

These opportunities need to be explored with stakeholders to determine whether projects can be aligned, which would allow additional benefits to be delivered.

5.3.3 Improve Community Wellbeing

The state highway has a significant impact on the wellbeing of the communities it passes through. This can be positive, in terms of passing trade, but can also be negative, as the highway can create severance which can make it difficult to perform basic activities in those communities. For example, high speeds and large numbers of trucks can make it difficult for people, particularly children and older people, to cross the road safely. This can deter people from walking to where they need to go, and in some cases may mean they prefer not to walk at all. Turning out of side roads can also be challenging in some locations, with serious consequences if an error in judgement is made, because of the high speeds and presence of a significant number of trucks.

Addressing some of these issues in the communities and recreation spots by Lake Taupō can improve community wellbeing.

5.3.4 Utilise Intelligent Transport Systems

There is an opportunity to utilise technology along the corridor, in particular in the form of Variable Message Signs to provide customers with information about road closures and detours on the route. If these signs were positioned at detour intersections, it would mean that users could turn off at the appropriate intersection immediately rather than having to turn back later. This would prevent delays and use of additional fuel. It would also present a feature of a world class highway, commonly seen overseas.

Real time information could also be used to provide a slowed speed environment when local roads are used as detours. This would mitigate risk and reduce the need to upgrade local roads.

Safety cameras could be used to ensure that it is easy to drive at the right speed for the road, and to provide feedback to drivers about their speed.

6. Investment Objectives

The investment objectives are a vital part of the business case process. They:

- Express the outcomes sought from investment
- Help direct and guide the study process
- Provide the basis for appraisal of alternatives and options

Investment objectives were agreed as part of the development of both PBCs, however these needed further refinement as a result of the revised scope of this business case. The revised high level investment objectives for this project are shown below. For the purposes of the investment objective target dates, it has been assumed that works will be completed by 2022.

6.1 Taupō - Waiouru

1. Improve safety of SH1 between Taupō and Waiouru by reducing the number of crashes resulting in death or serious injury from 41 (2014-18) to 34 (2022-26).

2. Improve the quality of infrastructure of SH1 between Taupō and Waiouru by increasing the length of corridor with KiwiRap Star Rating of 3 or above from 76% (of that which is rated) to 88% by 2022.

3. Provide a corridor where two trucks can pass each other at Tauranga Taupō bridge, Bulli Point/Te Poporo and Toki Point, by 2022.

4. Increase availability of SH1 between Taupō and Waiouru by reducing the number of journeys impacted by closures and delays from 100,000 to 67,000 by 2022.

5. Reduced conflict between road users, visitors and community by reducing injury crashes in urban and peri-urban areas from 15 to 11 by 2022.

7. Strategic Alignment

A summary of the strategic outcomes from each organisations' key strategy and policy documents is provided below. Overall, the investment aligns with and will contribute to Government and the Transport Agency aims, and to regional and local aims. The detail of how the investment will contribute is provided in the sections below, which take each key strategy document and describe the alignment between the strategy objective/aim and the investment outcomes.

7.1 Ministry of Transport

7.1.1 Government Policy Statement on Land Transport Funding 2018-28

Investing in a scheme to improve safety and route availability/resilience on SH1 between Taupō and Waiouru aligns closely with the objectives of the Government Policy Statement shown and described in Table 7-1.

Table 7-1: Alignment with Government Policy Statement Objectives

Objective	Alignment
Safety: A land transport system that is a safe system free of death and serious injury.	A primary focus of the project is on improving safety for all road users, and in particular reducing the number of crashes resulting in death or serious injury.
Access: A land transport system that provides increased access to economic and social opportunities.	Improvements to route availability and safety will support efficient freight movements and tourism across the North Island. Local access to economic and social opportunities will also be improved through reducing the frequency and duration of road closures.
Access: A land transport system that provides enables transport choice and access.	Active modes in local centres and along the route will be supported through safety improvements in the communities south of Taupo
Access: A land transport system that is and resilient	Improvements to reduce the frequency and duration of road closures will result in fewer disruptions and improved resilience. Some road closures are caused by crashes, and safety improvements will reduce the frequency of these incidents resulting in improved resilience for a critical connection for New Zealand.
Environment: A land transport system that reduces greenhouse gas emissions, as well as adverse effects on the local environment and public health	Improved access to active modes in local centres along the route will help to reduce transport's negative effects on the local environment and public health. It will do this by encouraging the uptake of cycling and walking which will help to reduce the effects of transport.
Value for money: A transport system that delivers the right infrastructure and services to the right level at the best cost.	Using a business case approach ensures decision making is based on evidence which will help to ensure the solution provides the right infrastructure at the best cost. This IBC is part of the overall preferred and staged programme.

Expectations in the Government Policy Statement for Land Transport are that the network will be increasingly available to High Productivity Motor Vehicles and 50 MAX vehicles. This is to enable and support economic development. The route is already open to these vehicles, but here are locations where two trucks cannot pass. A primary route of national importance where two vehicles of this nature cannot pass is undermining this Government aspiration.

7.1.2 Statement of Intent 2018-22

The proposed investment aligns with the three of the five overall core outcomes of the Statement of Intent, which is a transport network that is safe, resilient and delivers economic prosperity. It also aligns closely with two specific goals, as shown in Table 7-2.

Table 7-2: Alignment with Relevant Statement of Intent Goals

Goals	Alignment
Ensuring that transport supports regional development outcomes	Reducing the frequency and duration of closures, as well as providing a route where two trucks can pass, will contribute to improving freight supply chain efficiency. Providing the conditions for the private sector to justify investment in the regions is an objective under this goal.
Delivering a transport system which is resilient, safe to use, and managed and promotes health and other social benefits	Increasing route availability will contribute to greater resilience of the state highway network, which is an objective under this goal. Speed limits will be reviewed as part of this work and discrepancies addressed through infrastructure improvement or changes to speed limits to improve the safety of this section of road.

7.2 Ministry of Business, Innovation and Employment

7.2.1 Tourism Strategy (2016)

The Government's Tourism Strategy aims to support the tourism sector to secure the benefits that come with growth, while managing the pressures this places on businesses, communities and infrastructure. The Strategy aligns and coordinates government efforts to boost the economic contribution of tourism across the country and plan for the future.

The Tourism Strategy identifies three key challenges.

- Attracting the right visitor mix
- Responding to visitor demand
- Ensuring all regions benefit

Specific key actions with the Tourism Strategy that relate to this business case include:

- Pursuing initiatives aimed at lifting the quality and effectiveness of tourism-related information and communication technology (ICT) and roading infrastructure
- Improving overseas driver safety

A key problem identified for SH1 between Taupō and Waiouru relates to the increasing numbers of tourists on the road network, particularly those in large or unfamiliar vehicles (e.g. vans or campervans) and the impact this may have on delays. Safety is also recognised as a problem on the corridor, and solutions to ensure a positive customer experience, with visitors able to safely access tourist locations will be a priority. Investment to address these issues will align with some of the challenges identified in the Tourism Strategy.

The Ministry also has a programme to improve mobile phone coverage in black spots across the country, however there are still blackspots on the corridor and as yet no forward works indicated to cover these areas[6]

7.3 Waka Kotahi NZ Transport Agency

7.3.1 Road to Zero 2020-2030

Investing in SH1 between Taupō and Waiouru aligns closely with the Road to Zero Action Plan focus on reducing risk on New Zealand's highest risk roads, particularly those related to head on and run off road crashes, and crashes on the open road, as shown in Table 7-3.

Table 7-3: Alignment with Safer Journeys Action Plan 2016-20 Objectives

Objectives and Initial Actions	Alignment
Improve road safety in our cities and regions through infrastructure improvements and speed management. Initial actions include: • invest more in safety treatments and infrastructure improvements • review infrastructure standards and guidelines • introduce a new approach to tackling unsafe speeds • enhance the safety and accessibility of footpaths, bike lanes and cycleways	The investment is focussed on supporting safer travel on SH1. The evidence shows parts of the road have high collective risk, and there are also a high percentage of head on and run off road crashes. Much of the route is rural, 'open road'.

[6] Source: https://www.crowninfrastructure.govt.nz/wp-content/uploads/2017/08/02-Public-material-pack-RBI2-and-MBSF-map.pdf

7.3.2 Strategic Corridors

The importance of State Highway 1 is also highlighted in Waka Kotahi's Lower North Island strategic connection summary as part of the draft Arataki 10 year view (as shown in figure below)[6]. It shows that there is a national key flow of freight and tourism between Wellington and Taupo and further north.

Improved safety, resilience and ability for two trucks to pass each other help to support reliable on road freight movements.

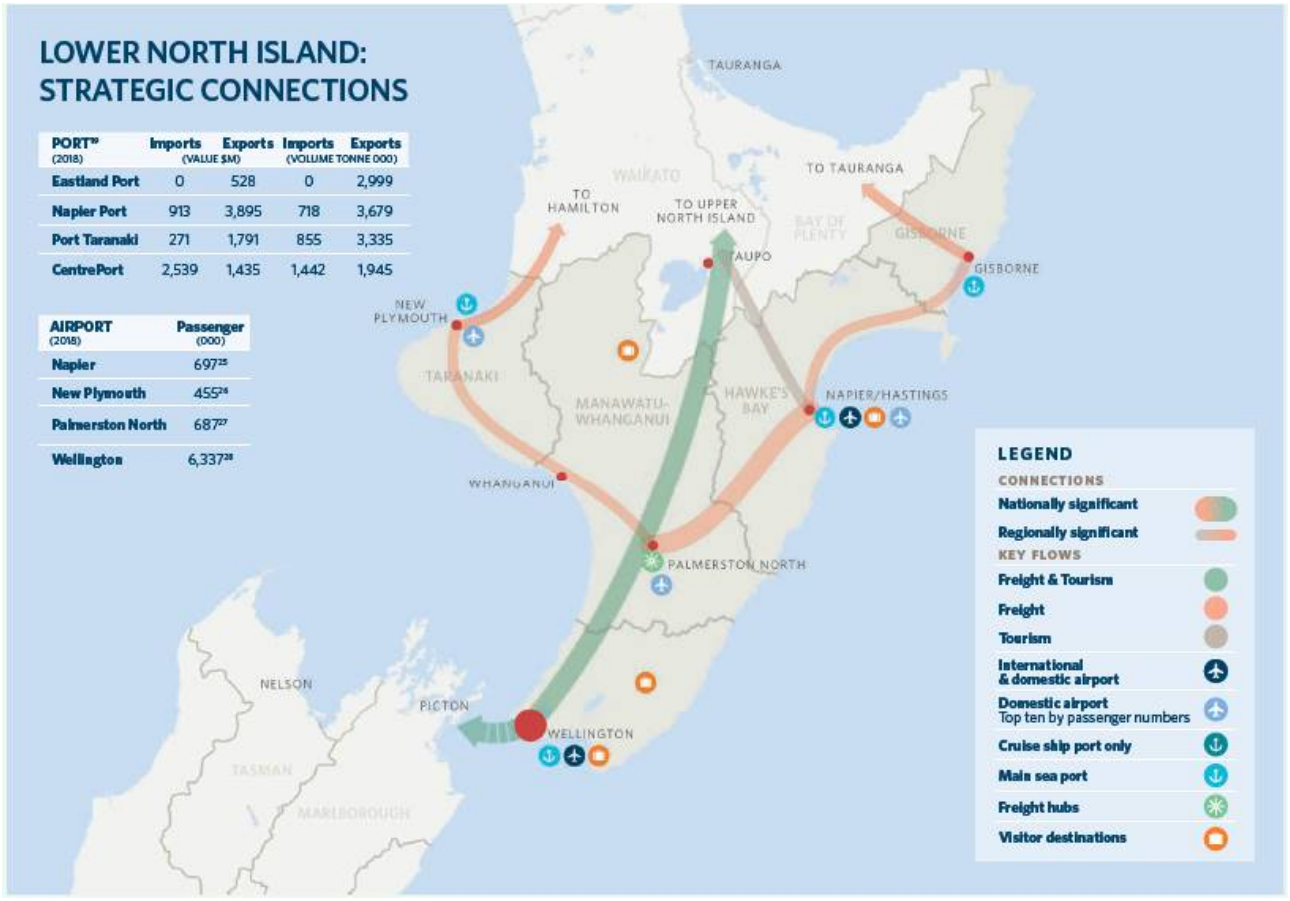


Figure 7-1: Lower North Island Strategic Connections

7.4 Waikato Regional Council

7.4.1 Waikato Regional Land Transport Plan 2015-2045

Investing to address the identified problems aligns with the Regional Land Transport Plan focus on supporting economic growth and reducing deaths and serious injuries (Table 7-4). It also contributes to the key implementation measure for the next 10 years of 'developing a business case to improve the route security of the SH1 national route between Taupō and Turangi, and Turangi to the Desert Road'.

Table 7-4: Alignment with Regional Land Transport Plan Objectives

Objective	Alignment
An efficient and resilient land transport system that advances regional economic wellbeing and facilitates freight movement on strategic corridors in the upper North Island	The proposed investment increases freight supply chain efficiency by increasing route availability and ensuring two trucks can pass one another.
A planned transport response that supports future growth areas	The proposed investment will improve the safety and reliability of connections between existing key locations and future growth areas identified in North Waikato.

Objective	Alignment
Land transport in the Waikato region is a Safe System, working towards zero deaths and serious injuries	The proposed investment has a strong safety focus and Investment Objectives which aim to reduce the number of crashes resulting in deaths and serious injuries.
A transport system that provides an inclusive range of integrated, quality transport choices for all users to meet their social, economic and cultural needs	South of Taupo, improvements in local communities that reduce the conflict between through traffic and local access (all modes) will better meet community needs eg. for safe walking and cycling trips.

7.4.2 Waikato Regional Council Long Term Plan 2018-2028

The Waikato Regional Council Long Term Plan sets the strategic direction for the region for the next ten years. A key challenge outlined in the Plan is maintaining flood protection assets. One of the main reasons for this is to protect infrastructure (such as roads, rail, and electricity) from flooding. This aligns with the business case as it relates to improved network resilience, particularly along the sections prone to flooding.

7.4.3 Waikato Means Business - Economic Development Strategy (2014)

The purpose of 'Waikato Means Business' is to realise opportunities for economic growth to achieve the vision which is 'We want to improve standards of living in the Waikato region, where all people, communities and businesses reach their potential'.

The document identifies four major objectives, which have been agreed through an understanding of regional opportunities and challenges. Of relevance to this business case is the following major objective:

- Leverage value from our location and connections as they key servicing hub of the North Island
- Continuing to maintain good connections
- Continuing to improve quality of local transport and broadband networks
- Building links between industries
- Recognising the importance of transport and freight between the primary and processing industries in the region
- Recognising the role of the region as an inter-regional service hub.

Initiatives to facilitate this opportunity include continued investment in infrastructure (e.g. the development of an inland port freight hub at Ruakura, utilising the East Coast Main Trunk line and the Waikato Expressway).

8. Risks and Constraints

8.1 Risks

A risk workshop was completed in September 2017 and a risk register developed for the project (refer Appendix A). The top five risks identified are shown in Table 8-1.

NB - Since this document was compiled the Covid 19 pandemic has resulted in a suite of policy measures from the NZ Government (and other governments around the world) which has the potential for significant economic downturn for an extended period, such as border closure impacting tourism by sharply reducing international visitor numbers. This situation, and its impacts, are still evolving. The duration and ultimate impact may not be fully understood for some time.

Table 8-1: Top Five Risks

Ref	Name	Risk
C3	**Community** - Iwi	Description: There is a threat of iwi dissatisfaction because of the limited scope of this IBC and problems with separate projects which have strained relationships

Ref	Name	Risk
		Cause: The cause of this threat is that other projects have caused tensions, and the staged approach to improvements will result in slower implementation Consequence: The consequence of this threat is stakeholder dissatisfaction and potential delay and/or sub optimal solution
C4	**Community**– Expectations	Description: There is a threat that the PBC has raised stakeholder expectations and that in the short term, this project will not deliver what is expected, especially south of Taupo with online rather than offline solutions Cause: The cause of this threat is the broad stakeholder engagement associated with the PBCs, and lack of communication about the timeframes proposed by the NZTA Board Consequence: The consequence of this threat is stakeholder dissatisfaction and potential delay
TP5	**Transport Planning/ Business Case -** Value for Money	Description: There is a threat that staging the improvements may mean the value for money for short term improvements may not be high enough, or completing short term improvements now may undermine the value for money of longer term improvements Cause: The cause of this threat is that the IBC has been divided into short-medium term improvements, and longer term more significant improvements (20-30yr timeframe) Consequence: The consequence of the threat is that the improvements may not represent the best value for money, may result in over or under investment, poor BCR and failure to meet current IBC's Investment Objectives.
DC2	**Design/ Construction** - Land	Description: There is a threat that some improvements may require land which is sensitive to acquire, which will prevent delivery of the preferred solution, noting that most improvements will be within the road reserve. Cause: The cause of this threat is that land adjacent to the highway is owned by iwi, Ministry of Defence, DoC and others Consequence: The consequence of this threat is a sub-optimal solution and/or delay to implementation
DC5	**Design/ Construction** – Property Access	Description: There is a threat of conflict between improvement options and landowners Cause: The cause of this threat is that some safety improvements (e.g. median barriers) can restrict property access Consequence: The consequence of this threat is less safe solutions or unhappy landowners

8.2 Constraints

There are a number of constraints which need to be considered as part of the business case and will influence how easy it will be to implement any of the short listed options. The known constraints for the project area have been identified through the following methods.

- Workshops with stakeholders
- Review of district plans (Taupō and Ruapehu) and regional plans (Waikato and Horizons)
- Analysis of other data sources including Department of Conservation (DoC), Land Information New Zealand (LINZ), Land Environments of New Zealand (LENZ), Ministry for the Environment (MfE), ArchSite (NZ Archaeological Association), NZ Fire and Emergency
- Previous reports including the Programme Business Cases and SH1 Taupō to Dessert Road Summit: Strategic Corridor Evaluation, Opus, 2009 (Opus Report)

8.2.1 Mapping

A significant amount of data has been collected as part of the constraints mapping process. This data has been mapped electronically using google maps as a base. In addition to providing inputs for this part of the project the data and associated detailed mapping will be very useful once specific projects have been identified. The maps that have been included as part of this report cover areas where significant constraints have been identified or where a number of constraints apply to a particular area.

8.2.2 Categories

Given the extent and nature of the project area a large number of constraints have been identified and mapped.

Table 8-2 sets out the various constraints identified in the vicinity of the SH1 corridor from Taupō to Waiouru. This section of the project area is contained mainly within the boundaries of the Waikato Region, however a small area south of Rangipo to the southern edge of the project area at Waiouru is located within the Manawatu – Whanganui Region (Horizons). The majority of the area is contained within the Taupō District apart from a small area south of Rangipo to the southern edge of the project area at Waiouru which is located in Ruapehu District.

Table 8-2: Taupo to Waiouru Constraints

Constraint Category	Constraint Identification
Hazards	• Erosion, cliff edges - numerous areas adjacent to Lake Taupō have been identified by MfE as having very high erosion susceptibility, particularly in Oruatau and south of Motuoapa. A number of cliff edges traverse the section of SH1 from Taupō to Oruatau. • Numerous areas adjacent to the Tongariro River have been identified by MfE as having very high erosion susceptibility, particular along the "Three Sisters" and south of Turangi. • Landslides – The Opus Report identified two locations on SH1 with specific landslide risk. One being the Hatepe Hill and the other the narrow bluffs section along the edge of Lake Taupō including Te Toki, Ohaumahanga and Te Poporo / Bulli Point/Te Poporo. Hatepe Hill has also been identified in the Opus Report as an ice risk and hazardous spill location. • Ice – The Opus Report identified that there are long sections in the Desert Road area where ice risk is high and on the Hatepe Hill section of the Highway. • Hazardous Spills – numerous 'mobile properties hazardous incidents' recorded by NZ Fire and Emergency along SH1 from Taupō to Waiouru. Two of these incidents are recorded as a gas/liquid spill. • Contaminated sites – eastern side of SH1 at Hatepe, identified in the TDP. • Flooding – flood hazard areas covering SH1 at Oruatua and Te Rangiita have been identified in the TDP.
Natural Environment	• Outstanding Natural Features and Landscapes – the Waikato Regional Policy Statement (WRPS) has identified Lake Taupō, Tongariro National Park, Lake Rotoaira, Mt Pihanga and Kakaramea-Tihia Massif as an ONF/L. • Significant Natural Areas – numerous SNAs identified in the TDP adjoin SH1 between Taupō and Rangipo Desert. • Outstanding Landscape Areas - a number of OLAs are identified in the TDP between Taupō and Rangipo Desert. • Wetlands – a large area between Motuoapa and Turangi has been identified by MfE as wetland. • National Parks, Forest Parks, reserves – SH1 adjoins and traverses Tongariro National Park. The Kaimanawa Forest Park is located adjacent to the eastern side of SH1. There are number of reserves that adjoin SH1along the edge of Lake Taupō. • Trout fishery – Fish and Game – further investigation required. • River Conservation orders – further investigation required.

Constraint Category	Constraint Identification
Cultural and Historic Heritage	• Archaeological sites – a historic settlement has been identified by NZAA adjacent to SH1 north of Rangipo. • Sites of significance / value to tangata whenua, Pa sites – numerous Pa sites have been identified by NZAA along the stretch of SH1 from Hatepe to Turangi. These range from defensive ditches through to middens. • A burial site is located east of SH1 adjacent to Korohe Road.
Land use	• Land cover – Terralink has identified an area of indigenous vegetation between Motuoapa and Turangi. • Designations – NZ Transport Agency – "state highway realignment" designation (D67) and "segregation strip" (D68) at Hatepe and "state highway realignment" at Tauranga Taupō are identified in the TDP. • Designations – Department of Corrections - D29 Tongariro Prison, adjacent to the eastern side SH1 south of Turangi. • Sensitive land uses – Waitahanui School north of Hatepe.
Land ownership	• Land ownership – numerous large parcels south of Taupō through to Turangi, adjacent to Lake Taupō and SH1, and further south at the "Three Sisters" are identified as Maori parcels by LINZ • Ngāti Tūwharetoa Land Transfers – numerous large land transfers between Taupō and Turangi, including Horomatangi and Wairakei – Tauhara • Agreement in principle to settle historical claims for the Rangipo Desert, part of Upper Waikato River (Waikato-Iti) and Moawhango River (east of Waiouru and SH1) • Land ownership – Tongariro National Park administered by the Department of Conservation. • Land ownership – Tongariro Prison, south west of Tongariro, Department of Corrections. • Land ownership – Ministry of Defence, south of Rangipo to Waiouru.
Infrastructure	• Transmission lines – run parallel along SH1 from Turangi to Waiouru and cross SH1 at Upper Waikato Stream, "Three Sisters" and south of Rangipo. • Electricity generation – SH1 crosses the Poutu Canal just south of Rangipo. The canal from part of the Tongariro Power Scheme.
Social / Recreation	• Tracks – A number of DOC tracks are located adjacent to SH1, including Poh to Desert Road Track and Waihohonu Track. • Cycleways – further investigation required. • Campsites - Motutere Bay Top 10 Holiday Park is traversed by SH1. • Golf course – southern edge of Turangi, adjoins western side SH1.

Many of the constraints identified are significant and effect large sections of SH1. These include constraints associated with hazards, identified outstanding natural features and landscapes, significant natural areas, sites of cultural significance, Tongariro National Park and other DoC estate, large areas of Maori land and treaty settlement land.

Maps showing the constraints are included in Appendix B. Once specific options have been identified to address the problems associated with the Highway a more detailed analysis of the constraints can be undertaken along with options to avoid, remedy or mitigate effects on activities and the environment.

It is noted that the Transport Agency has two existing designations in the Taupō District Plan for realignments of SH1 at Hatepe and Oruatua (Tauranga Taupō).

8.2.3 Workshop Identified Items

A number of constraints were identified by the participants at the stakeholder workshop. These included:

- Rail bridges

- Lichfield Stream
- Agricultural vehicles using corridor
- Marae and settlements
- Power cables
- Cycleway aspirations (Taupō to Turangi)
- Geothermal ground conditions
- South Taupō wetland (Turangi)
- Land ownership possibly restricting options (Turangi to Rangipo)
- Environmental impact of runoff into National Park

A number of these constraints are consistent with those identified in the above tables. However, some (rail bridges, Lichfield stream, agricultural vehicles using corridor and cycleway aspirations) will require further investigation when specific options have been identified.

An environmental and social responsibility screen has been completed and attached as Appendix C.

9. Key Stakeholders

The key stakeholders who have an interest in the expected outcomes or can influence the investment proposal are shown in Table 9-1.

Table 9-1: Key Stakeholders

Key Stakeholder	Focus areas
Automobile Association	Motor transport advocacy. The AA is a national organisation that offers motoring advice, insurance, finance, maps and travel guides. It is a leading advocate for New Zealand motorists and their interests. The AA has a long standing relationship with the NZ Transport Agency to deliver a range of vehicle and driver licensing services.
Department of Conservation	Government department charged with conservation of the country's natural and historical heritage. Land owner along parts of the route e.g. Tongariro National Park.
Love Taupo	Regional Tourism Organisation responsible for promoting the Great Lake Taupo region. Work includes marketing, media liaison, managing i-Sites and working with local businesses.
Fire and Emergency NZ	Responsible for emergency response to fires and crashes in the area.
Waikato Regional Council	Overarching consenting authority for the region's water, soil, air, geothermal areas and coastlines. It is also responsible for transport planning, walking and cycling, road safety promotion and public transport for the area north of Mt Ruapehu.
Horizons Regional Council	As above, but for the area south of Mt Ruapehu.
Iwi	The role of iwi is the sustained physical, cultural and spiritual well-being of the people. In particular the protection of land, water and resources as they relate to the origin, history and tribal affiliations and are a statement of identity. This covers a wide remit and differs between groups and therefore cannot be generalised. However, advocacy for local issues, protecting culture and tradition, and investment in the future of the environment and people is an underlying theme.

Key Stakeholder	Focus areas
Kiwi Rail (has not been involved in the development of this IBC)	Kiwi Rail is the Government-owned Enterprise which owns and operates New Zealand's rail transportation network and the between-Island ferry service. Kiwi Rail move 18 million tonnes of freight and provide 13 million passenger trips per year; operate, maintain and improve 4,000 km of track; and transport 30% of New Zealand's exports. Their principle interest in this corridor is the Kinleith Branch Line (line operation and designation) and Rotorua Branch Line (designation only as rail line removed).
NZ Police	The NZ Police have a strong interest in safe use of roads and vehicles through enforcing speed limits, checking vehicle compliance, managing traffic /congestion associated with accidents and other unplanned stoppages. They are a potential co-investor with regards to enforcement or incident management.
Road Transport Association NZ	Freight movement advocacy. RTANZ is a national association which represents the interests of Road Transport Operators providing resources, commercial benefits, assistance, support, advocacy and education for its members.
Taupō District Council	Taupō District Council is the local road controlling authority responsible for fully managing the local road network that forms, with the state highway, the land transport network connecting from Atiamuri to south of Rangipo and is responsible for the communities along the route. It is also the planning authority.
Ruapehu District Council	The local road controlling authority responsible for fully managing the local road network that forms, with the state highway, the land transport network connecting from south of Rangipo to Waiouru and is responsible for the communities along the route. It is also the planning authority.

9.1 Engagement during PBC Phase

9.1.1 Key Stakeholders

During the development of the PBCs, the majority of stakeholders[5] were involved closely with the project team through workshops.

Wider interest groups and management teams from the NZ Transport Agency were informed of progress and asked for opinions and input to various stages. Early engagement with Iwi commenced and confirmed their desire to be involved early in the planning process.

9.1.2 Customer Insights

Both PBCs used customer insights data that had been collected by the NZ Transport Agency through one-to-one engagement with customers in the Waikato Region. The Taupō to Waiouru PBC cited research which identified 5 key customer types whose interview results have been collated to give the following conclusions on how and why they make the travel decisions that they do. (Table 9-2).

Table 9-2: Customer Insights Data

Customer Group	Route Choice Priorities	Issues/Concerns	Needs/Values
Truck Drivers	Safety. HPMV has no route choice. Consistency in travel – less roundabouts, avoiding congestion. Vary routes to maintain interest. Tradition and availability of truck friendly services.	Congestion in urban areas. Risks caused by other drivers. Narrow bridges. Farm vehicles. Cyclists. No advance warning of problems.	Places to stop a truck. Roadside facilities (cafes, toilets etc.) Reliability is more important than speed. The ability for other road users to overtake safely.
Leisure/Travel	Scenic.	Safety.	Feel safe.

Customer Group	Route Choice Priorities	Issues/Concerns	Needs/Values
	Tradition (we always go this way). Variety. Stops such as cafes, viewpoints, attractions and toilets.	Road condition and road works. Slow or dangerous drivers. Lack of passing provision. Rest stops shared with trucks. Poor advance warning of problems.	Tradition Viewpoints/stopping places. Predictable and reliable journeys. Good quality roads. Better advance warning. Better signage.
Small – Medium Business	Quickest and shortest route. Routes with less traffic.	Slow drivers. Inconsistent travel speeds. Lack of warning of delays or closures.	Shortest possible travel time. Overtaking provision. Advance warning of problems.
Retiree/Domestic	GPS routing. Tradition (we always go this way) or routine (taking children to school going to shops). Time of day (to avoid congestion). Attractive or convenient stopping places for recreation, food and toilets etc.	Safety. Slow or speeding drivers. Lack of safe passing places. Intimidated by large trucks. Inconsistent speed environment.	Technology reliance. Landmarks and sites of interest to break the monotony. Journey experience. More frequent and better stopping places Consistent, reliable journeys.
Commuter/Business Traveller	Reliability, congestion, time of day. Routine. GPS routing.	Safety. Reliability and congestion. Unexpected closures and delays. Road works.	More reliable journeys. Safer journeys. Safe passing. Better information or warning.

9.1.3 Public Engagement

No public consultation on specific interventions or improvements was carried out during the PBC phase.

9.2 Engagement during IBC Phase

9.2.1 Key Stakeholders

Several stakeholder workshops and one-on-one meetings have been held throughout the project – workshop outcomes will be discussed in subsequent sections of this document. An overview of workshops is presented in the table below:

Table 9-3: Workshops

Workshop	Date	Location	Purpose
Workshop 1: commencement	August 2017	Taupō	An overview was given regarding the business case process, followed by a recap of the problem and benefit statements. A constraints exercise was completed, followed by option identification for five main areas: • Road User Facilities • Resilience/Emergency Response • Safety – Piarere to Taupō • Safety – Taupō to Waiouru • Tauranga Taupō Bridge.
Workshop 2: long-list MCA	December 2018	Taupō	Long-list presentation and assessment

Workshop	Date	Location	Purpose
Workshop 3: short-list MCA	August 2019	Taupō	Short-list corridor options; MCA scoring

During the course of the development of the corridor options, the Transport Agency also engaged in one-on-one discussions with stakeholders. The team held meetings with the Department of Conservation, Love Taupō, local authorities, Heritage NZ and NZ Police.

The stakeholders have been very supportive for the need for improvements throughout the development of the business case however there is an increasing level of frustration at the lack of progress on the ground.

The project team will issue a communication to close out the project with key stakeholders advising people about the recommended option, why we reached this option and an update on the next steps and timeframes for this project.

9.2.2 Iwi Engagement

The Transport Agency has been engaging with iwi since the development of the programme business case. On this Taupo to Waiouru corridor this liaison has been with Tūwharetoa Maori Trust Board (TMTB) and Ngāti Rangi. Initially there was agreement for one Mana Whenua Group to cover the whole Piarere to Waiouru corridor. However, in 2016, when the Transport Agency Board made the decision to push the timing of the Hatepe Hill to Motuoapa Realignment out into the long term (20-30 years), TMTB pulled out of the Mana Whenua Group. Since the commencement of this IBC, we have engaged separately with TMTB. In addition, there has been limited engagement with Ngāti Rangi during the development of this IBC as they have been busy with Settlement priorities.

Through the discussions with TMTB our understanding of their views and aspirations are as follows:

- Realignment of SH1 away from Lake Taupō is a priority. They have confirmed in writing that they are a major landowner and keen to work in partnership with the Transport Agency to progress this realignment. We are told that the realignment was promised 30 years ago.
- Safety, as well as noise and vibration from trucks, is a real concern for their communities
- There is concern that a vehicle will end up in the Lake causing an environmental disaster
- The situation is getting worse and more people are asking for the realignment option
- The building of the current SH1 affected many cultural sites at that time and therefore there is limited appetite for further adverse impact despite the concerns mentioned above

There have been a number of huis with TMTB throughout the development of the business case, however we have not been able to get feedback on the options developed for input into the options assessment process. This has been taken into consideration through Part B.

The project team has recently been informed that engagement would now need to progress with Te Kotahitanga o Ngāti Tūwharetoa (Settlement entity and represents local hapu) as well as TMTB.

9.2.3 Public Engagement

No public consultation to gather customer insights or on specific interventions / improvements was carried out during the IBC phase. Due to the uncertainty of project funding, the decision was made to not undertake wider community engagement, so expectations were not raised.

During September 2019, the speed management team within the Transport Agency ran an engagement with the local community specifically on a speed review for the Taupō Airport to Turangi section of SH1. One of the IBC project team attended these public drop-in sessions. A more formal consultation took place during October and November 2019. Some comments received related to the work this IBC is focussing on. The project team took the relevant comments about access, safety, road form and vehicle movements on board when reaching a recommended option.

9.2.4 Landowners

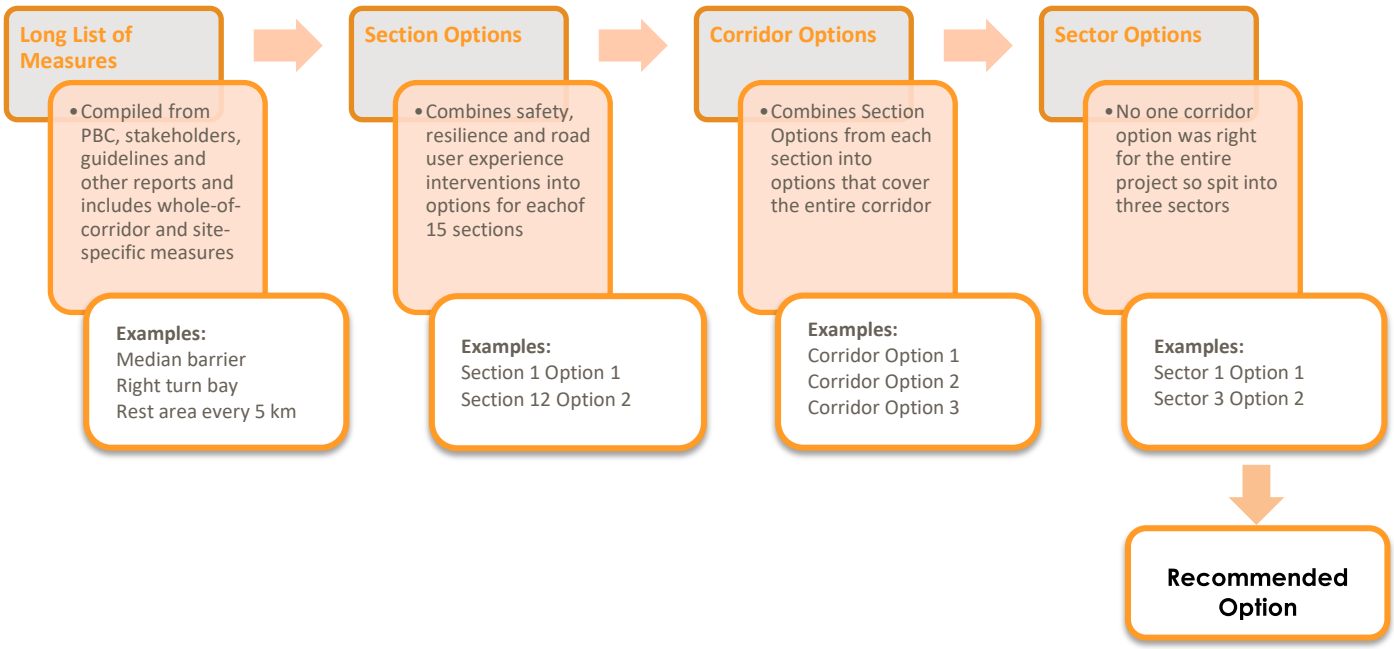
No landowner discussions have been held during the optioneering phase. The recommended option contains few locations were widening required land. Landowner conversations will need to be undertaken upon the project re-commencing.

10. Option Development Process

To continue the analysis and development of options, a staged approach was developed in consultation with the Transport Agency that ensures development of a comprehensive short list of options and enables identification of the Recommended Corridor Option for this project. The approach considers:

- All relevant measures, section option themes and reasons for exclusions
- Which measures should be site-specific and which apply to the whole corridor
- Which measures and option themes ensure the best contribution to the investment objectives
- The appropriate level of investment for the scale of the problem
- Which option themes are similar with the scale and location of the problem

This approach refines the long list of measures into full corridor options, as follows:



In a standard project development process, a preferred option would have been identified at the end of the Corridor Option stage. However, as this project is 100km long, through significantly different road environments, coupled with the fact that the corridor options were evaluated to be similar through the MCA process (likely a result of averaging out the benefits and effects over the long project length), an additional step was needed. Accordingly, the project was broken back up into three sectors and the evaluation repeated.

The sections below summarise the process taken up to the end of the corridor option stage, with more detail provided in the appendices. Detail on the Sector Options and their evaluation is provided in the following chapter.

10.1 Long List of Measures

A workshop was held in Taupō in August 2017 to discuss the long list of measures. A summary of the problem statements, identified in Part A of this IBC, was presented to the key stakeholders to help them identify measures. The scope of the measures was limited to short-medium term road works. Feedback from the workshop was compiled into master lists associated with each problem statement and then condensed into manageable categories (i.e., infrastructure measures).

10.2 Section Options

As the corridor is 100km long, the corridor was broken up into 15 sections to really understand problems at an indicative level and consider possible measures. After a number of detailed processes, a short list of options

for each of these sections was produced which included a range of responses across safety, resilience and road user experience.

These Section Options were then drawn up and presented as individual sheets per section to provide an idea of what each option involves and its key features (see Appendix D6).

An assessment of each option against the investment objectives, effects and implementability was performed. The ratings were based on expert knowledge of the proposed solution and site conditions. The Section Options were first presented to NZ Transport Agency internally for feedback before presenting to the wider group of stakeholders.

10.2.1 Stakeholder Feedback

Most feedback at the workshop concerned the problems identified in the corridor (specific and general), which was helpful to receive, as it reinforced the problems originally identified and the solutions. Other feedback helped refine the options, including:

- Ensure uniformity between urban areas
- Ensure road environment fluency between sections
- Ensure application of solutions does not result in unsafe vehicle speeds
- Ensure continued communication with current and proposed projects around the lake front

Some of the feedback highlighted the need to consider how the different sections would fit together over the corridor to provide a consistent road environment. However, no changes to the options were necessary based on the following:

- Interface between the sections will need careful consideration at subsequent stages of design; for example, the change between an urban area and rural area is typically given a threshold treatment. At other change points, designers must consider the length of change between measures, and the specific environment at these locations.
- The sections have already been differentiated by topography and existing road layout. This means the interface should make sense and be self-explanatory.
- The measures within section options are not 'hard and fast'. The interface between the sections will not be abrupt and will be considered by detailed designers, as noted in A above.
- Some differences and changes between road layout will be unavoidable. Due to the length of the corridor (100km), the changing environment and the scope of options available (no major works), there is no opportunity to create a uniform road environment. Major work, such as realignments, would be the best method to eliminate changes between section widths.

10.3 Corridor Options

After the section options were assessed, the next step was to combine these into corridor options. The corridor option themes were identified through a few different ways:

- Corridor options focussed on the different groups of MCA criteria i.e. Investment Objectives, Effects and Implementability
- Corridor options focussing on single problem areas
- Corridor options focussing on different parts of the corridor
- Corridor options focussing on different scales of investment

After consideration of the pros and cons of the different approaches the following corridor option themes were adopted:

Table 10-1: Description of Corridor Options

Corridor Option	Summary
Do Minimum	Continuation of maintenance operations along the corridor. No specific improvements.

Corridor Option	Summary
Speed Management	This corridor option focuses on reduced speed limits with minor infrastructure improvements – limited wide centreline, limited roadside barrier, some access improvements to rest areas lakeside, improved walking and cycling facilities in urban areas as well as slope stabilisation and minor cross section improvements at Te Poporo/Bulli Point. There will be limited to no specific resilience and road user facility treatments.
Safety Focussed	This corridor option focuses heavily to addressing the safety problems and includes median (or wide centreline) and median barrier throughout the corridor and targeted roadside barrier between Taupo and Turangi. This option includes widening of cross section at Te Poporo/Bulli Point, some access improvements to rest areas lakeside and improved walking and cycling facilities in urban areas.
Benefits Focused	A package of work that aims to do as much as we can that addresses the identified problems within the scope of works (i.e. online). This corridor option typically has wider shoulders and medians where possible, the greatest amount of hazard protection, and works to address resilience and competing interest concerns. Building on the Safety focussed option, this option includes some overtaking facilities, improved road user facilities throughout corridor, a re-alignment of the Tauranga-Taupo bridge, a new roundabout in Turangi and clip-on to existing bridges at Waitahanui and Turangi.
Effects Focused	A corridor option that stays largely within the existing road reserve which consists of the section option themes which are likely to have the lowest effects on the corridor. The option includes wide median where feasible but will have a typical centreline alongside the Lakefront and at the Three Sisters, some targeted roadside barrier and rockfall protection south of Turangi
Balanced	The refined corridor consists of treatments distilled from all of the options, but also drawing on stakeholder feedback, technical evidence, and engineering judgement, a balance of the benefits and effects corridor options. The option includes wide median where not significant works outside road reserve, median barrier at unconstrained sites between Taupo and Turangi, target roadside barrier in existing road reserve, rockfall protection and improved road user facilities alongside Lakefront, as well as widening at Te Poporo/Bulli Point.

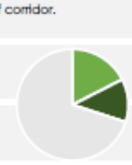
Further detail on options is shown in the table on the following page.

Each of the options take a similar approach to speed management, typically this adopts the philosophy to lower speeds in townships and Motutere campground, where there is regular conflicting demands between State Highway traffic and other users. On the rural road network each option is intended to support speeds close to the existing operating speeds by engineering-up by removing/ protecting roadside hazards, introducing channalised intersections, wider shoulder etc. None of the options significantly "engineer-up" highly constrained sections such as the lake side, three sisters or desert road curves (out of scope). As such, the treatments proposed will be used to make the environment more self-explaining.

Each Corridor Option was populated with the Section Options that best represented the corridor option theme for that particular section.

In preparing the options, works proposed by other agencies were considered, such as the proposal for an off-road shared path from Taupo to Turangi (T2T). To support this a number of complimentary infrastructure interventions were included in the corridor options such as pedestrian underpasses and clip-on bridges. Since those initial discussions the T2T cycleway has proved difficult to garner support from local landowners, as such is not likely in the short term. Only the Waitahanui clip on structure remains as a standalone project in the Benefits Option. If during the future stages of this project the T2T cycleway becomes viable then the complementary infrastructure should be considered for inclusion into all the infrastructure led Options.

Based on the intervention levels and site-specific assessments a table was developed which provides a high-level summary of how each Corridor Option addresses different issues in the project area.

Corridor Option	Speed management	Safety	Benefits focused	Effects Focused	Balanced
DSI reduction (relative)					
Cost (relative)	$$	$$$$	$$$$	$$	$$$
Description	This corridor option focuses on reducing vehicle speeds in order to reduce crash severity. This corridor option will primarily aim to treat areas where a safe and appropriate speed can be implemented without significant engineer-up works. There will be limited to no specific resilience and road user facility treatments.	This corridor option uses crash data obtained for each of the sections and applied the data along with other variables such as traffic against the draft Standard Safety Intervention Toolkit.	A package of work that aims to do as much as we can that addresses the identified problems within the scope of works. This corridor option typically has wider shoulders and medians where possible, the greatest amount of hazard protection, and works to address resilience and competing interest concerns.	A corridor option that stays largely within the existing road reserve which consists of the section option themes which are likely to have the lowest effects on the corridor.	The refined corridor consists of treatments distilled from all of the options, but also drawing on stakeholder feedback, technical evidence, and engineering judgement; a balance of the benefits and effects corridor options
Median treatments	No median barrier treatment. However, in some locations, especially where engineering works is required due to vehicle speeds, barrier will be considered.	Potential for median barrier to be located at unconstrained sites between **Turangi and Taupo** Wide median located where there is space to provide without requiring significant works outside the road reserve. Wide conventional centreline treatment with audio-tactile markers along the **Lakefront**, and the **Three Sisters**.		Wide median located where there is room, typical centreline treatment only along the **Lakefront**, or at the **Three Sisters**. Audio tactile pavement markers (ATP / rumble strips) will be used, and a wider than usual centreline marking also considered.	Potential for median barrier to be located at unconstrained sites between **Turangi and Taupo** Wide median located where there is space to provide without requiring significant works outside the road reserve. Wide conventional centreline treatment with audio-tactile markers along the **Lakefront**, and the **Three Sisters**
Current median barrier	0%				
Approx coverage of barrier	0% (0km)	10-15% (10-15km) (25-40% of north of Turangi (minus urban and constrained)	10-15% (10-15km) (25-40% of north of Turangi (minus urban and constrained)	0% (0km)	5-10% (5-10km) (10-25% of north of Turangi (minus urban and constrained)
Approx wide centreline coverage (incl urban)	30-50% (30-50km)	40-60% (40-60km)	40-60% (40-60km)	30-50% (30-50km)	40-60% (40-60km)
Hazard Protection	Limited additional hazard protection. This corridor option focuses more on reducing vehicle speeds in order to reduce crash severity. However, in some locations, especially where engineering works is required due to vehicle speeds, barrier will be considered.	Targeted roadside barrier at high severity locations where traffic volumes and risk factors dictate between Taupo and Turangi. Targeted roadside barrier installement where it can be achieved without going outside of the existing road reserve for rest of corridor.	Targeted roadside barrier at **throughout the corridor**. High severity locations typically treated with barrier. Wider shoulders provided where there is space to provide without requiring significant works outside the road reserve.	Targeted roadside barrier at high severity locations where installement can be achieved without going outside of the existing road reserve. Wider shoulders (increased to about 1-1.5m) only where the works can easily be accommodated within the existing road reserve.	Targeted roadside barrier at high severity locations where installement can be achieved without going outside of the existing road reserve, except in some isolated circumstances.Wider shoulders (increased to about 1-1.5m) only where the works can easily be accommodated within the existing road reserve.
Current side barrier protection	17.5% (35.5km)	17.5% (35.5km) 	17.5% (35.5km)	17.5% (35.5km)	17.5% (35.5km)
Approx coverage of barrier	18% (36km)	26% (50km)	28% (52km)	21% (42km)	26% (50km)
Resilience	Benefits restricted to those gained through the reduction of high severity crashes and their subsequent road closures. (Option 2 includes currently planned low cost low risk resilience works)	Benefits restricted to those gained through the reduction of high severity crashes and their subsequent road closures.	Rockfall protection along **Lakefront**, and at selected sites south of Turangi such as **near Rangipo**, and the **Desert Road Curves**. Snow fences on the **Desert Road**. Wider cross section **north of Turangi** to help manage flood events.	Rockfall protection at selected sites south of Turangi such as **near Rangipo**, and the **Desert Road Curves**.	Rockfall protection along **Lakefront**, and at selected sites south of Turangi such as **near Rangipo**, and the **Desert Road Curves**. Wider cross section **north of Turangi** to help manage flood events.
Road user facilities	Some access improvements at selected locations, concentrating mostly around existing rest areas such as those located along the the **lakefront** where works will correspond to a speed management treatment	Some access improvements at selected locations, concentrating mostly around existing rest areas such as those located along the the **lakefront** where works will correspond to a speed management treatment.	Access and internal safety improvements, and story telling opportunities at most existing rest areas such as those along the **lakefront**, but also on the **Desert Road**. Improvements for the needs of trucks; mostly through provision of signage, at places such as **Turangi**	Access improvements only concentrating mostly around existing rest areas such as those located along the the **lakefront**.	Access and internal safety improvements, and story telling opportunities at most existing rest areas such as those along the **lakefront**. Targeted truck improvements at places such as **Turangi**.
Overtaking facilities	No change	No change	2	No change	2
Two Trucks Passing	Typically treatments based on reduced speed limit, additional signage and linemarkings markings. Cross section improvements around **Bulli Point**.	Scope for widening the carriageway cross section around pinchpoint such as **Bulli Point** (to ~10m)	Scope for widening the carriageway cross section around pinchpoint such as **Bulli Point** (to ~10m), and at the **Tauranga Taupo Bridge** (possibly with a bypass treatment). In other locations a reduced speed limit, additional signage and marking treatments may be considered.	Typically treatments based on reduced speed limit, additional signage and linemarkings markings. Cross section improvements around **Bulli Point** and elsewhere as essential resilience works dictate.	Scope for widening the carriageway cross section around pinchpoint such as **Bulli Point** (to ~10m). In other locations a reduced speed limit, additional signage and marking treatments may be considered.
Urban treatment	Speed management treatments, and active mode treatments at **all urban settlements**.	Speed management treatments, and active mode treatments at **all urban settlements**.	Speed management treatments, and active mode treatments at **all urban settlements**. Possibility of active mode clip-on facilities at **Turangi**, and **Waitahanui** Roundabout considered at **Turangi**. **Tauranga Taupo** Bypass.	Speed management treatments, and active mode treatments at **all urban settlements**.	Speed management treatments, and active mode treatments at **all urban settlements**. Roundabout considered at **Turangi**.
Intersections	4	12	21	7	12
Speed management	Speed management is a major pillar of this corridor option. In addition to all **urban areas** to be treated similarly creating a consistent speed environment between all, other sections suitable to having a posted speed reduction without significant engineering works will be prioritised.	All **urban areas** to be treated similarly creating a consistent speed environment between all. Safe and appropriate speeds in some constrained sections such as the **Lakefront**. Other sections engineering works will support the current speed limits by removal of road side hazards, intersection improvements etc			

10.4 Corridor Multi Criteria Analysis

10.4.1 Multi-Criteria Analysis

Technical knowledge and a multi-perspective approach was used to rate the shortlisted corridor options using a multi-criteria system. The criteria used was the same used during earlier phases of option analysis in order to maintain consistency. The results from the multi-criteria analysis are presented below.

A 1 is a good score, indicating high benefits or low impacts. A 5 denotes a poor score, with few benefits or very high impacts.

Table 10-2: Corridor Multi Criteria Analysis

Option	Speed Management	Safety	Benefits	Effects	Balanced
Investment Objective 1	4	1	1	3	2
Investment Objective 2	4	3	2	4	2
Investment Objective 3	4	3	2	4	3
Natural Hazards	4	4	3	4	4
Natural Environment – Terrestrial	2	4	4	2	3
Natural Environment – Freshwater	2	3	3	2	2
Property and Land Use	2	4	4	3	2
Tangata Whenua Values	TBD	TBD	TBD	TBD	TBD
Visual and Landscape Impacts	2	4	4	2	3
Urban Design Opportunities	3	3	2	3	2
Contaminated Land	4	4	4	4	4
Community Cohesion	3	2	2	3	3
Engineering Degree of Difficulty	1	4	4	2	3
Operations and Maintenance	4	2	2	3	3
Cost	1	4	4	2	3

Appendix E contains a brief description of why each score was given and the differences between the corridor options:

10.4.2 Workshop 3

A workshop was held in Taupō in August 2019 with stakeholders to discuss the corridor options. The purpose of the workshop was to gain inputs from the stakeholders on the shortlisted corridor options as well as comments on the draft multi-criteria ratings, and their respective weightings. The feedback received on the corridor options is included in Appendix F. In summary the corridor option assessment feedback was:

- No suggested changes to the draft multi-criteria analysis scores or criteria.
- The stakeholders generally viewed safety as being of primary importance, with route availability also critical, and considered they should have strong weightings in the multi-criteria analysis.
- The most popular corridor options were Benefits and the Balanced, however it was also mentioned that selecting an option(s) that would be delivered should also be considered.

10.4.3 Weighting

As part of the MCA process, a number of different weighting systems are used. Within each weighting system each criterion is given a score between 1 and 10 which reflects how important it is.1 being of low importance and 10 being of high importance.

It is acknowledged that importance can change depending on the assessor or the context. A range of weighting scenarios to give a balanced view of what a preferred option could be would be undertake. However, it is very important to have a "workshop weighting" scenario which presents the importance that the workshop participants place on each of the criteria. The workshop weighting is often a very balanced outcome which reflects the project specific concerns across social, environmental cultural and economic aspects.

Eight weighting systems were developed to sensitivity test the results and ensure the outcome is considered from various different angles. The weighting systems developed were:

- Workshop weighting
- RMA Part 2
- Social
- Natural Environment
- Cultural
- Economic
- NZTA's draft MCA guide
- Even weightings

10.4.4 MCA Outcomes

Analysis of the multi-criteria scores was undertaken firstly by arranging the individual criterion with weightings into graphs to present their relative performance by criterion type. The results were analysed with cost included and excluded. The results are presented in Figure 10-1.

The results indicate that there is often not a lot of differentiation of the MCA outcome scores for most of the corridor options, over most of the weighting systems. One of the most noticeable differences is in the natural environment and cultural weighting systems where the Safety and Benefits Focussed corridor options both scored significantly worse than all other corridor options

Another noticeable difference is in regard to the economic criterion where the Speed Management and Effects Focussed corridor options perform well.

Overall, however, the outcome from the MCA weighting analysis was that there was no conclusive evidence for selecting a corridor option. Therefore, additional tasks were required to be undertaken to close gaps from the MCA, such as economic analysis, an archaeological assessment. The additional analysis is described in the following sections and helped to find the recommended option.

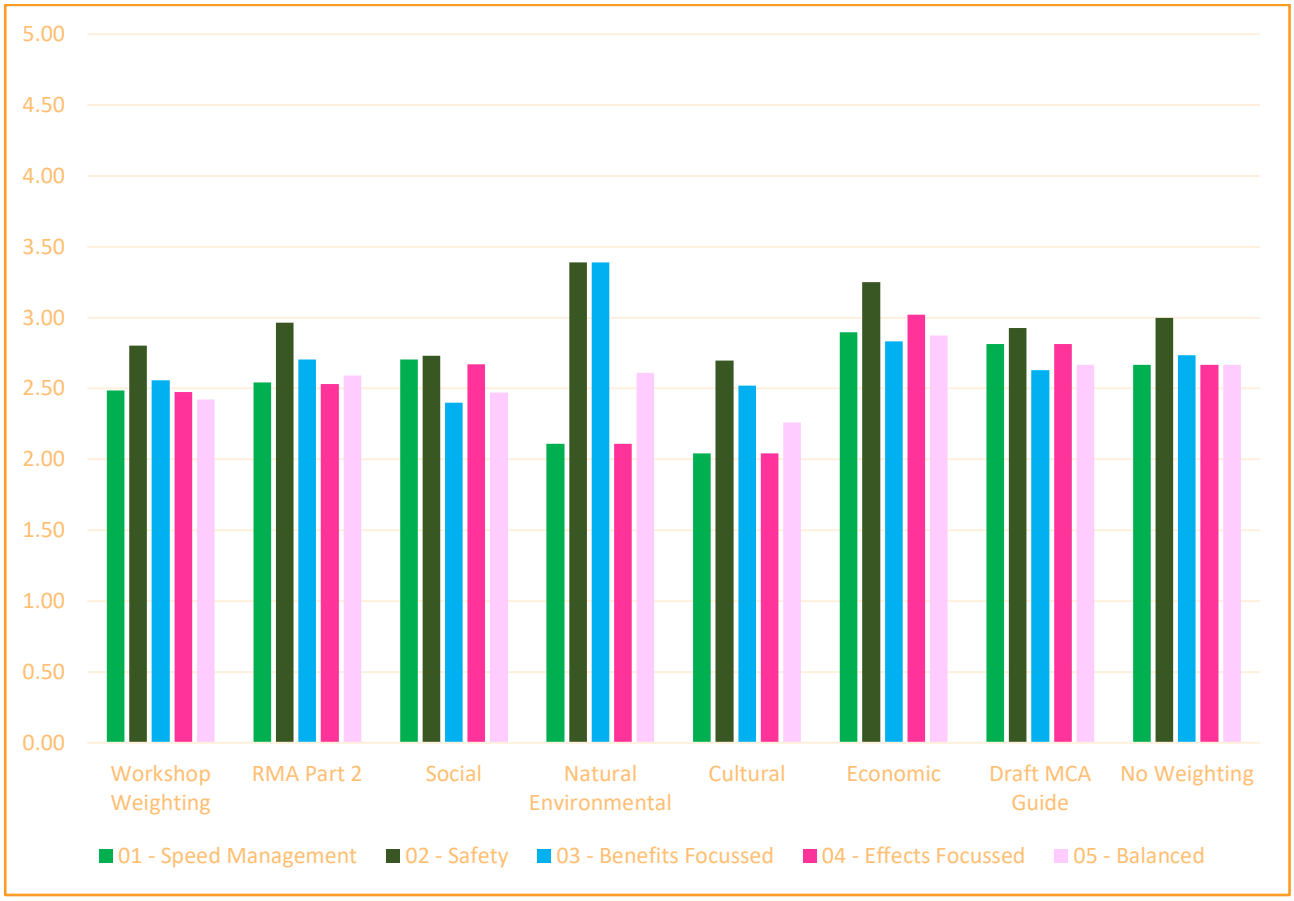


Figure 10-1: MCA outcomes under different weighting systems (including cost)

10.5 Engagement

Through workshop 3 and other one on one meetings, the project team has built up an understanding of the issues and desires of our key stakeholders. This is presented in the table below and has been an input into a decision on the recommended option.

Table 10-3: Summary of Stakeholder Feedback

Stakeholder	Overview of Feedback
Waikato Regional Council	Considered safety and resilience to be of highest importance on this section of highway.
NZ Police	Frustration that there is no momentum in physical improvement on the network. Police intimately know the high-risk locations and would like to input into identifying them when funding is likely. Need for the Minister of Police to apply additional pressure to Ministry of Transport and the Transport Agency board to bring forward funding.
Department of Conservation	Support improved accesses into rest stops and would be keen to discusses rationalising accesses where more than one exists. Follow-up conversation needed.
Taupō District Council	Support for township improvements, including lower speeds. Lower proposed speeds align with approach that TDC have adopted on their network. Recent high crash rate (DSI) near Taupo is alarming.
Love Taupō	Considered the two trucks passing was as bad or worse for large RVs and trailer carried boats, where the drivers are not professional or have the CB communication with opposing traffic. Keen to improve cycling provision around lake, both on road and recreational.

Stakeholder	Overview of Feedback
	Bulli Point "jump spot" is still very popular even after removal from AA top sites. Need to make access safer, parking on road is significant hazard.
Fire and Emergency	Local opposition to median barrier due to increased incident reaction time. True cost to their service not accounted for in preparing business cases. Loss of staff, long term sick due to stress caused by attending DSI incidents.
Heritage New Zealand	Concern regarding physical works through area of significant cultural and historic value. Would prefer the bypass that avoids any further physical works in this area. Difficult to reconcile irreversible damage now when future bypass would have avoided the need. Generally, support the Recommended Option as it limits work through the most sensitive areas to the least damaging solution. Further onsite verification and testing is required to understand true risk, current report is only a desk-top indication.
National Road Carriers	Two trucks passing used to be worse, 8 axle HPMV have improved swept path due to rear steering axle. Although still a problem. Passing private wide vehicles is most concerning as they are often wider into the lane. Increased loads have made it more likely that engine braking is used, often close to communities. In winter conditions large trucks are the first to struggle through 3 sisters due to low speed corners and steep approaches and departures. Winter alternative route, via Rimutaka Hill also has difficult alignment for two trucks passing.
Road Transport Association	There needs to be changes to infrastructure, not just band aids.
Tūwharetoa	Priority is to remove traffic from lake side and communities. Local Hapu will have strong views and need to be consulted as part of design process. Safety is a top concern as is environmental damage and potential contamination. Online options look sensible and address the same problems as they see them. Lack of implementation funding is disappointing and feeling that commenting/consulting on a paper exercise is a waste of time and community tolerance. Any site investigations, specifically archaeological need to involve affected Hapu.

10.6 Post MCA tasks

Before a decision could be made on a recommended option, a number of gaps in the analysis had to be filled. These related primarily to:

- Iwi engagement
- Archaeological assessment

- Economic outcomes

These are discussed in more detail below.

10.6.1 Iwi engagement

A hui was held with representatives of Tuwharetoa to discuss the project and the options. However, it was advised that discussions would need to take place with representatives of the individual hapu along the route to get the best picture of current constraints and potential impacts. This was not able to be undertaken prior to the business case being curtailed. However, an archaeological assessment has been undertaken to help inform the project team of potential sites of significance.

10.6.2 Archaeology Assessment

An archaeologist was engaged to assess the impact of undertaking works along the existing state highway designation. Refer to Appendix G for report. The findings highlighted the known archaeological risks on the corridor, particularly along the lake front.

The following figure is a summary of the sites identified in the archaeology assessment. They show the show the archaeological risk areas along the project length. It can be seen that there is a very high risk along the lake front where numerous sites are located within the road reserve.

Following this assessment further investigations were proposed to better understand the risks and how it may impact corridor options. Further consultation, and assessment of the risks, have been deferred by the Transport Agency, and have not been undertaken as part of this truncated business case.

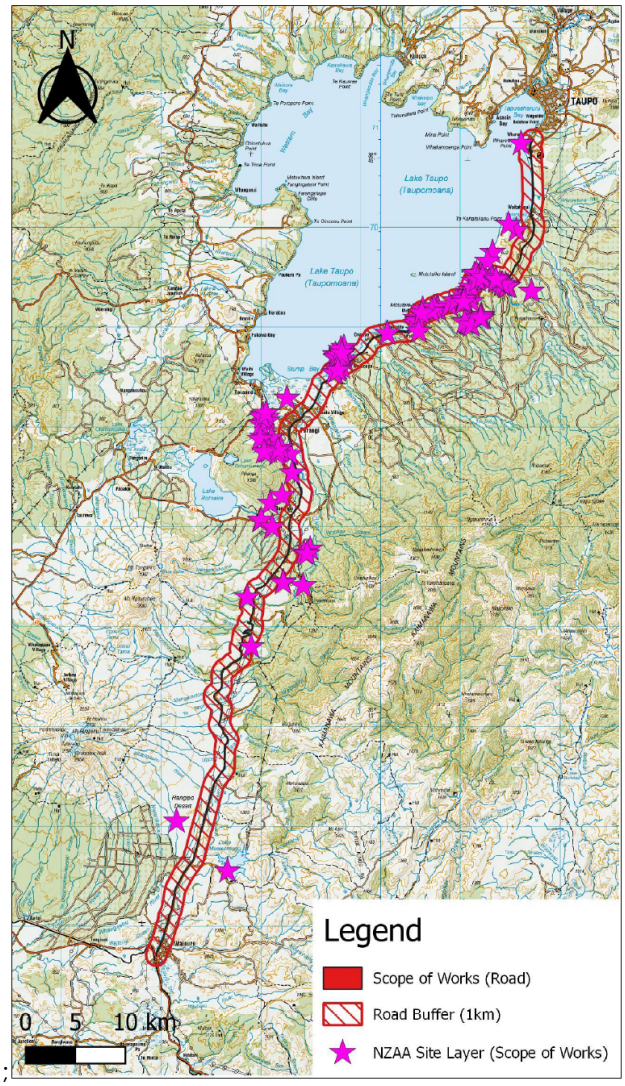


Figure 10-2 Overview plan of project area with NZAA sites

10.6.3 Planning review

A preliminary planning assessment was undertaken to identify the risks and constraints in undertaking works along this corridor, particularly in relation to stormwater discharges and earthworks.

Lake Taupō, and the Waitahanui, Tauranga-Taupō, Tongariro and Henemaiaia Rivers are all classified as Outstanding Freshwater Bodies. Numerous streams and rivers that drain into Lake Taupō have water classifications of "Trout Habitat", "Indigenous Fish Habitat" or "Natural State". Lake Taupō has a water classification of "Contact Recreation"

Stormwater: Despite the SH1 corridor between Taupō and Waiouru being located in a highly sensitive environment and the strong policy direction of the Regional Plan relating to the protection of this environment, from the preliminary assessment the discharge of stormwater generated by any potential future works and activities associated with the operation of future roading and safety improvements along the SH1 corridor is unlikely to require resource consent.

Earthworks: Given the characteristics of the environment that the SH1 corridor traverses including the proximity to Lake Taupō and numerous streams and rivers it is highly likely that potential construction works and activities involving soil disturbance, roading and tracking and vegetation clearance will be located in "High Risk Erosion" areas and will require resource consent.

Archaeological: Given that there are 39 recorded archaeological sites within the 200m road reserve buffer of SH1 between Taupō and Waiouru there is a reasonable probability that the conditions specifies that construction works and activities involving soil disturbance, roading and tracking and vegetation clearance shall not disturb any identified archaeological site or waahi tapu will not be complied with, thus triggering the need for a resource consent for a discretionary activity. This condition applies to all areas of the region not just "High Risk Erosion" areas. This also applies to works within the current designation which is a very important consideration for our option assessment.

The future National Policy Statement and National Environmental Standard for Freshwater management will be significant national planning instruments that must be given effect to and complied with. Any potential works in proximity to natural wetlands or that could involve the infilling of a bed of a river will be subject to the requirements of these planning instruments.

10.6.4 Economic Evaluation

Economic evaluation was begun at this stage but during the process it was decided to split the project up into sectors (see below). The economic assessment for the options is therefore presented and discussed under the sector option assessment below.

10.7 Conclusion of Option Development Process

A recommended option did not fall out easily from the above processes. The MCA processes were not conclusive, which could be a reflection of an averaging effect of benefits and impacts over the 100km long corridor.

Following the archaeological and planning reports it was clear that the constraints along the lakefront were substantive. The project team did not want the constraints in this area to dictate the recommended option for the entire 100km corridor.

Based on the above two elements, it was considered appropriate to break the corridor up into three sectors to enable separate consideration of the three separate environments.

11. Sector Options

11.1 Sectors

the corridor was divided into three sectors to enable separate consideration of the best option. The sector boundaries are also reflective of significant changes in the surrounding road environment the three sectors are as follows:

a) Taupō to Hatepe

b) Hatepe to Motuoapa

c) Motuoapa to Waiouru

The option assessment results presented below are those of the above three Sectors. The preferred option for each of the sectors will combine to be the preferred option for the entire corridor and this is discussed in Section 12.

During this stage the multi-criteria results for the whole route were also adjusted to reflect the respective Sectors. The results of which can be found in the following section, along with the investment objective analysis.

11.2 Sector 1: Taupō to Hatepe

11.2.1 Sector Summary

Sector 1 runs from the airport roundabout to Hatepe and includes the township of Waitahanui. The rural sections of the route are generally wide, open with good forward visibility, consistent lane width and vertical and horizontal geometry that is suitable for the posted speed limit of 100kph. There are multiple accesses and intersections along the route that are not always in optimal positions or configurations. There is no median separation and only limited application of guardrail at roadside hazards that are considered high risk. Waitahanui is a rural township that is busy with local traffic and pedestrian movements throughout the year from the local community but has seasonal increases due to the fishing and recreational activities accessible from the town. The Te Kura o Waitahanui educational facility is located to the northern end of the town where traffic speeds are still often in excess of the post 70kph speed limit.

11.2.2 Sector Option Description

Speed Management

Rural: This sector is generally well suited to current posted speed limit of 100kph, as such the emphasis of speed management is to engineer-up the route by protection of roadside hazards and improved intersections, including a new right turn bay. Engineering-down is not considered viable as it would not be self-explaining to road users.

Urban: Waitahanui is proposed to be reduced to 60kph, introduction of uncontrolled pedestrian crossings and school zone at Te Kura o Waitahanui. Consideration will also be given to further reduction to 50kph because of high density of direct accesses and crossing demand by vulnerable road users.

Safety

Rural: The wide existing corridor allows relatively easy implementation of 1.5m centreline and 2.5 shoulders to improve cyclist provision and reduced risk of head-on accident. Widening is assumed to continue through to the entire 11km of the route, terminating just before the bridge into Hatepe. The topographical constrains on the southern side of Hatepe Hill causes significant earthworks through an area identified as both an outstanding landscape area (OLA06) and significant natural area (SNA035 and SHA 119) to enable the widening to terminate just in advance of the bridge.

Urban: As per speed management improvements in Waitahanui.

Benefits

Rural: Rural width treatment is same as Safety with the key difference being the introduction of a median barrier between the airport roundabout and Waitahanui to provide a transitional section between the East Taupo Arterial and the lower standard rural state highway to the South.

Urban: This is the only option to provide a clip-on bridge to improve pedestrian connections into Waitahanui.

Effects

Rural: Similar treatment to Safety and Benefits, adopting a 1.5m median but reduced shoulder width to 1.5m. Because of the topographical constraints at the southern end of Hatepe Hill the road narrows to close the existing width to prevent encroachment in the outstanding or significant landscape areas.

Balanced

Balance adopts the width of Safety and Benefits but similar to Effects is sensitive to the OLA and SNA areas towards the southern end of the site and modifies the width to avoid encroachment.

Table 11-1: Comparison of Infrastructure Interventions

Sector 1					
	Speed Management	Safety	Benefits	Effects	Balanced
Roadside Barrier	0	3340m over 8 sites	3516m over 9 sites	1545m over 5 sites	3167m over 8 sites
Major Intersections Improvements (RTB)	3	2	6	4	5
Minor Intersections Improvements	1	1	5	4	3

11.2.3 MCA Outcomes

The A3 table below summarises the benefits and impacts that the options have on the identified criteria for this section.

11.2.3.1 Investment Objective Analysis

All options significantly contribute towards achievement of the investment objectives except for:

- Speed Management does not achieve the safety benefits of the other options, with Effects and Balanced performing behind Safety and Benefits
- Speed Management does not achieve the resilience benefits of the other options

11.2.3.2 Impacts Analysis

The Safety and Benefit options have the greatest effects, particularly on Natural Environment – Terrestrial, Property, and Visual and Landscape.

11.2.3.3 Critical Success Factors

Only the Effects and Balanced options achieve a BCR of over 1.0

The Safety and Benefits options almost achieve a BCR of 1.0 but are the most expensive and would be the most difficult to construct. The Speed Management option is the cheapest but also has a very poor BCR.

11.2.3.4 MCA Analysis

When undertaking the MCA analysis as described in Section 10.4, and assessing the options against the different weighting systems, the Safety option scored the worst, or equal worst.

All other options scored the best in at least one of the weighting systems.

The balanced option performed best under the most scenarios being the workshop, RMA Part 2, Social and no weighting systems.

11.2.4 Recommendation

It is recommended that the Balanced option be progressed for this sector. It has the greatest BCR, and manageable impacts. Although it involves greater investment than the Speed Management and Effects based options, this is appropriate for this section of the highway with higher volumes of traffic. It achieves over 80% of the safety benefits of the more expensive options but with only 65% of the cost.

		Speed Management	Safety	Benefits	Effects	Balanced
IO1 - Crashes		Benefit due to speed reductions	Benefit due to infrastructure works	Benefit due to infrastructure works	Benefit due to infrastructure works	Benefit due to infrastructure works
	(DSI crashes saved per 5 years)	0.2	3.7	3.7	2.4	3
IO2 - KiwiRAP		All options equally reduce the amount of <3 Star highway	All options equally reduce the amount of <3 Star highway	All options equally reduce the amount of <3 Star highway	All options equally reduce the amount of <3 Star highway	All options equally reduce the amount of <3 Star highway
	(% above 3 Star)	100%	100%	100%	100%	100%
IO3 - Two Trucks Passing		No identified issues on Sector 1				
IO4 - Resilience	No resilience issues identified					
	Currently over 4700 trips affected per year	negligible change	annual reduction of 1340 trips delayed	annual reduction of 1340 trips delayed	annual reduction of 900 trips delayed	annual reduction of 900 trips delayed
IO5 - Competing Interests		Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings. Clip on structure at Waitahanui	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.
	12 crashes over 5 years Annualised 2.5 crashes per year	41% reduction / 1 crashes saved per year	41% reduction / 1 crashes saved per year	41% reduction / 1 crashes saved per year	41% reduction / 1 crashes saved per year	41% reduction / 1 crashes saved per year
Natural Hazards		Limited scope for natural hazard mitigation	Limited scope for natural hazard mitigation	Moderate scope for natural hazard mitigation such as land instability and flooding	Limited scope for natural hazard mitigation	Limited scope for natural hazard mitigation
		4	4	3	4	4
Natural Environment - Freshwater		Scope of works and proximity to freshwater anticipated to result in low impact	Slightly greater scope of works and potential for freshwater impact	Slightly greater scope of works and potential for freshwater impact	Scope of works and proximity to freshwater anticipated to result in low impact	Scope of works and proximity to freshwater anticipated to result in low impact
		1	2	2	1	1
Natural Environment - Terrestrial		Impact anticipated to be low due as most works to be undertaken within road reserve	Greater impact possible due to works, especially near Hatepe Hill	Greater impact possible due to works, especially near Hatepe Hill	Impact anticipated to be low due as most works to be undertaken within road reserve	Moderate impact possible due to works, especially near Hatepe Hill
		2	4	4	2	3
Property and Land Use		Moderate property acquisition required	Significant property acquisition required	Significant property acquisition required	Moderate property acquisition required	Moderate to Significant property acquisition required
		3	5	5	3	4
Tangata Whenua		Input from hapu still required				
Visual and Landscape		Minimal affect on "Outstanding Landscape Areas"	Greatest affect on "Outstanding Landscape Areas", especially Hatepe Hill	Greatest affect on "Outstanding Landscape Areas", especially Hatepe Hill	Minimal affect on "Outstanding Landscape Areas"	Some land take and affect on "Outstanding Landscape Area" at Hatepe Hill
		2	4	4	2	3
Urban Design Opportunities		Minimal investment in this area	Minimal investment in this area	Greater investment in Road User Facilities	Minimal investment in this area	Greater investment in Road User Facilities
		4	4	3	4	3
Contaminated Land		No contaminated land identified in works area	No contaminated land identified in works area	No contaminated land identified in works area	No contaminated land identified in works area	No contaminated land identified in works area
		1	1	1	1	1
Community Cohesion		Township improvements	Township improvements	Township improvements	Township improvements	Township improvements
		2	2	2	2	2
Archaeology and Heritage		Identified cultural and heritage constraints are all within Sector 2				
Cost		Works within road reserve $7.5M	Greater cost associated with median barrier and works outside road reserve $23.5M	Greater cost associated with median barrier and works outside road reserve $24M	Works mostly within road reserve, and no median barrier. $14M	Potential for some works outside road reserve $15.5M
Economics	EEM	0.2	0.9	0.8	1.3	1.5
Engineering Degree of Difficulty		Work complexity low, within road reserve	Increased difficulty related greater degree of new infrastructure, and works around Hatepe Hill	Increased difficulty related greater degree of new infrastructure, and works around Hatepe Hill	Corridor option is predominantly within the road reserve.	Moderate difficulty associated with some works outside the road reserve
		1	4	4	2	3
Operations and Maintenance		Some width increase, which will enable easier operations and maintenance	Greater width available on shoulder for traffic management	Greater width available on shoulder for traffic management	Increased width available on shoulder for traffic management	Increased width available on shoulder for traffic management
		3	1	1	2	2
Stakeholder and customer perspectives		At workshop 3 stakeholders generally considered corridors options with greater infrastructure works (over the whole route) as preferable, however it was also noted that selecting a corridor option that would be delivered was also desirable.				
Specific Risks		Extent of works at Hatepe Hill. Vehicle speeds in Waitahanui, Community reluctance to accept lower speeds over section 1				

11.3 Sector 2: Hatepe to Motuoapa

11.3.1 Sector Summary

Sector 2 is much less consistent than Sector 1 having sections of rural road that are interrupted by three townships. Hatepe to Motutere is defined by the road's proximity to lake Taupō, challenging terrain, cultural significance and sites of archaeological interest. These constraints contribute to the existing alignment that is winding, narrow with steep unrecoverable lakeside hazards. The remaining sections of rural road are more consistent with old state highways, being mostly predicable alignment, consistent traffic lane width, narrow shoulders, no median separation and various unprotected roadside hazards ranging from trees, culverts and steep fill slopes.

A number of outstanding landscape areas and significant landscape areas run the full length of the lake side between Hatepe and Motutere. These are located directly adjacent to the road corridor areas and would be unavoidable, effected sensitive areas are identified in the District Plan as OLA04, SNA036 and SNA 155.

The three urbanised areas consist of Motutere, Te Rangiita/Oruatua and Motuoapa.

Motutere's permanent residential properties are located off a local road and are on the lake side of the state highway as such the speed limit has remained 100kph, however there is a large campground that located to the north of Waitapu Road that operates all year round with a considerable summer peak. Currently there is no urban traffic management through Motutere and speeds are consistent with the 100kph posted speed.

Te Rangiita/Oruatua, often referred to as Tauranga Taupō, is a ribbon like urban development that is served by a combination of intersections and service/local road and direct property accesses. Footpath provisions are provided for most of the urban length but are inconsistent in width and quality. Tauranga Taupō bridge is located to the South of the town.

Motuoapa is a combination of the old township that has direct property accesses and multiple accesses that serve the newly enlarged marina and residential properties and the newer subdivision located off Rangmoana Avenue.

11.3.2 Sector Option Description

Speed Management

Rural: Due to the constrained environment lake side the existing operating speed is lower than the posted speed limit. Using the self-explaining environment, a lower speed of 60kph is proposed between Hatepe to Motutere. The remaining rural sections adopt an 80kph speed limit in recognition of their less curvilinear alignment.

Urban: Motutere, Te Rangiita/Oruatua and Motuoapa would be reduced to 60kph. Pedestrian improvements such as new or widened footpaths and conspicuous pedestrian crossings complete with median refuge and buildouts are intended to serve a dual purpose; providing physical infrastructure to improve facilities for vulnerable road users but also to help reinforce the change in environment between rural and urban sections. Flush medians will be installed wherever reallocated space can the accommodate the changes. The purpose of the flush median it to assist right turns into property access and help provide a visual narrowing of the lanes and provide an even transition between pedestrian refuges.

Safety

Rural: In order to have a significant impact on the safety issues caused by the narrow, winding nature of the road and the unprotected falls there is a need to provide a wider corridor that eliminates the requirement for large vehicles to encroach into oncoming lanes. Along the lake side a consistent road width of 9m is the aim. This will have significant earthwork requirements, likely manifesting in a double lane retreat into the hill side at Toki Point and Bulli Point. Due to modern slope stability criteria this will require the cut slopes to be benched back at shallower gradients then existing. It is assumed that some relaxation in the desirable stability criteria will be used in recognition that this option primary aim is not to improve resilience. These earthworks would have a damaging effect on identified archaeological sites, potentially including Pā and Urupā sites.

Beyond Motutere the rural treatments widen to include a 1.5m wide centreline and 2m shoulders. Improvements to accesses into rest areas are also proposed with the desired treatment being right turn bay to separate turning traffic. There are significant natural areas adjacent to the road corridor, but it is

assumed these can be avoided by keeping within the road reserve of widening on the side of the road away from the SNA.

Urban: As speed management

Benefits

Rural: adopting the same width and alignment modification to Safety. Further resilience work may be required to ensure outages caused by environmental cause are minimised, however it is still assumed that a risk-based approach to slope stability will be adopted to minimise the effect on the highly sensitive environment.

Love Taupo's Bulli Point recreational plan is also supported in principle through this option, providing road safety is not compromised.

Urban: As speed management except this option is the only one that allows for a realignment of Tauranga Taupō bridge. The realignment broadly follows the existing designation D72 that bypasses to the south east of the township. It is however proposed to start the bypass further north than the existing designation to avoid the high density of direct property accesses. A further allowance is made for an intersection linking Rangiita to the bypass.

Effects

Rural: As the Effects option is highly sensitive to the impact of any infrastructure work, it mostly maintains the existing alignment and width between Hatepe and Motutere. Exceptions to this are where the constraints ease and work can be completed within the existing road designation. Where sensitive areas are experienced the work will be confined to the existing formation. Proactive resilience work is included if they prevent the potential for prolonged road closures.

Beyond Motutere where the constraints ease, 0.8m wide median and 1m shoulders are adopted throughout the remaining rural sections. It is expected that all of this would be kept within the existing road designation and narrowing adopted close to Rawhira Road if required.

Improvements to lakeside rest stops will be by way of safer intersection treatments, such as turn bays and sight distance improvements.

Urban: As speed management

Balance

Rural: adopting a hybrid of Balanced and Effects the aim is to widen to 9m for a much of the section from Hatepe to Motutere but reverts to existing width in highly sensitive areas. It is expected that there will be still be significant earthworks involved but Pa, Urupa will be undisturbed. Beyond Motutere the treatment is closely matched to Effects.

Urban: As speed management

Table 11-2: Comparison of Infrastructure Interventions

Sector 2					
	Speed Management	Safety	Benefits	Effects	Balanced
Roadside Barrier	0	4441m over 11 sites	4441m over 11 sites	2870m over 4 sites	4301m over8 sites
Major Intersections Improvements (RTB)	1	3	4	1	4
Minor Intersections Improvements	2	4	5	4	4

11.3.3 MCA Outcomes

The A3 table below summarises the benefits and impacts that the options have on the identified criteria for this section.

11.3.3.1 Investment Objective Analysis

All options have good safety benefits with the exception of Speed Management.

The Safety and Benefit options perform best in regard to resilience and removing constraints to allowing two trucks to pass safely.

11.3.3.2 Impacts Analysis

This section has the greatest areas of sensitive receiving environment – socially, culturally and environmentally, so options which involve significant widening, i.e. Safety and Benefits have very large impacts which may be difficult to mitigate. Iwi will not support any option that impacts on sites of cultural significance.

11.3.3.3 Critical Success Factors

None of the options achieve a BCR of above one, primarily due the high costs involved in constructing anything along this section. The Effects option has the highest BCR of 0.6. Whilst not under the remit of this investigation, stakeholders and iwi are very supportive of the Transport Agency considering a long-term alignment away from the lakefront.

11.3.3.4 MCA Analysis

The Speed Management option scored the best under the most weighting systems, with the Balanced option being the next best performing across the board.

Final results indicated that across the weighting scenarios the Safety corridor option scored the worst, or equal worst.

11.3.4 Recommendation

It is recommended that the Effects option be progressed for this sector. This option proposes as much work as possible without impactful effects outside of the current road corridor. It achieves almost 80% of the safety benefits of the Safety option without significant adverse impacts. Effects also achieves similar outcomes to the Balanced option, with slightly fewer impacts and at nearly half the cost. It also progresses limited investment on the current alignment whilst an offline alignment can be considered. Although the Speed Management option performed better under the MCA analysis, this was due to the better scores for some of the impacts. The Effects option also has the highest BCR of all the options. During the further development of the effects option, any treatment which does impact on the cultural or environmental constraints can be omitted.

		Speed Management	Safety	Benefits	Effects	Balanced
IO1 - Crashes		Benefit due to speed reductions	Benefit due to infrastructure works	Benefit due to infrastructure works	Benefit due to infrastructure works	Benefit due to infrastructure works
	(DSI crashes saved per 5 years)	0.5	1.6	1.6	1.4	1.4
IO2 - KiwiRAP		ATP markings increase proportion of +3. Increase unlikely to be enduring.	Moderate benefit due to infrastructure	Section 6 works remove some 2 star road not dealt with by others	Moderate benefit due to infrastructure	Moderate benefit due to infrastructure
	(% above 3 Star)	84%	84%	95%	84%	84%
IO3 - Two Trucks Passing		Reduced speeds will reduce consequence, however offset in part by traffic growth	Reduced speeds will reduce consequence, however offset in part by traffic growth	New alignment at Tauranga Taupō completely resolves issue.	Reduced speeds will reduce consequence, however offset in part by traffic growth	Reduced speeds will reduce consequence, however offset in part by traffic growth
	(Remaining problem sites)	4	2	1	3	2
IO4 - Resilience	Environmental Impacts - TREIS 48 over 6.5 year period with 72500 trips disrupted annually	Reduction in environmental resilience delays is due to works already proposed by NZTA.	Works are infrastructure heavy but not targeted at improving resilience. As such only improvements are as an effect of road widening.	Allows for widening and slope re-engineering around lake side. Due to cultural issues all issues are not anticipated to be addressed.	Reduction in environmental resilience delays is due to works already proposed by NZTA.	Reduction in environmental resilience delays is due to works already proposed by the Transport Agency.
		20% reduction Annual reduction in trips delayed 14500	50% reduction Annual reduction in trips delayed 36250	80% reduction Annual reduction in trips delayed 58000	40% reduction Annual reduction in trips delayed 29000	40% reduction Annual reduction in trips delayed 9000
	Crash delays - currently 39864 trips affected per year or 7972.8 per year	annual reduction of 180 trips delayed	annual reduction of 576 trips delayed	annual reduction of 576 trips delayed	annual reduction of 504 trips delayed	annual reduction of 5040 trips delayed
IO5 - Competing Interests	25 crashes over 5 years Annualised crash rate: 5	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.	Lower speeds in townships, threshold treatments and improved pedestrian paths and crossings.
		18% reduction / 0.9 crashes saved per year	18% reduction / 0.9 crashes saved per year	37% reduction / 1.9 crashes saved per year	18% reduction / 0.9 crashes saved per year	18% reduction / 0.9 crashes saved per year
Natural Hazards		Minor improvement from landslide/cliff edge improvements	Minor improvement from landslide/cliff edge improvements	Moderate improvement from landslide/cliff edge improvements	Minor improvement from landslide/cliff edge improvements	Minor improvement from landslide/cliff edge improvements
		4	4	3	4	4
Natural Environment - Freshwater		Limited widening, and works to be undertaken within existing road reserve	Larger scope of widening therefore potential for greater impact	Larger scope of widening therefore potential for greater impact	Moderate scope of widening	Moderate scope of widening
		2	4	4	3	3
Natural Environment - Terrestrial		Minimal widening	Impacts due to extent of proposed widening	Impacts due to extent of proposed widening	Minimal widening, or targeted widening	Less widening than safety and benefits.
		2	4	4	2	3
Property and Land Use		Works to be undertaken within existing road reserve.	Some acquisition may be required where scaling back edges or easing curves	Some acquisition may be required where scaling back edges or easing curves	Works to be undertaken within existing road reserve	Works predominantly undertaken within existing road reserve
		1	3	3	1	2
Tangata Whenua				Awaiting input from hapu		
Visual and Landscape		Minimal affect on "Outstanding Landscape Areas"	Greatest affect on "Outstanding Landscape Areas" around lakefront	Greatest affect on "Outstanding Landscape Areas" around lakefront	Minimal affect on "Outstanding Landscape Areas"	Some land take and affect on "Outstanding Landscape Area" at Hatepe Hill
		2	4	4	2	3
Urban Design Opportunities		Investment primarily in townships	Investment primarily in townships	Investment in townships and in rural areas	Investment primarily in townships	Investment in townships and in rural areas
		2	2	1	2	1
Contaminated Land		One section of contaminated land identified which straddles the existing highway	One section of contaminated land identified which straddles the existing highway	One section of contaminated land identified which straddles the existing highway	One section of contaminated land identified which straddles the existing highway	One section of contaminated land identified which straddles the existing highway
		4	4	4	4	4
Community Cohesion		Township improvements	New Roundabout in Turangi, Tauranga Taupo Bridge and clip-on footpath north of Turangi	New Roundabout in Turangi, Tauranga Taupo Bridge and clip-on footpath north of Turangi	Township improvements	Township improvements
		2	1	1	2	2
Archaeology and Heritage		no works in areas of archaeological concern - majority of works contained within existing seal	likely to be disturbance of known or unknown sites to achieve benefits. Assumed highest impact until approvals with all relevant stakeholders/partners is obtained	likely to be disturbance of known or unknown sites to achieve benefits. Assumed highest impact until approvals with all relevant stakeholders/partners is obtained	All work is expected to be avoid areas of significance or high risk	All work is expected to be avoid areas of significance or high risk
		1	5	5	2	2
Cost		Minimal infrastructure however still significant TM and EM costs.	Higher cost associated with widening corridor around constrained lakeside	Higher cost associated with widening corridor around constrained lakeside	Minor to moderate cost associated with widening corridor around constrained corridor	Moderate cost associated with widening corridor around constrained corridor
		$8.7M	$56M	$82M	$11M	$39M

		Speed Management	Safety	Benefits	Effects	Balanced
Economics	EEM BCR	0.4	0.3	0.2	0.6	0.3
Engineering Degree of Difficulty		Difficulty score mostly low due to low infrastructure works. However, there are still works planned around the lakeside the will require environmental controls	Infrastructure works have significant constraints around lake front	Infrastructure works have significant constraints around lake front	Corridor option provides for less widening than balanced	More physical works planned in the constrained areas.
		2	5	5	3	4
Operations and Maintenance		Limited widening, and stabilisation works means operations and maintenance unlikely to improve 5	Improvement related to improved widening 3	Improvement related to improved widening 3	Minor improvement related to improved widening 4	Minor improvement related to improved widening 4
Stakeholder and customer perspectives		At workshop 3 stakeholders generally considered corridors options with greater infrastructure works (over the whole route) as preferable, however it was also noted that selecting a corridor option that would be delivered was also desirable.				
Specific Risks		Most risks associated with the lakefront; sensitive land uses, Tangata Whenua, and resilience risks.				

11.4 Sector 3: Motuoapa to Waiouru

11.4.1 Sector Summary

Sector 3 runs from Motuoapa to Waiouru and accounts for more than 60% of the total project length. Mainly rural it has the largest township, Turangi, located towards the Northern end of the Sector. The section from Motuoapa to Turangi is an area that is prone to shallow flooding and has steep roadside drains and narrow shoulders. It is the last of assessed route that is affected by lake side seasonal activities, such as multisport and cycling use. South of Turangi is all rural highway and is a combination of open, geometrically consistent corridor and sections of winding, steep and narrow road referred to as Three Sisters and Desert Road curves. These winding sections are where the majority of crashes occur, however the severity is often low due the lower speeds. Weather impacts cause regular winter closures of the section referred to Desert Road, that commences at Rangipo and travels southward beyond Waiouru.

Turangi is the largest township on the route but unlike most the other townships has no direct property accesses onto to the stage highway. This has led to the speed limit remaining than the other communities at 80kph.

11.4.2 Sector Option Description

Speed Management

Rural: due to the steep roadside drains and narrow shoulders the speed limit between Motuapa and Turangi is reduced to 80kph. Beyond Turangi 100kph is typically proposed speed for all sections except for three sisters and desert road curves, that is likely to be 60kph and 80kph respectively.

Urban: this option does not propose any significant change through Turangi, a section of 60kph speed limit on the approach to the Pihangi Road intersection is likely.

Safety

Rural: 1.5m wide median and 1.5m shoulders is maintained for as much of the route as feasible. The constraints of three sisters and to a lesser extent desert road curves prevent widening to the same extent. Three sisters only provide localised widening on corners and some improvement to shoulder width consistency. Beyond this 0.8m wide median is proposed until the road exists south of desert road curves. After this it reverts to 1.5m wide median and 1.5m shoulders.

Much of sector three is flanked by SNA sites, it is expected that for the most part works would be undertaken in the road reserve. The exception to this is to the south of three sisters, there are locations of cut slopes that are likely to require significant works to widen the road. Here encroachment into SNA259 and SNA300 is anticipated.

Urban: urban treatments in Turangi are focused on speed reduction and improved pedestrian links between existing infrastructure. Pedestrian crossing improvements to connecting the footpath on the Tongariro Bridge to the main footpath into Turangi by way of buildouts and increased conspicuity. Traffic improvements by way of right turn into rest stop/parking close to the southern side of Tongariro bridge and an urban roundabout at the intersection with Pihangi Road. The roundabout serves to reduce speed, aid traffic turning right out of Pihangi Road and improve at grade pedestrian crossing.

Benefits

Rural: 1.5m wide median and 1.5m shoulders is maintained for as much of the Sector 3 as feasible. The constraints of three sisters and to a lesser extent desert road curves prevent widening to the same width. Three sisters only provide localised widening on corners and some improvement to shoulder width consistency. Beyond this 0.8m wide median is proposed until the road exists south of desert road curves. After this it reverts to 1.5m wide median and 1.5m shoulders.

Like Safety the carriageway widening to the south of three sisters is likely to require moderate to significant earthworks there is also additional resilience works proposed to stabilise cut slopes or install catch fences to contain rock fall. Where cut slope regrading is proposed it is anticipated that this will extend beyond the road reserve further into SNA259 and SNA300.

Urban: As Safety with the addition of a clip-on pedestrian bridge added to the existing Tongariro bridge.

Effects

Rural: between Turangi and three sisters 0.8m wide centreline and 1m shoulders is proposed. Through three sisters the existing width is maintained with improvements by way of increased visibility and minor corner easing. Beyond three sisters an 0.8m median and 1m shoulders is the target but is restricted by SNA land

constraints, after desert road curves the existing carriageway width is maintained, however reallocation of space by narrowing the shoulders to allow for a narrow wide centreline treatment is proposed.

Improved resilience is likely to be by increased use of catch fence rather that extensive cut slope reprofiling as such works are expected to be within the road reserve.

Urban: As safety

Balanced

Rural: between Turangi and three sisters 0.8m wide centreline and 1m shoulders is proposed. Through three sisters the existing width is maintained with improvements by way increased forward visibility and minor corner easing. Beyond three sisters a 0.8m median and 1m is proposed until the project terminates to the north of Waiouru.

The introduction of a 0.8m wide median to the south of three sisters will require earthworks that encroach into SNA259 and SNA300.

Urban: As safety

Table 11-3: Comparison of Infrastructure Interventions

Sector 3					
	Speed Management	Safety	Benefits	Effects	Balance
Roadside Barrier	0	6311m over 27 sites	6795m over 29 sites	2131m over 11 sites	6530m over 28 sites
Major Intersections Improvements (RTB)	0	4	5	3	4
Minor Intersections Improvements	2	5	7	2	7

11.4.3 MCA Outcomes

The A3 table below summarises the benefits and impacts that the options have on the identified criteria for this section.

11.4.3.1 Investment Objective Analysis

All options have good contribution to the investment objectives except the Speed Management option, which has little contribution to safety or resilience.

All other options are similar with the exception of Benefits which has the greatest predicted crash reduction due to increased infrastructure and better improvement for competing interests due to the active modes clip-on for the Tongariro Bridge.

11.4.3.2 Impacts Analysis

The Desert Road is a sensitive receiving environment environmentally and the Safety and Benefits option are likely to adversely impact this natural environment due to significant lengths of road widening. The Effects and Speed Management options are the least impactful.

11.4.3.3 Critical Success Factors

Only the Effects option has a BCR approaching 1.0. The Safety and Benefits options have a very high cost and would be moderately difficult to construct.

11.4.3.4 MCA Analysis

Final results show that Speed Management, Effects and Benefits all perform well under different weighting scenarios.

Benefits and Speed Management top 2 and 3 systems respectively but also perform poorly under other scenarios.

The Effects option scores the best under 5 systems, whilst the Balanced system scores next best under most scenarios.

11.4.4 Recommendation

It is recommended that the Effects option be progressed for this sector. This option proposes as much work as possible without impactful effects outside of the current road corridor. It performed the best under the MCA analysis, has the highest BCR and achieves almost 80% of the safety benefits of the Benefits option at less than half the cost. It also significantly reduces the adverse impacts through the Desert Road and is considered an appropriate level of investment for the modest traffic volumes.

		Speed Management	Safety	Benefits	Effects	Balanced
IO1 - Crashes		Benefit due to speed reductions	Benefit due to speed reductions	Benefit due to speed reductions	Benefit due to speed reductions	Benefit due to speed reductions
	(DSI crashes saved per 5 years)	0.3	3	3.7	2.9	2.4
IO2 - KiwiRAP		No change from base (2022)	Significant Benefit due to infrastructure works	Significant Benefit due to infrastructure works	Moderate Benefit due to infrastructure works	Moderate Benefit due to infrastructure works
	(% above 3 Star)	78%	89%	89%	87%	87%
IO3 - Two Trucks Passing		No identified issues on Sector 3. Multiple confined cross sections through 3 sisters but all are passable with normal HPMV trucks moving in both directions.				
IO4 - Resilience	Environmental Impacts - TREIS - 28 over 6.5 years. Annual trips effected - 15930	No environmental resilience works	Improvements related to road widening only	Rock face stabilisation and additional catch fences, some slope re-engineering	works mainly limited to lower cost treatments such as additional catch fences	allows for rock face regrading or protecting by mechanical means. Large slopes are unlikely to be treated due to cost/benefit
		0% reduction Annual trip reduction in trips delayed 0	30% reduction Annual reduction in trips delayed 4,800	50% reduction Annual reduction in trips delayed 8,000	25% reduction Annual reduction in trips delayed 4,000	40% reduction Annual reduction in trips delayed 6,400
	Crash delays - CAS. Assumes all DSIs resulted in delay: 22 over 5 years	annual reduction of 41 trips delayed	annual reduction of 366 trips delayed	annual reduction of 440 trips delayed	annual reduction of 350 trips delayed	annual reduction of 385 trips delayed
IO5 - Competing Interests	37 crashes over 5 years Annualised crash rate 7.5	Benefit due to speed reductions and infrastructure works.	Benefit due to speed reductions and infrastructure works. Includes for roundabout to support lower 60kph speed limit.	Benefit due to speed reductions and infrastructure works. Includes for roundabout to support lower 60kph speed limit. Additional benefit of including clip on bridge over Tongariro River	Benefit due to speed reductions and infrastructure works. Includes for roundabout to support lower 60kph speed limit.	Benefit due to speed reductions and infrastructure works. Includes for roundabout to support lower 60kph speed limit.
		17% reduction / 1.3 crashes saved per year	30% reduction / 2.3 crashes saved per year	30% reduction / 2.3 crashes saved per year	30% reduction / 2.3 crashes saved per year	30% reduction / 2.3 crashes saved per year
Natural Hazards		Widening minor widening achieved may allow for greater hazard protection	Widening may allow for greater hazard mitigation	Greater infrastructure works may result in better hazard mitigation, e.g. culvert replacements	Improvement from landslide/cliff edge improvements	Improvement from landslide/cliff edge improvements
		3	3	2	3	3
Natural Environment - Freshwater		Limited impact anticipated	Minor impact anticipated	Minor impact anticipated	Limited impact anticipated	Limited impact anticipated
		1	2	2	1	1
Natural Environment - Terrestrial		Minor widening may occur 2	Potential for greater widening 4	Potential for greater widening 4	Minor widening, where effects considered lower 2	Comparatively moderate widening 3
Property and Land Use		Minor property purchase may be required 2	Land may be required related to widening 4	Land may be required related to widening and roundabout in Turangi 4	Minor property purchase may be required 2	Some property may be required where curves are eased 3
Tangata Whenua		Awaiting input from hapu				
Visual and Landscape		Minimal affect on "Outstanding Landscape Areas"	Greatest affect on "Outstanding Landscape Areas" through Desert Road	Greatest affect on "Outstanding Landscape Areas" through Desert Road	Minimal affect on "Outstanding Landscape Areas"	Some land take and affect on "Outstanding Landscape Area" through Desert Road

		2	4	4	2	3
Urban Design Opportunities		Minimal investment in this area	Minimal investment in this area	Greater investment in Road User Facilities	Minimal investment in this area	Greater investment in Road User Facilities
		4	4	3	4	3
Contaminated Land		No contaminated land identified in or near the existing road reserve	No contaminated land identified in or near the existing road reserve	No contaminated land identified in or near the existing road reserve	No contaminated land identified in or near the existing road reserve	No contaminated land identified in or near the existing road reserve
		1	1	1	1	1
Community Cohesion		No significant communities through this sector 3	No significant communities through this sector 3	No significant communities through this sector 3	No significant communities through this sector 3	No significant communities through this sector 3
Archaeology and Heritage		Identified cultural and heritage constraints are all within Sector 2				
Cost		Relatively minimal infrastructure $15M	Greater potential for widening and barrier in some locations resulting in higher costs $46M	Greater potential for widening and barrier in some locations resulting in higher costs $50M	Widening and targeted barrier $22M	Greater widening than Effects, with more barrier. $40M
Economics	EEM	0.2	0.4	0.6	0.9	0.7
Engineering Degree of Difficulty		Lower volume of infrastructure works, and works within road reserve	Widening in some locations may require moderate to difficult works	Widening in some locations may require moderate to difficult works	Minor difficulty anticipated	Moderate difficulty anticipated
		1	4	4	2	3
Operations and Maintenance		Limited widening, and stabilisation works means operations and maintenance unlikely to improve	Improvement related to improved widening	Improvement related to improved widening	Minor improvement related to improved widening	Minor improvement related to improved widening
		5	3	3	4	4
Stakeholder and customer perspectives		At workshop 3 stakeholders generally considered corridors options with greater infrastructure works (over the whole route) as preferable, however it was also noted that selecting a corridor option that would be delivered was also desirable.				
Specific Risks						

11.4.5 Economics (EEM)

This section details the assumptions and findings of the economic analysis undertaken.

11.4.5.1 Methodology

The economic analysis has been prepared in accordance with the Transport Agency's latest EEM and Crash Estimation Compendium (both dated July 2018). The analysis considers two separate parts of the corridor options:

1. The treatments that apply to the entire corridor e.g. barrier or shoulder widening
2. Localised treatments at targeted locations

The benefits treatments were assessed for each of the 15 section lengths identified early in the study. The 15 sections were then compiled into 3 overall section lengths for reporting purposes, as tabled below.

11.4.5.2 Key Inputs

- Discount Rate: 6%
- Year Zero: 1 July 2020
- Base Date: 1 July 2019
- Update factors: Crash = 1.06
- Year start of Benefit stream: 1 (1 July 2021) and 40 year analysis period

Table 11-4: Traffic Data

Section	Count Station	2020 AADT	%HCV	%Growth
Sections 1 to 10 up to SH41, RS713 to 753	ID:01N00729	7250	14.7%	3.88%
Section 10 SH41 to SH46, RS753 to 763	ID:01N00758	4680	21.4%	3.17%
Sections 11 to 13, RS763 to 777/3.5	ID:01N00763	3965	25.2%	2.67%
Sections 14 and 15, RS777/3.5 to end	ID:01N00795	4237	20.8%	3.83%

11.4.5.3 Results

The option with the highest increment BCR is shown highlighted for each of the combined sections 1, 2, and 3. A +99 indicates an option yields higher benefits for identical cost. A -99 indicates an option yields weaker benefits for the same cost. Generally, BCR for most projects including packages of works are less than 1.0.

The results indicate that the low cost low benefits "Speed Management" philosophy is the most effective in combined section 2, and the medium cost/medium benefit "Balanced" and "Effects" philosophies are most effective in sections 1 and 3 respectively.

Table 11-5: Costs and BCRs for options per sector

Combined Section	Philosophy	Corridor Treatment				Targeted Treatment				Combined Treatment	
		Cost (M)	Benefits (M)	BCR	Incre-mental BCR	Cost (M)	Benefits (M)	BCR	Incre-mental BCR	BCR	Incre-mental BCR
1	Safety	17.0	16.7	1.0	0.0	5.6	6.6	1.2	0.7	1.0	-0.1
	Benefits	17.4	16.7	1.0	0.0	8.4	11.6	1.4	1.2	1.1	0.4
	Effects	7.6	7.3	1.0	1.0	2.6	4.4	1.7	3.3	1.1	1.2
	Balanced	8.8	16.7	**1.9**	**2.1**	6.0	7.2	1.2	0.8	1.6	**2.6**
	Speed Manage.	1.3	1.1	0.9		1.8	1.7	1.0	N/A	0.9	N/A
2	Safety	43.1	11.6	0.3	0.2	2.7	2.8	1.1	1.0	0.3	0.2
	Benefits	67.6	11.6	0.2	0.1	12.0	8.5	0.7	0.6	0.3	0.2
	Effects	9.9	9.5	1.0	0.9	1.3	1.4	1.1	N/A	1.0	1.0
	Balanced	26.1	9.5	0.4	0.3	3.0	2.9	0.9	0.0	0.4	0.3
	Speed Manage.	**2.8**	**3.0**	**1.0**		1.8	1.7	1.0	0.5	1.0	N/A
3	Safety	33.5	17.1	0.5	0.3	11.6	9.2	0.8	0.8	0.6	0.6
	Benefits	36.6	25.8	0.7	0.6	22.6	12.1	0.5	0.5	0.6	0.7
	Effects	**11.0**	**11.1**	**1.0**	**1.4**	11.5	6.4	0.5	0.5	0.7	0.8
	Balanced	24.7	17.4	0.7	0.5	20.3	11.0	0.5	0.5	0.6	0.6
	Speed Manage.	4.7	2.4	0.5		0.4	0.3	0.7	N/A	0.5	N/A

11.4.5.4 Crash Method

The EEM requires the adoption of do-minimum Method A or C crash analysis depending on the density of historic injury crashes. Method A can be used if a representative sample of crashes can be demonstrated. Where this is lacking, method C compensates for a modest crash history by using crash models. The two methods can give quite diverse results – of the two, the EEM favours the use of Method C. As only 3 of the shorter of 15 sections (about 5% of the total length) achieved the required criteria of 3 injury or 1 DSI midblock per km, method C has been adopted.

SafeRoads have recently undertaken a sister DBC on the adjacent Piarere-Taupo section of SH1 and used method A on this higher traffic volume section (AADTs of 8,000-11,000). Ideally Taupo-Waiouru would use a matching methodology. However, our study length has only 4,000 to 7,000 AADT and somewhat lower crash history, hence driving the alternative method C.

11.4.5.5 Benefits

The analysis follows a simplified method timeline, as no transport model has been developed requiring full procedures-style variable timeline reporting. A construction sequencing programme, if developed, would also impact PV benefits reporting.

This project has identified improvements focus on safety, as opposed to capacity or travel time enhancement. As a result, all benefits assessed have a safety component. A few projects also have TT and VoC etc assessed.

Several proposed improvements have only a crash component – for example, clearzones, verge guardrail, and right turn bays.

Curve improvement projects are likely to offer additional modest TT benefits due to improved travel speeds. These benefits have not been calculated, meaning the reported benefit for each project is conservative.

The Taupo Tauranga bypass, Turangi Roundabout and various passing lane projects include travel time and VoC as these are principle components. Frustration is assessed for passing lanes.

Some improvements that have a significant disbenefit that is not accounted for in the analysis are speed restrictions and median barrier. Depending on location, alignment and crash history the loss of passing opportunity can outweigh median barrier safety benefits; – this effectively occurs in section 1.

Barriers to crossing has been assessed for any walking and cycling (simplified method).

A number of projects have not been included in the analysis, either being unsuitable, or having very minor benefits combined with a lack of a suitable Compendium prediction model, projects such as:

- urban footpath extension, or pedestrian lighting, or improved facilities within an existing rest-area are seen as amenity improvements.
- damaged guardrail is normal maintenance, and
- projects such as rock slips are least cost maintenance issues (i.e. whether the cost of frequent debris cleanup justifies rock fencing).

For crash benefits where two or more improvements are applied, CMFs are multiplied as per the Compendium.

Benefits not assessed include noise (the project length is predominantly modestly populated rural) and WEBs.

Verge Guardrail and Clear-zones

Verge guardrail and clear-zones are treated differently to other types of improvement. These are crash mitigation measures which focus on reducing crash severity rather than incidence, and are thus assessed using method A. However, as there is often no crash history adjacent to a proposed treatment site, a representative crash sample is used. representative (fatal, serious, minor, noninjury) crash sample is calculated by:

$$\text{Crash sample} = \frac{\text{crashes over representative section length} \times \text{guardrail length}}{\text{representative section length}}$$

Passing lanes/SVBs

Slow Vehicle bays (SVBs) and passing lanes are assessed as per the EEM simplified method for individual lanes. The effect of combinations of sites will be ignored, as testing this level of detail requires a transportation model (TRARR or microism etc.). The facilities will be individually costed rather than using the generic facility costs in EEM A7.

Wide centrelines

The philosophies include wide centrelines of variable width. The Compendium does not differentiate between widths but warns that benefits may be marginal under 14,000 vpd. The assessment has made the assumption that the relatively low volume study length will not achieve full CMF of 0.8 at a "typical" wide centre line option of 0.8m but will at a more aggressive higher width intervention. The applied wide centre line CMFs are:

- Width = 0 to 1.0m CMF = 0.90
- Width = 1.0 to 1.5m CMF = 0.85
- Width = 1.5m + CMF = 0.80

11.4.5.6 Costs

Costs have been prepared in accordance with the appropriate analysis level within Waka Kotahi's SM014. The economic analysis uses the 50%ile (expected) estimate including fees and land and excluding sunk costs and GST.

11.4.5.7 Incremental Analysis

Incremental analysis has been calculated for options which are mutually exclusive. In this context analysis is required to compare the five "Benefits, Effects, Optimised, Speed Management, and Safety" philosophies. Incremental analysis is not generally required within the improvements list as nearly all of the proposals are single-site single-option activities.

11.4.5.8 FYRR

First Year Rate of Return is useful to gauge construction timing of a project. A low FYRR is an indicator that benefits are initially low and the project should be delayed until traffic growth drives greater positive net benefits. Under the simplified method, FYRR is proportional to BCR and for crash benefits at 6% discount rate and 3.9% growth, is around 2.6% for a BCR of 0.5 and 5.1% for a BCR of 1.0.

The EEM recommends delaying a project where the FYRR < BCR/15.4. Under simplified analysis this will occur for any project, regardless of BCR, where benefits growth is 2% or less and is thus not a particularly useful measure. For SH1, where benefits growth = traffic growth = 3-4%, this benchmark is never achieved. This rule of thumb is thus a more useful measure for full procedures analysis where the net benefits stream can vary markedly over the 40 year analysis period.

11.4.5.9 Sensitivity Testing

Sensitivity testing has not been undertaken on individual projects. However, testing for a discount rate of 4% or 8%, or for a lower than existing traffic growth rate, will yield for a given BCR the following effects. In general, reducing the existing traffic growth to 2% or increasing the discount rate to 8% will reduce the reported BCR by 25%. Reducing the discount rate will increase the BCR by around 25%. This later effect is particularly relevant as current PIKB discussion papers indicate that adoption of 4% for EEM analysis is imminent, which means that the reported BCRs are likely to be conservative.

Table 11-6: BCR Sensitivity

Existing Typical Growth	Existing Typical BCR	Modified BCR			
		2% growth	1% growth	4% Discount	8% discount
3.88%	0.5	0.38	0.32	0.6	0.4
3.88%	1.0	0.77	0.63	1.3	0.8

11.4.5.10 Maintenance

Maintenance effects are not included within the analysis. The assumption at short list assessment is that the maintenance activities undertaken under each option will eventually be cancelled out by the additional infrastructure that will need maintaining over the design life of the asset.

11.4.6 2020 Updated Discount Rate

An update of the EEM manual has just been realised with a reduced discount rate of 4% (previously 6%).

For the majority of quick wins the BCR will increase by around 35%. This is because the value of future net benefits is higher using 4% instead of 6%. Where speed limits in urban areas are reduced to below 70, benefit growth and thus BCR will be slightly higher because the speed adjustment is less; those projects will be around 38% higher. This is expected to apply to all quick win projects due to their common characteristics:

- Quick wins are expected to be built in 1 year with no staging.
- Crash benefits are proportional to traffic growth, therefore benefit growth equals traffic growth (which varies between 3.3% and 3.9%) – 2% EEM A14 adjustment. So net growth is about 1.4-1.9%. Where speed limits are less than 70km/h, the EEM A14 adjustment is -1%.
- Analysis period is 40 years for both 6% and 4% (as per new EEM, which is more realistic for light touch projects than the 60 years often proposed for a 4% rate)

An assessment using full procedures evaluations will also show an increased BCR but with more varied results.

12. Recommended Option

12.1 Recommended Option

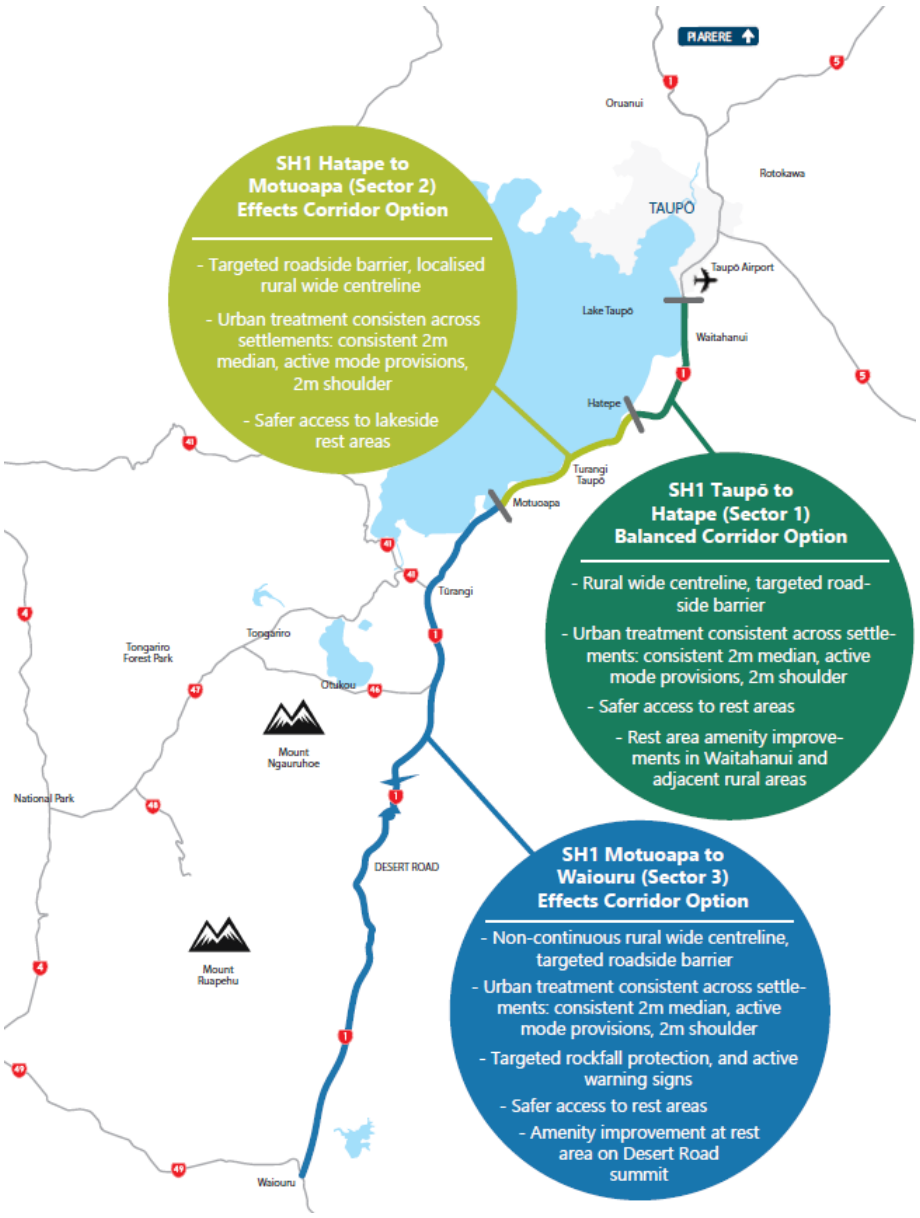
On the 22nd January 2020 the project team and other representatives from the Transport Agency met to discuss which corridor options had emerged as recommended for each sector, as presented above.

In summary:

In Sector 1, the Balanced option is recommended as it will provide a relatively good treatment of the investment objectives, in a Sector where there is less risk for negative impacts. It also provides the best benefit cost ratio.

Sector 2 is anticipated to be particularly sensitive to delivery impacts; the Effects option provides the flexibility to reduce treatments should the impacts be considered too great after discussion with Iwi, hapū and HNZ. Comparatively the Speed Management Corridor Option does not contribute as well to the investment objectives as the Effects option. The Effects option also has the best benefit cost ratio.

In Sector 3, the Effects option will have relatively low impact and comparative cost, without compromising significantly on addressing the investment objectives compared to the other corridor options. It also has the best benefit cost ratio.



The recommended option for the corridor includes:

- Reallocated road space to provide flush medians, lower speed limits and better facilities for pedestrians and cyclists including wider paths and pedestrian refuges through communities of Waitahanui, Motutere, Te Rangiita, Motuoapa and Turangi
- Wide centreline, intersection improvements and targeted roadside barrier from Taupo Airport Roundabout through to Hatepe
- Reduced speed limit with limited physical works alongside Lake Taupo from Hatepe to Motuoapa
- Minor widening and slip stabilisation at Te Poporo/Bulli Point
- Access improvements at selected rest area locations
- Wide centreline, audio tactile pavement markers, targeted roadside barriers, wider shoulders, intersection improvements and rockfall protection (where there is space without significant works outside the road reserve)
- Roundabout at Turangi
- Corridor wide vegetation/earthworks retreating, signage and active warning signage

The recommended options specifically excludes:

- New bridge realignment at Tauranga-Taupo
- Additional passing lanes
- Inter-town active travel (other than wider shoulders where feasible)

12.2 Description

12.2.1 Rural

The recommended option would improve rural road safety whilst also maintaining speeds close to the current operating speeds for much of the road. The extent of engineering-up is relatively modest with wider shoulder, wider medians (ranging from 1.5m to 0.8), simple curve easing within the existing road designation, channelised right turns bays, targeted road side barriers at high risk locations, visibility improvements and improved signage and road markings.

Because all the improvements are online, the Recommended Option does not seek to make a step-change in traffic speeds through the more constrained sections of the route, most notably Hatepe to Motutere and Three Sisters. The PBC identified longer term works for these sections and therefore the recommended option is limited to a series of online safety measures such as guardrail, vegetation / earthworks retreating, signage, active warning signage and lower speed limits.

12.2.2 Urban

All townships receive similar treatment that seeks to reinforce lower speeds; all speed limits would be reset to 60kmh with Waitahanui also having a 40kmh school speed zone. Most towns would have their speed limit areas extended back to allow for the slow reduction in speed that is often observed in these townships. New gated threshold entrances will be installed to provide narrowing effect on the entrance to townships.

Pedestrian improvements such as new or widened footpaths and conspicuous pedestrian crossings complete with median refuge and buildouts are intended to serve a dual purpose; providing physical infrastructure to improve facilities for vulnerable road users and to help reinforce the change in environment between rural and urban sections.

Flush medians will be installed wherever reallocated space can the accommodate the changes. he purpose of the flush median it to assist right turns into property access and help provide a visual narrowing of the lanes.

A roundabout is proposed at the entrance to Turangi township (Pihanga Road) to support lower speeds, provide safer at-grade pedestrian crossing and reduce the current intersection risk.

12.2.3 Resilience

Two areas along the corridor contribute to the majority of road closures and delays due to environmental effects. These are section adjacent to Lake Taupō and the section between and including the Three Sisters and Desert Road Curves.

The Recommended Option looks to address areas of environmental concern along the lakeside by providing retaining/shoring to areas identified as risk from erosion and removal/reinforcement of unstable slopes where there is a history of rock falls or slips.

The three sisters to desert road curves section has a number of existing catch fences, this typical containment treatment will be replicated in other area with a high risk of rockfall. Additionally, preventative measures will be employed with loose, weathered and overhanging material removed from exposed cut slopes.

12.2.4 Road User Facilities

Changes to rest areas will mostly be limited to improved entry/egress by way of improved visibility or channelised intersections. Information boards or cultural information relevant to the people and area has been briefly discussed with Tūwharetoa, who have expressed interest in the idea. It is expected that during the design stage this would be further developed and incorporated as part of this project.

No additional passing lanes are proposed under this option. Inherently dangerous right turns from existing passing lanes will be resolved by moving the start of one passing lane and shortening another. Alternatively, the accesses will be moved, however further consultation with effected parties in needed.

12.2.5 Active Modes

Local trips within townships is supported through wider path re-designated as shared paths and lower traffic speeds. In rural sections there is expected to be a supressed demand for sports cycling between Turangi and Taupo due to the areas status as a key multi-sport and road cycling destination. This option provides improvement by way of wider shoulders in many rural areas, however the existing primary restriction between Hatepe and Motuoapa will remain. This will continue to limit cycle numbers and present those that do use the route with a high-risk section of road to navigate. As such the improvements in shoulder width elsewhere are likely to do little to support growth in inter-township active travel.

Love Taupo and Bike Taupo have proposed a mainly off-road ride between Turangi and Taupo, the Recommend Option will provide infrastructure support if this project comes to fruition in the short term.

12.2.6 Tauranga Taupo Bridge

During this business case, specific consideration was given to the potential realignment of the Tauranga Taupo Bridge as it was considered to have significant safety concerns and issues with two trucks passing.

Whilst there is a perceived safety risk, the number and severity of crashes have reduced, particularly since additional signage was implemented approximately 5 years ago.

Accordingly, this project currently does not provide sufficient benefits in terms of safety or resilience at this point in time and therefore it is not included in the recommended programme. It is recommended that it be re-considered when the timing of a potential Hatepe to Motuoapa Bypass is confirmed.

A separate benefit cost calculation was completed for the realigned bridge. With an estimated $11M replacement cost the resulting BCR is 0.6, with the majority of the benefits coming from travel time and vehicle operating costs.

12.3 Recommended Option Visual Summary and Table

How the recommended option applies to each section of the corridor is outlined in the visual summary below. The image shows the final cross section, where walking and cycling facilities would be present, any resilience improvements, new road user facilities and speed management activities.

In the table following, more detail is provided in relation to the quantum of median treatments, carriageway widening, intersection treatments and urban treatments proposed.

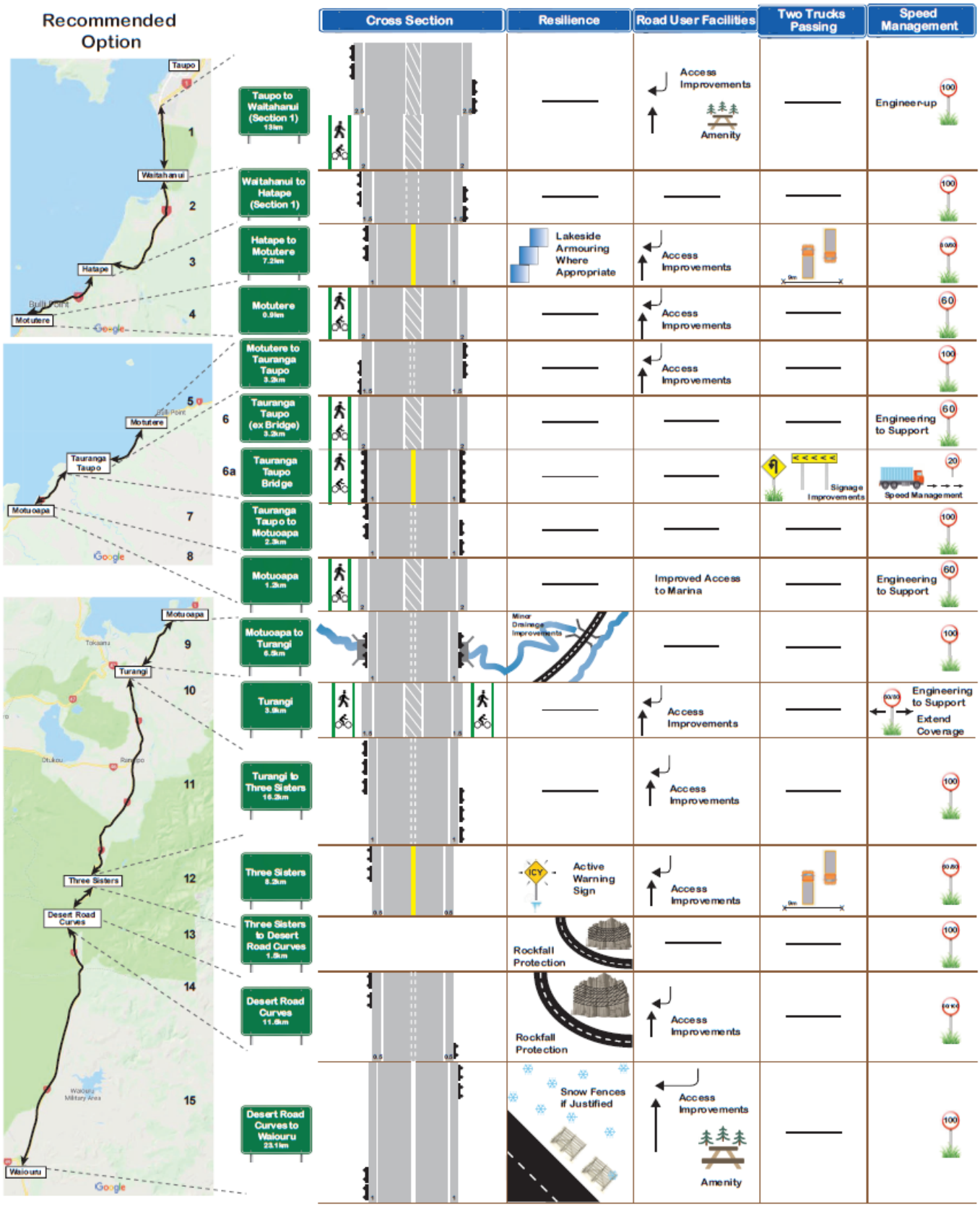

Recommended Option
Cross Section
Resilience
Road User Facilities
Two Trucks Passing
Speed Management
Taupo
Waitahanui
Hatepe
Motutere
Motuoapa
Turangi
Tokaanu
Tauranga Taupo
Three Sisters
Desert Road Curves
Waiouru
Google
1
2
3
4
5
6
6a
7
8
9
10
11
12
13
14
15
Taupo to Waitahanui (Section 1) 13km
Waitahanui to Hatepe (Section 1)
Hatepe to Motutere 7.2km
Motutere 0.9km
Motutere to Tauranga Taupo 3.2km
Tauranga Taupo (ex Bridge) 3.2km
Tauranga Taupo Bridge
Tauranga Taupo to Motuoapa 2.3km
Motuoapa 1.2km
Motuoapa to Turangi 6.5km
Turangi 3.9km
Turangi to Three Sisters 16.3km
Three Sisters 8.2km
Three Sisters to Desert Road Curves 1.5km
Desert Road Curves 11.6km
Desert Road Curves to Waiouru 23.1km
Access Improvements
Amenity
Engineer-up
Lakeside Armouring Where Appropriate
Signage Improvements
Speed Management
Improved Access to Marina
Minor Drainage Improvements
Engineering to Support
Extend Coverage
ICY
Active Warning Sign
Rockfall Protection
Snow Fences if Justified

Table 12-1: Recommended Option Summary Table

	Sector 1	Sector 2	Sector 3
Median Treatments			
Wide centreline 1.5m	14.5km		6.1km
Wide centreline 1m			11.6km
Wide centreline 0.8m		5.4km	37.2km
Shoulder widths			
2.5m	14.5km		
1.5m		3.3km	20.3km
1m		2.1km	24.4km
0.5m			19.4km
Roadside barrier	3.5km over 9 sites	2.9km over 4 sites	2.1km over 11 sites
Intersection improvements	6 new right turn bays and 3 minor intersection treatments	1 new right turn bays and 4 minor intersection treatments	3 new right turn bays and 2 minor intersection treatments
Encroachment into sensitive environment			Approximately 1000m2 over 7 sites. Given the philosophy of the recommended option it is assumed these will form localised reductions in width to avoid sensitive environments.
Resilience improvements	N/A	5 sites	2 sites
Carriageway Widening			
0 – 1m	0.5km	3km	23km
1 – 2m	1.5km	0.5km	14.5km
2 – 3m	1.7km	1km	2km
3 – 4m	4km		1.7km
4- 5m	6km (widening at existing passing lanes and over Hatepe hill)		
Urban Treatments			
Urban flush median (includes existing)	2km	4km	2km
Uncontrolled pedestrian crossings	2	4	1
Urban roundabout			1
Footpath improvements			

12.4 Assessment

12.4.1 Investment Objectives

The following table outlines how the recommended option contributes to the achievement of the investment objectives.

Table 12-2: Investment Objective Quantification

Investment Objective		Assessment	Comment
1	Improve safety of SH1 between Taupō and Waiouru by reducing the number of crashes resulting in death or serious injury from 41 (2014-18) to 34 (2022-26).	7 fatal and serious crashes	Reduction expected due to infrastructure treatments such as rural wide centreline, and targeted roadside barrier.
2	Improve the quality of infrastructure of SH1 between Taupō and Waiouru by increasing the length of corridor with KiwiRap Star Rating of 3 or above from 76% to 88% by 2022.	Halving proportion of 2 Star Road from 24% to 12%	Reduction in sub-3 Star rated highway anticipated due to treatment such as targeted roadside barrier. However, as noted earlier, Sector 2 will have a Star Rating at the lower end of 3 and will be somewhat susceptible to an increase 2 Star Rated road if traffic volumes continue to increase.
3	Provide a corridor where two trucks can pass each other at Tauranga Taupō bridge, Bulli Point/Te Popro and Toki Point	Some improvements to sites but not full treatment.	Speed limit changes, along with minor infrastructure treatments (where effects deemed to be low) will reduce consequence. This may be offset by traffic volume increase. Engagement with Iwi and detailed design to consider where any further improvements can be made.
4	Increase availability of SH1 between Taupō and Waiouru by reducing the annual number of journeys impacted by closures and delays from 100,000 to 67,000 by 2022.	Currently around 100,000 journeys affected per year and this would be reduced to 67,000	There will be a significant reduction in journeys impacted by injury crashes. Improvements will also be had in relation to flooding; however, this will be limited to where widening is being undertaken including adjacent civil infrastructure upgrades e.g. culverts. A reduction in journeys impacted by closures due to snow and ice will unlikely be seen as a result of the recommended option. However, improvements suggested by stakeholders that fall outside the scope of this project, such as changes to winter maintenance requirements, or improvements to state highway status communications are being pursued in parallel. Large scale natural events such as snowstorms, volcanic eruptions, and earthquakes, will likely still result in road closure and diversions to the nearest appropriate available road. Some residual land stability issues would remain along the lake front. The scope to which these may be addressed will need to be unpacked during discussions with local iwi as part of the agreed ongoing consultation.

Investment Objective		Assessment	Comment
5	Reduced conflict between road users, visitors and community by reducing injury crashes in urban and peri-urban areas from 15 to 11 by 2022.	4 fewer crashes per year	The design will provide improved separation between users, especially active modes and heavy vehicles. Consistent median treatments will ease access and lowered posted speed limits will reduce crash severity.

12.4.2 Cost

The recommended cost estimate has been developed from two components. Targeted treatments were identified along the route and priced as individual items, mainly for delivery through the Low Cost Low Risk framework. The pricing of each treatment was compiled through comparison to similar projects or in some instances based on the expected quantities. The quantity-based estimates were mainly reserved for the bigger or more complex projects where direct comparison to similar projects was difficult.

The corridor pricing is based on the quantities generated from a basic 12D model that followed the LiDAR survey centreline, elevation and crossfalls. Widening was applied to one side, normally the side with the fewest restrictions. From this a per square meter rate was developed for road widening that was inclusive of excavation and pavement materials. Earthworks were based on generated volumes. As the designs were only progressed to concept stage details such as retaining areas of hard dig were not exclusively identified. However, increased rates were used lake side where cost of environmental compliance, traffic management and excavation would all lead to higher construction costs. A 35% contingency has been applied at this stage of design will an expectation it would be refine during the detailed business case.

The cost of the recommended option is estimated to be $49M. The 95%ile cost is estimated to be $60

12.4.3 Benefit Cost Ratio

The recommended option yields a BCR of 1.0, based on a capital cost of $49m. The majority of benefits coming from crash cost savings.

12.4.4 Investment Assessment Framework

The following is an assessment of the preferred option using the framework outlined in https://www.nzta.govt.nz/assets/planning-and-investment/nltp/IAF-for-GPS-2018.pdf

Sector		Assessment	Comment	BCR	Corresponding IAF Prioritisation Order
1	Safety - a safe transport system free of death and serious injury	HIGH: addresses safety issues presenting a high crash risk, affecting communities subject to high safety risk, and/or in Safer Journeys area of high concern addresses safety issues presenting a high societal consequence risk	The 2014-2018 data (for the rural section of this Sector) indicates a High Collective Risk which means it is classified as a high-risk rural road by the High Risk Rural Roads Guide.	1.6	5
2	Safety - a safe transport system free of death and serious injury	HIGH: addresses safety issues presenting a high crash risk, affecting communities subject to high safety risk, and/or in Safer Journeys area of high concern addresses safety issues presenting a high societal consequence risk	The 2014-2018 data (for the rural section of this Sector) indicates a High Collective Risk which means it is classified as a high-risk rural road by the High Risk Rural Roads Guide.	1.0	5

Sector		Assessment	Comment	BCR	Corresponding IAF Prioritisation Order
3	Safety - a safe transport system free of death and serious injury	MEDIUM: addresses safety issues presenting a medium crash risk, affecting communities subject to medium safety risk, and/or in Safer Journeys area of medium concern	The 2014-2018 data indicates a Medium Collective Risk which means it is classified as a high-risk rural road by the High Risk Rural Roads Guide.	0.7	6 (based on entire route rather than this sector)

When considering the entire corridor, the rural road collective risk is Medium, and the BCR is 1.0. If it is considered appropriate to include Sector 3 on the basis of programme rather than an individual project, then the corresponding IAF prioritisation order is 6.

12.4.5 Effects

This corridor has significantly high social, environmental and cultural values and throughout the course of the investigations, it became clear that these need to be protected. Unfortunately, due to the truncated nature of this business case, it was not possible to completely define the location of some of the cultural constraints.

Accordingly, this project has sought to provide improvements only where impacts to the social, environmental or cultural environment are able to be avoided or minimised. This was considered appropriate for the level of investment being contemplated and the fact that other long term bypasses in the highest constrained areas has been signalled by the PBC.

Nevertheless, the impacts of the recommended option needs to be considered in more detail once the project is re-established.

12.4.6 Consenting

A preliminary planning assessment (see Appendix H) has been undertaken to determine the likely consenting requirements associated with the works. This primarily has considered the stormwater and earthworks elements within the Waikato areas as this is the most sensitive area.

The planning assessment identified that the Regional Plan classifies Lake Taupō, and the Waitahanui, Tauranga-Taupō, Tongoriro and Henemaiaia Rivers as Outstanding Freshwater Bodies. Numerous streams and rivers that drain into Lake Taupō have water classifications of "Trout Habitat", "Indigenous Fish Habitat" or "Natural State". Lake Taupō has a water classification of "Contact Recreation"

Despite the SH1 corridor between Taupō and Waiouru being located in a highly sensitive environment and the strong policy direction of the Regional Plan relating to the protection of this environment, the discharge of stormwater generated by any potential future works and activities associated with the operation of future roading and safety improvements along the SH1 corridor is unlikely to require resource consent.

Given the characteristics of the environment that the SH1 corridor traverses including the proximity to Lake Taupō and numerous streams and rivers it is highly likely that potential construction works and activities involving soil disturbance, roading and tracking and vegetation clearance will be located in "High Risk Erosion" areas and will require resource consent.

Given that there are 39 recorded archaeological sites within the 200m road reserve buffer of SH1 between Taupō and Waiouru there is a reasonable probability that the conditions specifies that construction works and activities involving soil disturbance, roading and tracking and vegetation clearance shall not disturb any identified archaeological site or waahi tapu will not be complied with, thus triggering the need for a resource consent for a discretionary activity. This condition applies to all areas of the region not just "High Risk Erosion" areas.

This would also apply to works that trigger a resource consent within the road corridor, meaning that any potential works need to be developed alongside iwi and hapu to ensure cultural impacts are minimised.

13. Inter-related Investigations

13.1 Hatepe to Motuoapa

The preferred programme from the Taupō to Waiouru Programme Business Case includes a realignment of SH1 between Hatepe Hill and Motuoapa in the long term. A bypass in this vicinity has previously been investigated but not delivered, resulting in about 30 years of expectation by Iwi and the local community.

Funding priorities (rather than the case for change) meant that the bypass is not currently being investigated further and it is not within the scope of works for the Taupō to Waiouru Indicative Business Case. However, the scale of improvements recommended by the IBC could be influenced by the timing of a bypass.

Accordingly, the Draft Hatepe to Motuoapa Problem Summary Report was produced by Stantec which revisited the problems along this section of SH1 to determine their size and significance.

As presented in this IBC, the key issues of safety, resilience and two trucks passing are of particular concern along this length, potentially more so than other parts of the corridor.

In previous investigations, land stability was one of the main drivers to investigate alternative alignments. However, no significant slope failures seem to have occurred since these reports were written. Nevertheless, it is recommended that further geotechnical investigations are undertaken to gauge how serious the risk is, what the potential treatments are, and whether these would be acceptable to stakeholders, particularly in terms of cultural and environmental concerns.

There is also some efficiency concern in terms of average speeds for freight. This is a key strategic route for freight. Due to the alignment and constraints, there are no obvious treatments that could increase the mean speed on the current alignment, and if it were possible this could lead to an increased safety risk (in terms of crash severity), and greater competition with other interests; such as tourism and local movements.

Operational concerns were also investigated as the constrained environment limits the activities that can occur and the closures that need to be put in place during these activities. This is presented in the following section.

Some of the problems cannot be rectified by on-line treatments due to the many constraints that exist along this stretch of SH1. Some of these, such as environmental and cultural concerns were initially explored during earlier investigations.

Various options have been investigated in the past. Most of them involve the construction of a new bypass route located between Pākā Bay and Motutere. These reports are detailed, however are becoming dated. New design standards, changes in public opinion, and new treatments will likely change the requirements and footprint of the bypass, and new additional benefits might also be drawn.

A high-level assessment of online treatments against an inland bypass indicates that a bypass would more effectively address the identified issues.

Iwi concerns have not been rated here, however historical consultation (1998), and recent discussions with Tūwharetoa indicate that they favour an inland bypass.

The report recommends that further investigation proceeds into the identification of an offline route

13.2 Operations and Maintenance Investigations

The programme business case identified a number of operational matters which are not being addressed by the current IBC. Accordingly, a separate investigation into the problems associated with operations and maintenance activities was undertaken by Stantec.

Specific problem statements have been developed, and the evidence considered to see whether there is an issue and/or opportunity for improving route availability through changes to operational practices.

Problem – The constrained road environment and expectations of a future bypass has led to deferral of renewals leading to a level of service for amenity below that expected from a national state highway.

An assessment of the historic and planned maintenance work has been completed for the section between Hatepe and Motuapa based on the evidence available. The findings of this assessment include:

- The MIS reflects the correct intervention status for this section of road, given there are no confirmed plans for a bypass.
- Reseal quantities have reduced in the first couple of seasons post introduction of the NOC.
- Future reseal are forecast to return to similar levels pre-NOC.
- A significant proportion of the route has aged surfaces that should be reviewed and potentially considered for inclusion in the forward works programme.
- A significant proportion of this route has multiple seal layers, i.e. between Hatepe to Motuopa over 50% of the route appears to have more than 4 seal layers. This should be taken into account when considering future treatments.
- The roughness on this route is higher than the average on the remainder of the national strategic state highway network and appears to be getting worse over time, primarily between Hatepe and Motuoapa.
- Maintenance repair costs and associated delay costs have recently increased after a reduction in works undertaken post introduction of the NOC.

All of the above provides evidence that supports the problem statements and indicates that rehabilitation renewal work may be required and may have been deferred due the constrained route and the potential expectation of major capital investment to bypass this route. However, this deferral of work is not formally reflected in the current MIS.

Problem – Closures on this route due to winter weather are happening more often and lasting longer than necessary resulting in delays

An assessment of disruption associated with adverse winter weather. i.e. snow and ice closures, has been completed based on the evidence available. The findings of this assessment include:

- Current documentation does not differentiate or prioritise between treatments on different roads.
- Previous direction contained within the CW Winter Operations Strategy was more specific than the current NOC documentation.
- Decisions regarding where, when and how treatments are undertaken is the sole responsibility of the Contractor.
- Comprehensive information on the times and durations of snow and ice related disruption is lacking for all routes.
- The level of service is less than expected on a National Strategic Route due to the frequency of closures between 13 hours and 2 days duration. However, this only exceeds the expected level of service by 0.6 days of closure between 13 hours and 2 days per year.
- Winter and ice related closures affect SH1, on average, for less than 2% of the year.
- The Contractor is meeting their winter maintenance performance requirements when assessed against the NOC OPMs and KPIs.
- The traffic delay cost of annual closures has been assessed at $560k.
- Climate change may reduce the frequency of future closures due winter conditions.

In terms of route availability alone, there does appear to be a case for further investment. However, there may be additional safety benefits associated with different winter maintenance response regimes that could strengthen the case for further investment.

In terms of the problem statement, there is not sufficient evidence to support the problem statement which anticipated that closures on this route due to winter weather are happening more often and lasting longer than necessary. The quality of closure data needs to be improved to understand if closures are happening more often. In terms of whether they last longer than necessary, there is also a lack of evidence to support this and the quality of data needs to be improved. The closures are resulting in delays, however the financial cost of the delays per year (based on existing data) at $560k is relatively minor to justify future investment.

13.3 Bulli Point Te Poporo

A project developed in parallel to the current business case has been undertaken for the Bulli Point/Te Poporo by AECOM to address resilience and safety issues at Bulli Point and the immediate approaches. The Bulli Point/Te Poporo project has been developed over a number of years and has morphed in scope as more investigation and design has been completed. Originally 5 resilience sites were identified around Bulli Point years, instigated by the short term need to address the on-going resilience concerns. Since then localised road alignment options have been developed that address the current resilience concerns and also provide an improved alignment that allows trucks to navigate without the need to encroach into opposing lanes.

These works as this project is further progressed than this IBC, the estimated costs and benefits have been added to the final BCR analysis.

Initially planned as lakeside retaining on approaches to Bulli Point/Te Poporo with a retreat into the hillside at Bulli Point/Te Poporo the works have now been limited to the resilience works only. During Huis held as part of the Business Case Mana Whenua raised objections to the encroachment into a significant site, these discussion were unable to be continued to a sufficient stage where any realignment works could be confidently incorporated in the Recommended Option. Additionally, Heritage New Zealand were also reluctant to endorse any project that would disrupt important archaeological sites when a full bypass option was planned for the future. This coupled with high estimated costs eliminated significant works to the lake side environment from the Recommended Option

The recommended option from the AECOM study is designed to avoid cultural, environmental and heritage sites unless the effects can be mitigated to the satisfaction of the effected stakeholders, as such it is assumed that no further retreatment will be progressed at Bulli Point/Te Poporo in the short term. Any further retreatment should be discussed with Mana Whenua and Heritage New Zealand when the IBC project restarts, or further investigation is given to the bypass route.

The following discussion outlines where the works from the parallel project fits into this IBC, and a guide on its alignment with the corridor options for Sector 2.

13.3.1 Alignment with Business Case Problem Statements

The problems faced in the Bulli Point Te Poporo Works Package section of SH1 are completely consistent with this IBC (refer to Section 4.2.4 above).These are summarised in the table below:

Taupō to Waiouru BC Problem	Bulli Point Te Poporo
Problem area 1 - Safety (section 4.1)	Star Rating Star rating for Bulli Point using the KiwiRap assessment methodology is 2 star. An assessment was also conducted with the iRAP tool, which returns a star rating of only 1 star because the nature of the roadside hazard being a near vertical drop of several meters. **Roadside hazards**: Barrier is installed around the apex of the Bulli Point bend, although it is noted that some of the supports for the barrier are embedded in subsiding material that could compromise the effectiveness of the barrier system. On the approach to the barrier the road is sided by a steep drop that fall several meters into the lake. **Inconsistent shoulders**: The shoulders are both inconsistent and narrow, ranging from little more than the thickness of the painted edge line to 300mm. The shoulders is amongst the narrowest anywhere on the project length. **Out of context curves (alignment)**: Bulli Point has a radius of approximately 40m that is well below the absolute minimum value for a rural state highway. The KiwiRap Assessment Tool (KAT) categorises this curve as "severely out of context". **Safe and Appropriate Speed**: The 2019 TomTom speed data shows the average speed around Bulli Point is 41kph and close to 60kph on the approaches. The current speed limit is 100kph, however this under review as part of the Transport Agency's Speed Management, with an intended reduction to 60kph.

Taupō to Waiouru BC Problem	Bulli Point Te Poporo
	Road User Facilities: There are no road user facilities along this route and within the current road corridor there is no safe place to provide safe rest/stopping areas. This conflicts with the recreational demands of Bulli Point that is a known attraction for locals and tourists to use the rock outcrop as a jump spot. This often leads to parking along the road corridor, with the majority of the vehicle being in the traffic lane, or pedestrians walking along the narrow verge.
Problem Areas 2 Route availability (section 4.2)	**Resilience** A number of investigations have been undertaken by WSP and AECOM regarding the ongoing and future resilience issues at Bulli Point. The narrow road corridor has the consequence of preventing suitable capture and disposal of stormwater, this in turn is causing erosion of the road shoulders. Left untreated this will cause partial failure of the lakeside lane. **Two Trucks Passing** The narrow corridor and small radius bend prevents two large vehicles from passing each other around the apex of Bulli Point. This issue is not limited to commercial vehicles, trailer mounted boats, intercity buses and campervans all required to occupy a portion of the oncoming lane to navigate the bend. This issue is well known and have been raised on a number of occasions by stakeholders ranging from Road Transport Association to the emergency services.
Problem Area 3 – Completing interest	Bulli Point is often used as a recreational lake jump spot and is well known amongst local and international visitors. Because of the remote location this requires visitors to either drive and park roadside or walk from Motutere camp site. Both of these cause significant conflicts between the SH traffic and recreational visitors.

Five different options (covered in 2 stages) were developed and assessed during the Bulli Point/Te Poporo Works Package:

13.3.2 Option 1 - Do minimum Online (fix resilience 1 – 5 sites only)

The sites are locations of under-slips and have had ongoing instability issues over a considerable period. Remedial works have been undertaken at a number of the sites however movement has continued. As a result, slope failure is now encroaching into the carriageway. In addition, a slightly over-hanging bluff a few hundred metres north of Bulli Point is forcing trucks to cross the centreline

into the paths of oncoming traffic and causing frequent minor accidents. The planned resilience works are listed below:

- Site 1 (RP726/6.230): Install a gabion or cantilever timber retaining wall to prevent the slip encroaching into the carriageway and also gain an additional 1m of carriageway. A stormwater control and disposal system designed to prevent future erosion adjacent to the carriageway.
- Site 2 (RP726/6.384): Install a gabion or cantilever timber pole retaining wall with redesigned stormwater disposal system.
- Site 3 (RP726/6.500): Preferred option to install a tied-back cantilever timber pole retaining wall with a concrete ground beam to support the barrier arms and possibly gaining a further 1m of additional carriageway. – Completed 2019/20
- Site 4 and 5 (RP726/6.735-6.870): Both slips require slope repair from the base (lake level) up to carriageway level. The preferred repair method was to remove unsuitable or loose fill material and repair the slope with a gabion retaining wall with compacted construction fill for the carriageway.
- At Sites 4 and 5, a kerb has been installed at the slope crest, however this was blocked in places with water running over the slope crest and causing erosion. There is no drainage on the inside of the south bound lane and due to the existing gradient of SH1 at this location it is likely that surface waterflows cross the road. – Completed 2019/20

Figure 13-1: Resilience Site Locations, AECOM

13.3.3 Option 2 - Do something Online (stage 1 + Resilience sites 3 -5) only.

Online realignment and road widening towards the lake with retaining along much of the shoreside carriageway edge. Main aim is to avoid the overhanding rock and stabilise the slopes from further scouring.

Figure 13-2: Northern Approach to Bulli Point – Online Curve Easing

13.3.4 Option 2a - Do Something Online stage 1 (future proofed) + resilience sites 3 -5.

Option 2a is likely to adopt a similar horizontal alignment to Option 2, shown above, but will be up to 1m higher at the righthand curve immediately to the north of Bulli Point. The additional elevation will be required to provide a less disruptive vertical alignment when combined with Option 4

13.3.5 Option 3 - Do Something Online (stage 1 and stage 2).

Option 3 progresses the work proposed as Option 2. A retreat of Bulli Point is designed to improve the severe left-hand curve.

Figure 13-3: Bulli Point – Curve Retreat, AECOM 2018

13.3.6 Option 4 - Do Something Offline (Alternative to Stage 2 aka Stage 2a).

Originally proposed by Opus in the 2017 Bulli Point curve Easing Feasibility Report this option bypasses the current headland through a significant cutting.

Figure 13-4: Bulli Point - Offline Realignment, OPUS 2017

It is understood engagement was undertaken on the Option 2 and 3 with Tūwharetoa, and option 1 is supported by Hapū, but option 3 and 4 that fundamentally change the headland have either not been supported or are contentious points for consideration, (as per minutes from 12.12.19 Hui).

An overall alignment assessment of the treatments identified in the Bulli Point/Te Poporo Works Package, in terms of how their treatment philosophy relates to the recommended corridor option for Sector 2, is presented below.

13.3.7 Alignment with Business Case Investment Objectives

The Bulli Point/Te Poporo work has been assessed against the Business Case Investment Objects. The works align with the investment objectives however the current site lacks crash evidence due to the low speed nature of the alignment.

Taupō to Waiouru BC Problem	Bulli Point Te Poporo
Improve safety of SH1 between Taupō and Waiouru by reducing the number of crashes resulting in death or serious injury from 41 (2014-18) to 34 (2022-26).	The current crash statistics for the Bulli Point curve does not include any high severity crashes over the last 5 years. Probably due to the low speeds at which vehicles navigate the bends.
Improve the quality of infrastructure of SH1 between Taupō and Waiouru by increasing the length of corridor with KiwiRap Star Rating of 3 or above from 76% to 88% by 2022.	Option 2 on its own does not provide infrastructure with a KiwiRap rating of 3 or higher due the Bulli Point curve remaining narrow, out of context and with hazardous roadside. Option 3 and 4 develop scores in excess of 3.
Provide a corridor where two trucks can pass each other at Tauranga Taupō bridge, Bulli Point/Te Popro and Toki Point	All options will significantly improve or, in the case of Options 3 and 4, resolve the issues of two trucks passing.
Reduced conflict between road users, visitors and community by reducing injury crashes in urban and peri-urban areas from 15 to 11 by 2022.	Options 3 and 4 will allow for better management of visitors to the Bulli Point rock jump and will provide a wider carriageway for cyclist and pedestrians to co-share space. Although it is noted that the realigned carriageway is likely to still be less than a desirable cross section width for cyclists to keep clear of the live lanes.

13.3.8 Cultural and Heritage Impacts

Taupō to Waiouru IBC Sector 2 Recommended Corridor Option	Bulli Point Te Poporo Option 2	Comment	Bulli Point Te Poporo Option 3 and 4	Comment
Effects Corridor Option	Maybe	Consistent with outcomes desired but alignment with IBC contingent on effects being confirmed as low. This will require further discussion with iwi, Heritage NZ, and additional consideration of consent risks.	Currently does not align	Iwi are not supportive of this stage. If suitable mitigation can be incorporated to the satisfaction of iwi and Heritage NZ then the outcomes of the works aligns with the investment objective of this business case.

The Effects Corridor option seeks to address identified issues, but in a manner that reduces the negative environmental, cultural and archaeological effects.

The Bulli Point/Te Poporo work package is more invasive than much of the work in the recommended corridor option for Sector 2. However, if the effects are considered acceptable or mitigatable by iwi then it would be consistent.

A peer review of the process and technical outputs of the Bulli Point/Te Poporo Works Package is also recommended before the project is funded.

13.4 Cost and Economics

The economic analysis has been prepared to the Transport Agency's Economic Evaluation Manual 2018, first edition amendment 2. Full procedures have been followed.

The analysis follows the same option naming convention detailed earlier in this section. The Do-minimum is "option 1" and comprises resilience improvements to slip sites 1 and 2, located within the length of Option 2. The other resilience sites within Option 1, namely 3, 4 and 5 are understood to have already been completed.

Options 3 and 4 are amalgams of the options as we assume that only the end result of the options is considered relevant. Option 2A is not assessed on its own, as its only purpose is to enable the inland bypass (memo option 4). Option 3 is not assessed on its own, as it is assumed it will only be built if option 2 is either built first or at the same time.

Option Description				
Analysis Option	Op 1 (Do-Minimum)	Op 2	Op 3	Op 4
Memo Option	1	2	2+3	2a+4
Vehicle operating cost savings	Construct Online improvements at slip sites 1 and 2	Construct on-line full length wall and minor straightening for stage 1 RP 6.1 to 6.5	Construct on-line full length wall and minor straightening for stages 1 and 2 RP 6.1 to 6.86	Construct part on-line and part bypass RP 6.1 to 6.87
Status	Designed and can be built next season	Designed and can be constructed next season	Stage 2 (memo Op3) not designed and requires land purchase.	Not designed.
Construct	July 20-Dec 20	Oct 20-Jan 21	Oct 21-Apr 22	Oct 22-Jan 24
Cost	$2.68	$3.8	$9.05	$12.0
Confidence	Estimate	Estimate	ROC	ROC

Input Data and Project Timing

- Time zero (the start of the financial year that funding is requested for) is assumed to be 1 July 2020. The base date is 1 July 2019. The discount rate is 6% and the analysis period is 40yrs from start of construction.
- Growth is 3.25% based on 8yrs of data from count station 01N00729 at Hallets Bay (Telemetry), located some 4km to the north.
- Construction timing is option dependant. The lowest cost options are already designed and can proceed immediately to implementation, whereas the bypass options are only at an early stage of concept development.
- It should be noted that Option 2 and 2a are mutually exclusive. This means that Option 4 must be eliminated from further consideration before option 2 (and/or option 3) can be progressed further. This is because Option 4 requires the elevated option 2a to be built, which in turn disrupts the building of option 2.

Benefits ($m)	Op 1(DM)	Op 2	Op 3	Op 4
Travel time savings	-	$1.856	$2.645	$13.031
Vehicle operating cost savings	-	$0.192	$0.709	$1.371
Crash cost savings	-	$1.325	$1.821	$3.939
Vehicle emissions reductions	-	$0.009	$0.035	$0.068
Total	-	$3.383	$5.211	$18.409
Analysis Results	Op 1(DM)	Op 2	Op 3	Op 4
BCR	-	5.3	1.0	2.7

FYRR	-	20%	4%	10%
Incremental (Over Op2)	-	-	0.4	2.5

Implementation Costs

The costs provided have little background detail and it is unclear what is included. It is assumed these are P50 (i.e. expected costs) and include fees and land costs and exclude gst. The costs have differing levels of confidence as indicated in the table above. Option 4 cost has in turn been adopted from an early Opus investigation and appears to have been adjusted with a large lumpsum item.

Maintenance Costs

A maintenance regime has been estimated based on the following scenario, focussing on key pavement costs:

Do-minimum:

- Rehab 300m yr 0, remainder at yr 10, and full-length rehab yr 30
- Reseal/AC at 8yr cycles
- Resilience maintenance $20k/yr

Option:

- Rehab all new pavement at yr 25, rehab any residual pavement at yr 10 and yr 30
- Reseal/AC at 8yr cycles
- Resilience maintenance $0k/yr (Op4) to $10k/yr (Op2)

Travel Time Benefits

Travel time benefits are achieved via increased speeds resulting from the improved alignment. Existing speeds are measured from TomTom GPS data supplied by the Transport Agency. The speeds have been collated into 5 sections (E1 to E5) loosely approximating to the extents of options 2,3, and 4. Existing speed varies from 47km/hr on option 2, and around the hairpin bend, to 71km/hr on the straighter section south.

Proposed speeds are assessed at 55kph for option 2, 52km/hr for option 3 (which still retains a fairly sharp bend around the point) and 80km/hr for the significantly improved option 4.

Vehicle operating Benefits

Vehicle operating costs are largely based on speed and gradient. All options are considered to have gradient = 0%, except option 4 which is assumed to rise over the hill to the south with average gradient = 2%. Roughness is ignored.

Crash Benefits

Method C has been adopted for crash analysis using 5 years of data from 2014 to 2018 inclusive. In that time 5 non-injury and 5 minor injury crashes occurred, nearly all loss of control (apart from 2 rear ends).

BCR Result Summary

Option 2 achieves a higher BCR due to its relatively low incremental cost above the heavy resilience maintenance required for the do-minimum. Option 3 appears to achieve relatively little in terms of traffic benefits but is a high cost option. Option 4 achieves significant benefits (largely due to speed improvements and crash benefits) but is very high cost and high risk. Its incremental benefit of 2.5 over and above option 2 is above one but is still classed as low.

13.5 Bulli Point Te Poporo Works Package Summary

We consider that the Bulli Point Te Poporo Works Package aligns with the objectives to improve safety, resilience, and two-truck passing issues of the wider business case. Providing the mitigated effects are acceptable to Iwi and Heritage New Zealand and the Transport Agency still considers the results of the mitigated design acceptable, it should be progressed to Detailed Business Case stage. It is understood from engagement conducted as part of the Bulli Point/Te Poporo project that Mana Whenua support

Option 2, as such this is likely to align with the low cultural/archaeological impact philosophy of the Recommend Option. Although it is understood that HNZ have not yet commented on the proposed works.

Options 3 and 4 are understood to be less acceptable to Mana Whenua as such this needs to be addressed before progressing either option to implementation.

Further details on the next steps for the Bulli Point/Te Poporo Works Package can be found in the Part C of the IBC.

13.5.1 Te Poporo Bulli Point – Low Cost Low Risk

Because there is likely to be a lengthy engagement and consultation process involved in delivering the option described above, a low cost low risk project has been identified that which is less than $2 million.

Through discussions with the Regional Safety Engineer, a concept for installing guardrail around much of the Bulli Point outcrop has been suggested. This comprises barrier, secured in a ground beam that is set within a gabion basket wall (assuming average of 3 tiers high). From previous project costs an approximate per metre rate of $3,000 is considered realistic for this type of detail given the higher than normal earthworks and traffic management costs. Both are hampered by the constrained corridor width.

The indicated length of treatment is 530m or less depending on how much of the existing guardrail is incorporated into the project length.

The capital costs is likely to be $1.5 million to $2.0 million. The length of the project can be adjusted to suit design stage cost estimate and available funds. **Error! Reference source not found.** shows the approximate extent of works.

Figure 13-5: Te Poporo Bulli Point LCLR Extent of Works

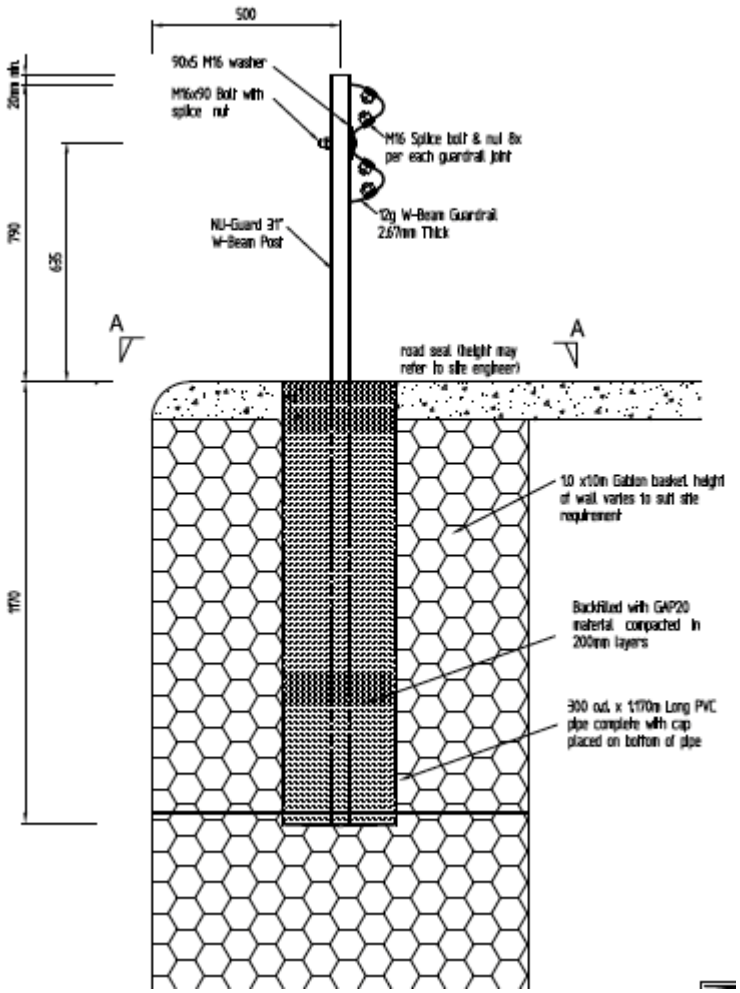


Figure 13-6: Nu Guard Gabion Basket Installation Detail

PART C – READINESS AND ASSURANCE

14. Next Steps

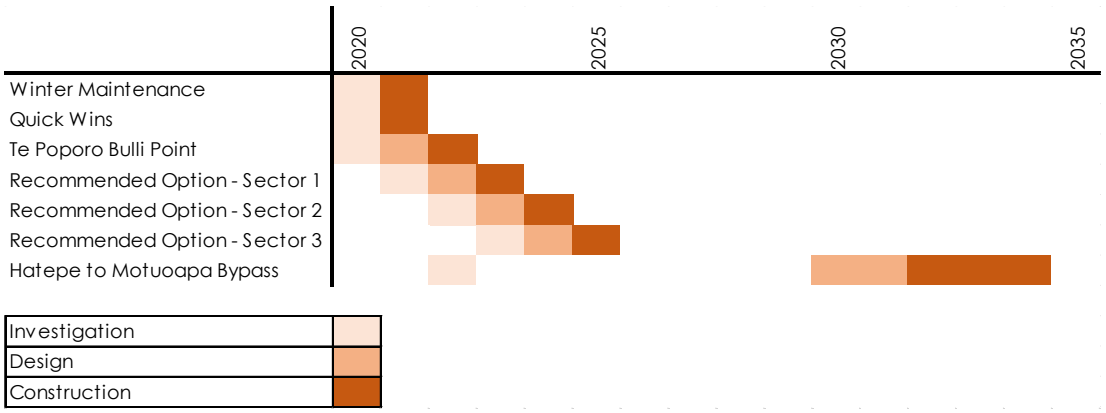
As explained earlier in this document, there has not been sufficient time and funding available to complete a full Detailed Business Case, and this document is therefore an Indicative Business Case. With no funding available for further phases in the current National Land Transport Plan (2018-21), the Transport Agency is keen to confirm the recommended option to enable works to be fed into the development of the next 3 year programme. Accordingly, this section focusses on the next step for the project and the related activities.

This business case has confirmed that there are opportunities to achieve good safety, resilience and community outcomes. There are also opportunities to deliver some quick wins.

The business case has also confirmed that there is limited infrastructure works that can be done on the lakefront section between Hatepe and Turangi. Both Tūwharetoa and Heritage New Zealand have raised concerns around impact to sites of cultural and archaeological significance at this location therefore further engagement is needed but also investigations in the realignment option should be progressed early.

In summary, it is recommended that work continue this year into the investigation and delivery of quick wins and alterations to the maintenance regime to get immediate improvements in safety and resilience. The proposed works at Te Poporo/Bulli point, initially developed as part of the Low-Cost Low Risk Programme (but now too large), needs further discussion with Tūwharetoa to address this particular constraint and social attraction.

The recommended option should be, designed and constructed in stages over the next few years. progressing investigations into the Hatepe to Motuoapa Bypass concurrently with the Sector 2 investigations will ensure that a coherent business case can be developed for both short term and long-term elements[7].



Further discussion is presented below in terms of the next steps for, the recommended option, quick wins and maintenance, however in summary:

- Feed Quick Wins identified as part of the business case into the Safer Network Programme and Low Cost Low Risk programmes
- Update TAIP with the larger projects as per this business case
- Gather additional data for the winter maintenance regimes to determine need for a changed approach
- Continue iwi engagement

[7] There have been a number of recent projects where this has not been done and separate investigations have been undertaken (e.g. Cambridge to Piarere and Otaki to Levin). Both the short term and long-term projects have had ongoing questions about the scope and been delayed as a result.

- Once additional funding comes available, complete the gaps in this business case and progress the preliminary design.
- Undertake business case to consider SH1 Hatepe to Motuoapa Realignment in parallel with investigations into online improvements for Sector 2.

14.1 Recommended Option

The initial tasks once funding becomes available to progress the recommended option, will be to complete this business case fully to DBC level. The completion of the business case will include further development of the design of the preferred option to give greater confidence in the expected cost and impacts.

In parallel, engagement will need to be undertaken with iwi as well as stakeholders such as Heritage NZ and DoC.

The major element of uncertainty at this stage relates to potential effects on cultural values. Good relationships have been developed with iwi, but this needs to be extended down to hapū level and discussions progressed on the recommended option and the issues, risks and opportunities that it brings. This could modify the recommended option and how it progresses through the next stages. As future funding commitments are uncertain, no detailed programme has been developed. Nevertheless, due to the significant safety and resilience problems it is recommended that work continue to investigate, design and consent the recommended option.

As identified above, this could be done in a staged manner, please refer to the Financial Case table for details on each package.

An indicative programme has been developed which shows when each package is expected to enter investigation, design, and delivery phases.

14.1.1 Procurement

It is recommended that when the project gets re-activated, the preliminary design and any outstanding DBC requirements needs to be completed. This would be able to be procured through the DBC Panel and would allow the quickest delivery of the outstanding matters.

Quick wins should be progressed through the Safer Networks Panel or through the Low-Cost Low Risk service providers. The following section (Section 14.4)outlines which elements of the recommended option would likely meet the criteria for this approach.

For future phases, these would need to be agreed through the final DBC activities. The procurement of any future phases would need to be aligned with the Transport Agency Procurement Strategy. Consideration would need to be given to breaking the route into manageable construction projects.

Indicative procurement options that appear best suited to each package are shown in the Management Case package matrix. For all of the packages it is proposed that existing contracts are utilised wherever possible. These are primarily the Safe Networks Programme (for safety projects, especially those nearing pre-implementation), the IBC/DBC Panel (for IBCs and DBCs), and the Network Operating Contract (generally for smaller projects).

14.1.2 TAIP information

Based on the above it is recommended that the projects in the table below be input into TAIP

Table 14-1: Projects to input into TAIP

Name	SH1 Taupo Airport Roundabout to Hatepe Safety and Community Improvements	SH1 Hatepe to Motuoapa Safety, Community and Resilience Investigations	SH1 Motuoapa to Waiouru Safety Community and Resilience Improvements
Description	Rural wide centreline and targeted roadside barrier; urban treatments with 2m wide median active mode provisions and 2m shoulders; safer access to	Investigation into both offline and online improvements for the section of SH1 adjacent to Lake Taupo. Online project would include	Targeted rural wide centreline and roadside barrier; urban treatments with 2m wide median active mode provisions and 2m shoulders;

	rest areas and improvements in Waitahanui and adjacent rural areas.	targeted roadside barrier and wide centreline; urban treatments with 2m wide median active mode provisions and 2m shoulders; safe access to lakeside rest areas. Offline investigations to consider different alignments to avoid social, cultural, environmental, safety and resilience concerns around the lake.	targeted rockfall protection and active warning signs, safer access to rest areas, amenity improvements at rest areas; new roundabout in Turangi.
Problems	Safety, social impacts within Waitahanui	Safety, resilience, two trucks passing plus current road has social, environmental and cultural effects.	Safety, resilience and social impacts at Turangi.
Outcomes	Save 3 DSIs per 5 years, improve star rating, 900 fewer trips affected by delays per year, better amenity in townships	Offline route would have major benefits that are yet to be quantified. Online improvements would save 1-2 DSIs per 5 years, improve star rating, 9000 fewer trips delayed per year and improved environmental resilience plus better safety and amenity in townships	Save 3 DSIs per 5 years, improve star rating, 18000 fewer trips delayed per annum plus better safety and amenity in townships
Cost	$15.5M	$11.3M	$22M
Timing	Complete DBC 2021 Design 2022 Construction 2023	Complete DBC 2022 Online Design 2023 Online Construction 2024 Offline Design TBC Offline Construction TBC	Complete DBC 2023 Design 2024 Construction 2025
IAF Profile	HIGH (priority 5)	HIGH (priority 5)	MEDIUM (priority 6)

The priority rating for Bulli Point Te Poporo is estimated to be 3 based on the high-risk safety rating (<3 star rating) and the BCR of 5.3.

An IAF rating is yet to be determined for the Hatape to Motuoapa bypass indicative business case as a BCR has not been developed.

14.2 Hatepe to Motuoapa

The Hatepe to Motuoapa problems report identified significant issues along the lakefront that cannot be solved by online improvements. Accordingly, it is recommended that offline routes be considered concurrently with online improvements as part of the business case completion for this section. This will ensure a cohesive short, medium and long-term strategy for this section and enable coherent conversations to be had about timing and levels of investment.

14.3 Winter Maintenance

The Maintenance report found evidence gaps in the winter maintenance data which need to be filled before determining whether a significant problem exists. This data (on number, duration and reason for closures) needs to be collected and analysed to calculate the economic costs of the closures before determining if a significant problem exists and the level of benefit that may be obtained by improving the current regime.

14.4 Quick Wins

A list of over 130 interventions has been compiled from within the Recommended option that could be implemented quickly. Mainly safety focused, they are suitable for delivery either with the corridor improvements or as quick win projects delivered through the Safe Networks programme, Low Cost Low Risk, or other suitable delivery mechanism. The safety treatments have been assessed against the Transport Agency's Standard Safety Intervention Toolkit as defined in the February 2019 issue, those treatments notes as Standard Safety Interventions (SSI) compliant should meet the criteria for the Streamlined Investment Pathway. It is noted this is a Standard Safety Intervention Toolkit living document and is expected to be periodically updated, as such this table should be checked against future issues as required.

The table of these improvements is presented in Appendix J and noted in Table 14-2: Project Funding Pathways.

Around 60 of the treatments identified are consistent with the SSI toolkit. Approximately 115 of the treatments would be less than $1M, enabling them to be considered under the low-cost low risk funding category.

When the project is re-activated it is recommended that this list be perused to determine whether these improvements can be fast-tracked to implementation.

14.5 Implementation

Implementation of the corridor improvements is currently assumed to some years away. In part due to lack of funding but also because there are several consultation activities that need to be finalised to the satisfaction of stakeholders. This business case has highlighted that due to the number of sensitive environments that this is likely to a protracted process. To implement improvements, it is recommended that the focus is shifted to the townships and the quick win list. In this period full investigation of the Hatepe to Motuoapa bypass should be completed and the outstanding consultation activities completed. Outstanding consultation activates include, but not limited to, Tūwharetoa and Heritage New Zealand, Waikato Regional Council, public engagement.

14.5.1 Township Improvements

The townships along the route should all be prioritised for improvements to reinforce the speed limit reductions to 60kph. Whilst the conflict between state highway traffic and local function will always remain efforts need to be made to reduce their impact. The proposed speed reduction to 60kph are very unlikely to be observed without further works that will continue to endanger vulnerable road users and lower amenity through elevated road noise and vibration. The township improvements are intended to be constructed within the current road reserve with very little change in seal width, as such the works do not require land purchase. Full community engagement with drop in sessions is recommended to garner local ideas and feedback prior to moving into the design stages. Appendix I1 contains concept drawings for each township (drawings C101 to C116), these are concept only and should be confirmed through consultation with residents and Hapu.

14.5.2 Quick Wins

The developed list of Quick Wins, tabulated in Appendix J, is intended for implementation either as part of the corridor improvements or as individual sites. Given the high capital costs involved in widening the corridor, lack of committed future funds and conflicting demands from other national projects it is anticipated that implementation of the corridor works is some years in the future. In the meantime, there is an on-going risk of future accidents and significant stakeholder frustration that nothing tangible has been implemented to address the inherent dangers to road users. As such the sites identified as eligible for low cost low risk funding should be considered for implementation in the short term. Prior to finalising the quick win list, the police have indicated they would like to pass share their knowledge of the high-risk sites, these should be included into the list as appropriate.

14.6 Median Barrier

After the preferred option was selected, it was identified that Waka Kotahi is currently developing a new guideline entitled "*SAFE SYSTEM INFRASTRUCTURE OPERATIONAL POLICY - Implementing Aotearoa New Zealand's Road Safety Strategy – Road to Zero*".

This guideline required State Highways with traffic volumes in excess of 6,000 vpd and a speed greater than 80km/h to be treated with median barrier.

If this occurs further consideration on the option(s) will be required during the DBC. The following provides a brief discussion on what those considerations might entail.

Sector 1

Through the work undertaken in this business case a median barrier option did not emerge as preferred because of the number of accesses and lower BCR. However, it was acknowledged that the option did provide scope for the implementation of a median barrier at some stage in the future. The width of the rural wide centre line proposed would be such that installation could be undertaken using the widening undertaken to facilitate the wide centre line. Given the traffic volume and other considerations, this Sector is the most likely candidate for a median barrier treatment.

Sector 2

There is currently in excess 6,000 vehicles per day, and there are stretches of highway with a posted speed limit in excess of 80kph, although operating speeds less than this for much of the length. Crucially, however, the physical scope for widening is generally restricted – more so than Sector 1. Reducing the speed limit would be more achievable, and potentially more appropriate in this section. Where the constraints are less the recommended option does allow for a wider wide centreline that will facilitate retrofit of median barrier

Sector 3

Most of this Sector has a posted speed limit in excess of 80kph, but a lower traffic volume. In terms of barrier installation, snow fall is also more prevalent here which would likely require specific design consideration. Normal traffic volume monitoring should be undertaken by Waka Kotahi. The DBC for this Sector should consider the eventual impact of growth in the final design. It may be possible and desirable to incorporate median barrier into selected locations during this time, or by designing in a fashion that would allow for relatively simple retrofit of median barrier in future.

Overall

Median barrier will provide significant safety benefits in terms of reducing the risk and severity of head-on and run-off road to the right crashes , however it may produce undesirable impacts too, as evidenced throught he environmetnal elements identified throughout this business case. Consequently, these options should be tested against the current recommended option for these sections, and importantly, on cultural and environmental considerations. In addition to this various design considerations will need to be considered for the detail of a median barrier system (for example maintenance, signage, lighting, drainage, vegetation, pull over areas, among others). There may be smaller pockets where median barrier could be possible such as south of Motuoapa, or in Sector 3 locations. The suitability of smaller lengths should be carefully considered to optimise the balance between issues such as short section benefits and the amount of end terminals (as discussed in the draft Standard Safety Intervention Toolkit, among other considerations).

14.7 Management, Commercial, and Financial Cases

The following tables and text outline the key Management, Commercial, and Financial Case information for the workstreams recommended to follow on from this IBC.

14.7.1 Management Case

The table below outlines the key decision points, issues and stakeholders that the Transport Agency needs to manage through the upcoming stages for each of the packages

Project / Package	Next Stage	Key decision points	Cost Management	Issues Management	Post Imp Monitoring	Iwi	Stakeholders
SNP - Quick wins (Low-cost low risk)	Pre-Imp / Imp	A decision needs to be made as to how these projects should proceed (i.e. packages and procurement methods).	The project design includes mitigation and design risk factors that are already allowed for in the current concept-level project cost. The environment effects assessment together with topographic and geotechnical investigations will help provide certainty around the scope of any further mitigation needed. The risk register will be maintained and if required, the cost estimate revised.	Issues are proposed to be managed through the risk register process, with the top risks reported monthly. Issues that have potential strategic implications or may create precedents should be escalated within the relevant project initiative lead organisation, as per normal process. Normal issues management processes where outlined in relevant existing contracts should followed.	Crash statistics can be monitored via re-running reports using the most up to data available via CAS.	Engagement with Tūwharetoa Maori Trust Board, Te Kotahitanga o Ngāti Tūwharetoa Trust, Ngāti Rangi needs to be continued to ensure support for quick wins	Limited additional consultation will be needed with stakeholders however they do need to be kept informed.
Bulli Point Te Poporo	DBC	Consultation and engagement will comprise a major decision point for this package to proceed – especially in term of iwi support.	Costs for these works have been provided via the outputs of the parallel project. Base estimates have not been available to date, it is recommended a peer review of the project costs in undertaken during the detailed business case.		Monitoring methods should be developed during the respective DBCs however the following methods might be considered: CAS – for incidence of crashes and deaths and serious injuries. TREIS – for data on the incidence, durations, and type of closures to the highway. Consideration of supplementation of this data should also be undertaken, such as talking directly to the network contractor, or monitoring local news media. A video monitor could be set-up for monitoring the locations of two-truck passing concerns.	Engagement with Tūwharetoa Maori Trust Board, Te Kotahitanga o Ngāti Tūwharetoa Trust, Ngāti Rangi needs to be continued to confirm support for any proposed works and the appropriateness of any mitigation measures.	Normal DBC level engagement required. Early engagement with Heritage New Zealand recommended.
Sector 1 Sector 2 Sector 3	DBC	The first key decision point is when to proceed to completion of the DBC. The next key decision point will be the conclusion of the DBC once further engineering design and consultation has been undertaken.	The project design includes mitigation and design risk factors that are already allowed for in the current concept-level project cost. The environment effects assessment together with topographic and geotechnical investigations will help provide certainty around the scope of any further mitigation needed. The risk register will be maintained and if required, the cost estimate revised.			Engagement with Tūwharetoa Maori Trust Board, Te Kotahitanga o Ngāti Tūwharetoa Trust, Ngāti Rangi needs to be continued to gain better understanding of the cultural sites of significance and obtain agreement for site inspections once project restarts.	Normal DBC engagement processes to be followed.
Hatape to Motuoapa Bypass	IBC/DBC	The key decision here is whether this investigation is progressed in parallel to the DBC for Sector 1.	Management of the cost to deliver the IBC/DBC should be undertaken by following standard the Transport Agency procedures, as well as those set out in the IBC/DBC Panel contractual arrangements.		To be developed during the IBC and subsequent phases. Likely items to monitor include safety, resilience, and travel time data.	Engagement with Tūwharetoa Maori Trust Board, Te Kotahitanga o Ngāti Tūwharetoa Trust, Ngāti Rangi needs to be continued to better understand their preferences and concerns	Normal IBC engagement processes to be followed.

The table below provides guidance towards implementation and next step pathways in progressing various projects. Where initial concepts and scoping has been undertaken the table also provides reference to where this data is contained within the current IBC.

Table 14-2: Project Funding Pathways

No assumed for short term implementation, see footnote 1		Enter into SNP for consideration for SSI assessment	Low Cost Low Risk Projects for progression into scoping and design			
Projects >$M and cannot be implemented by SNP	SNP – ST major project	SNP - SSI	SNP – LCLR (Safety)	LCLR (Resilience)	Quick Win SNP – LCLR (Boost, Level Crossing and Safety Others)	Quick Win SNP – LCLR (Non-safety - System Management)
Township Improvements						
Clip on footbridge at Waitahanui. (not part of Recommended Option) - $1 million Realigned bridge at Turangi Taupo (not part of Recommended Option) - $4.2million (no injury crashes in last 5 years make it unsuitable for SNP) Clip on bridge at Turangi (not part of Recommended Option) - $2 million	None identified	New roundabout at Turangi – see Appendix 310201099-01-100-C222. $3 million	Improvements as per appendix I1 drawings 310201099-01-100-C101 to 310301099-01-100-C115. Town thresholds, new footpaths, uncontrolled pedestrian crossings		Boost treatments are assumed to be high performance road markings, ATP, signage upgrades and infrequent use of roadside barrier to align with the $40,000 per km philosophy	None identified
Rural Improvements						
Sector 1 Taupo to Hatepe	None identified	Section 1 – wide centreline and consistent shoulders $10 million – See appendix I1 drawings 310201099-01-100-C116 to 310201099-01-100-C131	Low cost low risk are tabulated in Appendix J – • 38 treatments • $6.0 million		Boost treatments are assumed to be high performance road markings, ATP, signage upgrades and infrequent use of roadside barrier to align with the	None identified
Sector 2 – Hatepe to Motuoapa		Section 2 – consistent shoulders plus township improvements – 10 million. See appendix I1 drawings 310201099-01-100-C132 to 310201099-01-100-C148 Bulli Point/ Te Poporo – cost depending on option identified in Detailed Business Case	Low cost low risk are tabulated in Appendix J • 22 treatments • $1.3 million	Bulli Point Site 1 - (RP726/6.230): Install a gabion or cantilever timber retaining wall to prevent the slip encroaching into the carriageway and also gain an additional 1m of carriageway. A stormwater control and disposal system designed to prevent future erosion adjacent to the carriageway.	$40,000 per km philosophy	None identified
Sector 3 - Turangi to Waiouru		Section 3 – wide median and consistent shoulders 11 million. See appendix I1 drawings 310201099-01-100-C149 to 310201099-01-100-C218	Low cost low risk are tabulated in Appendix J: • 75 treatments • $11.5 million			None identified

[1] Three projects were identified during the IBC phase that helped support the touted Taupo to Turangi Cycleway. This project has since lost momentum due to various landowner issues. As such they have made it to the recommended Option. If the Taupo to Turangi cycleway regains momentum, then these projects should be re-assessed to help support a safe cycle route

14.7.1.1 Roles and responsibilities

Normal Transport Agency roles and responsibilities, including change control and composition of the project board are proposed for all of the workstreams.

It is recommended that all projects report up to the same project manager, investment client and project sponsor to ensure consistency and collaboration across workstreams. An indicative roles and responsibilities table is presented below. In time details such as the supplier and team leader for each package will be confirmed.

Role	Name
Project Sponsor	Chris Gasson (the Transport Agency)
Investor Client	Mark Jack (the Transport Agency)
Project Manager	Clair Rusin (the Transport Agency)
Senior supplier	Yet to be determined for all proposed packages. Stantec will be retained to complete DBC requirements of the current business case in future.
Team leader	Yet to be determined

14.7.1.2 Independent Risk and Assurance Reviews

The Transport Agency have advised that formal reviews for the current business case will be undertaken at the Detailed Business Case phase (and subsequent phases).

These projects/designs should be subject to the normal project review processes with no specific unusual engineering or operational considerations prevailing. The reviews would include:

- Economics peer review
- Road safety audits
- Business case reviews

The consenting strategy documentation, to be produced during the DBC stage, will be reviewed by the following parties:

- Safe and Sustainable Transport Team as appropriate to review technical reports and advise on their alignment with relevant policy, guides, specifications and standards.
- Legal team
- Planning and Investment team.
- Project Management team to review of any proposed conditions to ensure that constructability is not compromised and to retain flexibility for ensuing phases.

The post RMA consenting implementation process (specimen and detailed, and construction) has not been determined. It is anticipated that these ensuing phases will be subject to normal quality assurance processes

14.7.2 COMMERCIAL CASE

The following table outlines the risk and procurement approach to the next phases of project development

ID	Project / Package	Communications and Engagement	Risk	Procurement	Implementation Strategy
1	Quick Wins (Low-cost low risk)	It is proposed that existing project and stakeholder management approaches are retained, as this allows existing systems and structures to be used for the next phases. This approach fits with the proposed breadth of the ensuing investigation which will need to take into consideration multi-faceted and competing issues. In the coming weeks, it is recommended that the project team issues a communication to close out the project with key stakeholders advising people about the recommended option, why we reached this option and an update on the next steps and timeframes for this project. The Communications and Engagement Plan has been updated and is provided in Appendix K.	The major risks identified earlier in the project are still relevant now and need continued management through the next phases. These include: 1. Iwi and hapu involvement and support 2. Stakeholder expectations of project implementation. It is recommended that expectations, and reputational risks are managed by ensuring pro-active engagement with regular stakeholders, treaty partners, and public communications. 3. Relationship between short term and long-term works 4. Sensitive receiving environments and landowners It is that property risks are managed through early engagement with potentially affected landowners. 5. Technical risks where effects either lead to significant design change or cause significant cost escalation (by introducing or increasing the scope of mitigation). It is recommended that technical risks be managed with robust technical reviews, and robust submissions for statutory approvals 6. Programme risks - for example, discussions with affected parties and stakeholders, staff resourcing, or hearings and appeal processes. It is recommended that programme risks are mitigated through careful programme management against realistic deliverables. Refer also to the Risk Register developed for this IBC.	Quick wins should be progressed through the Safer Networks Panel, through the Low-Cost Low Risk service providers or NOC contracts. The following section outlines which elements of the recommended option would likely meet the criteria for this approach.	It is proposed that the options be packaged together (based on complexity and best procurement approach to enable the following tasks: 1. Procure pre-implementation services, including: a. Detailed design b. Resource consent application. 2. Procure construction services. 3. Construction.
2	Bulli Point Te Poporo			This package could be progressed via the Safer Networks Panel.	As discussed earlier in this business case there remains more assessment to be undertaken before implementation can commence. Project leads will take the lead role on funding applications and project planning. It is proposed that when pre-implementation is reached for each respective recommended option that the implementation strategy follows the task list as outlined above for the Quick Winn package of works.
3	Sector 1			It is recommended that when the project gets re-activated, the preliminary design and any outstanding DBC requirements. This would be able to be done through the DBC Panel and would allow the quickest delivery of the outstanding matters.	
4	Sector 2				
5	Sector 3				
6	Hatape to Motuoapa Bypass			Procurement suggested via the IBC / DBC panel, ideally in conjunction with Sector 2 above.	At this stage implementation is not envisaged to take place until the 2030s. Indicative level commentary on implementation strategy might be occur in the next proposed phase (IBC/DBC), however a more thorough unpacking of the implementation strategy will occur at later phases.

14.7.2.1 Property

Due to the level of design undertaken, exact property impacts have not yet been determined however some landowners will be impacted. The project may also have an impact on DoC and Ministry of Defence land. As soon as the project is re-commenced it is recommended that the properties likely to be affected are identified and early discussions held with these landowners.

The Quick Wins list has been developed under the assumption that the works could occur within the existing road reserve and no further property would be required. In the event property is required (possibly after refinements of design) then those works will need to enter a property pre-implementation phase, including early discussions with landowners.

For the most part any property requirements over the whole project area will likely be in small sections such as where a curve is eased that encroaches slightly on adjacent land. The recommended options for both Sector 2 and 3 are the Effects Corridor Option which tends towards treatments within the existing road reserve to help minimise this type of occurrence.

The Sector 1 corridor option (Balanced) has greater scope to go outside of the existing road reserve, therefore more property might be required there. However, the topography of this Sector helps to mitigate this need.

14.7.2.2 Consenting

At this stage a consenting strategy has not been developed. This needs to be developed during the next phase of investigation once the recommended option design has been progressed. The preliminary planning assessment identifies that any construction work in High-Risk Erosion areas or near archaeological or waahi tapu sites will require resource consent. As the design in progressed and further discussions are had with iwi and hapu a clearer picture of consenting requirements will emerge.

Leading up to lodgement of RMA applications the process would likely follow:

- Consultation on proposed mitigation and design with landowners and stakeholders.
- Confirm/finalise the project design.
- Finalise assessment of effects.
- Finalise land requirement plans.
- Review property strategy (developing land purchase / entry agreement as necessary).
- Finalise RMA lodgement documentation in consultation with relevant authorities.

The proposed approach enables whole of project mitigation discussions to occur, which enables the development of complementary and efficient mitigation methods to be adopted. Equally, this allows design and construction flexibility issues to be considered.

Transparent communications across the Project team should be maintained when making decisions about design and mitigation. The risk register will focus on managing both consenting and construction risk.

14.7.3 Financial Case

ID	Project / Package	Proposed Next Stage	Indicative Project Delivery Costs	Project Timing Overview	Maintenance and operational costs
1	Quick Wins (Low-cost low risk)	Pre-Implementation / Implementation	$18.8M	This package is recommended to progress to pre-implementation / implementation in the short term.	Any new and / or additional assets which will require ongoing maintenance, such as signs, and targeted roadside barrier. Changes in asset types may also require changes in maintenance requirements, such as where timber sight-barriers are upgraded to a more modern barrier system. Appropriate details of implementation should be given to the relevant network operating contractor, and the Transport Agency representative, so that the new assets can be maintained as per standard Transport Agency procedures. Detailed maintenance costs estimate(s) to be prepared at DBC stages.
2	Bulli Point Te Poporo	DBC	TBD depending on option selected	Investigation to be undertaken in 2020 to continue to build upon the work previously undertaken by AECOM to alleviate the identified issues. Ultimate delivery time will be dependent on how quickly issues such as agreement from iwi and Heritage NZ can be achieved, along with any required consent(s), and property purchase(s).	
3	Sector 1	DBC	$15.5M	It is recommended that investigation begin in 2021, and construction in 2023. This Sector is proposed to progress first as this has the highest traffic volumes, the least environmental and cultural impacts and the greatest return on investment.	
4	Sector 2	DBC	$11.3M	It is recommended that investigation begin in 2022 and construction in 2024. Sector 2 could follow Sector 1 with a parallel investigation into the costs and benefits of an offline bypass. It is not recommended that the bypass progress in the short term, but it would help determine the scale of investment for the safety improvements along the lakefront.	
5	Sector 3	DBC	$22M	Sector 3 could follow Sector 2 with investigation beginning in 2023 and construction in 2025.	
6	Hatape to Motuoapa Bypass	IBC	IBC is estimated to be in the order of $1M	This IBC is recommended to begin in 2022 so that the option(s) can be developed in parallel to that of Sector 2. Additionally, although the design and construction is not anticipated to occur until at least the 2030s developing an IBC in 2022 would lessen the amount of work required later, and also help with the more immediate discussions with key stakeholders.	There is potential for this project to result in a significant amount of new offline state highway, with large maintenance and operational cost savings. Details to be explored and examined during later business case phases.

14.7.3.1 Other general financial considerations

The Transport Agency has been assumed as the sole funder for the next stages, with funding coming from the NLTP. No other revenue streams have been considered, therefore no alternative funding source risks are anticipated. However, there is potential for a relatively small portion of the costs to be bore for the maintenance of any new assets at rest stops. This might be done either Territorial Authorities (Taupō District Council, and Ruapehu District Council), or by the Department of Conservation.

Such facilities would include toilet and rubbish bin maintenance etc. With regards to post consenting decision making, formal construction funding acceptance would take place in the normal way for each of the project lead organisations. This process will occur after consenting.

Specific funding discussions with these potential funding partners has not occurred yet, and will need to take place during the DBC phases. Given the likely level of costs, we consider the financial risk to be low. Additionally, if third party funders were unable to commit then the treatments such as toilets or rubbish bins could be excluded from the project without significantly altering the overall corridor option philosophy.

Appendices

Appendix A: Risk Register

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RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
TP1	**Transport Planning/ Business Case** Forestry Land (OPPORTUNITY)	Description: There is an opportunity in some locations to improve highway alignment by utilising adjacent forest area Cause: The cause of the opportunity is that where forestry land is adjacent to highway, timing of wood harvest may mean land is more readily available to be used to realign highway Consequence: The consequence of the opportunity is that some realignments may be able to proceed more quickly resulting in improved levels of service and/or alternative routes	P Peet	Stantec	19-09-17	Live - Treat	Detailed Business Case	Early engagement	Medium	Medium	15	Advance discussions with Forestry operation early	Medium	Medium	15
TP2	**Transport Planning/ Business Case** Multiple business cases	Description: There is a threat that the numerous business cases underway across the region may result in a disjointed level of service, risk and poor user experience and perception Cause: The cause of this threat is that this business case is in two parts (north and south of Taupo) and there is a separate business case for SH29 which intersects with this route. All business cases are progressing in parallel. Timeframes for implementation may not align resulting in inconsistent levels of service Consequence: The consequence of the threat is that some works proceed more quickly than others, resulting in safety risk and poor user experience as well as ongoing roadworks	A Fitzwalter	NZTA	19-09-17	Closed	Detailed Business Case	Agreed Level of Service Requirements. Ongoing liaison with other projects	Medium	Very Low	4		Medium	Very Low	4

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
TP3	**Transport Planning/ Business Case** Community projects (OPPORTUNITY)	Description: There is an opportunity to integrate known community projects/aspirations into the proposed works where they align Cause: The cause of this opportunity is that there are several other known projects within the corridor of this DBC e.g. Taupo to Turangi cycleway; Bulli Point visitor enhancements, which are at an early stage Consequence: The consequence of the opportunity is that the DBC delivers on the community's aspirations, achieving an optimised one network solution with a broader set of outcomes, positive working relationships, and potential for co-funding some sections.	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Stakeholder liaison	Medium	Low	11	Team to liaise regularly with other stakeholders to determine compatibility for inclusion in DBC	Medium	Low	11
TP4	**Transport Planning/ Business Case** Community projects (risk)	Description: There is a threat that community projects/aspirations may not yet be developed sufficiently, be unclear, uncertain, untested, unfunded and/or unconsulted Cause: The cause of this threat is that there are several other known projects within the corridor of this DBC e.g. Taupo to Turangi cycleway; Bulli Point visitor enhancements, which are at an early stage and it is uncertain whether they will progress Consequence: The consequence of the threat is that the DBC may be delayed as a result, or the DBC may propose improvements which conflict with community aspirations for other improvements.	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Stakeholder liaison	Low	Medium	10	Team liaise regularly with other stakeholders and ensure joined up communications with other projects	Low	Low	6
TP5	**Transport Planning/ Business Case** Value for Money	Description: There is a threat that the split in scope (re: timeframes) for the DBCs may mean the value for money for short term improvements may not be high enough, or completing short term improvements now may undermine the value for money of longer term improvements Cause: The cause of this threat is that the DBC has been divided into short-medium term improvements, and longer term more significant improvements (20-30yr timeframe) Consequence: The consequence of the threat is that the improvements may not represent the best value for money, may result in over or under investment, poor BCR and failure to meet current DBC's Investment Objectives.	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Parked	Detailed Business Case	PBC, Current scope of services	High	High	21	Ensure DBC takes into account long term view as input into deciding which treatment to proceed with	High	Medium	19

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
TP6	**Transport Planning/ Business Case** Tauranga Taupo Bridge	Description: There is a threat that the solution for Tauranga Taupo Bridge may not be economic Cause: The cause of this threat is that there is a limited crash history in this location, which may mean the investment cannot be justified Consequence: The consequence of the threat is that the pinch point may remain, resulting in dissatisfaction with CLoS	P Peet	Stantec	19-09-17	Live - Parked	Detailed Business Case	Option evaluation process, EEM	Medium	High	17	Look at wide range of solutions; infrastructure and non-infrastructure	Medium	High	17
TP7	**Transport Planning/ Business Case** Options	Description: There is a threat that the wrong option is selected at the DBC stage Cause: The cause of this threat is that there is inadequate information (including cultural and environmental) Consequence: The consequence of the threat is that the cost of the preferred option may increase resulting in a lower BCR, and/or the preferred option may change as a result	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Robust methodology to identify and assess options. Identify information gaps early. Keep internal stakeholders up to date	Medium	Low	11	Monitor. See if established controls keep risk low	Medium	Low	11
TP8	**Transport Planning/ Business Case** Early wins (OPPORTUNITY)	Description: There is an opportunity to advance early wins Cause: The cause of this opportunity is that some projects will be easy and quick to implement Consequence: The consequence of this opportunity is positive stakeholder relationships and perception, early realisation of benefits	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case		Medium	High	17	Team to identify early wins and make case for acceleration	Medium	High	17
C1	**Stakeholders** Incidents	Description: There is a threat of a serious incident during the DBC e.g. fatal crash, road closure Cause: The cause of this threat is that whilst the investigation is underway, the network risks remain Consequence: The consequence of this threat is stakeholder dissatisfaction and a need to accelerate project	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Accept the risk	Low	Very High	14	Pre-prepared media/stakeholder messages	Low	Very High	14
C2	**Community** Townships	Description: There is a threat of stakeholder dissatisfaction because township improvements north of Taupo are out of scope Cause: The cause of this threat is that the townships are excluded from scope Consequence: The consequence of this threat is stakeholder dissatisfaction	C McKegg A Fitzwalter	Safe Roads NZTA	19-09-17	Live - Treat	Project	Stakeholder Messaging	Low	Medium	10	Need to talk with SWDC and other stakeholders soon. NZTA to determine potential to progress townships sooner	Low	Low	6

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
C3	**Community** Iwi	Description: There is a threat of iwi dissatisfaction because of the limited scope of this DBC and problems with separate projects which have strained relationships Cause: The cause of this threat is that other projects have caused tensions, and the scope of this DBC is more limited than iwi would like Consequence: The consequence of this threat is stakeholder dissatisfaction and potential delay and/or sub optimal solution	NZ PM, Anuradha	NZTA	19-09-17	Live - Treat	Detailed Business Case	Ongoing Comms Iwi Liaison Use of respected cultural advisor	High	Medium	19	Monitor. See if established controls keep risk low	High	Medium	19
C4	**Community** Expectations	Description: There is a threat that the PBC has raised stakeholder expectations and that this project will not deliver what is expected, especially south of Taupo with online rather than offline solutions Cause: The cause of this threat is the broad stakeholder engagement associated with the PBCs, and *lack of communication about the timeframes proposed by the NZTA Board??* Consequence: The consequence of this threat is stakeholder dissatisfaction and potential delay	NZ PM, Anuradha	NZTA	19-09-17	Live - Treat	Detailed Business Case	Workshops and ongoing engagement. New GPS.	High	High	21	Monitor. Once additional consideration of the problems have occurred, Project Team to consider whether they are more efficiently solved by off line alignments. Needs change in scope.	High	Medium	19
C5	**Community** Customer Insights	Description: There is a threat that not undertaking customer insights surveys to inform evaluation of long list will result in sub-optimal solution Cause: The cause of this threat is not undertaking customer insights surveys Consequence: The consequence of this threat is sub-optimal recommended option and the need to undertake rework once the design phases of the project are progressed.	NZ PM, Anuradha	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Comms/Engagement Strategy. Workshops. Gain insights where ever possible, such as Speed Management project, stakeholders and NZTA network managers	Medium	Medium	15	Have pre-prepared media/community responses. Regularly review Strategy	Medium	Medium	15
C5	**Community** Land Requirements	Description: There is a threat that land requirements are not understood yet which could influence the cost and feasibility of options Cause: The cause of this threat is that some of the options are not developed to a stage where land requirements are clear Consequence: The consequence of this threat is delay to the implementation or sub-optimal solutions	P Peet C McKegg	Stantec Safe Roads	18-09-17	Live - Treat	Implementation	Inclusion of Property Consultant. Undertake initial property risk assessment to help understand major property issues.	High	Low	16	Continuing involvement of property team	High	Low	16

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
C6	**Community** Land Requirements (Iwi)	Description: There is a threat that land requirements are not understood yet which could influence the cultural impact of the project Cause: The cause of this threat is that some of the options are not developed to a stage where land requirements are clear Consequence: Area of high cultural significance could require re-scoping/re-work to avoid sensitive environments.	P Peet C McKegg	Stantec Safe Roads	17-09-19	Live - Treat	Implementation	Undertake consultation with Iwi and produce sufficient design to assess potential earthwork envelope	High	Medium	19	Introduce pinch points in design avoid sensitive areas	Medium	Medium	15
F1	**Funding** Restructure	Description: There is a threat that the project is not approved by NZTA as a result of the restructure and affect on involvement of Planning and Investment advisors Cause: The cause of this threat is the internal NZ Transport Agency restructure Consequence: The consequence of this threat is delay to the business case or that the business case will stop	NZ PM, Anuradha	NZTA	19-09-17	Closed	Project	Establishment of new structure & approval process	High	Low	16	Continuing internal engagement	Medium	Low	11
F2	**Funding** Political	Description: There is a threat that the new government causes a change in direction that affects this DBC Cause: The cause of this threat is the election Consequence: The consequence of this threat is possible changes in timeframes and/or scope	A Khan	NZTA	19-09-17	Closed	Detailed Business Case	No controls	Medium	Medium	15	Frequent discussions with NZTA senior management to get direction	Medium	Low	11
F3	**Funding** Asset Growth	Description: There is a threat that the improvements will increase maintenance cost e.g. wider asset Cause: The cause of this threat is any improvement which increases the size of the asset Consequence: The consequence of this threat is increased maintenance cost and effect on Network Operating Contract	NZ PM, Anuradha	NZTA	19-09-17	Live - Treat	Detailed Business Case	NOC Consultation	Very Low	High	7	Include maintenance cost in evaluations	Very Low	High	7
F4	**Funding** Cost Estimates	Description: There is a threat that the available funding is insufficient to address the agreed problems Cause: The cause of this threat is the available funding Consequence: The consequence of this threat is that the works are unaffordable Consequence: Little to no improvement to the road corridor in the short term with no reduction in crash rate and also further disengagement with stakeholders who have contributed to outcomes.	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Parked	Implementation	Cost estimation processes	High	High	21	Undertake internal parallel cost estimates and also consider against other projects on a per km basis. Management case to consider part implementation to address areas of highest risk	High	High	21

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
H1	**H&S** Site Visits	Description: There is a threat of injury because of the nature of the corridor, which makes it difficult to stop and conduct site visits, etc Cause: The cause of this threat is the nature of the carriageway Consequence: The consequence of this threat is personal injury, and/or insufficient site visits	P Peet C McKegg NZ PM	Stantec Safe Roads NZTA	19-09-17	Live - Treat	Detailed Business Case	H&S Plans. Specific H&S site visit plan per visit.	Very High	Very Low	13	Zero Harm app	Very High	Very Low	13
H2	**H&S** Contamination	Description: There is a threat of contamination of Lake Taupo because of construction activity Cause: The cause of this threat is the nature of the carriageway and proximity to Lake Taupo with no buffer zone for long stretches Consequence: The consequence of this threat is pollution, iwi criticism, reputational issues	NZ PM, Anuradha	NZTA	19-09-17	Live - Parked	Implementation	MCA to include environmental assessment of options, including constructability	High	Low	16	Ensure understanding of issues in this area. Investigate different construction techniques and prioritise treatments which do not impact	High	Low	16
DC1	**Design/ Construction** Corridor Effect	Description: There is a threat that the scope will lead to improvements in some locations and not others, resulting in even more inconsistent corridor Cause: The cause of this threat is the short-medium term scope, funding and timeframes Consequence: The consequence of this threat is an inconsistent corridor solution resulting in poor CLoS and poor safety outcomes, particularly south of Taupo	P Peet	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	ONRC Minimum standards. Methodology includes assessing corridor consistency.	Medium	Medium	15	Robust optioneering process understanding problems per section and ensure short list of options have corridor consistency	Medium	Low	11
DC2	**Design/ Construction** Land	Description: There is a threat that the improvements will require land which is sensitive to acquire, which will prevent delivery of the preferred solution Cause: The cause of this threat is that land adjacent to the highway is owned by iwi, Ministry of Defence, DoC Consequence: The consequence of this threat is a sub-optimal solution and/or delay to implementation	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Pre Implementation	Stakeholder Engagement Plan. Undertake initial property risk assessment to help understand major property issues.	Very High	Medium	23	Continuing involvement of the property team. Talk to key landowners to understand risks and sensitivities. Review after MCA.	High	Medium	19
DC3	**Design/ Construction** Rework	Description: There is a threat that improvements are timed such that they result in digging up recent other works (e.g. rehabs) Cause: The cause of this threat is lack of integration and planning with other NZ Transport Agency works Consequence: The consequence of this threat is a missed opportunity to align work, poor customer experience, inefficient use of funding	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Pre Implementation	Advanced works programme. Frequent communications with NOC teams.	Medium	Medium	15	Frequent communications with NOC teams	Medium	Low	11

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
DC4	**Design/ Construction** Disruption	Description: There is a threat of extended periods of road works along the corridor as a result of the improvements for this and adjacent business cases Cause: The cause of the threat is the length of the corridor and likely improvements which could extend along long stretches, as well as the constrained width and lack of alternative routes Consequence: The consequence of this threat is delayed travel and customer dissatisfaction	NZ PM, Anuradha	NZTA	19-09-17	Live - Treat	Implementation	Works Programming	Medium	Medium	15	Consider customer experience and traffic management during management case of DBC. Consider during Management Case.	Medium	Low	11
DC5	**Design/ Construction** Property Access	Description: There is a threat of conflict between improvement options and landowners Cause: The cause of this threat is that some safety improvements (e.g. median barriers) can restrict property access and we are not consulting with all landowners during this phase Consequence: The consequence of this threat is less safe solutions or angry landowners	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Talk to the key landowners.	Medium	High	17	Sell safety benefits of median barriers (if preferred solution). Consider alternative forms of access.	Medium	High	17
DC6	**Design/ Construction** Ground Condition	Description: There is a threat of cost increases as a result of lack of information about ground conditions Cause: The cause of this threat is the lack of detailed information about ground conditions Consequence: The consequence of this threat is increasing cost and need for rework	P Peet C McKegg	Stantec Safe Roads	19-09-17	Live - Treat	Detailed Business Case	Geological mapping	Medium	Medium	15	Geotechnical investigations at the appropriate time	Medium	Low	11
DC7	**Design/ Construction** Industry Capacity	Description: There is a threat that there may be a lack of industry capacity for design/construction Cause: The cause of this threat is the health of the market Consequence: The consequence of this threat is poor value for money, delay, quality issues	NZ PM, Anuradha	NZTA	19-09-17	Live - Parked	Pre Implementation	Early warning to suppliers	High	Very Low	8	Discussion with industry during management case	High	Very Low	8
O1	**Other** Maintenance and Operations	Description: There is a threat that the expected improvement in maintenance and operations does not eventuate Cause: The cause of this threat is poor performance/contract management Consequence: The consequence of this threat is continued level of service issues which could be addressed through maintenance and operations, which dilutes the outcomes of the business case	NZ PM, Anuradha	NZTA	19-09-17	Live - Parked	Project	Involvement of NOC through process	Low	Low	6	Continued monitoring and capacity to bring further works into business case if required	Low	Low	6

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
C1	**Community**	Description: There is a threat that the public do not support the preferred option Cause: The cause of this threat is lack of community engagement / insights Consequence: The consequence of this threat is delays and rework on the preferred option	NZ PM, Anuradha	NZTA	05-11-18	Live - Treat	Detailed Business Case	Engagement Strategy	Medium	Medium	15	Regular review of engagement strategy and check in with stakeholders	Medium	Medium	15
C2	**Community -** Landowners	Description: There is a threat that the landowners do not support the preferred option where land take is required Cause: The cause of this threat is lack of landowner engagement Consequence: The consequence of this threat is delays	NZ PM, Anuradha	NZTA	05-11-18	Live - Treat	Detailed Business Case	Engagement Strategy	Medium	Medium	15	Regular review of engagement strategy and check in with stakeholders	Medium	Medium	15
C3	**Transport Planning / Business Case -** Safer Networks	Description: There is a threat that the safer network approach encroaches onto this DBC Cause: The cause of this threat is parallel development of Safer Networks Approach Consequence: The consequence of this threat is delays or rework to bring DBC in line with Safer Networks	NZ PM, Anuradha	NZTA	05-11-18	Live - Treat	Detailed Business Case	Discussions with Safer Network team	Medium	Low	11	Ongoing discussions	Medium	Low	11
DC2	**Design / Construction** - Cost Estimates	Description: There is a threat that the cost estimates are grossly inaccurate Cause: The cause of this threat is lack of information, partic geotech, availability of materials, TTM, haulage etc Consequence: The consequence of this threat is cost increases and affordability of project	P Peet C McKegg	Stantec Safe Roads	05-11-18	Live - Treat	Detailed Business Case	Cost estimation processes, Peer Reviews	Medium	Medium	15	Compare with other projects nationwide. Bring forward geotech testing. Investigate availability of materials.	Medium	Low	11
C5	**Environmental -** Consent	Description: southern section traverses environmentally sensitive area. Earthworks and stormwater consents may be difficult to obtain given the narrow corridor to mitigate or treat. Confirmed that there are no existing stormwater consents in place for SH1 (adjacent to Lake Taupo). If works trigger stormwater consent it could be that entire run off needs to be treated. Cost and land implications	NZ PM, Anuradha	NZTA	11-01-19	Live - Treat	Detailed Business Case	Undertake assessment of shortlisted options against potential for triggering consent	High	Medium	19	ongoing investigation and discussion with iwi regarding water quality	High	Medium	19
C6	**Environmental - Crash Risk**	Description: There is a threat of contamination to the lake as a result of ongoing crashes Cause: The cause of this threat is risk around Lake Taupo Consequence: The consequence of this threat is environmental and cultural effects. Reputational if not addressed by project	NZ PM, Anuradha	NZTA	05-11-18	Live - Treat	Detailed Business Case	Ongoing maintenance/operation activities	High	High	21	Speed management	High	High	21
DC3	**Design/ Construction** Cost	Description: HNZ have asked for testing not inline with expectation for on-line corridor treatments Cause: HNZ letter Consequence: Additional cost and time delay.	NZ PM, Anuradha	NZTA	06-11-18	Live - Treat	Detailed Business Case	Open up discussions with NZTA national office for normal procedure	Medium	Medium	15	Get requirement overturned and pushed into design phase	Medium	Low	11

RID	Risk Title	Description/ Cause/ Consequence	Risk Owner	Risk Owning Org	Date Raised (xx/xx/xxxx)	Risk Status	Phase	Established Controls	Consq.	Likelihood	Risk Score	Individual actions to be recorded in the Actions Register (Tab 4)	Consq.	Likelihood	Risk Score
C7	**Stakeholders**	Description: Bulli Point realignment project is currently in a detailed design phase. Need to align stakeholder consultation between DBC and Bulli Point project Cause: Parallel project Consequence: Inconsistent message and stakeholder alienation	NZ PM, Anuradha	NZTA	10-03-19	Live - Treat	Detailed Business Case	Establish on-going meetings between project teams	Medium	High	17	Align stakeholder message and rigor of approach	Medium	Low	11
C8	**Community** Iwi	Description: Failure to get sufficient feedback from Iwi on the Sothern section to close out MCA process. Cause: Interested parties are unable to commit to a date for Hui Consequence: Unable to complete MCA and causes delay in progressing from short list to recommended option.	NZ PM, Anuradha	NZTA	01-04-19	Live - Treat	Detailed Business Case	Establish on-going meetings between Iwi and project team	Medium	High	17	Continue to try and find date and venue that suits all parties	Medium	Very High	18
C9	**Programme**	Description: extended project duration is leading to turn over of key staff, risking project IP and programme Cause: Originally programmed project duration of 12 months will be over 24 months by completion Consequence: delay to programmed and possibility of relitigation due to change in approving lines and transport policy	Project Team	All	31-03-19	Live - Treat	Detailed Business Case	Frequent project meetings and internal (within NZTA) engagement	Medium	Medium	15	Ensuring project teams have knowledge shared across the team, ensure documented evidence of key decisions are prepared.	Medium	Medium	15
C10	**Community** Safety	Description: extended project duration is exposing road users to high levels of safety and resilience risks. With crashes accounting for 20 fatalities and 58 seriously injuries over the project length since commencement of the DBC (mid 2017). Cause: Originally programmed project duration of 12 months will be over 24 months by completion Consequence: Continued exposure to identified risks that lead to high severity outcomes	Project Team	All	01-04-19	Live - Treat	Detailed Business Case	Establish on-going meetings between Iwi and project team	Very High	High	24	Progress DBC as quickly as feasible and try and secure funding for safety improvements	Very High	High	24

Appendix B: Constraints Maps

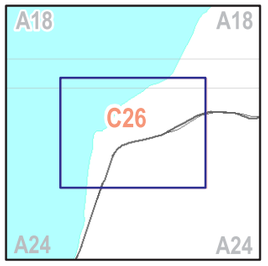
C26

Environment Map

N

400
300
200
100
0
Meters

SCALE 1:5000



NOTES

Designated Site D67: Realignment State Highway 1 Hatepe
Designated Site: All State Highways are designated - refer to Section 8.2.12
Known Contaminated Site C4: Old refuse disposal site

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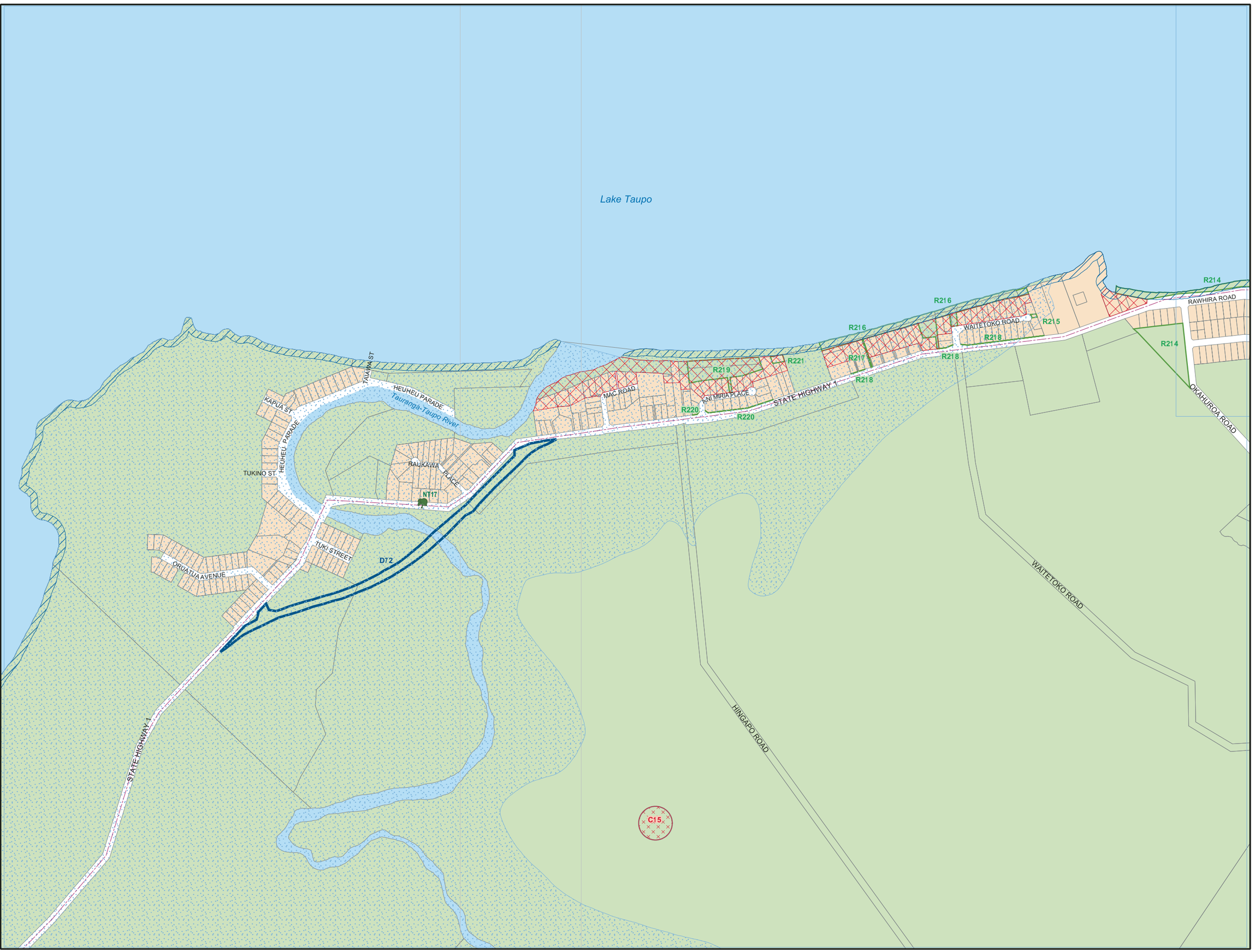
OPERATIVE DATE:

PRINTED DATE: 21/08/2007

B29

Environment Map



N

800
700
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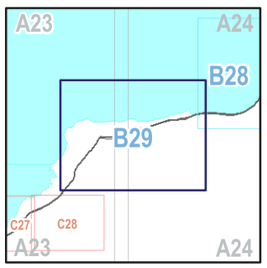

NOTES

Amenity Tree AT7: Big-cone Pines
Designated Site D72: Realignment State Highway 1
Designated Site: All State Highways are designated - refer to Section 8.2.12
Known Contaminated Site C15: Tauranga Taupo Quarry (approx location)

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OPERATIVE DATE:

PRINTED DATE: 30/03/2007

Appendix C: ESR Screen

ENVIRONMENTAL AND SOCIAL RESPONSIBILITY SCREEN V2.FEBRUARY 2016

Use to assess options in the Indicative Business Case

Use this screen to identify opportunities and risks and assess options for state highway projects. Complete the screen for each option to distinguish them from one another or bundle options where appropriate. Screen results will signal where technical assessments are required and provide a written record to support the alternatives assessment required for statutory applications. For further assistance contact the EUD Team.

Additional instructions and content, including information sources, to help complete the screen can be found on the Highways Information Portal Screen pages here

Decide how many times screen should be filled out (Group Options) ▶ Answer screen questions using project information and suggested information sources ▶ Refer to screen questions explanation, particularly if you answered yes to any of the questions ▶ Complete page 2 of screen ▶ Incorporate page 2 text in IBC assessment of options table (Background and MCA)

PROJECT LOCATION:	PROJECT PURPOSE:	DATE:	OPTION DESCRIPTION:
Taupo to Waiouru	DBC	September 2017	

CATEGORY		QUESTION	ANSWER				USEFUL INFORMATION SOURCES
GENERAL	G1	What is the zoning of adjacent land? Are there any encumbrances on the land? e.g. Maori Reserve or other reserve/covenants	Rural ◉	Commercial ◉	Industrial ◉	Residential ◉	District/Unitary Plan Zoning Maps
			High density residential ☐	Parks/open space ◉			
	G2	Does the option disturb previously undisturbed land?	Y ☐	N ○			
	G3	What is the construction timeframe?	>18 months ☐	<18 months ○			
NATURAL ENVIRONMENT	NE1	Are there any outstanding/significant natural features (e.g. geological or geothermal)/landscapes?	Y ☐	N ○			NZTA MapHub Environmental and Social Risk Map- Natural Environment
	NE2	Will the option affect the coastal marine area, wetlands, lakes, rivers, streams or their margins?	Y ☐	N ○			Regional Plan Maps and Schedules
	NE3	Will the option affect areas of the conservation estate, or areas of known significance for biodiversity or known habitats of uncommon or threatened species?	Y ☐	N ○			District Plan Maps and Schedules
	NE4	Is the option in an area of potential hazard risk e.g. fault lines, significant erosion, flooding, sea level rise etc?	Y ☐	N ○			Department of Conservation
	NE5	Will more than 0.5 hectares of vegetation be removed?	Y ☐	N ○			
		What type?					
CULTURAL AND HISTORIC HERITAGE	CH1	Are there sites/areas of significance to Maori within 200m of the area of interest?	Y ☐	N ○			Iwi
	CH2	Are any recorded, scheduled or listed archaeological sites within 200m of the area of interest?	Y ☐	N ○			NZTA MapHub Environmental and Social Risk Map- Culture and Heritage Heritage New Zealand List
	CH3	Are any scheduled, listed or other important heritage buildings/ structures within 200m of the area of interest?	Y ☐	N ○			NZ Archaeological Association District Plan Maps and Schedules
	CH4	Will the option affect the setting of any historic building/structure or archaeological site?	Y ☐	N ○			Regional Plan Maps and Schedules IPENZ Heritage List
	CH5	Is a group of archaeological sites or an area of historic built environment (even partially) within 200m of the area of interest?	Y ☐	N ○			NZTA GIS predictive models
HUMAN HEALTH	HH1	What is the One Network Road Classification?	National ◉	Regional ☐	Arterial ☐	Collector ☐	NZTA MapHub Environmental and Social Risk Maps- Human Health and Community which includes: - Designated airsheds (including one network classification)
	HH2	Is the area of interest designated as a non-compliant airshed?	Y ☐	N ○			
	HH3	Are there medical sites, rest homes, schools, child care sites, residential properties, maraes or other sensitive receivers located within 200m of the area of interest?	Y ☐	N ○			- Highly sensitive receivers Regional Council Contaminated sites Team
	HH4	Does land use within 200m of the area of interest include industrial sites, chemical manufacturing or storage, petrol stations, vehicle maintenance, timber processing/treatment, substations, rail yards, landfills or involve other activities that may result in ground contamination? OR Are there HAIL or SLUR (contaminated) sites within 200m of the area of interest?	Y ☐	N ○			
SOCIAL	S1	Does the option affect access to community facilities i.e. libraries, open space etc (either temporarily or permanently)?	Y ☐	N ○			NZTA MapHub Project Team District Plan Maps
			Which?				
	S2	Does the option affect community cohesion and accessibility including vehicular connectivity on the local road network?	Y ☐	N ○			Council and Community Strategy Documents
URBAN AND LANDSCAPE DESIGN	ULD 1	Are there opportunities to enhance infrastructure for, and/or improve access to, public transport and/or active modes of travel such as as walking and cycling?	Y ☐	N ○			NZTA MapHub Environmental and Social Risk Map- Natural Environment (Scenic Routes) Regional Land Transport Plan
	ULD2	Does the option enhance the development potential of adjacent land where appropriate?	Y ☐	N ○			Project Team
	ULD3	Is the option located on a themed highway? Is the option part of or near a national cycle or walking route?	Y ☐	N ○			Strategies and District Plan
	ULD4	Are there opportunities to enhance the urban character, landscape character and visual amenity?	Y ☐	N ○			

Answers and Comments	Refer to screen questions explanation to help complete this part.

1. **Summarize the potential environmental and social risks/impacts associated with this option. Consider short and long term risks and impacts.**

NATURAL ENVIRONMENT:	The Waikato Regional Policy Statement (WRPS) has identified Lake Taupō, Tongariro National Park, Lake Rotoaira, Mt Pihanga and Kakaramea-Tihia Massif as Outstanding Natural Features and Landscapes (ONL) (ONF). There are numerous Significant Natural Areas identified in the Taupō District Plan (TDP) that adjoin SH1 between Taupō and Rangipo Desert. There are a number Outstanding Landscape Areas (OLAs) dentified in the TDP between Taupō and Rangipo Desert. There is a large wetland between Motuoapa and Turangi identified by MfE. There are number of reserves that adjoin SH1along the edge of Lake Taupō. SH1 adjoins and traverses Tongariro National Park. The Kaimanawa Forest Park is adjacent to SH1.
CULTURAL AND HISTORIC HERITAGE:	Numerous Pa sites have been identified by NZAA along the stretch of SH1 from Hatepe to Turangi. A historic settlement has been identified by NZAA adjacent to SH1 north of Rangipo
HUMAN HEALTH:	The TDP has identified a contaminated sites eastern side of SH1 at Hatepe.
SOCIAL:	A number of DOC tracks are located adjacent to SH1, including Poh to Desert Road Track and Waihohonu Track.

The responses above will be used in the IBC assessment of options summary table: MCA of the Option.

URBAN AND LANDSCAPE DESIGN:	Once specific options have been identified to address problem areas, urban design and landscape opportunities and benefits can be identified.

Incorporate the relevant comments from above into the economy, social and geography sections of the IBC assessment of options summary table.

2. **What are the environmental, social integration, landscape design or urban design benefits or opportunities presented by this option? Particularly record opportunities that could be lost if not considered early in the design process.**

Once specific options have been identified to address problem areas opportunities for environmental enhancement and social integration can be identified.

3. **Are there any impacts, risks or opportunities which require preliminary technical assessments to help understand risks or opportunities? Is further information required to support the development of the detailed business case or can it be left until the detailed business case/pre-implementation?**

More detail on the location and nature of options and activities is required before the need for preliminary technical assessments can be determined.

Completed by	Paula Hunter, Stantec	
Reviewed by NZTA Project Manager		
Incorporated results into IBC assessment of options summary table?	**Yes** ☐	**No** ○

Appendix D: Optioneering

D1: Long-list of measures workshop notes

D2: Long-list

D3: Single-outcome measures

D4: Single-outcome section options by option

D5: Single-outcome section options retained

D6: Multi-outcome section option sheets

D7: Multi-outcome section options MCA

D8: Tauranga Taupō Bridge WS1 and shortlist

Appendix A Long - List of Measures Workshop Notes

Workshop 1

SH1 Piarere to Waiouru Detailed Business Case

Date/Time:	August 23, 2017 / 10:00am	
Place:	Suncourt Hotel, Taupō	
Attendees:	Gordon Naidoo	South Waikato DC
	Denis Lewis	Taupō DC
	Tom Cloke	RTA/NRC
	Keith McGuire	RTA
	Bill McMaster	WRC
	Brent Crowe	NZ Police
	Fane Troy	NZ Police
	Hamish Smith	NZ Fire & Emergency
	Roger Coles	AA (Wanganui)
	Damien Coutts	Destination Great Lake Taupō
	John Garvitch	NZTA
	Bevan Percival	NZTA
	James Darge	Downer (Network Contractor)
	Ami Willmoth	Downer (Network Contractor)
	Adrian Khan	NZTA
	Daniel Gilmour	NZTA
	Anuradha Fitzwalter	NZTA
	Keryn Zimmerman	NZTA
	Todd Webb	NZTA
	Stephen Parker	NZTA
	Phil Peet	Stantec
	Paula Hunter	Stantec
	Jeremy France	Stantec
	Andrew Maughan	Stantec
	Sarah Connolly	Stantec
	Caroline Wratt	Stantec (Facilitator)
	Lisa Matthews	Safe Roads
	Craig Inskeep	Safe Roads
	Jamie Minchington	Safe Roads
Absentees:	Ruapehu DC, Horizons RC, Waiouru Military Camp, ACC, DOC, Tuwharetoa	

Item:

Welcome and Introductions

Caroline Wratt welcomed everyone.

Business Case Process

Anuradha Fitzwalter provided an update on where the NZ Transport Agency are at in the Business Case process. She gave a presentation of the preferred programme and outlined the scope of the DBCs (see presentation in Attachment 1).

There was concern raised that the larger aspects of the PBCs, i.e. the realignments, weren't being progressed at this time. Anuradha stated that there is still a need to undertake the online safety improvements regardless. NZ Transport Agency are still continuing to gather evidence through this DBC phase and they will still need to test any potential solutions against the long term realignments to ensure value for money.

Recap of the Problem and Benefit Statements and Investment Objectives

Phil Peet gave an update of these from the PBC and how they will be slightly modified for the DBC (see presentation in Attachment 1).

These were accepted by the attendees.

Identification of Constraints

Paula Hunter presented the constraints as currently identified.

All attendees were invited up to long plot aerials of the corridor to add additional constraints to the maps using pens and sticky notes. These have been captured and will be added to the constraint maps.

Option Identification

The attendees were split into 5 groups and each had 15 minutes at each of the following stations to identify potential improvement options.

- Road User Facilities
- Resilience \ Emergency Response
- Safety – Piarere to Taupō
- Safety – Taupō to Waiouru
- Tauranga Taupō Bridge

Each of the stations had background information for the attendees which is provided in Attachment 2.

A raw list of the options identified are presented in Attachment 3.

Key Principles

Caroline posed the following question for the attendees to complete.

"I don't mind what is proposed along here as long as……."

The following responses were received. NZ Transport Agency will consider these and filter, consolidate and refine them to compile a set of Key Principles.

- It's straight with no hill and no corners
- Solves the identified issues
- Reduces travel time variability
- Looks at the entire journey rather than sections in isolation
- It is done working with partners
- Its National Strategic function is delivered so consequences (crashes, delays and closures) are minimised.
- It is of substance to address the issues
- Short term works are started immediately
- Safety standards are improved
- Reduces significant resilience risk
- Protects environmental aspects around the lake
- It is done in line with joint outcomes for the towns (as per PBC)
- It improves the visitor experience
- High risk sites get attention first (e.g. Bulli Point)

We stop “band-aiding” the route

Next Steps

Anuradha and Phil briefly outlined the next steps and noted that Workshop 2 is proposed for early November.

The meeting adjourned at 2:00 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec NZ Ltd
Phil Peet
3 September
Phone: 04 3815783
Phil.peet@stantec.com

Attachments: Attachment 1: Presentation
Attachment 2: Background Information
Attachment 3: Option Identification

Long List of Measures

Safety

ID	Long List Options	Generic	Site Specific	4 Star Transformation excluding pinch points	4 Star Transformation on high risk sections only	Consistent 3 Star incl wide centreline	3 Star on high risk sections only	Safer Corridors: Consistent wide shoulder width with side barriers in high and medium risk locations	Safer Corridors: Consistent minimum shoulder width with side barriers in high risk locations	Targeted side barriers	Safety maintenance programme	Safe Speed limits + self explaining road
1.0	Infrastructure Measures (Based HRRRG)	y	y									
1.1	Median barriers	y	y									
1.1.1	(PBC Barrier system upgrades)	y		y	y		y					
1.1.1.1	Unconstrained Rural	y		y	y							
1.1.1.2	Constrained Rural	y					y					
1.1.1.3	Urban	y										
1.2	Wide medians (may be related to 2.2)	y	y									
1.2.3	Rural wide centreline (generic)	y		y	y	y		y	y			y
	Unconstrained Rural	y		y	y	y		y	y			y
1.3	Roadside barrier	y	y									
1.3.1	(PBC Barrier system upgrade)	y		y	y	y	y	y	y	y		
1.3.2	High risk sections	y			y	y	y		y	y		
1.3.3	High and medium risk sections	y				y	y	y		y		
1.3.4	All areas	y										
1.4	Clear zones	y	y									
1.4.1	Clear zones	y		y	y		y					
	Unconstrained Rural recoverable	y		y	y							

	Unconstrained Rural traversable	y		y	y						
	Constrained Rural recoverable	y									
	Constrained Rural traversable	y									
	Removing non frangible hazards (low cost)										
	Removing non frangible hazards (high cost)										
2.0	Safer Corridor Measures (Based on HRRRG)	y	y								
2.1	Delineation	y									
2.1.1	(PBC Improved delineation at high risk locations)	y		y	y	y	y	y	y		y	y
2.1.2	improved deliniation at high and medium risk locations	y		y	y	y	y	y	y		y	y
2.3	Seal widening	y	y									
2.3.1	(PBC shoulder widening)	y		y	y	y	y	y	y			
2.3.2	Shoulder widening to 1m	y		y	y	y	y	y	y	y		
2.3.3	Shoulder widening to 2m	y		y	y	y	y	y	y	y		
2.3.4	Shoulder widening greater than 2m											
2.4	Passing lanes (incl slow vehicle bays)	y	y									
2.4.1	2+1	y		y	y							
2.4.2	Passing lanes every 5km	y		y								
2.4.3	Passing lanes every 10km	y		y	y	y	y	y	y			
2.4.4	Passing lanes every 20km	y		y	y	y	y	y	y			

2.4.5	Improve safety of slow vehcile bays	y				y	y				y	
2.4.6	More slow vehicle bays on uphill sections	y				y	y					
2.4.7	Safety improvements to existing passing facilities											
2.5	Geometry (super elevation, cross section improvements, curve radius, alignment consistency	y										
2.5.1	No out of context curves	y		y	y	y	y	y	y			y
2.5.2	Design speed minimum of 60km/h (high speed rural only)	y						y	y	y		y
2.5.3	Design speed minimum of 80km/h (high speed rural only)	y				y	y			y		y
2.5.5	Repair all deficient superelevation	y		y	y	y	y	y	y		y	y
2.5.6	Improve conspicuancy of out of context curves	y				y	y	y	y	y	y	y
2.5.6	Improve conspicuancy of out of context curves (including undercut of obscuring road geometry)											
2.6	Realignments and curves	y	y									
2.6.1	Realignments from PBCs	y	y	y	y							
2.8	Speed management (Rural) (SAWS, speed thresholds, lowered speed limit)	y										

2.8.1	(PBC speed limit assessments)	y										
2.9	Speed management (Urban)	y										
2.8.1	(PBC speed limit assessments)	y				y	y					y
3.0	Safety Management (Based HRRRG)	y	y									
3.1	Skid resistance and intervention levels	y										
3.1.1	(PBC Surfacing enhancements)	y		y	y	y	y	y	y	y	y	y
3.2	Intersections (auxiliary lanes, sight distance, priority control)	y										
3.2.1	(PBC Minor intersection improvements)	y		y	y	y	y	y	y			y
3.2.2	Highest risk intersections	y		y	y	y	y	y	y			y
3.2.2	High and medium risk intersections	y		y	y	y	y	y	y			y
3.3	Signs and information	y	y									
3.3.1	Warning Signs	y		y	y	y	y	y	y			y
3.3.2	Information Signs	y		y	y	y	y	y	y			y
3.3.3	Electronic Signs	y		y	y	y	y	y	y			y
3.4	Vegetation maintenance and planting policies	y	y									
3.5	Trip Management	y	y									
4.0	Road lighting	y	y									
4.1	Midblock	y										

4.1.1	Midblock lighting (urban only)	y		y	y	y	y					
4.2	Intersection	y										
4.2.1	Intersection lighting	y		y	y	y	y	y	y			y
4.3	Pedestrians	y										
4.3.1	Pedestrian facility lighting	y		y	y	y	y	y	y			y
5.4	Other (some of these related to other headings?)	y	y									
5.4.9	Emergency things to buy (vending machine) located around charging stations + Provide cycle repair stations (vending machines that dispense wheel tubes etc)	y										
5.0	Pedestrian / Cycle (active mode) facilities	y	y									
5.3	PBC - Provision of walking and cycling facilities that encourage active transport mode choice and tourism	y										
5.4	More separated cycle facilities (All works need to be mindful of regional cycle trail routes.)	y		y	y	y	y	y	y	y	y	y
5.5	Wide shoulders (shared space)											
5.6	Dedicated cycle lanes											
6.0	Other	y	y									
6.2	Public transport improvements (minor improvements such as bus	y		y	y	y	y	y	y	y	y	y

	pull over areas)											

Resilience

ID	Long list option	High	Medium	Low
1	**General**			
1.1	ITS solution at route decision points	Out of scope		
1.2	HPMV improvements on detour routes	Out of scope		
1.3	Improve standard of assets on detour routes so they can operate effectively as detour routes when major incidents occur without significant damage	Out of scope		
1.4	Improve standard of local road detour routes for HPMV with additional NZTA funding to provide for these	Out of scope		
1.5	More VMS at journey decision points	Out of scope		
2	**Flooding**			
2.1	Bound pavements in areas of expected inundation (2)	Y	Y	
2.2	Flood water depth gauge for real time information	Out of scope		
2.3	Armouring of shoulders	Out of scope		
2.4	Ultrasonic sensor to monitor stream levels	Out of scope		
2.5	More drainage to address increased rainfall and saturated pavements	Y	Y	Y
2.6	Larger/more cross culverts (2)	Y	Y	Y
2.7	Raise road in flood plain areas.	Y		
2.8	Bridge upsizing should be considered	Y		
2.9	Drainage improvements	Y	Y	Y
2.10	Geometric alterations to avoid long flow paths	Y		
2.11	Increase Tauranga Taupō Bridge flood clearance level; it is close to flood level at the moment	Y		
2.12	Possible dredging/other hydraulic improvements	Out of scope		
2.13	Widen shoulders to minimise risk to drivers during floods		Y	Y
3	**Rockfalls/slips**			
3.1	Local realignment incorporating shallower cuts slopes or wider berms (2)		Y	Y
3.2	Rock pinning	Y	Y	
3.3	Slope re-grading	Y	Y	Y
3.4	Widen road along Lakes edge (Motuopa Hatepe): into Lake, cutting into bluff, cantilever/bridge	Out of scope?		
3.5	Wire netting		Y	Y

4	Snow/ice			
4.1	Add piezo to pavements that emits heat under traffic movement reducing ice/snow	Y		
4.2	Design barriers that can drop in a snow event so snow plough doesn't get constrained and road can be cleared quicker	Y		
4.3	Explore different road surface treatments in snow / ice areas	Y	Y	Y
4.4	Fences – primary purpose for snow control	Y		
4.5	Geometric – wider berms designed to catch drift etc	Y	Y	
4.6	Install snow fences, Desert Road	Y		
4.7	Install wind turbines to transfer heat into asphalt surfacing	Y		
4.8	Local realignment of Three Sisters and Desert Road curves (2)	Out of scope		
4.9	Metal slag in surfacing to keep temperature of the surface warmer reducing ice	?		
4.10	Reduce shaded areas, Desert Road	Y		
4.11	Remove barriers because these make it difficult to use snow plough and delay opening road	Y		
4.12	Snow Fences	Y		
4.13	Straighten snow affected roads so can be driven on safely even when there is snow or ice	Out of scope		
4.14	Utilise geothermal energy to heat road pavements and surfaces to reduce ice	Y		

Road User Experience

ID	Long list option	Relevant Sections (TBC)	High	Medium	Low
1	Some rest stops require some TLC - upkeep - upgrade. Then maintenance.	All	Y	Y	Y
2	Turning facilities must be safe to the rest stops (or the rest stop shifted / closed)	All	Y	Y	Y
3	Rest stops need to have shade for families	All	Y	Y	
4	The photo opportunities/stops should be advertised/told to drivers so they know where to stop	All	Out of scope?		
5	Bulli Point (refuge and lookout) there is no where to pull over. It is also dangerous to walk down the highway to access. (there was also mention of another stopping place nearby that has only capacity for about 6 vehicles)	Bulli Point	Y	Y	Y
6	Freedom camping - the spots where people can do this needs to be regulated	All	Out of scope?		
7	Stopping places need to have design considerations for motorcyclists (i.e. changing from a sealed road to a gravel rest stop)	All	Y	Y	Y

8	There was also a general discussion on what road users we should concentrate on (no conclusion came from this but one thought was that based on what people thought perhaps some rest stops could be rationalised)	All			
9	Waitahanui (as an example) has a rest stop where there is opportunity for informal access . This is unsafe and unnerving.	Waitahanui	Y	Y	Y
10	Mission Bay reststop could be formalised too	Mission Bay	Y	Y	Y
11	Lots of people try to cross the road at Tirau, Putaruru, at the informal jumping area at Bulli Point, and the Motutere Camping ground. So pedestrians crossing at these locations needs to be considered and addressed	Bulli Point and Motutere Camping Ground	Out of scope?		
12	There is a business opportunity for fatigued drivers coming from the skifield at Whakamaru	Out of scope?	Out of scope		
13	Need to work with local authorities for where pull over areas are in town - they need to be multi purposed and future proofed (originally written 'purpose'?)	Urban - all	Y	Y	Y
14	Need breaks in wire rope barrier sections so people can go to the toilet in emergency/when desparate	All	Y	Y	Y
15	Rest stops need to cater for passengers	All	Y	Y	Y
16	Increase (and make permanent) VMS signs for road users	All	Out of scope		
17	Road users often unaware of climate conditions / variability of Desert Road (this was related to pre information and live information to drivers)	Desert Road	Out of scope		
18	Information signs for drivers - what is coming up and how far. This is especially required for northbound, but a whole corridor approach is required. Also need to have this set up in a way so people don't have to go on their phone.	All	Out of scope		
19	Advance information for drivers on what places have is needed.	All	Out of scope		
20	Can we also change / improve the message system (this was related to the information we are currently able to put on a sign - restricted symbols etc)	All	Out of scope		
21	Increasing number (frequency) and upgrading (truck facilities and rest stops	High Speed rural (or **Urban** if necessary). Spacings (incl which side of road it is located) to be considered for *'Taupō to Turangi'*, and *'Turangi to Waiouru'* legs of corridor.	Y	Y?	
22	Upgrading to mandatory	High Speed rural, **Urban**, and where appropriate and possible within Constrained rural - upgrade level site specific.		Y	Y
23	Upgrading to desirable		Y		
24	Increasing signage	*All - whole route*	Y	Y	Y
25	Closing	Constrained rural, or where ever else mandatory upgrade not possible	Y	Y	Y

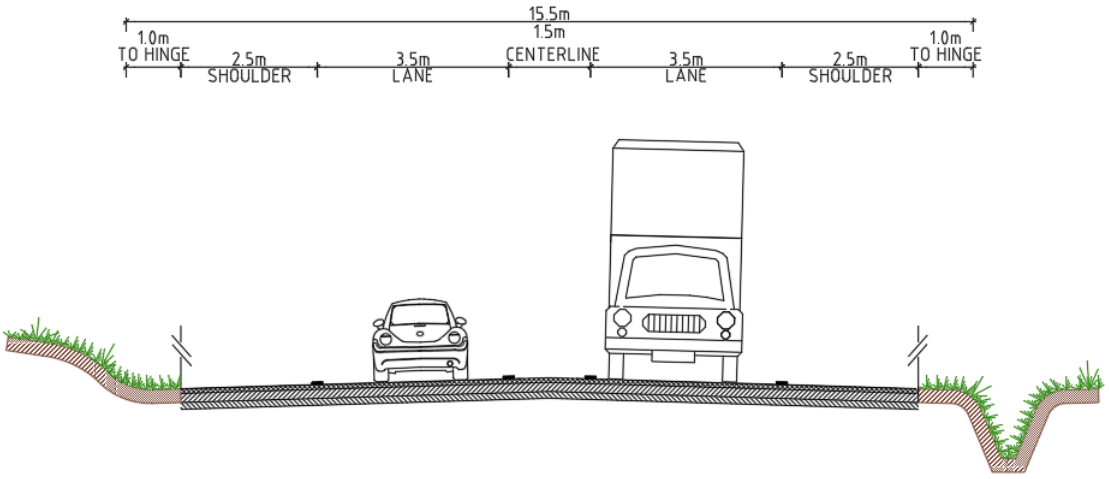
26	Truck facilities	**Urban** (or High Speed rural if appropriate/required - such as between Turangi and Waiouru)	Y	Y	Y
27	Additional passing facilities as indicated in the passing lane opportunity assessment.	Rural	Y	N	N
28	Targeted provision of additional slow vehicle bays / passing lanes (concentrating on sections with the largest spacing between facilities), and previously designed . Extension of existing passing facilities where possible.	Rural	Y	Y	N
29	Extend existing passing lanes where possible, and targeted improved shoulder widening (>2.5m) in traffic volume areas (South of Turangi), and associated signage, to allow for safe stopping for tourists and for slower vehicles to allow faster moving traffic to pass?	Rural	Y	Y	Y

Single-Outcome Section Options Measures

Rural Safety High

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment 3.5m lanes 2.5m shoulders Wide centreline (typically 1.5m) Forgiving or protected road side environment Upgraded structures to maintain geometry or width requirement Geometry Localised realignment and corner easing All high speed out of context curves removed Intersections All at grade intersection upgrades considered Speed Management Guide alignment; tending towards 'Engineer Up'	Improved delineation Additional warning signage High friction surfacing Visibility improvements Localised carriageway widening for tracking requirements Clip-on structures considered where pedestrian need dictates Shape corrections Median barrier where appropriate / required.	Safety Issues Reduced side friction leads to higher speeds limit local access or reduce intersection sight distance to road side barriers, probable additional widening through winding sections Other Issues Road side barriers worsen issues with drifting snow Road side barriers hamper snow ploughing operations	Safety Benefits Future proofed Improved Safety – road side barriers target greatest DSI crash type Improved Safety – wide centreline reduces occurrence of head-on crashes Improves on-road cycle amenity Allows stopped vehicle to be clear of traffic lanes Other Benefits Wide carriageway and shoulders provides added resilience against minor/moderate rock falls More forgiving road environment when road is in flood. Wide carriageway cross section will eliminate issues of two trucks passing

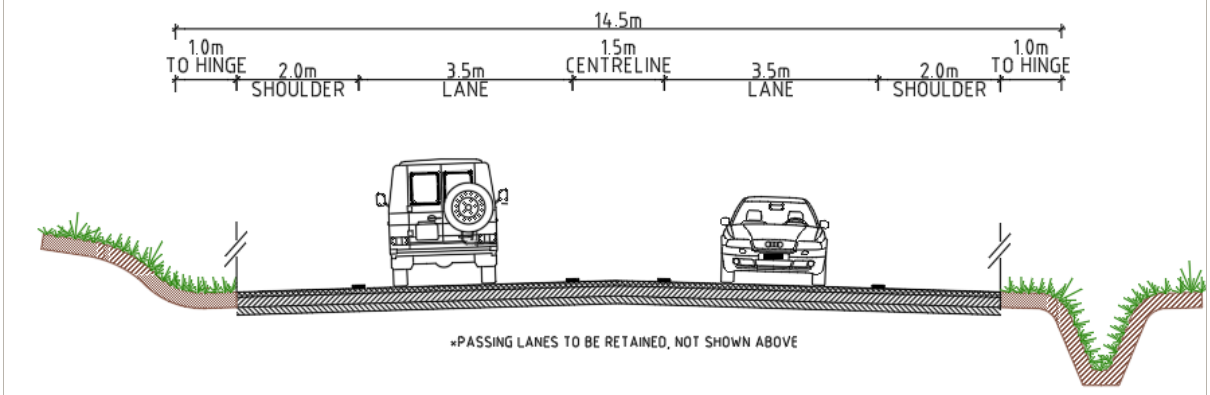
Desirable Cross Section



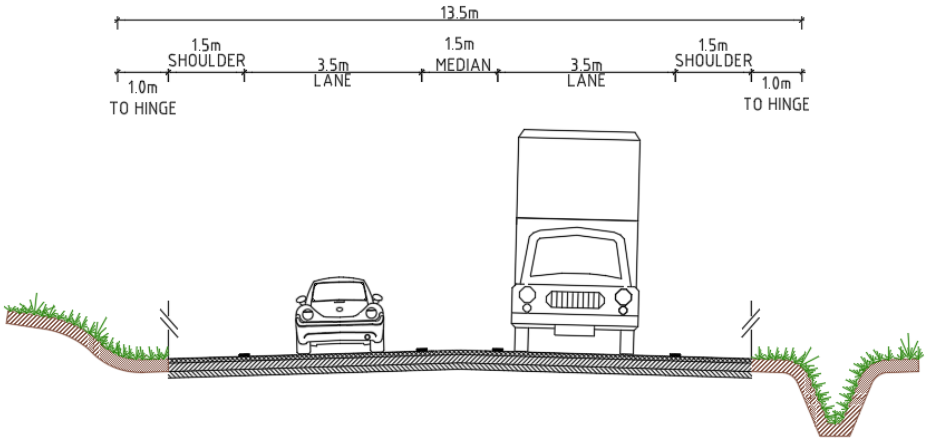
Rural Safety Medium-High

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment excluding pinch points 3.5m lanes 2m shoulders Wide centreline (typically 1.5m) Forgiving or protected road side environment Upgraded structures to maintain geometry or width requirement Geometry Localised realignment and corner easing All high speed out of context curves removed Intersections All at grade intersection upgrades considered Speed Management Guide Alignment; tending towards 'Engineer Up – Challenging Conversations'	Improved delineation Additional warning signage High friction surfacing Visibility improvements Localised carriageway widening for tracking requirements Clip-on structures considered where pedestrian need dictates Shape corrections	Safety Issues Reduced side friction leads to higher speeds limit local access or reduce intersection sight distance to road side barriers, probable additional widening through winding sections Shoulder width only provides absolute minimum clearance to cyclist envelope for 100kph road Stationary vehicles are likely to be partially in live lane Other Issues	Safety Benifits Future proofed Improved Safety – road side barriers target greatest DSI crash type Improved Safety – wide centreline reduces occurrence of head-on crashes Improves on-road cycle amenity Allows stopped vehicle to be clear of traffic lanes Other Benefits Wide carriageway and shoulders provides added resilience agaist minor/moderate rock falls More forgiving road environment when road is in flood. Wide carriageway cross section will eliminate issues of two trucks passing

Desirable Cross Section



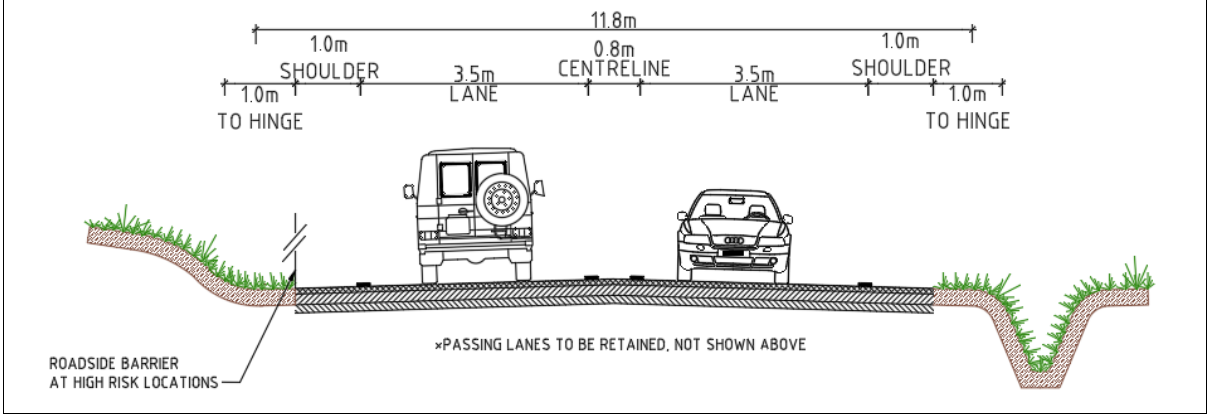
Rural Safety Medium

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment Cross Section 3.5m lanes 1.5m shoulders Wide flush median (typically 1.5m) Slight restrictions accepted at structures and confined locations Forgiving or protected road side environment Geometry Geometry suitable for the environment if accommodated without major realignment All high speed out of context curves removed or improved Intersections Improvements to existing intersection form considered where safety or capacity concerns have been identified Speed Management Guide Alignment; tending towards 'Challenging Conversations'	Improved delineation Additional warning signage High friction surfacing Visibility improvements Road site hazard removal Localised carriageway widening for tracking requirements Speed management Clip-on structures considered where pedestrian need dictates Shape corrections	Safety Issues Narrower shoulders and edge barrier make road less safe for cyclists (when compared to High Intervention) Vehicles tracking into the shoulder are more at risk at striking barrier limit local access or reduce intersection sight distance Stopped vehicle are required to encroach into trafficked lanes. Especially in areas with road side barriers Less emphasis on re-aligning out of context sections Other Issues Road side barriers worsen issues with drifting snow Road side barriers hamper snow ploughing opperations	Improved Safety – road side barriers target greatest DSI crash type Improves on-road cycle amenity compared to much of the existing corridor Other Benefits Wide carriageway and shoulders provides addeded resilience agaist minor/moderate rock falls More forgiving road environment when road is in flood Wide carriageway cross section will eliminate issues of two trucks passing Lower cost on sections that required new bridges/ extensive realignment
Desirable Cross Section – update 			

Rural Safety Medium-Low

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor treatment excluding pinch points and within existing road reserve Cross Section 3.5m lanes 1.0m shoulders (or existing if greater) Narrower wide centreline median (typically 0.8m) Existing structure to remain. Clip-on structures considered where pedestrian need dictates Removal of certain road side hazards or barrier protected at high risk locations Signage VMS at pinch points Geometry High speed out of context curves improved or removed within road reserve Shape corrections Intersections Vegetation/ obstruction clearance to aid sight distances Speed Management Guide Alignment; tending towards 'Challenging Conversations to Self-explaining'	Improved delineation Additional warning signage High friction surfacing Visibility improvements Road side hazard removal Localised carriageway widening for tracking requirements	Safety Issues Shoulder width is absolute minimum and below the standard required for National Highway Unsafe for shared use of cyclists and motorised users. Vehicles tracking into the shoulder are more at risk at striking barrier limit local access or reduce intersection sight distance Stopped vehicle are required to encroach into trafficked lanes. Especially in areas with road side barriers. Very limited sections that will be Other Issues Road side barriers worsen issues with drifting snow Road side barriers hamper snow ploughing opperations	Safety Benefits Improved Safety – road side barriers at high risk locations target greatest DSI crash type Improved Safety – wide centreline reduces occurrence of head-on crashes Other Benefits More forgiving road environment when road is in flood. Wider carriageway cross section will eliminate issues of two trucks passing

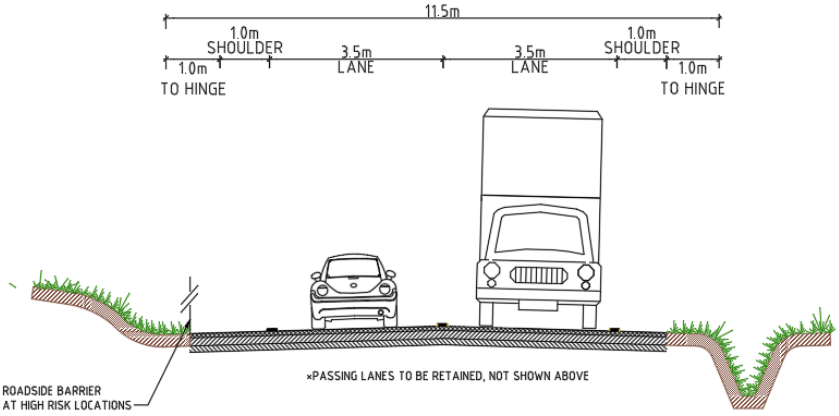
Desirable Cross Section – update



Rural Safety Low

Treatment Characteristics			
Defining features	Additional features	Generic Risks	Generic Benefits
Corridor treatment excluding pinch points and within existing road reserve Cross Section 3.5m lanes 1.0m shoulders (or as existing if greater) Existing structure to remain. Clip-on structures considered where pedestrian need dictates Removal of certain road side hazards or barrier protected at high risk locations Signage VMS at pinch points Geometry Shape corrections Intersections Vegetation/ obstruction clearance to aid sight distances Speed Management Guide Alignment; tending towards 'Self-explaining'	Improved delineation Additional warning signage High friction surfacing Visibility improvements Road side hazard removal Localised carriageway widening for tracking requirements	Safety Issues Shoulder width is absolute minimum and below the standard required for National Highway Unsafe for shared use of cyclists and motorised users Vehicles tracking into the shoulder are more at risk at striking barrier limit local access or reduce intersection sight distance Stopped vehicle are required to encroach into trafficked lanes. Especially in areas with road side barriers Only short sections will be improved beyond existing cross section Sliver widening of carriageway is difficult to construct efficiently Increased nuisance crashes as barrier close to road edge Other Issues Road side barriers worsen issues with drifting snow Road side barriers hamper snow ploughing opperations Intervention level so low that on unconstrained sections it will be seen as too little to address issues.	More easily achievable through constrained sites Safety improvement - Targeted barrier treatment will be focused on high risk areas

Desirable Cross Section – update



Urban Safety High

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment 3.5m lanes Narrow shoulders where parking prohibited 2.5m shoulder where parking allowed Wide flush median (typically 2.0m plus) Separated or defined cycle/shared facilities Ped crossing locations, including build-outs and refuges Ped underpass considered Improved lighting including higher class and less light polluting LEDs Increased side friction Speed / town thresholds Bus bays if demand exists Formed paths for all desire lines Dedicated turning facilities for right turning traffic into tourist/recreation areas Separated/protected bridge crossings suitable for shared use All at grade intersections improvements considered	Improved delineation Additional warning/information signage High friction surfacing Visibility improvements	Increased speed management may be unpopular with certain stakeholders Does not fully address conflicting interests in urban areas (requires offline bypass) Pedestrian underpasses not appropriate in all locations Additional foot/shared paths may create new crossing locations. May require land purchase for certain intersection treatments, increasing conflict points	Improved safety from lower speeds, additional separation between users and improved turning facilities Improves on-road cycle amenity Separated shared use paths will aid safety for none motorised users Other Benefits Reduced or improved conflict points will reduce interaction between local and SH users. Separated shared use facility will promote sustainable transport for local trips

Urban Safety Medium

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment 3.5m lanes Narrow shoulders where parking prohibited Wider shoulders considered where parking allowed – without land take Wide flush median (typically 2.0m plus) Separated or defined cycle/shared facilities Ped crossing locations, including build-outs and refuges Improved lighting including higher class and less light polluting LEDs Increased side friction Speed / town thresholds Bus bays if demand exists Formed paths for all desire lines Improved entry exits into tourist/recreation areas to achieve minimum standards Separated/protected bridge crossings suitable for shared use Intersections upgraded to meet minimum standards	Improved delineation Additional warning/information signage High friction surfacing Visibility improvements	Increased speed management may be unpopular with certain stakeholders Does not fully address conflicting interests in urban areas All pedestrian crossing facilities will continue to be at-grade Additional foot/shared paths may create new crossing locations. May require land purchase for certain intersection treatments, increasing conflict points Minimum standards for entry/exit into tourist/recreation areas may not provide uninterrupted SH1 traffic flow through urban areas	Improved safety from lower speeds, additional separation between users and improved turning facilities Improves on-road cycle amenity Other Benefits Reduced or improved conflict points will reduce interaction between local and SH users. Separated shared use facility will promote sustainable transport for local trips

Urban Safety Low

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Corridor Treatment 3.5m lanes Generally existing shoulder widths retained. Wider shoulders considered where parking allowed – without land take Wide flush median (typically 2.0m plus) Pedestrian crossing locations, including build-outs and refuges Improved lighting at intersections and pedestrian crossing locations Increased side friction from line markings/soft measures Speed / town thresholds Improved/widened paths Improved entry exits into tourist/recreation areas to minimum standards only	Improved delineation Additional warning/information signage High friction surfacing Visibility improvements	Increased speed management may be unpopular with certain stakeholders Does not fully address conflicting interests in urban areas All pedestrian crossing facilities will continue to be at-grade Limited new infrastructure for pedestrians/shared path users Minimum standards for entry/exit into tourist/recreation areas may not provide uninterrupted SH1 traffic flow through urban areas Intervention level likely to be below public expectation	Improved safety from lower speeds, additional separation between users and improved turning facilities Improves on-road cycle amenity Unlikely to involve any land purchase Other Benefits Reduced or improved conflict points will reduce interaction between local and SH users. Separated shared use facility will promote sustainable transport for local trips

Resilience High

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Section 3 Hatepe to Motutere Offline realignment to avoid problem area Online Treattments Underslip – realignment to move road from lake shoreline in at risk area – short tunnels to straighten up alignment Rockfalls – realignment to provide separation between cut slope and carriageway and extensive rock slope re-engineering Section 9 Motuoapa to Turangi Flooding – elevated roadway and bridges or adjoined box culvert structures Section 11 Turangi to three sisters realignment to provide separation between cut slope and carriageway and extensive slope re-engineering Section 14 Desert Road Curves realignment to provide separation between cut slope and carriageway and extensive slope re-engineering Section 15 Desert Road Intensive response - Heated pavements (geothermal solar), piezo heat stored pavements. Wind turbine with energy transfer to heat road surface,		High cost	Significant improvement for route availability

Resilience Medium

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Section 3 Hatepe to Motutere Localised realignment Slope stabilisation and armouring of lake side Section 9 Motuoapa to Turangi Flooding – bound pavements in area of inundation. Upsizing culverts/small structures Section 11 Turangi to three sisters Snow fences Localised realignment Slope stabilisation or catch fence Section 14 Desert Road Curves Localised realignments Slope stabilisation or catch fence Section 15 Desert Road Snow fences Geometric improvements to cause drifting snow to dump away from carriageway	VMS at decision points Monitoring devices linked to VMS/control centre	High cost	Significant improvement for route availability

Resilience Low

Treatment Characteristics			
Defining features	Additional features	Generic Issues	Generic Benefits
Section 3 Hatepe to Motutere Armouring lake side Section 9 Motuoapa to Turangi VMS at decision points Monitoring devices linked to VMS/control centre Section 11 Turangi to three sisters Wire netting/catch fence of existing cut faces Surfacing improvement/innovation – metal slag etc VMS at decision points Monitoring devices linked to VMS/control centre Section 14 Desert Road Curves Wire netting/catch fence of existing cut faces Surfacing improvement/innovation – metal slag etc VMS at decision points Monitoring devices linked to VMS/control centre Section 15 Desert Road Surfacing improvement/innovation – metal slag etc VMS at decision points Monitoring devices linked to VMS/control centre	HPMV improvements on alternative routes (copy to all intervention levels)	Any long term underlyinjg will remain	Low intervention levels match the short term requirements providing the PBCs long term interventions are adopted.

Road User Experience High

Treatment Characteristics				
	Southbound	Northbound	Generic Issues	Generic Benefits
Upgrade existing facilities where required and provide new provisions in line with stakeholders (show in red). Truck Additional effluent disposal as required Additional truck stops as per stakeholder requests? Additional passing facilities as indicated in the passing lane opportunity assessment.	Section 1 Southbound Section 2 Section 3 DOC site with poorly formed access Section 4 Section 5 Section 6 Gravel storage – occasional carpark Section 7 Section 8 Section 9 Section 10 Facilities within town Section 11 southbound passing opportunity Section 12 Rest area – photo opportunity Section 13 Section 14 Section 15 Facilities within Waiouru Southbound passing opportunity of exit from desert road curves	Section 1 Rest stop – Flush median to provide separation for right turn vehicles. Section 2 Rest stop – pedestrian connectivity improvements provided under urban safety Crossing for fishers heading up the estuary Clip on or pedestrian bridge between lakeside car parks Section 3 Upgarde access/exit for DOC carpark between Hatepe and Bulli Point Bulli Point – parking at end of camp site and overflow carpark at gravel pit. Including underpass for crossing road to DT's proposed walkway. Section 4 Section 5 Rest stop – Flush median to provide separation for right turn vehicles. Used by trucks – upgrade or provide a separate facility Section 6 Rest stop by lake Section 7 Section 8 Section 9 northbound passing opportunity Section 10 Two road side rest stops – advanced signage Section 11 National Trout Centre – access improvements inc flush median Section 12 Rest area – mainly parking Significant works including possible relocation Section 13 Section 14 Section 15	Low intervention level is below stakeholder expectations	\Good level of service for improvements to passing opportunities Safety and amity improvements at rest stop entry/exits Additional RUFs in line with stakeholder feedback

		Viewing place – space for 5 domestic vehicles		

Road User Experience Medium

Treatment Characteristics				
	Southbound	Northbound	Generic Issues	Generic Benefits
Upgrade existing facilities in line with minimum standards and safety assessment only. Improve capacity, facilities, CPTED etc where required. Capacity based on 10th worst day Targeted provision of additional slow vehicle bays / passing lanes (concentrating on sections with the largest spacing between facilities), and previously designed . Extension of existing passing facilities where possible.	Section 1 Section 2 Section 3 DOC site with poorly formed access Section 4 Section 5 Section 6 Gravel storage – occasional carpark Section 7 Section 8 Section 9 Section 10 Facilities within town Section 11 southbound passing opportunity Section 12 Section 13 Section 14 Section 15 Facilities within Waiouru Southbound passing opportunity of exit from desert road curves	Section 1 Rest stop – Flush median to provide separation for right turn vehicles. Section 2 Rest stop – pedestrian connectivity improvements provided under urban safety – picnic facility/ seating etc Section 3 Section 4 Section 5 Rest stop – Flush median to provide separation for right turn vehicles. Section 6 Rest stop by lake Section 7 Section 8 Section 9 northbound passing opportunity Section 10 Two road side rest stops – advanced signage Section 11 National Trout Centre – access improvements inc flush median Northbound passing opportunity on exit from three sisters Section 12 Rest area – mainly parking Section 13 Section 14 Section 15 Viewing place – space for 5 domestic vehicles	Low intervention level is below stakeholder expectations	No land purchase required Some improvements to passing opportunities Safety improvements at rest stop entry/exits

Road User Experience Low

Treatment Characteristics				
	Southbound	Northbound	Generic Issues	Generic Benefits
Upgrade existing facilities in line with minimum standards and safety assessment only. Works mainly limited to within existing road reserve or NZTA maintained asset. Extend existing passing lanes where possible, and targeted improved shoulder widening (>2.5m) in traffic volume areas (South of Turangi), and associated signage, to allow for safe stopping for tourists and for slower vehicles to allow faster moving traffic to pass?	Section 1 Section 2 Section 3 DOC site with poorly formed access Section 4 Section 5 Section 6 Gravel storage – occasional carpark Section 7 Section 8 Section 9 Section 10 Facilities within town Section 11 Section 12 Section 13 Section 14 Section 15 Facilities within Waiouru	Section 1 Rest stop – Flush median to provide separation for right turn vehicles. Section 2 Rest stop – pedestrian connectivity improvements provided under urban safety Section 3 Section 4 Section 5 Rest stop – Flush median to provide separation for right turn vehicles. Section 6 Rest stop by lake Section 7 Section 8 Section 9 Section 10 Two road side rest stops – advanced signage Section 11 National Trout Centre – access improvements inc flush median Section 12 Rest area – mainly parking Section 13 Section 14 Section 15 Viewing place – space for 5 domestic vehicles	Low intervention level is below stakeholder expectations leading to ambivalent feelings towards proposals.	No land purchase required Some improvements to passing opportunities Safety improvements at rest stop entry/exits

Single-Outcome Section Options by Option

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Rural Safety High																
Section 1 Wharewaka to Waitahanui					Safety Issues • Likely to be sections of geometric improvements required Other Issues	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	2	0	0			3	3	2	2	12
Section 2 Waitahanui					Wider carriageway and (likely) faster speeds will expose pedestrians to more risk when crossing the road.[could be slight negative for safety score] May need lower speed limit or enforcement of existing speed limit through township	Wide median/flush median will aid right turning traffic	0	0	-1			1	1	-1	2	2

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 3 Hatepe to Motutere					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline do due to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	3	2	2	3	-1	-3	-2	-2	-3	-1
Section 4 Motutere					• Right turn bays and existing flush median already in place • Pedestrian and none motorised user demand on both sides of the road would not be aided by wider carriageway to cross	• Side barriers would provide protected separation between SH1 and the campsites. • Urban section likely to be close to 3 star already	2	0	-1			0	0	-1	2	2

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo					Safety Issues Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road limits the options for widening	• Wide centreline/ flush median could be used to aid right turns into lake side service roads Horizontal and vertical geometry is generally already compliant	1	0	2		2	-1	-1	0	1	4
Section 6 Tauranga Taupo					• Requires bridge realignment	• Eliminates the issue of two trucks passing at ******** bridge. • Road cycling demand more safely accommodated	2	0	2	3		-1	0	0		6
Section 7 Tauranga Taupo to Motuoapa					• As per generics	• As per generics	1	2	0			0	0	-1		2

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa					• Flush median already in place for much of the length • Fuel tank and associated contamination likely to require removal		2	0	-1			-1	-1	-1	0	-2
Section 9 Motuoapa to Turangi					• Flood prone area with swampy ground conditions expected • Bridge requires widening	• Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. • Geometry relatively flat and straight • Road cycling demand more safely accommodated	3	1	0			-1	-1		0	2
Section 10 Turangi					• Likely new bridge required over Tongiriro River	• Provides scope to provide roundabout at intersection with Pihanga Road	2	2	0			0	-1	-1	-2	0

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters							2	0	0			-2	-1	-1	1	-1
Section 12 Three Sisters					Not possible to achieve without significant lengths of realignment, out of scope.	• Improved resilience to plan and unplanned events, including snow and ice. • Improved safety • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Safer for none motorised users, such as cyclists • Provides improvements in line with three of the investment objectives	2	2	0	2		0	0	0	-2	4
Section 13 Three Sisters to Desert Road Curves					• Will produce a heavily out of context section, being located between two constrained sections of alignment. • Widening into National Park land • May promote unsafe overtaking due to driver frustration through slow sections	• Opportunity to provide passing lanes • Imprroved safety	2	1	0			0	0	1	1	5

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Not possible to achieve without significant lengths of realignment, out of scope.	• Improved resilience to plan and unplanned events, including snow and ice. • Improved safety • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Safer for none motorised users, such as cyclists • Provides improvements in line with three of the investment objectives	2	2	0	2		-2	-1	-1	-2	0
Section 15 Desert Road curves to Waiouru					• Widening into National Park • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	• Part already 4 star • More forgiving road environment and low traffic volumes make 4 start relatively easy to achieve	1	1	0			1	-1	0	1	3
Rural Safety Medium-High																
Section 1 Wharewaka to Waitahanui					Safety Issues Other Issues • Likely to be sections of geometric improvements required	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	1	0	0			3	3	2	2	11

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Urban Section – Not Applicable											
Section 3 Hatepe to Motutere					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline do to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	1	2	2	3	-1	-3	-2	-2	-3	-3

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 4 Motutere					Urban Section – Not Applicable											
Section 5 Motutere to Tauranga Taupo					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) • Existing bridge assumed as pinch point, as such will form local narrowing of carriageway Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening	Safety Benefits • Wide centreline/ flush median will aid right turns into lake side service roads Other Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side	1	0	1		2	0	-1	0	2	5
Section 6 Tauranga Taupo					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 7 Tauranga Taupo to Motuoapa					• As per generics	• As per generics	1	0	0			0	0	0		1
Section 8 Motuoapa					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal										0	0
Section 9 Motuoapa to Turangi					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected • Bridge requires widening	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	1	1	0			-1	-1		0	0

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 10 Turangi					Urban Section – Not Applicable										-2	-2
Section 11 Turangi to three sisters					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Encroaching into Tongariro National Park for some of the length	Safety Benefits • Remove out of context curves • Widens existing narrow shoulders that are narrower than average for section • Wide shoulders allow stricken vehicle to wait mostly clear of live carriageway, see Other Benefits. Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest clear of lanes, improving route availability for response vehicles.	1	0	0			-2	-1	-1	1	-2
Section 12 Three Sisters					Other Issues • Not possible to achieve without significant lengths of realignment, out of scope • . Encroaching into Tongariro National Park for realignment and widening	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	2	0	2		-2	-2	2	-2	1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 13 Three Sisters to Desert Road Curves					Safety Issues • Will produce an out of context section, being located between two constrained sections of alignment.(assuming TS and DRC remain out of scope. This could lead to higher speeds entering the adjoining curvilinear alignments • May promote unsafe overtaking due to driver frustration through slow sections Other Issues • Encroaching into Tongariro National Park for realignment and widening	Safety Benefits Other Benefits • Opportunity to provide passing lanes • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	-1	2	0			0	-1	-1	1	0
Section 14 Desert Road Curves					Other Issues • Not possible to achieve without significant lengths of realignment, out of scope • .Encroaching into Tongariro National Park for realignment and widening • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	2	0	2		-2	-2	1	-2	0
Section 15 Desert Road curves to Waiouru					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benifits • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	1	0			1	1	-1	1	4
Rural Safety Medium																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 1 Wharewaka to Waitahanui					Safety Issues Other Issues • Likely to be sections of geometric improvements required	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	1	0	0	0		3	3	3	3	13
Section 2 Waitahanui					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 3 Hatepe to Motutere					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline do to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	1	2	2	3	-1	-3	-2	-2	-3	-3
Section 4 Motutere					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) • Existing bridge assumed as pinch point, as such will form local narrowing of carriageway Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening	Safety Benefits • Wide centreline/ flush median will aid right turns into lake side service roads Other Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side	1	0	1		2	0	-1	0	1	4
Section 6 Tauranga Taupo					Urban Section – Not Applicable											
Section 7 Tauranga Taupo to Motuoapa					• As per generics	• As per generics	1	0	0			0	0	0		1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal										0	0
Section 9 Motuoapa to Turangi					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected • Bridge requires widening	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	1	1	0			-1	-1		0	0
Section 10 Turangi					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Encroaching into Tongariro National Park for some of the length	Safety Benefits • Remove out of context curves • Widens existing narrow shoulders that are narrower than average for section • Wide shoulders allow stricken vehicle to wait mostly clear of live carriageway, see Other Benefits. Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest clear of lanes, improving route availability for response vehicles.	1	0	0			-2	-1	-1	1	-2
Section 12 Three Sisters					Other Issues • Some encroaching into Tongariro National Park for realignment and widening • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles. • Intervention level does not require the extensive re-alignment of High and Med-high	0	1	0	2		-2	-1	1	-1	0
Section 13 Three Sisters to Desert Road Curves					Safety Issues • Will produce an out of context section, being located between two constrained sections of alignment.(assuming TS and DRC remain out of scope. This could lead to higher speeds entering the adjoining curvilinear alignments • May promote unsafe overtaking due to driver frustration through slow sections Other Issues • Encroaching into Tongariro National Park for realignment and widening	Safety Benefits Other Benefits • Opportunity to provide passing lanes • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	-1	2	0			0	-1	-1	1	0

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Other Issues • Some encroaching into Tongariro National Park for realignment and widening • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles. • Intervention level does not require the extensive re-alignment of High and Med-high	1	1	0	2		-1	-1	1	-1	2
Section 15 Desert Road curves to Waiouru					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benifits • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	1	0			1	1	1	-1	4
Rural Safety Medium-Low																
Section 1 Wharewaka to Waitahanui					Safety Issues Combination of narrow shoulders and Other Issues • Reduction in existing shoulder width • Higher volume section, reduced shoulder width is not the intent of ONRC or design standards	Safety Benefits • Targeted road side hazard protection helps reduce main crash type Other Benefits • Mostly wide corridor with compliant geometry allows for easy implementation • Minimal additional width to existing, could partially be accommodated with re-allocation of space (re-marking)	1	0	0			3	3	3	3	13

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Urban Section – Not Applicable											
Section 3 Hatepe to Motutere					Safety Issues • Challenging alignment will remain mostly unchanged with only very limited corner easing in the less topographically constrained sites • Little to no additional width for cyclist/pedestrians or stopped vehicles Other Issues • Very limited improvement to resilience issues with corridor remaining constrained • Two trucks passing issue likely to be unchanged.	Safety Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use Other Benefits • Minimal corner easing, localised carriageway widening could benefit the competing interests of pedestrians trying to access Bulli Point etc • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	-2	-2	-1	1	1	-1	-3	-1	-7
Section 4 Motutere					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) • Existing bridge assumed as pinch point, as such will form local narrowing of carriageway Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening	Safety Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side • Clip on bridge considered for pedestrian/shared use Other Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	0	1		2	0	-1	0	2	5
Section 6 Tauranga Taupo					Urban Section – Not Applicable											
Section 7 Tauranga Taupo to Motuoapa					• As per generics	• As per generics	1	0	0			0	0	0		1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal										0	0
Section 9 Motuoapa to Turangi					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected • Bridge requires widening	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	1	1	0			-1	-1		1	1
Section 10 Turangi					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Remove or improve out of context curves • . Other Benefits	1	0	0			-2	-1	-1	1	-2
Section 12 Three Sisters					Safety Issues • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions • Targeted safety barrier may only be feasible with carriageway widening, to account for tracking. Other Issues • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits • Intervention level does not require the extensive re-alignment	0	-1	0	2		-2	-1	1	-1	-2
Section 13 Three Sisters to Desert Road Curves					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits	1	-1	0			0	-1	-1	1	-1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benefits • Wide median provides improvement for head-on crash type Other Benefits • Intervention level does not require the extensive re-alignment	0	-1	0	2		-2	-1	1	-1	-2
Section 15 Desert Road curves to Waiouru					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benefits	0	-1	0			1	1	-1	1	1
Rural Safety Low																
Section 1 Wharewaka to Waitahanui					Safety Issues • Barriers close to shoulder will push vehicles closer to the centreline Other Issues • Existing shoulder widths are likely to be unchanged • Higher volume section, reduced shoulder width is not the intent of ONRC or design standards	Safety Benefits • Targeted road side hazard protection helps reduce main crash type Other Benefits • Mostly wide corridor with compliant geometry allows for easy implementation • Minimal additional width to existing, could partially be accommodated with re-allocation of space (re-marking)	0	0	0			3	3	0	3	9

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Urban Section – Not Applicable											
Section 3 Hatepe to Motutere					Safety Issues • Challenging alignment will remain mostly unchanged with only very limited corner easing in the less topographically constrained sites • Little to no additional width for cyclist/pedestrians or stopped vehicles Other Issues • Very limited improvement to resilience issues with corridor remaining constrained • Two trucks passing issue likely to be unchanged.	Safety Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use Other Benefits • Minimal corner easing, localised carriageway widening could benefit the competing interests of pedestrians trying to access Bulli Point etc • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	-2	-2	-1	-1	2	2	-3	1	-3
Section 4 Motutere					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo					Safety Issues • No real improvement on current situation • No improvement for right turning vehicles (multiple intersections/access ways over length) Other Issues	Safety Benefits • Horizontal and vertical geometry is generally already compliant • Clip on bridge considered for pedestrian/shared use Other Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	-1	0	1		2	3	3	-2	2	8
Section 6 Tauranga Taupo					Urban Section – Not Applicable											
Section 7 Tauranga Taupo to Motuoapa					• As per generics	Safety Benefits • Little to no benefit from existing	-1	0	0		2	3	3	-2	2	7

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa					Urban Section – Not Applicable											
Section 9 Motuoapa to Turangi					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected	Safety Benefits • Targeted barrier improvements and VMS only likely safety improvements Other Benefits • Geometry relatively flat and straight so would require minimal realignment • No formation widening necessary	0	0	0			2	2	-1	2	5
Section 10 Turangi					Urban Section – Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters					Safety Issues • Only benefit is from road side barriers (see below) Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations difficult	Safety Benefits Other Benefits	-1	0	0			2	2	-1	2	4
Section 12 Three Sisters					Safety Issues • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions • Targeted safety barrier may only be feasible with carriageway widening, to account for tracking. Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits • Intervention level does not require the extensive re-alignment	0	-1	0	-1		2	2	2	2	6
Section 13 Three Sisters to Desert Road Curves					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits	1	-1	0			0	-1	-1	1	-1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benefits • Wide median provides improvement for head-on crash type Other Benefits • Intervention level does not require the extensive re-alignment	0	-1	0	-1		2	2	2	2	6
Section 15 Desert Road curves to Waiouru					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benefits	0	-1	0			1	1	-1	1	1
Urban Safety High																
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2		2		1	2	2	2	1	12
Section 3 Hatepe to Motutere					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 4 Motutere					Safety Issues Other Issues	Safety Benefit • Crossing demand exists between lake side and campsite on opposing side of road. Pedestrian improvements including new paths and crossing facilities • Road side barrier to separate campsite from SH1 traffic • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2				1	2	2	2	1	10
Section 5 Motutere to Tauranga Taupo					Rural – Option Theme Not Applicable	Safety Benefits • Improved accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge Other Benefits • New bridge removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians										

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 6 Tauranga Taupo					Other Issues • In part road corridor constrained by lake on one side and parallel local road on the other side (Rawhira Road) • Bridge replacement expensive and will require land purchase for realignment, possible consenting issues		2		2	3		-1	-1	2	-2	5
Section 7 Tauranga Taupo to Motuoapa					• Rural – Option Theme Not Applicable											
Section 8 Motuoapa					Safety Issues Other Issues • Fuel tank and associated contamination likely to require removal, more complex consenting issues	Safety Benefits • New pedestrian/shared facilities through town between known trip generators • Improved lighting at intersections and ped crossings • Introduce flush median to aid turning into private accesses. Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues • Intervention level allows for potential pedestrian underpass aligns with TDC's proposed Bulli Point footpath plans	2		3	1	-1	3	-1	7

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 9 Motuoapa to Turangi					• Rural – Option Theme Not Applicable											
Section 10 Turangi					Other Issues • Bridge replacement expensive and will require land purchase for realignment, possible consenting issues	Safety Benefits • Provides scope to provide roundabout at intersection with Pihanga Road that will make right turns out of the town safer. • Widening/replacing of existing bridge would make it safer for two wide vehicles passing • Introduce flush median to aid turning into private accesses. Other Benefits • Improved town threshold if intersection form changes • Improved access into rest areas • New bridge or clip-on provides opportunity to improved shared/pedestrian facilities	2		2	1		1	-1	2	-2	5
Section 11 Turangi to three sisters					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 12 Three Sisters					Rural – Option Theme Not Applicable											
Section 13 Three Sisters to Desert Road Curves					Rural – Option Theme Not Applicable											
Section 14 Desert Road Curves					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 15 Desert Road curves to Waiouru					Rural – Option Theme Not Applicable											
Urban Safety Medium																
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2		2		1	2	2	2	1	12
Section 3 Hatepe to Motutere					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 4 Motutere					Safety Issues Other Issues	Safety Benefit • Crossing demand exists between lake side and campsite on opposing side of road. Pedestrian improvements including new paths and crossing facilities • Road side barrier to separate campsite from SH1 traffic • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2				1	2	2	2	1	10
Section 5 Motutere to Tauranga Taupo					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 6 Tauranga Taupo					Other Issues • In part road corridor constrained by lake on one side and parallel local road on the other side (Rawhira Road) • Bridge replacement not considered part of intervention level	Safety Benefits • Improved accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge via clip on or new separate pedestrian bridge. Other Benefits	1		2	-1		-1	0	2	-1	2
Section 7 Tauranga Taupo to Motuoapa					Rural – Option Theme Not Applicable											
Section 8 Motuoapa					Safety Issues Other Issues • Fuel tank and associated contamination likely to require removal, more complex consenting issues	Safety Benefits • New pedestrian/shared facilities through town between known trip generators • Improved lighting at intersections and ped crossings • Introduce flush median to aid turning into private accesses. Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues	2		2	1	-1	2	1	2	1	7

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 9 Motuoapa to Turangi					• Rural – Option Theme Not Applicable											
Section 10 Turangi					Other Issues • Changes are minimal and likely not in line with community expectation	Safety Benefits • Introduce flush median to aid turning into private accesses. Other Benefits • Improved access into rest areas • Clip-on provides opportunity to improved shared/pedestrian facilities across existing structure	0		0			2	2	-1	2	5
Section 11 Turangi to three sisters					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 12 Three Sisters					Rural – Option Theme Not Applicable											
Section 13 Three Sisters to Desert Road Curves					Rural – Option Theme Not Applicable											
Section 14 Desert Road Curves					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 15 Desert Road curves to Waiouru					Rural – Option Theme Not Applicable											
Urban Safety Low																
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions (less wide spread than higher intervention levels) • Existing road reserve wide enough to accommodate changes without land purchase	2		1		0	2	2	-1	2	8
Section 3 Hatepe to Motutere					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 4 Motutere					Safety Issues • Intervention level doesn't allow for new pedestrian facilities • Intervention level doesn't allow for new road side barrier Other Issues	Safety Benefit • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Existing road reserve wide enough to accommodate changes without land purchase	0				0	2	2	-1	3	6
Section 5 Motutere to Tauranga Taupo					Rural – Option Theme Not Applicable											
Section 6 Tauranga Taupo					Other Issues • Bridge replacement not considered part of intervention level	Safety Benefits • Some minor Improveds to accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge via clip on or new separate pedestrian bridge. Other Benefits • Road widening not required, lowering cost	0		2	-1		-1	2	-1	3	4

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 7 Tauranga Taupo to Motuoapa					Rural – Option Theme Not Applicable											
Section 8 Motuoapa					Safety Issues • Currently footpath only on one side of the road. • Intervention level may not be enough to provide flush median Other Issues • Land side residential development underway, leading to future interest conflicting interest issues. Not likely to be addressed at this intervention level	Safety Benefits • Upgrade to existing footpath • Improved lighting at intersections and ped crossings Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues	0				0	2	2	-1	3	6
Section 9 Motuoapa to Turangi					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 10 Turangi					Safety Issue • Most interventions within this level have already been applied (or better) Other Issues • No shared/footpath introduced alongside SH1 • Changes are minimal and likely not in line with community expectation • No improvement to existing structures	Safety Benefits Other Benefits	-1		0			2	2	-2	2	3
Section 11 Turangi to three sisters					Rural – Option Theme Not Applicable											
Section 12 Three Sisters					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 13 Three Sisters to Desert Road Curves					Rural – Option Theme Not Applicable											
Section 14 Desert Road Curves					Rural – Option Theme Not Applicable											
Section 15 Desert Road curves to Waiouru					Rural – Option Theme Not Applicable											
Resilience High																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											
Section 2 Waitahanui					Offline issues • Challenging topography with multiple bridges required. • Environmental and culturally sensitive land • Out of scope as a short term measure and likely to be a future intervention • High cost Online issues • Online works unlikely to resolve all issues but may be more expensive than offline (including economic dis-benefits of long term route outage during construction. • Difficult construction with increased H&S risks. • Re-engineering rock slopes will be significant work that will impact other parts of the network for cartage to clean fill site.	Offline Benefits • Built offline so disruption to route availability is not persistent over construction duration • Opportunity to build section of high speed rural road, away from local communities and conflicting uses • Take traffic away from environmentally and culturally important lake Taupo • Separated local road and SH networks Online Benefits • Incremental implantation, with targeted action on worse areas • Overall less road assets to maintain	3	3		3	3	-3	-3	3	-3	6

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 3 Hatepe to Motutere																
Section 4 Motutere																
Section 5 Motutere to Tauranga Taupo																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 6 Tauranga Taupo																
Section 7 Tauranga Taupo to Motuoapa																
Section 8 Motuoapa																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 9 Motuoapa to Turangi					Intervention level does not match problem, event only cause delays/warnings that are managed onsite. Flooding is mainly safety issue, see Safety Intervention Summary Sheets			3				-3	-3	-3	-3	-9
Section 10 Turangi																
Section 11 Turangi to three sisters					• Realignment a long term intervention and out of scope of this DBC • Significant encroachment into National Park • High Cost • Still susceptible to snow/ice closures	• Aligns with the more effective safety interventions • Offline work has less effect on route availability during construction • Improved resilience to snow related closures because of improved geometry	3	2		1		-3	-3	2	-3	-1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 12 Three Sisters																
Section 13 Three Sisters to Desert Road Curves																
Section 14 Desert Road Curves					• Realignment a long term intervention and out of scope of this DBC • Significant encroachment into National Park • High Cost • Still susceptible to snow/ice closures	• Aligns with the more effective safety interventions • Offline work has less effect on route availability during construction • Improved resilience to snow related closures because of improved geometry	3	2		1		-3	-3	2	-3	-1

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 15 Desert Road curves to Waiouru					Intensive Response • Improved route availability • Shown to be effective by CALTRANS etc • No physical required to existing route	Intensive Response • Requires year round upkeep and storage of compounds and machinery of infrequently used plant • Additional number of personnel required to be on stand-by within close proximity to compounds	1	2				-2	3	2	-3	3
					Heated Pavement • Proven to be effective in a limited number of applications across the world (Japan, London Heathrow etc) • Reduced maintenance intervention costs • Improved safety from loss of control due to snow/ice	Heated Pavement • High whole of life costs, with maintenance likely to be expensive and specialists • Only provides benefit on small number of days • Climate change may reduce days required (converse also possible) • Snow clearing will still be required for drifting/heavy snow falls.	1	2				-2	-2	2	-3	-2
Resilience Medium																
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui																
Section 3 Hatepe to Motutere					Online issues • Work will require road closures for much of it • Even localised realignment is difficult due to size of cut slopes at high risk location	• Can be implemented over time, targeting highest risk locations • Established techniques	-1	2		0	0	-2	-2	2	-2	-3
Section 4 Motutere																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo																
Section 6 Tauranga Taupo																
Section 7 Tauranga Taupo to Motuoapa																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa																
Section 9 Motuoapa to Turangi					Requires reconstruction of existing pavement No feedback from NOC contractor stating this is required	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of rising flood water	1	0				-1	1	-1	-1	-1
Section 10 Turangi																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters					Some encroachment into National Park Catch fence require regular maintenance to clear Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Effective containment Sections of realignment will align with safety improvements	0	2				2	1	2	2	9
Section 12 Three Sisters																
Section 13 Three Sisters to Desert Road Curves																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Some encroachment into National Park Catch fence require regular maintenance to clear Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Effective containment Sections of realignment will align with safety improvements	3	2		1		-3	-3	2	-3	-1
Section 15 Desert Road curves to Waiouru					Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Sections of realignment will align with safety improvements Geometric changes (wider shoulders etc) will align with safety improvements	1	1				2	3	-1	2	8
Resilience Low																
Section 1 Wharewaka to Waitahanui					Rural – Option Theme Not Applicable											

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui																
Section 3 Hatepe to Motutere					Does not solve nuisance rock falls No measurable improvement to outages, underslip is an event waiting to happen Likely to be a disappointing intervention to most stakeholder	• Lake side erosion is main long term route security issue • Mostly constructed outside of live lanes		1				-1	-1	-1	0	-2
Section 4 Motutere																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo																
Section 6 Tauranga Taupo																
Section 7 Tauranga Taupo to Motuoapa																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa																
Section 9 Motuoapa to Turangi					Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of rising flood water	0	0				3	3	-1	3	8
Section 10 Turangi																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	0	0				3	3	-1	3	8
Section 12 Three Sisters																
Section 13 Three Sisters to Desert Road Curves																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	0	0				3	3	-1	3	8
Section 15 Desert Road curves to Waiouru					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	0	0				3	3	-1	3	8
Road User Experience High																
Section 1 Wharewaka to Waitahanui						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles Passing facility opportunity northsouth of Waitahanui for southbound traffic	2		2		0	2	2	0	0	8

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui							2		1		0	2	2	0	2	9
Section 3 Hatepe to Motutere					Underpass is expensive to build with complex traffic management issues	Aligns with Destination Taupo's Bulli Point plan	2		2		2	-2	0	0	-2	2
Section 4 Motutere																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles Upgraded to provide separate facilities for truck stop over Possible passing facility (SVB)	2		2		0	2	2	0	0	8
Section 6 Tauranga Taupo																
Section 7 Tauranga Taupo to Motuoapa						Possible passing facility (SVB)										

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa																
Section 9 Motuoapa to Turangi					Widening required into swampy ground Possible environmental consenting issues	Northbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehiclesPossible passing lane facility (passing lane). Northbound out of Turangi may be desirable	2		2			1	1	2	1	9
Section 10 Turangi																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters						Possible passing lane facility (passing lane). Southbound out of Turangi may be desirable Southbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles Northbound passing lane/opportunity on exit from three sisteres, less driver frustration and improved safety	2		2			2	2	2	1	11
Section 12 Three Sisters					Unless coupled with other works, intervention level is too minor to allow right turn improvements	Improved visibility New photo op. Reduce stopping in unsafe/unwise locatons if combined with advanced warning	2		1			2	2	0	-1	6
Section 13 Three Sisters to Desert Road Curves																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves																
Section 15 Desert Road curves to Waiouru						Sealed access Improved information signage Enlargement if required to accommodate demand. Possible right turn bay Southbound passing lane/opportunity on exit from desert road curves, less driver frustration and improved safety	0		0			2	2	0	2	6
Road User Experience Medium																
Section 1 Wharewaka to Waitahanui						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	2		2		0	2	2	1	1	10

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui							2		2		0	2	2	1	1	10
Section 3 Hatepe to Motutere					Maybe no additional improvement from Low Intervention, DOC site that is not official rest area RUF	Improves current poor access	2		1		0	2	2	1	2	10
Section 4 Motutere																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	2		2		0	2	2	1	1	10
Section 6 Tauranga Taupo							2		2		0	2	2	1	1	10
Section 7 Tauranga Taupo to Motuoapa							2	0	2			2	2	2	-1	9

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa																
Section 9 Motuoapa to Turangi					Widening required into swampy ground Possible environmental consenting issues	Northbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles	2		2			1	1	2	1	9
Section 10 Turangi																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters						Southbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles Northbound passing lane/opportunity on exit from three sisteres, less driver frustration and improved safety	2		2			2	2	2	1	11
Section 12 Three Sisters					Unless coupled with other works, intervention level is too minor to allow right turn improvements	Improved visibility	2		2			2	2	0	1	9
Section 13 Three Sisters to Desert Road Curves																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves																
Section 15 Desert Road curves to Waiouru						Sealed access Improved information signage Enlargement if required to accommodate demand. Possible right turn bay Southbound passing lane/opportunity on exit from desert road curves, less driver frustration and improved safety	2		2			2	2	1	1	10
Road User Experience Low																
Section 1 Wharewaka to Waitahanui						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	2		1		0	2	2	0	2	9

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 2 Waitahanui						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles Safer crossing for pedestrians	2		1		0	2	2	0	2	9
Section 3 Hatepe to Motutere					Improvements not likely to incorporate right turning provisions	Stakeholder highlighted safety improvements required to DOC site	2		1		0	2	2	0	2	9
Section 4 Motutere																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 5 Motutere to Tauranga Taupo						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	2		1		0	2	2	0	2	9
Section 6 Tauranga Taupo																
Section 7 Tauranga Taupo to Motuoapa																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 8 Motuoapa																
Section 9 Motuoapa to Turangi																
Section 10 Turangi									0			3	3	0	3	9

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 11 Turangi to three sisters							1		0			2	2	0	2	7
Section 12 Three Sisters					Unless coupled with other works, intervention level is too minor to allow right turn improvements	Improved visibility where possible	1		0			2	2	0	2	7
Section 13 Three Sisters to Desert Road Curves																

Section	Problem Summary				Option theme assessment		Investment Objectives					Risks				Total
	Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs	
Section 14 Desert Road Curves																
Section 15 Desert Road curves to Waiouru					Does not provide capacity for increased tourist numbers	Sealed access	2		2			2	2	0	2	10

Single-Outcome Section Options by Section

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
1	Rural High Safety					Safety Issues • Likely to be sections of geometric improvements required Other Issues	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	2	0	0			3	3	2	2	12	
	Rural Medium-High Safety					Safety Issues Other Issues • Likely to be sections of geometric improvements required	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	1	0	0			3	3	2	2	11	Same risks and the high intervention, but lower return on investment objective. **(DISCARD)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium Safety					Safety Issues Other Issues • Likely to be sections of geometric improvements required	Safety Benefits • Defined historic safety issue with high DSI crash rate Other Benefits • Higher traffic volumes improve justification • Mostly wide corridor with compliant geometry allows for easy implementation	1	0	0			3	3	3	3	13	
	Rural Medium-Low Safety					Safety Issues Combination of narrow shoulders and Other Issues • Reduction in existing shoulder width • Higher volume section, reduced shoulder width is not the intent of ONRC or design standards	Safety Benefits • Targeted road side hazard protection helps reduce main crash type Other Benefits • Mostly wide corridor with compliant geometry allows for easy implementation • Minimal additional width to existing, could partially be accommodated with re-allocation of space (re-marking)	1	0	0			3	3	3	3	13	
	Rural Low Safety					Safety Issues • Barriers close to shoulder will push vehicles closer to the centreline Other Issues • Existing shoulder widths are likely to be unchanged • Higher volume section, reduced shoulder width is not the intent of ONRC or design standards	Safety Benefits • Targeted road side hazard protection helps reduce main crash type Other Benefits • Mostly wide corridor with compliant geometry allows for easy implementation • Minimal additional width to existing, could partially be accommodated with re-allocation of space (re-marking)	0	0	0			3	3	0	3	9	No return on safety investment objective **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban High Safety																0	
	Urban Medium Safety																0	
	Urban Low Safety																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience High																0	
	Resilience Medium																0	
	Resilience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience High						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles Possible passing facility south of Waitahanui for southbound traffic	2	0	2	0	1	1	2	2	1	11	
	Road User Experience Medium						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	1	0	2	0	1	2	2	1	2	11	
	Road User Experience Low						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	1	0	1	0	1	2	2	0	2	9	Lowest score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural High Safety					Urban Section – Not Applicable											**0**	
2	Rural Medium-High Safety					Urban Section – Not Applicable											**0**	
	Rural Medium Safety					Urban Section – Not Applicable											**0**	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Urban Section – Not Applicable											0	
	Rural Low Safety					Urban Section – Not Applicable											0	
	Urban High Safety					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide	2	0	2	0	1	2	2	2	1	12	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
							enough to accommodate changes without land purchase											
	Urban Medium Safety					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2	0	2	0	1	2	2	2	1	12	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Low Safety					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions (less wide spread than higher intervention levels) • Existing road reserve wide enough to accommodate changes without land purchase	**2**	**0**	**1**	**0**	**0**	**2**	**2**	**-1**	**2**	**8**	Lowest score **(DISCARDED)**
	Resilience High					Urban Section – Not Applicable											**0**	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Urban Section – Not Applicable											0	
	Resilience Low					Urban Section – Not Applicable											0	
	Road User Experience High					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide	2	0	2	0	1	2	2	2	1	12	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
							enough to accommodate changes without land purchase											
	Road User Experience Medium					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2	0	2	0	1	2	2	2	1	12	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Low					Safety Issues Other Issues	Safety Benefits • Pedestrian crossing required between lake side stopping areas and footpath • School crossing improvements • Narrow footpaths widened to shared path width where demand exists • Better speed management via increased side friction – narrowed shoulders and wider flushed median. • Wider flush median will aid right turn movements • Improved lighting at pedestrian crossing/intersection Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions (less wide spread than higher intervention levels) • Existing road reserve wide enough to accommodate changes without land purchase	2	0	1	0	0	2	2	-1	2	8	
3	Rural High Safety					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline due to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	3	2	2	3	-1	-3	-2	-2	-3	-1	Negative overall score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-High Safety					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline do to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	1	2	2	3	-1	-3	-2	-2	-3	-3	Negative overall score **(DISCARDED)**
	Rural Medium Safety					Safety Issues • Improved geometry will lead to higher speeds through section that has uses beyond the movement of traffic could lead to an increase in pedestrian accidents Other Issues • Extensive geometric improvements required to provide compliant geometrics • Required corridor width not practicable through extreme environmental constraints • Area of high cultural and aesthetic value, likely opposition • High cost, likely long term solution would potentially make on line improvements redundant • Any widening towards the lake will increase risk of underslip • Higher speeds will likely reduce amenity for local and recreational users visiting the area (increased noise, vibrations etc)	Safety Benefits • Improved safety with a reduction in the probability of head-on crashes resulting from vehicles crossing the centreline do to challenging alignment • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to planned and unplanned events because of wide corridor and improved geometric/earthworks • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length	1	2	2	3	-1	-3	-2	-2	-3	-3	Negative overall score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Safety Issues • Challenging alignment will remain mostly unchanged with only very limited corner easing in the less topographically constrained sites • Little to no additional width for cyclist/pedestrians or stopped vehicles Other Issues • Very limited improvement to resilience issues with corridor remaining constrained • Two trucks passing issue likely to be unchanged.	Safety Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use Other Benefits • Minimal corner easing, localised carriageway widening could benefit the competing interests of pedestrians trying to access Bulli Point etc • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	0	0	-1	1	1	1	-3	-1	-1	Negative overall score **(DISCARDED)**
	Rural Low Safety					Safety Issues • Challenging alignment will remain mostly unchanged with only very limited corner easing in the less topographically constrained sites • Little to no additional width for cyclist/pedestrians or stopped vehicles Other Issues • Very limited improvement to resilience issues with corridor remaining constrained • Two trucks passing issue likely to be unchanged.	Safety Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use Other Benefits • Minimal corner easing, localised carriageway widening could benefit the competing interests of pedestrians trying to access Bulli Point etc • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	0	0	1	0	2	1	-3	1	3	
	Urban High Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	
	Resilience High					Offline issues • Challenging topography with multiple bridges required. • Environmental and culturally sensitive land • Out of scope as a short term measure and likely to be a future intervention • High cost Online issues • Online works unlikely to resolve all issues but may be more expensive than offline (including economic dis-benefits of long term route outage during construction. • Difficult construction with increased H&S risks. • Re-engineering rock slopes will be significant work that will impact other parts of the network for cartage to clean fill site.	Offline Benefits • Built offline so disruption to route availability is not persistent over construction duration • Opportunity to build section of high speed rural road, away from local communities and conflicting uses • Take traffic away from environmentally and culturally important lake Taupo • Separated local road and SH networks Online Benefits • Incremental implantation, with targeted action on worse areas • Overall less road assets to maintain	3	3				3	3	-3	-3	3	-3	6	Out of scope **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Online issues • Work will require road closures for much of it • Even localised realignment is difficult due to size of cut slopes at high risk location	• Can be implemented over time, targeting highest risk locations • Established techniques	1	2		0	0	-2	1	2	-2	2	Out of scope **(DISCARDED)**
	Resilience Low					Does not solve nuisance rock falls No measurable improvement to outages, underslip is an event waiting to happen Likely to be a disappointing intervention to most stakeholder	• Lake side erosion is main long term route security issue • Mostly constructed outside of live lanes		2				-1	-1	-1	1	0	Last availble option **(RETAINED)**
	Road User Experience High					Underpass is expensive to build with complex traffic management issues	Aligns with Destination Taupo's Bulli Point plan -1 given for cost based on assumption of money available for Bulli Point Plan	2	0	3	0	3	-2	0	2	-1	7	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium					Maybe no additional improvement from Low Intervention, DOC site that is not official rest area RUF	Improves current poor access Doesn't support local plans – therefore poor acceptability rating	1	0	1	0	0	2	2	-2	2	6	
	Road User Experience Low						Doesn't support local plans – therefore poor acceptability rating	1	0	0	0	0	2	2	-2	3	6	Lowest score, and neutral benefit on relevant investment objective **(DISCARDED)**
4	Rural High Safety					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-High Safety					Urban Section – Not Applicable											0	
	Rural Medium Safety					Urban Section – Not Applicable											0	
	Rural Medium-Low Safety					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Low Safety					Urban Section – Not Applicable											0	
	Urban High Safety					Safety Issues Other Issues	Safety Benefit • Crossing demand exists between lake side and campsite on opposing side of road. Pedestrian improvements including new paths and crossing facilities • Road side barrier to separate campsite from SH1 traffic • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2				1	2	2	2	1	10	
	Urban Medium Safety					Safety Issues Other Issues	Safety Benefit • Crossing demand exists between lake side and campsite on opposing side of road. Pedestrian improvements including new paths and crossing facilities • Road side barrier to separate campsite from SH1 traffic • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Improvement for conflicting interests by improved pedestrian facilities and improved right turn provisions • Existing road reserve wide enough to accommodate changes without land purchase	2				1	2	2	2	1	10	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Low Safety					Safety Issues • Intervention level doesn't allow for new pedestrian facilities • Intervention level doesn't allow for new road side barrier Other Issues	Safety Benefit • Improved speed management including possible relocation of gated 70kph zone Other Benefits • Existing road reserve wide enough to accommodate changes without land purchase	0				0	2	2	-1	3	6	Lowest score **(DISCARDED)**
	Resilience High					Urban Section – Not Applicable											0	
	Resilience Medium					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Low					Urban Section – Not Applicable											0	
	Road User Experience High																0	
	Road User Experience Medium																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Low																0	
5	Rural High Safety					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) but wide shoulder will provide manoeuvring room Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road limits the options for widening • Probable land purchase required	• Wide centreline/ flush median could be used to aid right turns into lake side service roads • Horizontal and vertical geometry is generally already compliant	2	0	2		2	-1	-1	2	-1	5	More risks on balance
	Rural Medium-High Safety					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) but wide shoulder will provide manoeuvring room Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening • Probably land purchase required	Safety Benefits • Wide centreline/ flush median will aid right turns into lake side service roads Other Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side	2	0	1		2	0	-1	2	-1	5	Used if off road bike Taupo off road facility does no go ahead

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium Safety					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening • Possible sections of land purchase	Safety Benefits • Wide centreline/ flush median will aid right turns into lake side service roads Other Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side	2	0	1		2	0	-1	2	-1	5	Used if off road bike Taupo off road facility goes ahead
	Rural Medium-Low Safety					Safety Issues • Wide centreline will have insufficient width to allow right turning cars to be clear of carriageway (multiple intersections/access ways over length) Other Issues • Relatively large amount of earthworks required to move road inland • Lake foreshore close to road, limits the options for widening	Safety Benefits • Horizontal and vertical geometry is generally already compliant • improved access arrangements in road side rest areas/tourist stops on lake side • Clip on bridge considered for pedestrian/shared use Other Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	1	0	1		1	0	0	1	1	5	Lower safety investment objective return
	Rural Low Safety					Safety Issues • No real improvement on current situation • No improvement for right turning vehicles (multiple intersections/access ways over length) Other Issues	Safety Benefits • Horizontal and vertical geometry is generally already compliant • Clip on bridge considered for pedestrian/shared use Other Benefits • Variable message signage will help warn wide vehicles of opposing wide vehicles. Helpful for vehicles towing boats that do not have the radio communication that HCV drivers use	0	0	0		0	3	3	-1	2	7	No investment objective return

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban High Safety					Rural – Option Theme Not Applicable											0	
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience High																0	
	Resilience Medium																0	
	Resilience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience High						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles Upgraded to provide separate facilities for truck stop over	2	0	2	0	2	-1	0	-1	0	4	Goes some way to addressing truck driver requirements, however at this location there seem to be too many trade offs – hence the lower overall rating. Other locations provide better opportunities
	Road User Experience Medium						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	2	0	2	0	0	2	1	1	1	9	
	Road User Experience Low						Reduced risk of nose to tail collision Less congestion due to waiting right turning vehicles	1	0	1	0	0	2	1	0	1	6	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
6	Rural High Safety					Urban Section – Not Applicable											**0**	
	Rural Medium-High Safety					Urban Section – Not Applicable											**0**	
	Rural Medium Safety					Urban Section – Not Applicable											**0**	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Urban Section – Not Applicable											0	
	Rural Low Safety					Urban Section – Not Applicable											0	
	Urban High Safety					Other Issues • In part road corridor constrained by lake on one side and parallel local road on the other side (Rawhira Road) • Bridge replacement expensive and will require land purchase for realignment, possible consenting issues	Safety Benefits • Improved accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge Other Benefits • New bridge removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians	2	0	2	3	0	-1	-1	2	-2	5	Aligns with Tauranga-Taupo bridge replacement MCA (separate to this analysis). Positive total score and safety investment objective score

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Medium Safety					Other Issues • In part road corridor constrained by lake on one side and parallel local road on the other side (Rawhira Road) • Bridge replacement not considered part of intervention level	Safety Benefits • Improved accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge via clip on or new separate pedestrian bridge. Other Benefits	1	0	2	-1	0	-1	0	2	-1	2	
	Urban Low Safety					Other Issues • Bridge replacement not considered part of intervention level	Safety Benefits • Some minor Improveds to accesses into lake side rest stops • Improved pedestrian facilities including over existing bridge via clip on or new separate pedestrian bridge. Other Benefits • Road widening not required, lowering cost	0	0	2	-1	0	-1	2	-1	3	4	Neutral safety investment objective return.
	Resilience High					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Urban Section – Not Applicable											0	
	Resilience Low					Urban Section – Not Applicable											0	
	Road User Experience High					General access safety improvements with improvement to facilities		2	0	2	0	0	0	1	1	0	6	Same as medium – but no new facilities

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium					General access safety improvements with improvement to facilities		2	0	2	0	0	0	1	1	1	7	
	Road User Experience Low					General access safety improvements		2	0	1	0	0	0	1	1	1	6	Lower rating for experience return
6a																	0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
																	0	
																	0	
																	0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
																	0	
																	0	
																	0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
																	0	
																	0	
																	0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
																	0	
																	0	
																	0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
																	0	
7	Rural High Safety					As per generics	As per generics	2	0	0		1	-1	0	0	-3	-1	Negative overall score **(DISCARDED)**
	Rural Medium-High Safety					As per generics	As per generics	2	0	0		1	0	0	0	0	3	Relatively low overall score comparatively to other remaining two interventions

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium Safety					As per generics	As per generics	2	0	0		0	1	0	1	1	5	
	Rural Medium-Low Safety					As per generics	As per generics	1	0	0		0	2	0	1	2	6	
	Rural Low Safety					As per generics	Safety Benefits • Little to no benefit from existing	0	0	0		0	3	3	-2	3	7	Relevant intervention investment objective is neutral

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban High Safety					Rural – Option Theme Not Applicable											0	
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience High					Rural – Option Theme Not Applicable											0	
	Resilience Medium					Rural – Option Theme Not Applicable											0	
	Resilience Low					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience High					Possible passing facility (SVB)											0	
	Road User Experience Medium																0	
	Road User Experience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
8	Rural High Safety					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal											**0**	
	Rural Medium-High Safety					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal											**0**	
	Rural Medium Safety					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal											**0**	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal											0	
	Rural Low Safety					Urban Section – Not Applicable • Fuel tank and associated contamination likely to require removal											0	
	Urban High Safety					Safety Issues Other Issues • Fuel tank and associated contamination likely to require removal, more complex consenting issues	Safety Benefits • New pedestrian/shared facilities through town between known trip generators • Improved lighting at intersections and ped crossings • Introduce flush median to aid turning into private accesses. Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues • Intervention level allows for potential pedestrian underpass aligns with TDC's proposed Bulli Point footpath plans	2	3	1	-1	3	-1	7	Signals intent to do something more costly at this part of the route.

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Medium Safety					Safety Issues Other Issues • Fuel tank and associated contamination likely to require removal, more complex consenting issues	Safety Benefits • New pedestrian/shared facilities through town between known trip generators • Improved lighting at intersections and ped crossings • Introduce flush median to aid turning into private accesses. Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues	2				2	1	-1	2	1	7	**(DISCARDED)** – see above
	Urban Low Safety					Safety Issues • Currently footpath only on one side of the road. • Intervention level may not be enough to provide flush median Other Issues • Land side residential development underway, leading to future interest conflicting interest issues. Not likely to be addressed at this intervention level	Safety Benefits • Upgrade to existing footpath • Improved lighting at intersections and ped crossings Other Benefits • Land side residential development underway, leading to future interest conflicting interest issues	0				0	2	2	-1	3	6	Lowest score
	Resilience High																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium																0	
	Resilience Low																0	
	Road User Experience High																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium																0	
	Road User Experience Low																0	
9	Rural High Safety					• Flood prone area with swampy ground conditions expected • Bridge requires widening	• Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. • Geometry relatively flat and straight • Road cycling demand more safely accommodated	3	1	0			-1	-1	2	0	4	Lowest overall score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-High Safety					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected • Bridge requires widening	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	2	1	0			-1	-1	2	0	3	Lowest overall score **(DISCARDED)**
	Rural Medium Safety					Safety Issues Bridge widening excluded, narrowing at bridges maybe obscured if pavement markings are obscured Other Issues • Flood prone area with swampy ground conditions expected	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	2	1	0			0	-1	1	1	4	
	Rural Medium-Low Safety					Safety Issues Bridge widening excluded, narrowing at bridges maybe obscured if pavement markings are obscured Other Issues • Flood prone area with swampy ground conditions expected	Safety Benefits • Wider carriageway across flood prone land is stakeholder request to allow safer passage when road is inundated. Other Benefits • Geometry relatively flat and straight so would require minimal realignment	2	1	0			0	-1	1	1	4	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Low Safety					Safety Issues Other Issues • Flood prone area with swampy ground conditions expected	Safety Benefits • Targeted barrier improvements and VMS only likely safety improvements Other Benefits • Geometry relatively flat and straight so would require minimal realignment • No formation widening necessary	0	0	0			2	2	-1	2	5	Neutral safety investment objective benefit **(DISCARDED)**
	Urban High Safety					• Rural – Option Theme Not Applicable											0	
	Urban Medium Safety					• Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Low Safety					• Rural – Option Theme Not Applicable											0	
	Resilience High					Intervention level does not match problem, event only cause delays/warnings that are managed onsite. Flooding is mainly safety issue, see Safety Intervention Summary Sheets			3				-3	-3	-3	-3	-9	Safety deals with resilience – issue is that there is no shoulder. No resilience issue noted in the problem summary.
	Resilience Medium					Requires reconstruction of existing pavement No feedback from NOC contractor stating this is required	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of rising flood water	1	0				-1	1	-1	-1	-1	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Low					Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of rising flood water	0	0				3	3	-1	3	8	
	Road User Experience High					Widening required into swampy ground Possible environmental consenting issues	Northbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles	2	0	2	0	0	-1	1	2	-1	5	Same ratings as High, covering same issues.
	Road User Experience Medium					Widening required into swampy ground Possible environmental consenting issues	Northbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles	2	0	2	0	0	-1	1	2	-1	5	Low score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
10	Road User Experience Low							-1	0	0	1	0	0	1	1	1	3	
	Rural High Safety					Urban Section – Not Applicable											0	
	Rural Medium-High Safety					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium Safety					Urban Section – Not Applicable											0	
	Rural Medium-Low Safety					Urban Section – Not Applicable											0	
	Rural Low Safety					Urban Section – Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban High Safety					Other Issues • Bridge replacement expensive and will require land purchase for realignment, possible consenting issues	Safety Benefits • Provides scope to provide roundabout at intersection with Pihanga Road that will make right turns out of the town safer. • Widening/replacing of existing bridge would make it safer for two wide vehicles passing • Introduce flush median to aid turning into private accesses. Other Benefits • Improved town threshold if intersection form changes • Improved access into rest areas • New bridge or clip-on provides opportunity to improved shared/pedestrian facilities	2	0	2	1	1	1	-1	2	-2	6	
	Urban Medium Safety					Other Issues	Safety Benefits • Introduce flush median to aid turning into private accesses. • Improved threshold into Turangi, including possible roundabout Other Benefits • Improved access into rest areas • Clip-on provides opportunity to improved shared/pedestrian facilities across existing structure	2	0			1	2	2	-1	1	7	Highest score, plus intervention deals with safety and a roundabout is still possible at the Z corner within medium intervention level, others interventions discarded
	Urban Low Safety					Safety Issue • Most interventions within this level have already been applied (or better) Other Issues • No shared/footpath introduced alongside SH1 • Changes are minimal and likely not in line with community expectation • No improvement to existing structures	Safety Benefits Other Benefits	0	0			1	2	2	-2	3	6	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience High																0	
	Resilience Medium																0	
	Resilience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience High																0	
	Road User Experience Medium						Theme improvements (to existing stop). Truck stop (off State Highway) not considered part of scheme. Access improvements considered under urban safety.	0	0	1	0	0	3	3	1	3	11	
	Road User Experience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural High Safety							2	1	0	0	0	-3	-1	-1	1	-1	Negative overall score **(DISCARDED)**
11	Rural Medium-High Safety					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Encroaching into Tongariro National Park for some of the length	Safety Benefits • Remove out of context curves • Widens existing narrow shoulders that are narrower than average for section • Wide shoulders allow stricken vehicle to wait mostly clear of live carriageway, see Other Benefits. Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest clear of lanes, improving route availability for response vehicles.	2	1	0	0	0	-1	1	1	1	5	
	Rural Medium Safety					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Encroaching into Tongariro National Park for some of the length	Safety Benefits • Remove out of context curves • Widens existing narrow shoulders that are narrower than average for section • Wide shoulders allow stricken vehicle to wait mostly clear of live carriageway, see Other Benefits. Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest clear of lanes, improving route availability for response vehicles.	2	1	0	0	0	-1	1	1	1	5	Shoulder width appropriate given expected traffic volume and preceding section (section 12) environment

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Remove or improve out of context curves • . Other Benefits	1	0	0	0	0	1	1	1	1	5	
	Rural Low Safety					Safety Issues • Only benefit is from road side barriers (see below) Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations difficult	Safety Benefits Other Benefits	0	0	0	0	0	2	2	-1	2	5	Neutral return to the safety investment objective **(DISCARDED)**
	Urban High Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	
	Resilience High					• Realignment a long term intervention and out of scope of this DBC • Significant encroachment into National Park • High Cost • Still susceptible to snow/ice closures	• Aligns with the more effective safety interventions • Offline work has less effect on route availability during construction • Improved resilience to snow related closures because of improved geometry	3	2	0	1	0	-3	-3	2	-3	-1	Out of scope. **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Some encroachment into National Park Catch fence require regular maintenance to clear Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Effective containment Sections of realignment will align with safety improvements	1	2	0	0	0	2	1	2	2	10	Highest overall score, deals with resilience the best. However further investigation required re: resilience issue. Data may refer to section 12.
	Resilience Low					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	1	0	0	0	0	3	3	-1	3	9	
	Road User Experience High						Possible passing lane facility (passing lane). Southbound out of Turangi may be desirable Southbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles Northbound passing lane/opportunity on exit from three sisteres, less driver frustration and improved safety	2	0	2	0	0	1	1	2	-1	7	Essentially same response as medium – and keeps general consistency (using medium rated interventions)

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium						Southbound passing lanes provides good spacing to existing passing opportunities, leading to less driver frustration and improved safety Opportunity to pass heavies before entering more constrained sections of alignment that have very low speeds for certain heavy vehicles Northbound passing lane/opportunity on exit from three sisteres, less driver frustration and improved safety	2	0	2	0	0	1	1	2	-1	7	
	Road User Experience Low							1	0	0	0	0	2	2	0	2	7	Neutral return to experience investment objective **(DISCARDED)**
12	Rural High Safety					Not possible to achieve without significant lengths of realignment, out of scope.	• Improved resilience to plan and unplanned events, including snow and ice. • Improved safety • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Safer for none motorised users, such as cyclists • Provides improvements in line with three of the investment objectives	2	2	0	2	0	-2	-1	2	-2	3	Out of scope **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-High Safety					Other Issues • Not possible to achieve without significant lengths of realignment, out of scope • . Encroaching into Tongariro National Park for realignment and widening • Higher speeds without significant improvement to alignment	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	2	0	2	0	-2	-1	2	-2	2	Out of scope **(DISCARDED)**
	Rural Medium Safety					Other Issues • Some encroaching into Tongariro National Park for realignment and widening • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions • Higher speeds without significant improvement to alignment	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles. • Intervention level does not require the extensive re-alignment of High and Med-high	1	1	0	2	0	-2	-1	2	-1	2	Out of scope **(DISCARDED)**
	Rural Medium-Low Safety					Safety Issues • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions • Targeted safety barrier may only be feasible with carriageway widening, to account for tracking. Other Issues • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits • Intervention level does not require the extensive re-alignment	1	-1	0	2		-2	-1	1	-1	-1	Negative overall score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Low Safety					Safety Issues • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions • Targeted safety barrier may only be feasible with carriageway widening, to account for tracking. Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits • Intervention level does not require the extensive re-alignment	1	-1	0	-1		2	2	-2	3	4	
	Urban High Safety					Rural – Option Theme Not Applicable											0	
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Low Safety					Rural – Option Theme Not Applicable											0	
	Resilience High																0	
	Resilience Medium																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Low																0	
	Road User Experience High						Improved visibility New photo op. Reduce stopping in unsafe/unwise locatons if combined with advanced warning	2	0	1	0	0	1	1	0	-1	4	Lower overall rating **(DISCARDED)**
	Road User Experience Medium					Unless coupled with other works, intervention level is too minor to allow right turn improvements Note: there appear to be some deficient SVBs (also as stated by stakeholders), these addressed under safety based project. Also check section 13 for similar issues.	Improved visibility	1	0	1	0	0	2	2	0	1	7	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
13	Road User Experience Low					Unless coupled with other works, intervention level is too minor to allow right turn improvements	Improved visibility where possible	1	0	0	0	0	2	2	0	2	7	Neutral return on the experience investment objective **(DISCARDED)**
	Rural High Safety					• Will produce a heavily out of context section, being located between two constrained sections of alignment. • Widening into National Park land • May promote unsafe overtaking due to driver frustration through slow sections	• Opportunity to provide passing lanes • Improved safety	-1	2	1	0	0	0	0	1	1	4	Negative safety investment objective return **(DISCARDED)**
	Rural Medium-High Safety					Safety Issues • Will produce an out of context section, being located between two constrained sections of alignment.(assuming TS and DRC remain out of scope. This could lead to higher speeds entering the adjoining curvilinear alignments • May promote unsafe overtaking due to driver frustration through slow sections Other Issues • Encroaching into Tongariro National Park for realignment and widening	Safety Benefits Other Benefits • Opportunity to provide passing lanes • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	-1	2	1	0	0	0	1	1	1	5	Negative safety investment objective return **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium Safety					Safety Issues • Will produce an out of context section, being located between two constrained sections of alignment.(assuming TS and DRC remain out of scope. This could lead to higher speeds entering the adjoining curvilinear alignments • May promote unsafe overtaking due to driver frustration through slow sections Other Issues • Encroaching into Tongariro National Park for realignment and widening	Safety Benefits Other Benefits • Opportunity to provide passing lanes • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	-1	2	1	0	0	0	1	1	1	5	Negative safety investment objective return **(DISCARDED)**
	Rural Medium-Low Safety					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits	1	-1	1	0	0	2	1	1	2	7	Highest overall rating and positive return on safety investment objective
	Rural Low Safety					Safety Issues Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more	Safety Benefits • Targeted safety barrier will help address run-off road, which account for 100% of DSIs Other Benefits	1	-1	1	0	0	2	1	-1	2	5	Positive safety investment objective score, and overall positive score.

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban High Safety					Rural – Option Theme Not Applicable											0	
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience High																0	
	Resilience Medium																0	
	Resilience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience High																0	
	Road User Experience Medium																0	
	Road User Experience Low																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
14	Rural High Safety					Not possible to achieve without significant lengths of realignment, out of scope.	• Improved resilience to plan and unplanned events, including snow and ice. • Improved safety • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Safer for none motorised users, such as cyclists • Provides improvements in line with three of the investment objectives	3	2	2	0	0	-2	0	2	-2	5	Out of scope **(DISCARDED)**
	Rural Medium-High Safety					Other Issues • Not possible to achieve some realignment • .Encroaching into Tongariro National Park for realignment and widening • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • TM requirements difficult to maintain route availability	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	2	2	1	0	0	-2	0	1	-1	3	Out of scope **(DISCARDED)**
	Rural Medium Safety					Other Issues • Some encroaching into Tongariro National Park for realignment and widening • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Even without extensive realignment will remain an expensive option that may be superseded by PBC recommended realignment option • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benifits • Improved safety due to higher standard geometry • Safer for none motorised users, such as cyclists Other Benefits • Aids route efficiency by increasing speeds and allowing two heavy vehicles to pass along full length • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles. • Intervention level does not require the extensive re-alignment of High and Med-high	2	1	1	0	0	-1	1	1	0	5	Out of scope **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-Low Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benefits • Narrow wide median provides improvement for head-on crash type • Increased shoulder width Other Benefits • Intervention level does not require the extensive re-alignment	1	0	0	0	0	1	1	1	1	5	
	Rural Low Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult • Barriers close to shyline – could increase head ons (main DSI type) • Existing gradients mostly to remain, large vehicles struggle to gain traction in icy conditions	Safety Benefits • Intervention level does not require re-alignment	0	1	0	0	0	2	2	-2	2	5	Neutral return on the safety investment objective **(DISCARDED)**
	Urban High Safety					Rural – Option Theme Not Applicable											0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Medium Safety					Rural – Option Theme Not Applicable											0	
	Urban Low Safety					Rural – Option Theme Not Applicable											0	
	Resilience High					• Realignment a long term intervention and out of scope of this DBC • Significant encroachment into National Park • High Cost • Still susceptible to snow/ice closures	• Aligns with the more effective safety interventions • Offline work has less effect on route availability during construction • Improved resilience to snow related closures because of improved geometry	3	2		1		-3	-3	2	-3	-1	Negative overall score **(DISCARDED)**

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Some encroachment into National Park Catch fence require regular maintenance to clear Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Effective containment Sections of realignment will align with safety improvements	1	1				2	1	1	1	7	
	Resilience Low					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	0	0				3	3	-1	3	8	Neutral
	Road User Experience High																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium																0	
	Road User Experience Low																0	
15	Rural High Safety					• Widening into National Park • Road side barriers exacerbate drifting snow and make snow plough operations more difficult Acceptability may seem extravagant if other sections are not upgraded to similar standard, would be higher standard than anything between Turangi and Bulls	Safety Benifits • Safer for none motorised users, such as cyclists • Part already 4 star • More forgiving road environment and low traffic volumes make 4 start relatively easy to achieve	2	1	0	0	0	1	0	0	1	5	High does not align well with anticipated corresponding interventions. Corridor allows for this intervention, but inconsistent application with other sections. Even in event of realignment north of this section, 2.5m shoulder appear excessive.

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Medium-High Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benifits • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	1	0	0	0	1	1	0	1	5	See discussion below
	Rural Medium Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult	Safety Benifits • Safer for none motorised users, such as cyclists Other Benefits • Improved resilience to plan and unplanned events, including snow and ice including allowing vehicles to rest mostly clear of lanes, improving route availability for response vehicles.	1	1	0	0	0	1	1	0	1	5	
	Rural Medium-Low Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult – see benefits	Safety Benefits Extensive use of road side barriers can probably be avoided as forgiving road side environment can be provided	1	1	0	0	0	2	1	1	2	8	Provides some option flexibility from medium-low in case future realignment north of this section are desired to be investigated. Chosen ahead of Medium-High as a balance between the practicalities of dealing with issues now, and possible future scenarios.

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Rural Low Safety					Other Issues • Road side barriers exacerbate drifting snow and make snow plough operations more difficult – see benefits • Sliver widening difficult to construct	Safety Benifits Extensive use of road side barriers can probably be avoided as forgiving road side environment can be provided Overall width of road almost unchanged	0	0	0	0	0	1	2	-1	2	4	Neutral return on safety investment objective **(DISCARDED)**
	Urban High Safety																0	
	Urban Medium Safety																0	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Urban Low Safety																0	
	Resilience High					Intensive Response • Improved route availability • Shown to be effective by CALTRANS etc • No physical required to existing route	Intensive Response • Requires year round upkeep and storage of compounds and machinery of infrequently used plant • Additional number of personnel required to be on stand-by within close proximity to compounds	1	2	0	0	0	-2	3	-1	-3	0	See comment immediately below
						Heated Pavement • Proven to be effective in a limited number of applications across the world (Japan, London Heathrow etc) • Reduced maintenance intervention costs • Improved safety from loss of control due to snow/ice	Heated Pavement • High whole of life costs, with maintenance likely to be expensive and specialists • Only provides benefit on small number of days • Climate change may reduce days required (converse also possible) • Snow clearing will still be required for drifting/heavy snow falls.	1	2	0	0	0	-2	-2	2	-3	-2	Discarded, but recognise that maintenance will form an important

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Resilience Medium					Snow barriers would provide improvements in very specific conditions (snow/wind speed/prevailing direction)	Mostly online treatment - does not require significant realignment of existing road Relatively low cost treatments Sections of realignment will align with safety improvements Geometric changes (wider shoulders etc) will align with safety improvements	1	1	0	0	0	2	3	-1	2	8	
	Resilience Low					Heat retaining surfacing unlikely to make much difference to prolonged snowfalls Warning and monitoring only. Improvements would be from widening associated with safety improvements	Can be incorporated into widening works associated with safety improvements VMS and monitoring can provide early warning of snow/ice	0	0	0	0	0	3	3	-1	3	8	No return on the resilience investment objective
	Road User Experience High						Sealed access Improved information signage Enlargement if required to accommodate demand. Possible right turn bay Southbound passing lane/opportunity on exit from desert road curves, less driver frustration and improved safety	2	0	2	0	0	0	0	2	0	6	

Section	Treatment	Problem Summmary				Option theme assessment		Investment Objectives					Risks				Total	Comment
		Safety	Resilience	2 Trucks	Interests	Section Specific Issues	Section Specific Benefits	Safety	Resilience	Experience	Efficiency	Competing Interests	Constructability	Consentability	Acceptability	Costs		
	Road User Experience Medium						Sealed access Improved information signage Enlargement if required to accommodate demand. Possible right turn bay Southbound passing lane/opportunity on exit from desert road curves, less driver frustration and improved safety	2	0	2	0	0	0	0	2	0	6	Likely to be the same as Medium. However this section does have good photo opportunities as per Stakeholder comment. Therefore discarded to allow for greater flexibility in intervention (via High)
	Road User Experience Low					Does not provide capacity for increased tourist numbers	Sealed access	1	0	0	0	0	3	3	0	3	10	Neutral return on experience investment objective **(DISCARDED)**

Single-Outcome Section Options Retained

Section		Single-Outcome Section Options kept	Single-Outcome Section Options discarded	Rational for discarding
1	Safety (Rural)	High, Medium Medium-Low	Medium -High Low	Medium-High – Same risks as High but with lower returns on benefits Low – No return on safety investment
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	High Medium	Low	Busy lake side rest stops will benefit from an improved entry/exit configurations as a minimum
2	Safety (Urban)	High Medium	Low	High and Medium are required to support speed management (engineer down) and potential clip-on structure
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	Medium Low	High	High RUF treatments not required or identified by stakeholders, such as new bridges or grade separated pedestrian links
3	Safety (Confined Rural)	Low	High, Medium-High, Medium, and Medium-Low	Environmental, cultural and topographical constraints limit options to align with Low Rural Safety only
	Resilience	Low	High, Medium	High resilience requires realignment that is already out of scope. Medium was considered out of scope however may align with other work planned by NZTA that is outside of this DBC
	Road User Facility	High Medium	Low	Important and well-regarded vantage points and swimming areas leads to conflicts between SH traffic and recreational users. Low intervention would not address issues.
4	Safety (Urban)	Medium	High Low	High is not required as expensive infrastructure such as bridges and underpasses are not proposed. Low does not allow scope for required NMU improvements
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	None	All	No existing RUFs were identified.
5	Safety (Rural)	Medium-High Medium	High Medium - Low Low	High – more constructability and consenting risks than medium high with limited additional benefit Medium-Low. Low safety benefit return with similar capital cost to medium Low – little to no improvement on existing
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	Medium Low	High	Whilst High could provide for separate facility for HVs the acceptability of this is likely to be poor and access/exits would require significant work
6	Urban Safety	High Low	Medium	Medium excludes replacement TT bridge
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	Medium	High Low	Medium and High assessed to give the same outcome. Low doesn't provide sufficient improvements to entry/accesses
7	Safety (Rural)	Medium Medium-Low	High Medium-High Low	High – cost and constructability issues resulted in an overall negative score Medium high – same benefits as medium at increased cost Low – no return on safety investment
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	None	All	No existing RUFs were identified.
8	Safety (Urban)	High	Medium Low	Medium – same overall treatment as medium but would exclude the underpass that aligns with T2T shared path proposal Low – does not allow for adequate work to address conflicting interest between NMUs and SH traffic

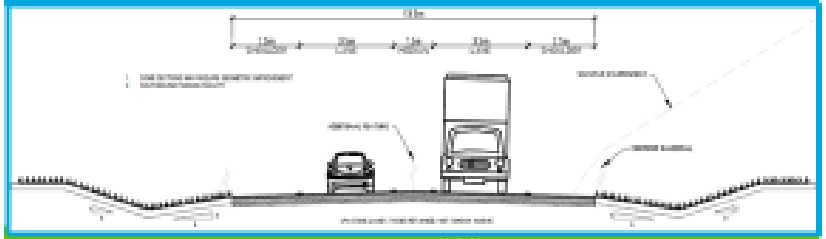
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	None	All	No existing RUFs were identified.
9	Safety (Rural)	Medium Medium-Low	High Medium-High Low	High – out of context with low identified safety problem Medium – High out of context for low identified safety problem Low – no return on safety investment
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	Medium	High Low	High – same benefits and risks to Medium Low – no return on RUF investment
10	Safety (Urban)	Medium	High Low	High – difference from medium is option of new bridge. Not considered in scope Low – does not provide scope to address issues
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis
	Road User Facility	Medium	High Low	High – upgrade to off road facilities out of scope Low – does not provide scope to improve existing arrangements
11	Safety (Rural)	Medium Medium Low	High Medium-High Low	High – negative overall rating due to high risks Medium High – same return on investment as Medium but at higher cost Low - Low – no return on safety investment
	Resilience	Medium	High Low	High – would require realignment that is out of scope Low – does not provide scope for improvement
	Road User Facility	Medium	High Low	High – effectively the same as Medium Low – no return on RUF investment
12	Safety (Confined Rural)	Low	High Medium-High Medium Medium-Low	All other interventions require changes to structures and realignment and are out of scope.
	Resilience	Medium Low	High	High – requires realignment that is out of scope
	Road User Facility	Medium Low	High	High – like medium assumes that the existing rest area/gravel store is relocated, no difference in treatment so medium selected.
13	Safety (Rural)	Medium-Low Low	High, Medium-High and Medium	
	Resilience	None	All	No resilience issues due to environmental and weather identified at during Part A's analysis. Likely to be amended with further investigation.
	Road User Facility	Medium	All	High - no existing RUFs were identified to upgrade, medium allows for lengthening of slow vehicle bay. Low – does not provide scope for changes to passing opportunities
14	Safety (Confined Rural)	Medium Medium-Low	High Medium- High Low	High – out of context and would require realignment in line with PBC. Out of scope Medium High – out of context with surrounding environment, requires significant local realignment Low – no return on safety investment
	Resilience	Medium Low	High	High – requires realignment that is out of scope
	Road User Facility	None	All	No existing RUFs were identified.
15	Safety (Rural)	Medium Medium-Low	High Medium-High	High – Out of context for surrounding environment and T2W corridor. Medium – High out of context for surrounding environment and T2W corridor. Low – whilst option to retain existing cross section is low spend the resulting cross section is more aligned with medium-low.
	Resilience	Medium Low	High	High – high capital investment on existing alignment would not resolve snow issue
	Road User Facility	High Low	Medium	Medium – High selected over high to allow for significant off-road upgrade of the RUF facilities at the summit of Desert Road and new passing lane

Multi-Outcome Section Option Sheets

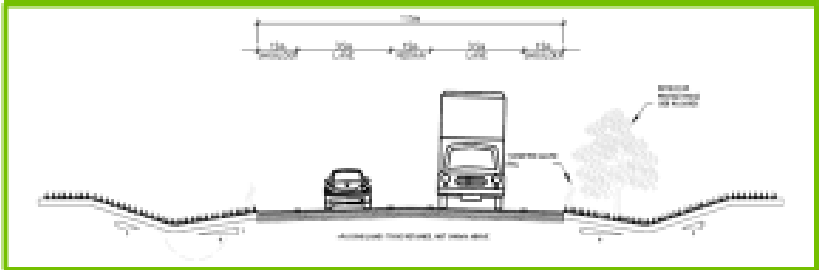
Section 1: Taupo to Hatepe ex Waitahanui (11km) [draft for comment]

PROBLEM:
Reduced road cross section compared to proceeding corridor (ETA). Narrow shoulders. Speed limit not always aligned to safe and appropriate speed. Resulting in 9 DSI in the last 5 years

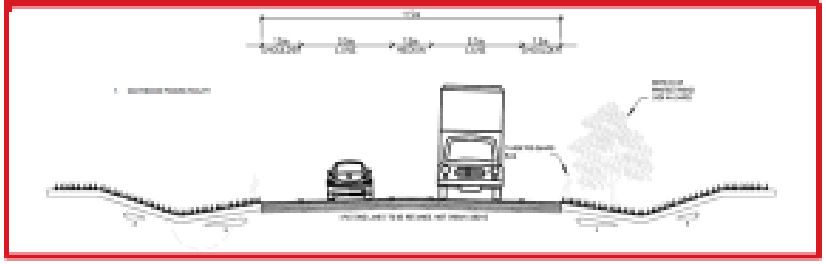
DSI Benefit: ↟ ↟ ↟ ↟ Cost: $$$$ Route Availability: ✓✓✓✓✓



DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



Option 1

CORRIDOR SAFETY + SCENIC STOP UPGRADE

Safety
- Corridor implemented road side barriers target most frequent DSI crash type
- Improved Safety – wide centreline reduces occurrence of head-on crashes and future proofed for barrier
- Good on-road cycle amenity
- Allows stopped vehicle to be clear of traffic lanes

Road User Facilities
- Upgrade entry/exits, RUF facilities, including new facilities and cultural references where appropriate.

Land
- Current wide corridor however likely some encroachment into adjacent land, to be limited by use of guardrail vs forgiving roadside, likely significant impact at Southern end

Option 2a

TARGETED SAFETY + SCENIC STOP UPGRADE

Safety
- Targeted road side barrier at high risk locations
- Improved Safety – wide centreline reduces occurrence of head-on crashes and future proofed for median barrier

Road User Facilities
- Upgrade existing RUF facilities entry/exits and , improve CPTED etc

Land
- Work confined to existing designation, width reduced at pinch points.

Option 2b

TARGETED SAFETY

Safety
- Targeted road side barriers at high risk locations
- Improved Safety – wide centreline reduces occurrence of head-on crashes and future proofed for median barrier

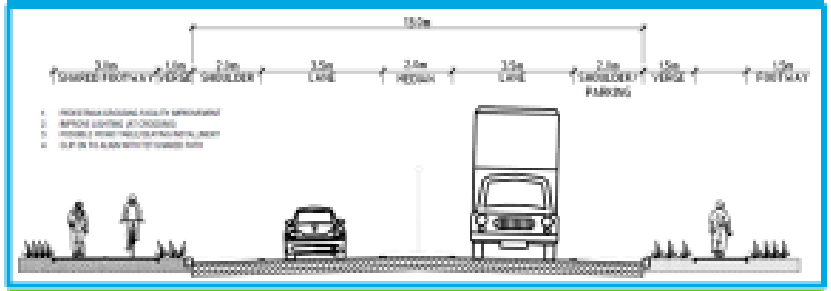
Road User Facilities
- Improved access to lake side rest stops only.

Land
- Work confined to existing designation, width reduced at pinch points.

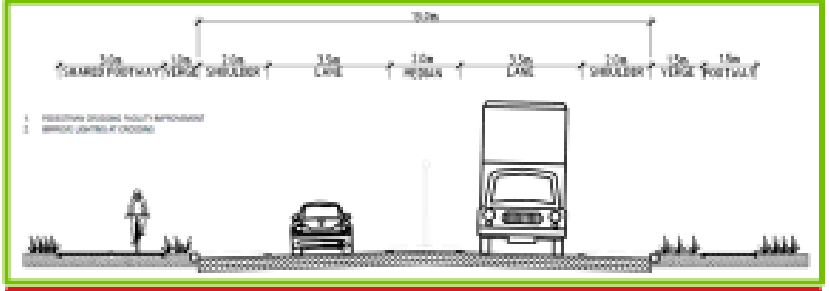
Section 2: Waitahanui (2km) (draft for comment)

PROBLEM:
Speed limit. Severance. Narrow shoulders.

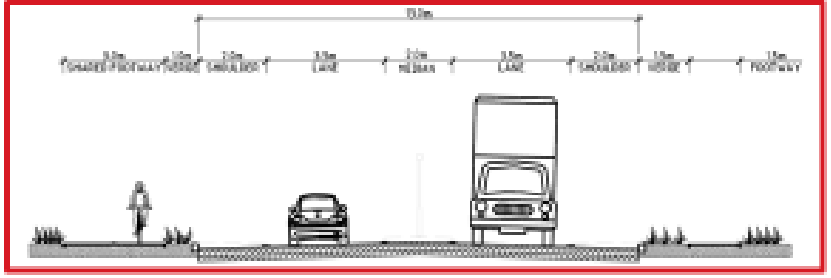
DSI Benefit: ↑ ↑ ↑ Cost: $$$ Route Availability: ✓✓✓

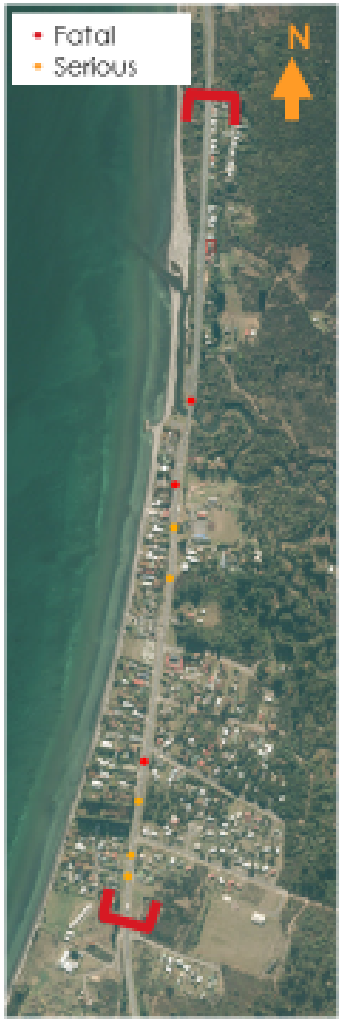


DSI Benefit: ↑ ↑ ↑ ↑ Cost: $$ Route Availability: ✓✓✓



DSI Benefit: ↑ ↑ ↑ Cost: $$ Route Availability: ✓✓✓





Option 1

URBAN SAFETY + T2T CYCLE UPGRADE + SCENIC STOP UPGRADES

Safety
- Pedestrian crossing required between lake side stopping areas and footpath
- School crossing improvements
- Narrow footpaths widened to shared path width where demand exists
- Wider flush median will aid right turn movements
- Improved lighting at pedestrian crossing/intersection
- Engineering to support speed management

Road User Facilities
- Clip on bridge to align with T2T shared path
- Upgrade entry/exits, RUF facilities, including new facilities and cultural references where appropriate.

Land
- May require land for certain intersection treatments

Option 2

URBAN SAFETY + SCENIC STOP UPGRADES

Safety
- Pedestrian crossing required between lake side stopping areas and footpath
- School crossing improvements
- Narrow footpaths widened to shared path width where demand exists
- Wider flush median will aid right turn movements
- Improved lighting at pedestrian crossing
- Engineering to support speed management

Road User Facilities
- Upgrade entry/exits, RUF facilities, including new facilities and cultural references where appropriate.

Land
- May require land for certain intersection treatments

Option 3

URBAN SAFETY

Safety
- Pedestrian crossing required between lake side stopping areas and footpath
- School crossing improvements
- Narrow footpaths widened to shared path width where demand exists
- Wider flush median will aid right turn movements
- Improved lighting at pedestrian crossing/intersection
- Engineering to support speed management

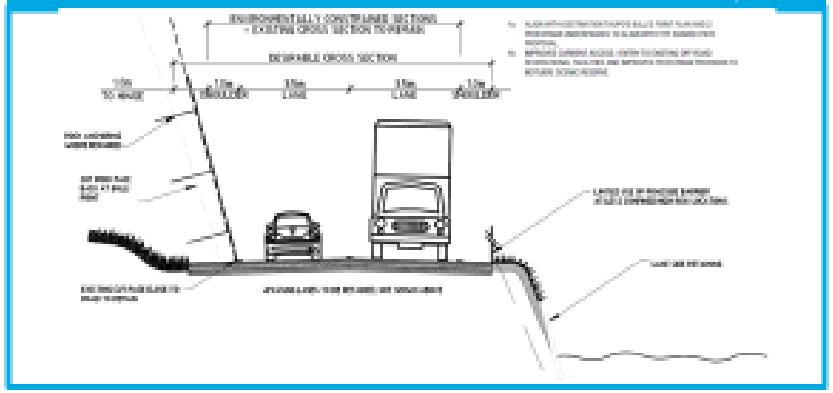
RUF
- Upgrade entry/exits

Land
- May require land for certain intersection treatments

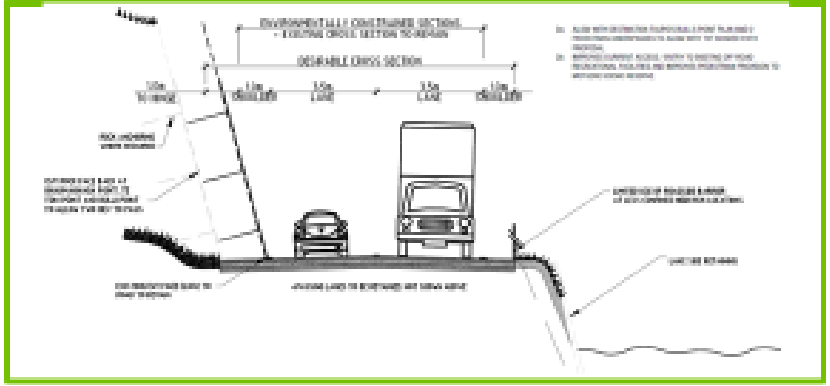
Section 3: Hatepe to Motutere (7.2km) [draft for comment]

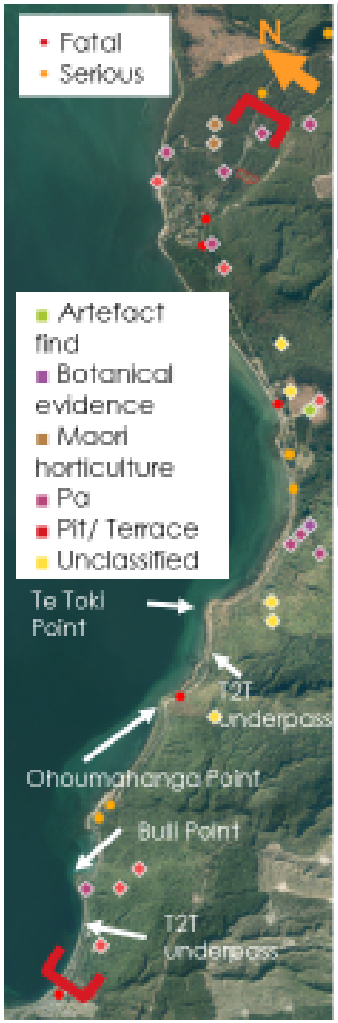
PROBLEM:
Safety, resilience and two trucks passing all compromised by topography, environment and cultural constraints. 2 star. Narrow shoulders. Slips an issue.

DSI Benefit: ↑ ↑ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↑ ↑ ↑ Cost: $$$$ Route Availability: ✓✓✓





Option 1a

TARGETED SAFETY LOW ENVIRONMENTAL IMPACT + NON MOTORISED USER/TOURIST UPGRADES

Safety
- Speed management
- Safety works confined to topography – some localised guardrail and shoulder widening where corridor allows. Variable message signage will help warn wide vehicles of opposing wide vehicles etc. Helpful for vehicles towing boats that do not have the radio communication that HCV's utilise
- Corner easing at Bull Point

Resilience
- Implement 2015/TP low side-erosion protection designs and stability measures to existing cuttings + identified stability works required to ensure continued corridor availability

Road User Facilities
- Access improvements only

Land
- Some land required at Bull Point

Option 1b

TARGETED SAFETY LOW ENVIRONMENTAL IMPACT

Safety
- Speed management
- Safety works confined to topography – some localised guardrail and shoulder widening where corridor allows. Variable message signage will help warn wide vehicles of opposing wide vehicles etc. Helpful for vehicles towing boats that do not have the radio communication that HCV's utilise
- Corner easing at Bull Point

Resilience
- Implement 2015/TP low side-erosion protection designs and stability measures to existing cuttings + identified stability works required to ensure continued corridor availability

Road User Facilities
- Access improvements only

Land
- Some land required at Bull Point

Option 2a

THREE POINTS CORNER EASING + NON MOTORISED USER/TOURIST UPGRADES

Safety
- Speed management
- Safety works confined to topography – some localised guardrail and shoulder widening where corridor allows. Variable message signage will help warn wide vehicles of opposing wide vehicles etc. Helpful for vehicles towing boats that do not have the radio communication that HCV's utilise
- Corner easing at Ohoumahanga Point, Te Toki Point and Bull Point

Resilience
- Implement 2015/TP low side-erosion protection designs and stability measures to existing cuttings + identified stability works required to ensure continued corridor availability

Road User Facilities
- Access improvements only

Land
- Land required for corner easing

Option 2b

THREE POINTS CORNER EASING

Safety
- Speed management
- Safety works confined to topography – some localised guardrail and shoulder widening where corridor allows. Variable message signage will help warn wide vehicles of opposing wide vehicles etc. Helpful for vehicles towing boats that do not have the radio communication that HCV's utilise
- Corner easing at Ohoumahanga Point, Te Toki Point and Bull Point

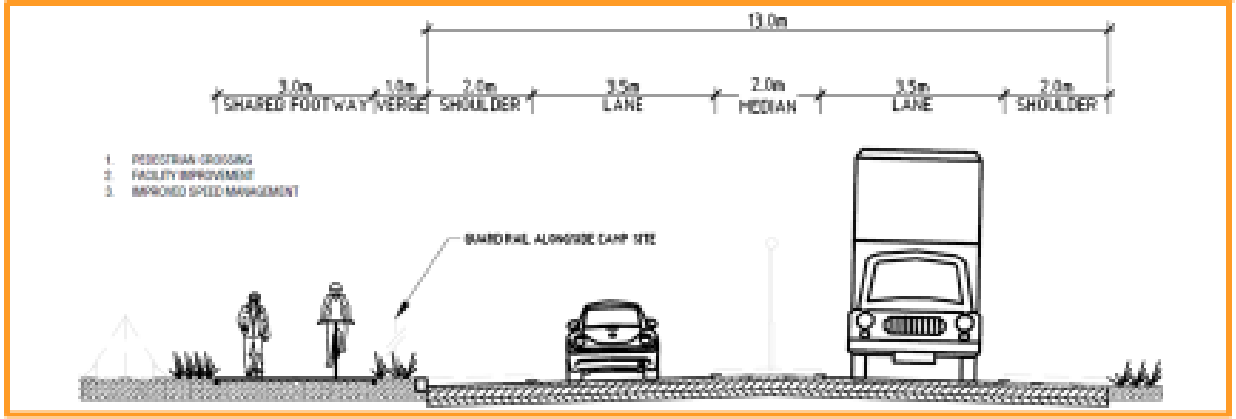
Resilience
- Implement 2015/TP low side-erosion protection designs and stability measures to existing cuttings + identified stability works required to ensure continued corridor availability

Road User Facilities
- Access improvements only

Land
- Land required for corner easing

Section 4: Motutere (0.9km) (draft for comment)

PROBLEM:
Safety: 2 star route, head on crashes. Competing Interests: Motorcamp straddles road creating conflict/risk.



Option 1

URBAN SAFETY + SPEED MANAGEMENT

DSI Benefit: ↑ ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- Flush median to aid right turn into property accesses.
- Where possible increase footpath width to provide shared access
- Engineering to support lower speed environment

Road User Facilities
- Improved accesses into lake side rest stops
- Removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians

Land
- Generally within road corridor with exception of realigned bridge

Option 2

URBAN SAFETY

DSI Benefit: ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- Flush median to aid right turn into property accesses.
- Where possible increase footpath width to provide shared access

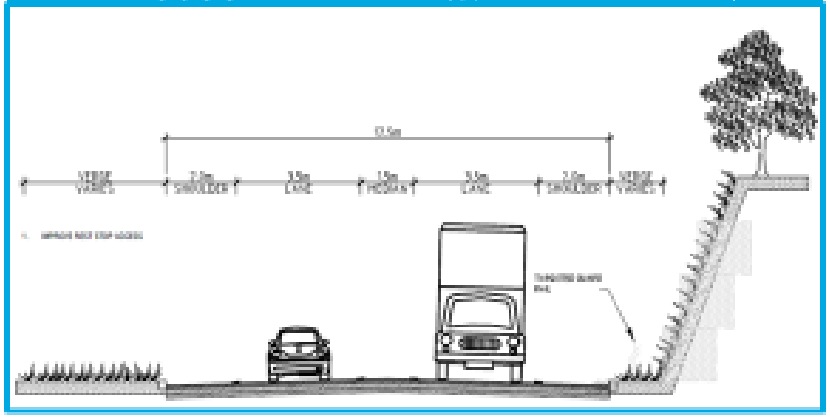
Road User Facilities
- Improved accesses into lake side rest stops
- Removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians

Land
- Generally within road corridor with exception of realigned bridge

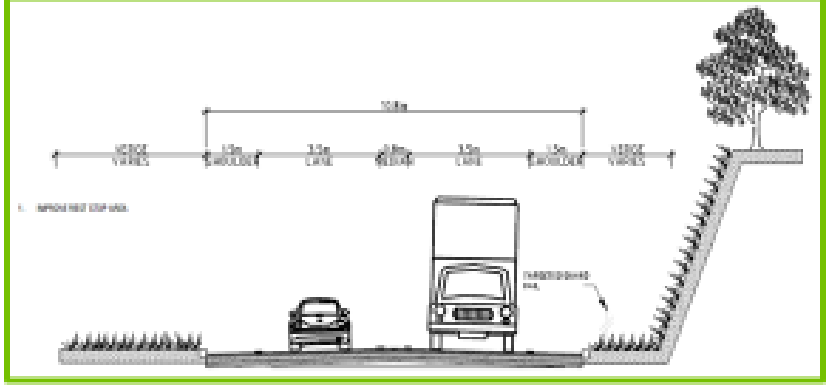
Section 5: Motutere to Tauranga Taupo (3.2km) (draft for comment)

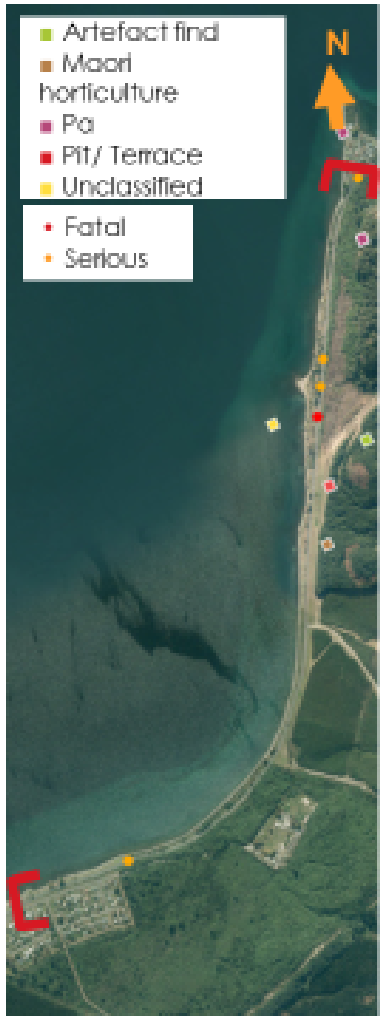
PROBLEM:
Primary issues are access to recreation areas, speed and severance.

DSI Benefit: ↟ ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ ↟ Cost: $$ Route Availability: ✓✓





Option 1

TARGETED SAFETY + RSI

Safety
- Guardrail to protect road side hazards.
- 1.5m Wide centreline/ flush median will aid right turns into lake side service roads
- Other benefits
- Horizontal and vertical geometry is generally already compliant

Road User Facilities
- Upgrade entry/exits, sun facilities (including new facilities and cultural references where appropriate.

Land
- Relatively large amount of earthworks or retaining required to move road more
- Lake foreshore close to road, limits the options for widening
- Probably land purchase required

Option 2a

TARGETED SAFETY – LIMITED EARTHWORK/LAND IMPACT + RSI IMPROVEMENTS

Safety
- Targeted road side barriers at high risk locations
- 0.5m Wide centreline/ flush median will aid right turns into lake side service roads
- Horizontal and vertical geometry is generally already compliant

Road User Facilities
- Improved access arrangements in road side rest areas/tourist stops on lake side

Land
- Works mostly limited to existing road designation.
- Lake foreshore close to road, limits the options for widening

Option 2b

TARGETED SAFETY – LIMITED EARTHWORK/LAND IMPACT

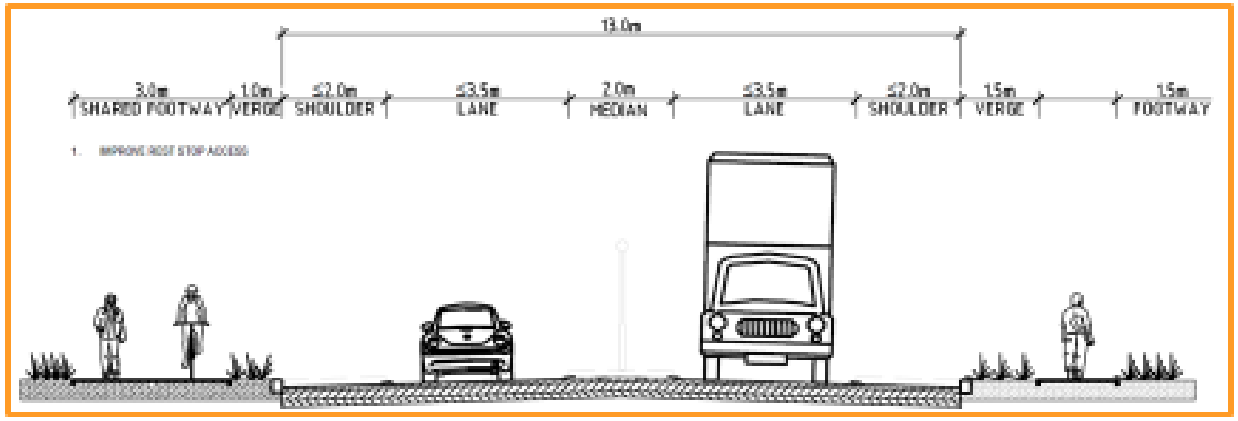
Safety
- Targeted road side barriers at high risk locations
- 0.5m Wide centreline/ flush median will aid right turns into lake side service roads
- Horizontal and vertical geometry is generally already compliant

Road User Facilities
- Upgrade entry/ exit to minimum standards only

Land
- Works mostly limited to existing road designation.
- Lake foreshore close to road, limits the options for widening

Section 6: Te Rangiita/ Tauranga Taupo ex Bridge (3.2km) (draft for comment)

PROBLEM:
Run off road risk, and severance.



Option 1

URBAN SAFETY + SPEED MANAGEMENT

DSI Benefit: ↑ ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- Flush median to aid right turn into property accesses.
- Where possible increase footpath width to provide shared access .
- Engineering to support lower speeds

Road User Facilities
- Improved accesses into lake side rest stops
- Removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians

Land
- Generally within road corridor with exception IT bridge works (separate section)

Option 2

URBAN SAFETY

DSI Benefit: ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- Flush median to aid right turn into property accesses.
- Where possible increase footpath width to provide shared access .

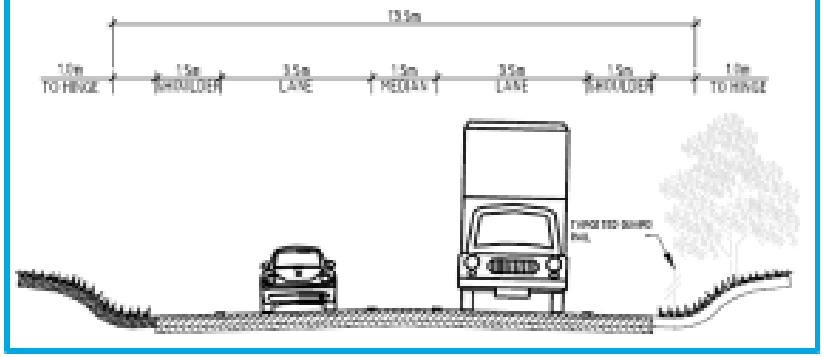
Road User Facilities
- Improved accesses into lake side rest stops

Land
- Generally within road corridor with exception IT bridge works (separate section)

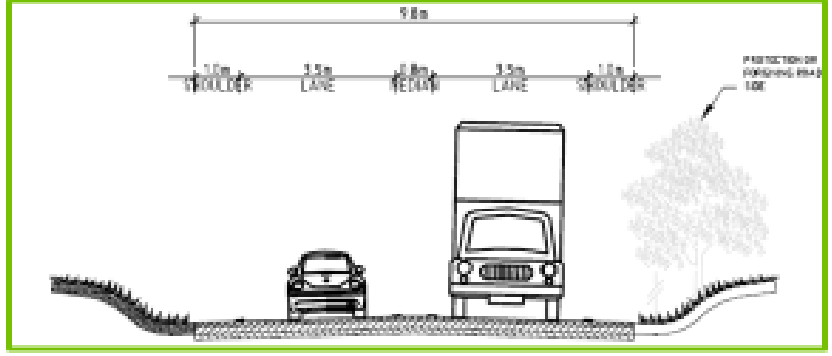
Section 7:Te Rangiita/Tauranga Taupo to Motuoapa (2.3km) (draft for comment)

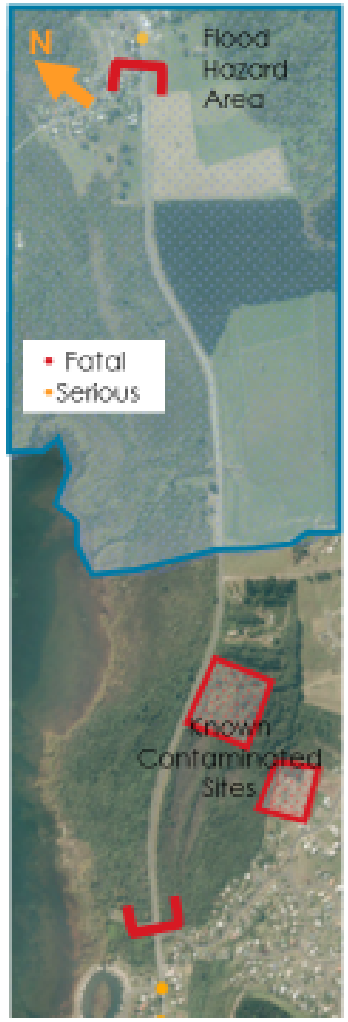
PROBLEM:
Flood prone area with deep road side drains.

DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ Cost: $$ Route Availability: ✓✓





Option 1

TARGETED SAFETY

Safety
- Targeted road side barriers at high risk locations
- Pinch point at existing structures

Resilience
- Road side barriers reduce risk of DSI accidents

Land
- Some widening possible depending on earthwork profile

Option 2

TARGETED SAFETY – NARROW

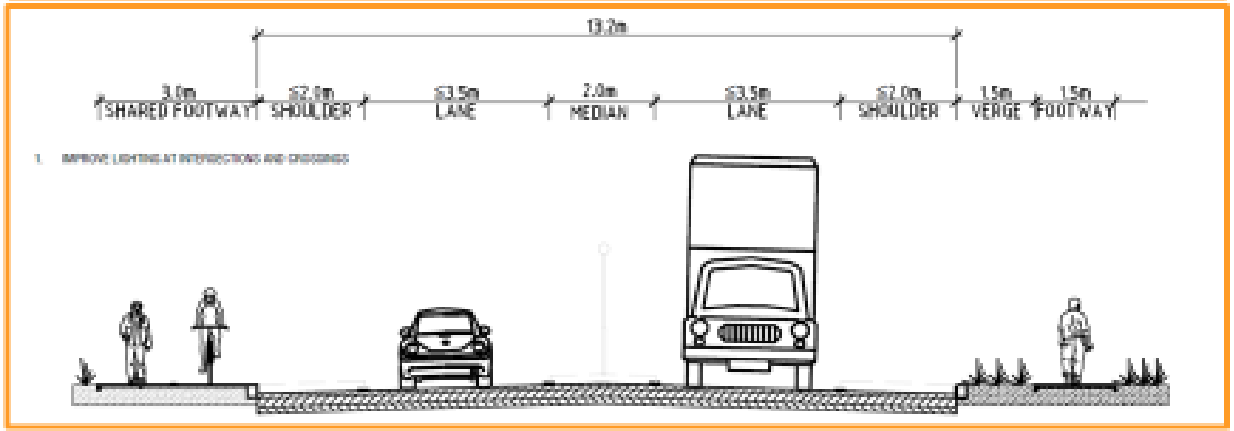
Safety
- Targeted road side barriers at high risk locations, mainly deep road side ditches.
- Pinch point at existing structures
- Narrow wide centerline does not provide for future flexible median barrier

Resilience
- Road side barriers reduce risk of DSI accidents

Land
- Work limited to existing road designation and limited widening into soft flood prone ground

Section 8: Motuoapa (1.2km) (draft for comment)

PROBLEM:
Zoned for residential development will increase conflicting demands



Option 1

URBAN SAFETY + SPEED MANAGEMENT

DSI Benefit: ↑ ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- New pedestrian/shared facilities through town between known trip generators
- Improved lighting at intersections and pedestrian crossings
- Introduce flush median to aid turning into private accesses.
- Engineering options to support lower speeds

Road User Facilities
- Land side residential development underway, leading to future conflicting interest issues

Land
- Work limited to existing road designation.

Option 2

URBAN SAFETY

DSI Benefit: ↑ ↑ ↑
Cost: $$
Route Availability: ✓✓

Safety
- New pedestrian/shared facilities through town between known trip generators
- Improved lighting at intersections and pedestrian crossings
- Introduce flush median to aid turning into private accesses.

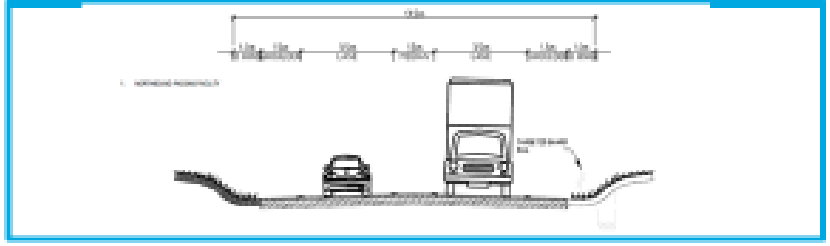
Road User Facilities
- Land side residential development underway, leading to future conflicting interest issues

Land
- Work limited to existing road designation.

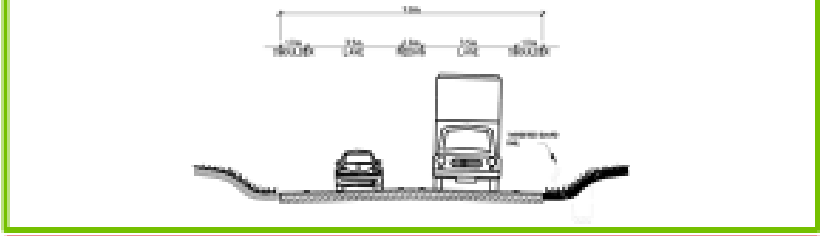
Section 9: Motuoapa to Turangi (6.5km) (draft for comment)

PROBLEM:
Deep road side ditches are located close to edge of seal, increasing the risk of high severity accidents

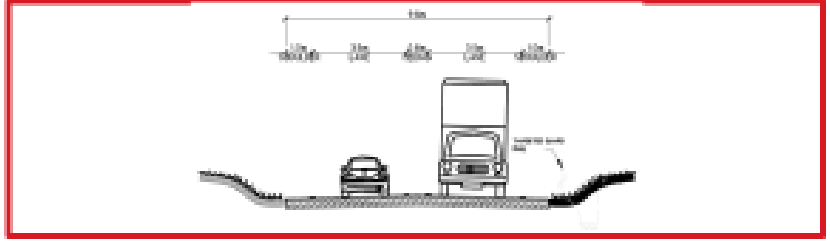
DSI Benefit: ↟ ↟ ↟ ↟ Cost: $$$$ Route Availability: ✓✓✓✓

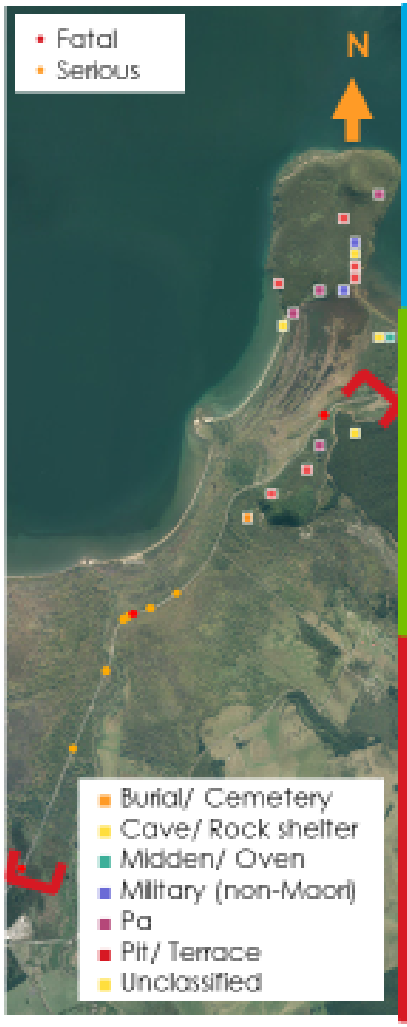


DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ Cost: $$$ Route Availability: ✓✓✓





Option 1

TARGETED SAFETY + PASSING LANE

Safety
- Targeted road side barriers at high risk locations, mainly deep side drains.
- Wider carriageway across flood prone land provides some recovery room for errant vehicles

Road User Facilities
- New northbound passing lane.

Land
- Existing road alignment appears to sit outside designation
- Passing lane will require land purchase

Option 2

TARGETED SAFETY

Safety
- Targeted road side barriers at high risk locations, mainly deep side drains.
- Wider carriageway across flood prone land provides some recovery room for errant vehicles

Road User Facilities
- N/A

Land
- Existing road alignment appears to sit outside designation

Option 3

TARGETED SAFETY – MIN LAND IMPACT

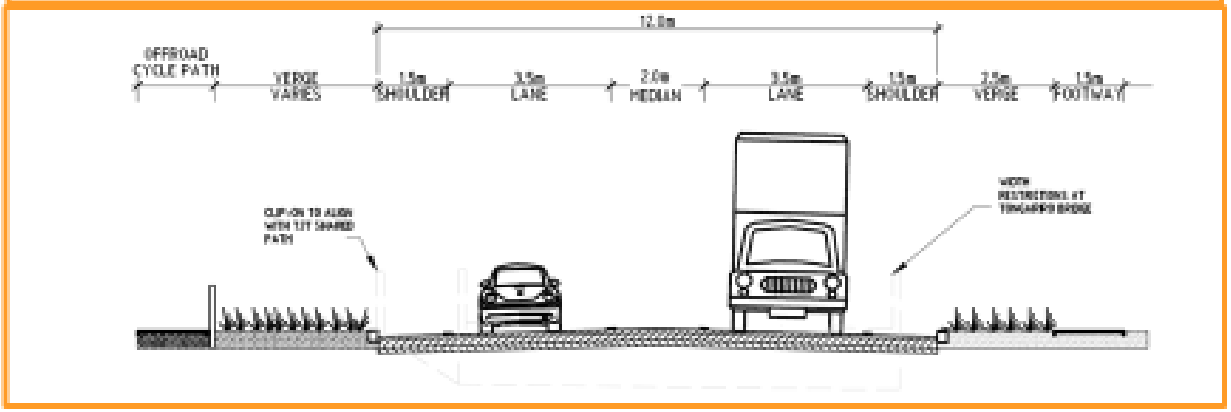
Safety
- Targeted road side barriers at high risk locations, mainly deep side drains.
- Wider carriageway across flood prone land provides some recovery room for errant vehicles
- Narrow wide centerline does not provide for future flexible median barrier
- Narrow shoulders and guardrail provides only marginal improvement for Non Motorised Users

Road User Facilities
- N/A

Land
- Existing road alignment appears to sit outside designation

Section 10: Turangi (3.9km) (draft for comment)

PROBLEM:
Low level of pedestrian safety and amenity, intersection form at Pihanga Road/SH1 is appropriate for 80kph speeds and high percentage of HCV right turns.



Option 1

URBAN SAFETY + SPEED MANAGEMENT + T2T CYCLE INFRASTRUCTURE

DSI Benefit:	↓ ↓ ↓ ↓
Cost:	$$$$
Route Availability:	✓✓✓

SAFETY
- Pedestrian improvements, clip on structure at existing bridge
- Upgrade off-road path to shared path standard
- Possible upgrade intersection to roundabout
- Improve CPTED quality of pedestrian underpass
- Engineering to support lower speeds

Road User Facilities
- Improve access to formalized truck stop facilities.

LAND
- Land purchase required for roundabout

Option 2

URBAN SAFETY + T2T CYCLE INFRASTRUCTURE

DSI Benefit:	↓ ↓ ↓ ↓
Cost:	$$$
Route Availability:	✓✓✓

SAFETY
- Pedestrian improvements, clip on structure at existing bridge
- Upgrade off-road path to shared path standard
- Upgrades to existing intersection form
- Improve CPTED quality of pedestrian underpass

Road User Facilities
- Improve access to formalized truck stop facilities.

LAND
- Work limited to existing road designation.

Option 3

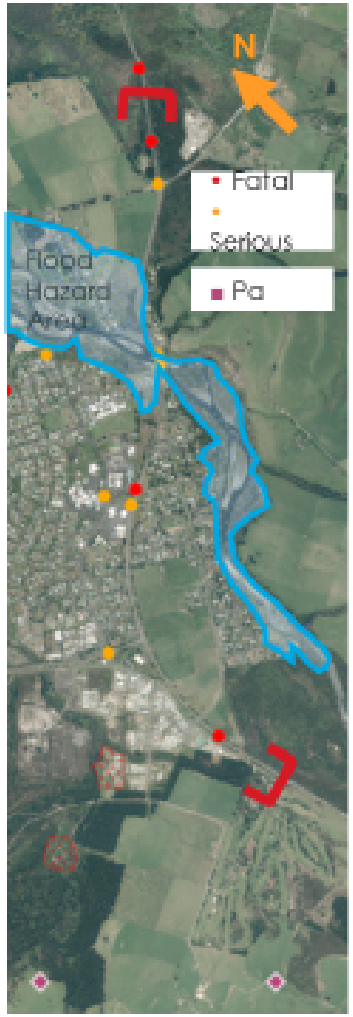
URBAN SAFETY

DSI Benefit:	↓ ↓
Cost:	$$
Route Availability:	✓✓✓

SAFETY
- Upgrade off-road path to shared path standard
- Upgrades to existing intersection form
- Improve CPTED quality of pedestrian underpass

Road User Facilities
- Improve access to formalized truck stop facilities.

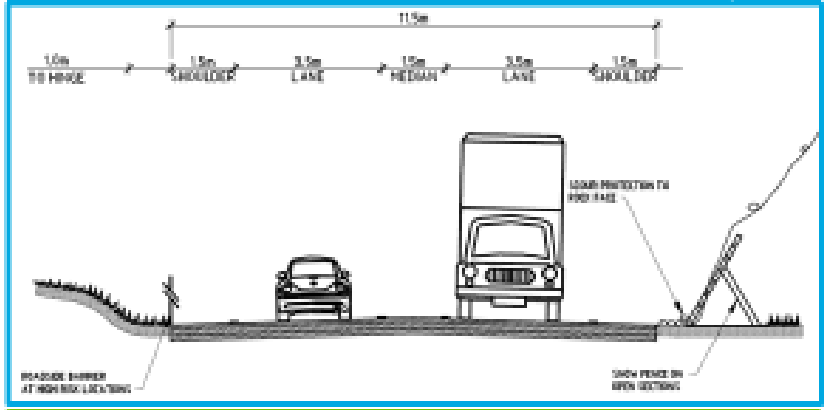
LAND
- Work limited to existing road designation.



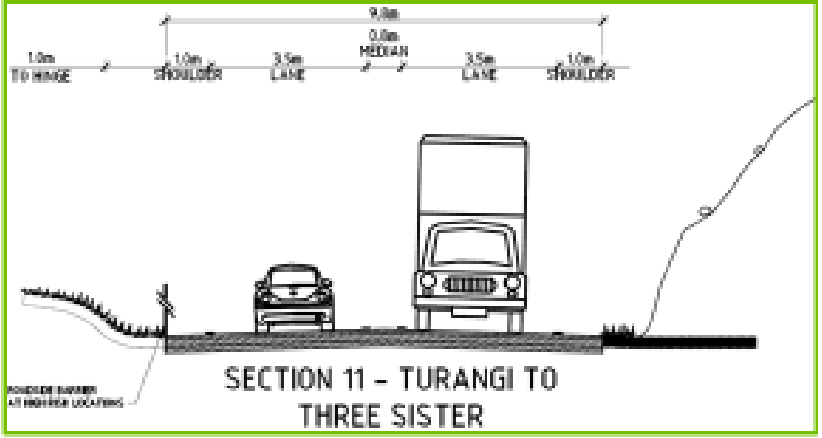
Section 11: Turangi to Three Sisters (past Rangipo) (16.2km) [draft for comment]

PROBLEM:
Narrow shoulders. Run off road risk higher. Snow, ice, trees and crashes all contribute to recorded closures

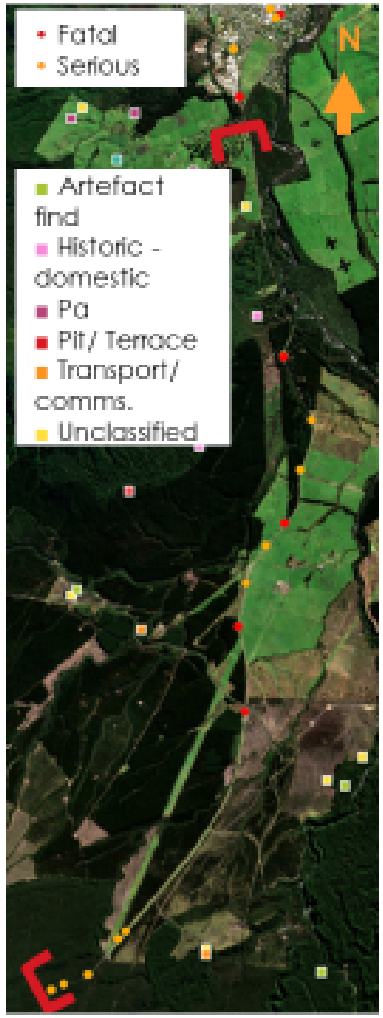
DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ ↟ Cost: $$ Route Availability: ✓✓



SECTION 11 – TURANGI TO THREE SISTER



Option 1

TARGETED SAFETY + ENVIRONMENTAL RESILIENCE

Safety
- Targeted guardrail in areas that are high risk and don't hamper snow clearing.
- Widens existing narrow shoulders that are narrower than average for section

Resilience
- Scour protection
- Snow fences installed if benefit justifies use
- Widened shoulder improves resilience to plan and unplanned events, including snow and ice including allowing vehicles to reat clear of lanes, improving route availability for response vehicles.
- Wide shoulders allow stricken vehicle to wait mostly clear of live carriageway.

Land
- Existing road outside designation in places.

Option 2

TARGETED SAFETY

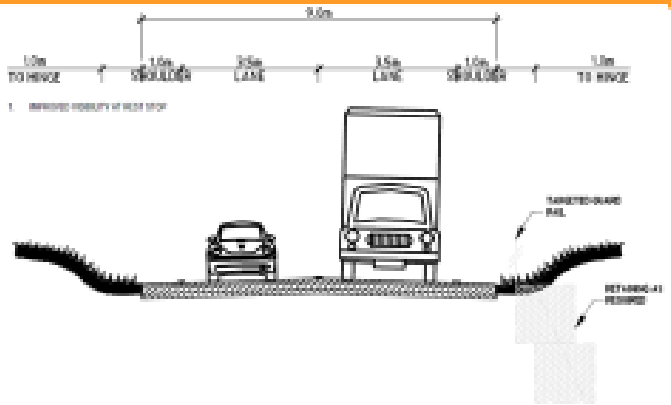
SAFETY
- Targeted guardrail in areas that are high risk and don't hamper snow clearing.
- Narrower cross section is more consistent with lower speed environment to the South

LAND
- Existing road outside designation in places.

Section 12: Three Sisters (8.2km) (draft for comment)

PROBLEM:
Narrow shoulders, run off road risk higher. Speed limit not safe and appropriate speeds. Two trucks passing not comfortable.

DSI Benefit: ♦ ♦ | Cost: $$ | Route Availability: ✓✓



Option 1

SAFETY MANAGEMENT + SPEED MANAGEMENT + RESILIENCE

Safety
- Targeted road side barriers will focus on run off road type accidents that account for 100% of DSIs
- Widen corners where structures don't prohibit
- Possible solar powered lighting at high risk areas
- Engineering to support lower speeds

Resilience
- Scour protection
- Reshaping of rock slopes

Land
- Road appears to be outside of current designation due to previous realignment.
- In places the road appears to the boundary, any change will likely result in land purchase

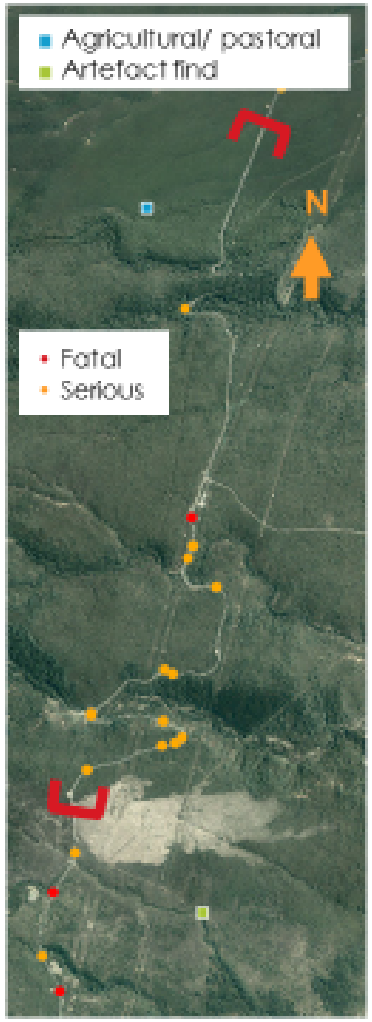
Option 2

SAFETY MANAGEMENT + RESILIENCE

Safety
- Targeted road side barriers will focus on run off road type accidents that account for 100% of DSIs
- Widen corners where structures don't prohibit
- Rock fall containment installed
- Possible solar powered lighting at high risk areas

Resilience
- Scour protection
- Reshaping of rock slopes

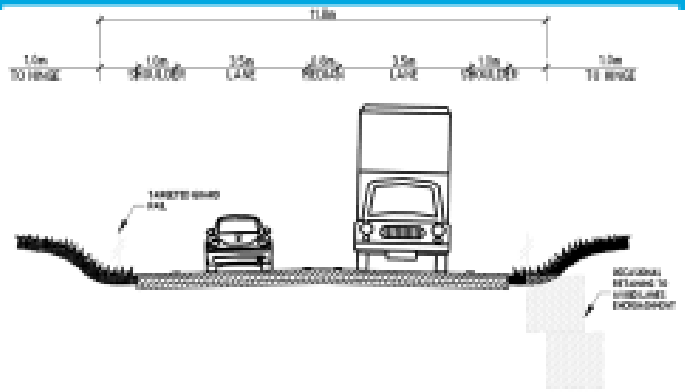
Land
- Road appears to be outside of current designation due to previous realignment.
- In places the road appears close to the boundary, any change will likely result in land purchase



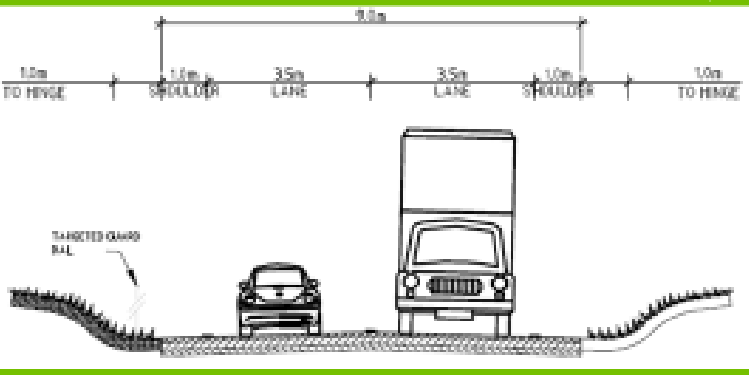
Section 13: Three Sisters to Desert Road Curves (1.5km) (draft for comment)

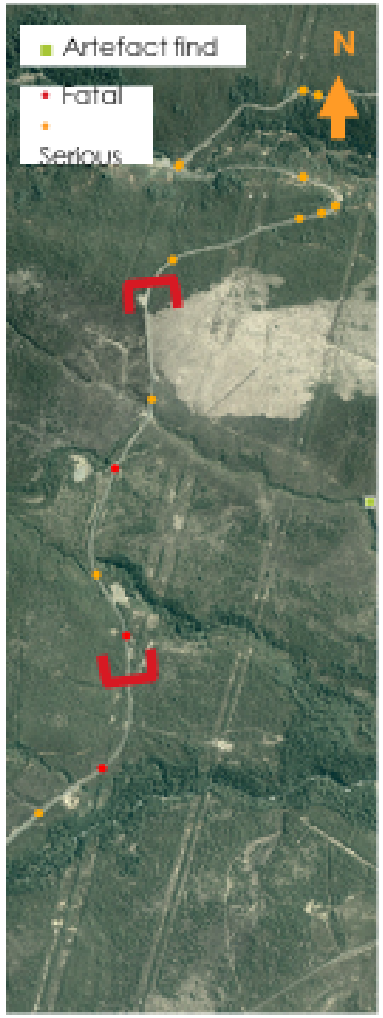
PROBLEM:
Narrow shoulders, run off road risk higher. Speed limit not safe and appropriate speeds.

DSI Benefit: ↑ ↑ ↑ Cost: $$$ Route Availability: ✓✓



DSI Benefit: ↑ ↑ Cost: $$ Route Availability: ✓✓





Option 1

TARGETED SAFETY

Safety

- Targeted road side barriers will focus on run off road type accidents that account for 100% of DSIs
- Widen corners where structures don't prohibit
- Rock fall containment installed
- Possible solar powered lighting at high risk areas
- Narrow wide centerline reduces risk of head-on crashes

LAND

- Road appears to be outside of current designation due to previous realignment

Option 2

TARGETED SAFETY + SPEED MANAGEMENT

Safety

- Targeted road side barriers will focus on run off road type accidents that account for 100% of DSIs
- Widen corners where structures don't prohibit
- Rock fall containment installed
- Possible solar powered lighting at high risk areas

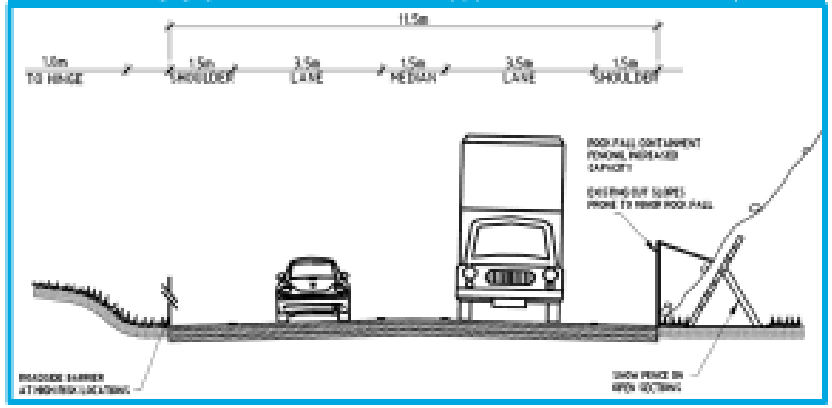
LAND

- Road appears to be outside of current designation due to previous realignment

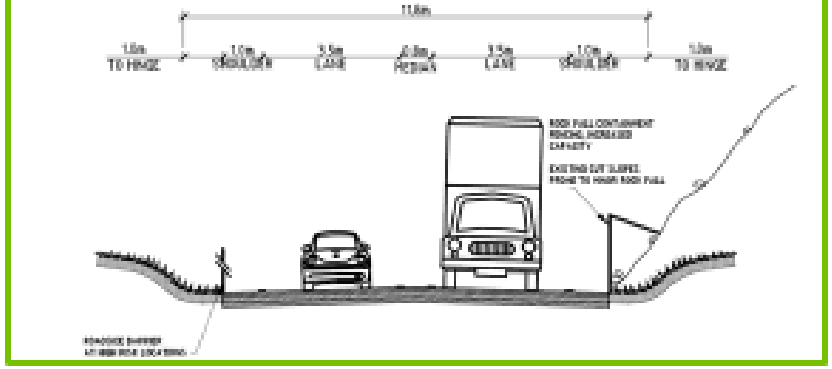
Section 14: Desert Road Curves (11.6km) (draft for comment)

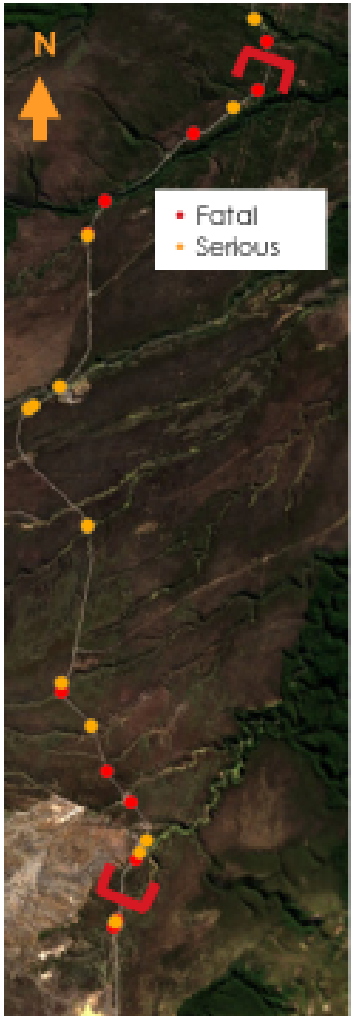
PROBLEM:
Speed limit not safe and appropriate speed. Crashes and slips have caused closures in the past. High crash risk. Majority are head on crashes.

DSI Benefit: ↟ ↟ ↟ Cost: $$$ Route Availability: ✓✓✓



DSI Benefit: ↟ ↟ Cost: $$ Route Availability: ✓✓





Option 1

TARGETED SAFETY

Safety
- Targeted road side barriers
- Widen corners and 1.5m wide centerline will help to reduce head-on accidents
- Rock fall containment installed
- Possible solar powered lighting at high risk areas
- Speed management

Land
- Road appears to be outside of current designation due to previous realignment.
- In places the road appears close to the designation boundary, any change will likely result in land purchase

Option 2

TARGETED SAFETY – AVOIDING LAND TAKE

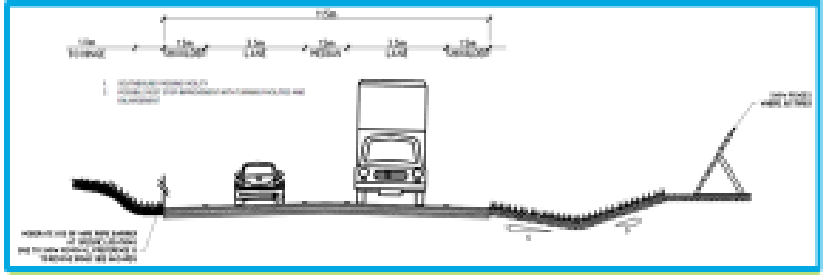
Safety
- Targeted road side barriers
- 0.8m wide centerline will help to reduce head-on accidents
- Rock fall containment installed
- Possible solar powered lighting at high risk areas
- Ease out of context curves where possible
- Speed management

Land
- Road appears to be outside of current designation due to previous realignment.
- In places the road appears very close to the designation boundary, any change will likely result in land purchase

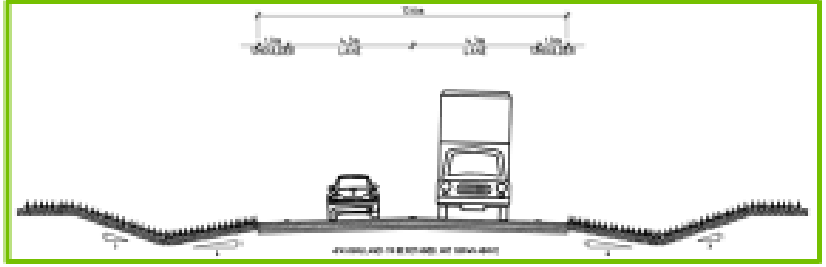
Section 15: Desert Road Curves to Waiouru (23.1km) (draft for comment)

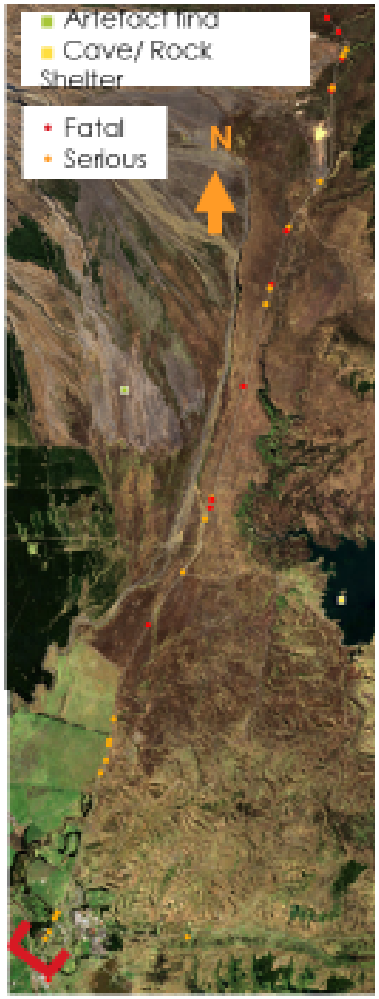
PROBLEM:
Run off road risk. Snow and ice primary cause of regular closures.

DSI Benefit: ↑ ↑ ↑ Cost: $$ Route Availability: ✓✓



EXISTING CROSS-SECTION





Option 1

TARGETED SAFETY + RESILIENCE + SCENIC STOP UPGRADES

Safety
- Targeted road side barrier
- Limited widening and reallocation for wide centerline

Resilience
- Snow fences installed if benefit justifies use
- Place road side barrier away from road edge to allow effective ploughing

Road User Facilities
- Southbound passing facility
- Improve off road facilities

Land
- Road appears to be outside of current designation due to previous realignment.
- Snow fence likely outside of road reserve
- Work likely contained with existing designation – where designation correct

Option 2

EXSITING + TARGETED SAFETY

Safety
- Targeted road side barrier
- Retain current section and alignment – 4 Star currently

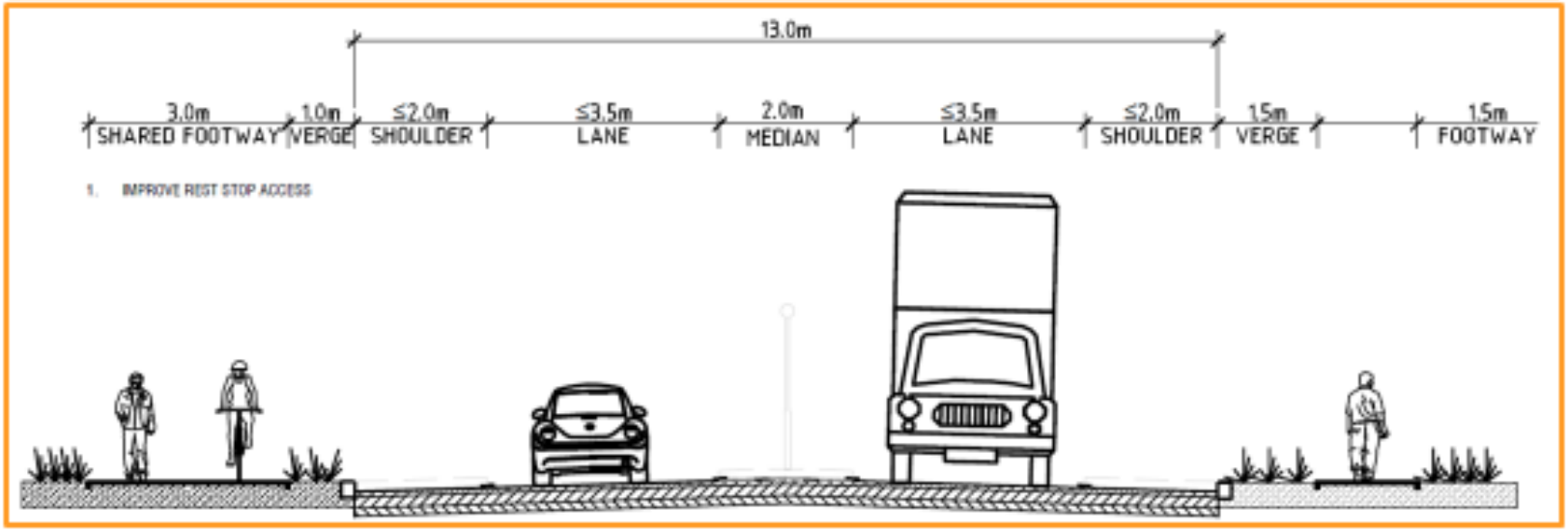
Resilience
- Snow fences installed if benefit justifies use
- Place road side barrier away from road edge to allow effective ploughing

Road User Facilities
- Improve access into existing off road facilities

Land
- Road appears to be outside of current designation due to previous realignment.
- Snow fence likely outside of road reserve
- Work likely contained with existing designation – where designation correct

Generic Urban Options

PROBLEM(S):
Severance, vehicle speeds, competing interests, amenity.



Option 1

URBAN SAFETY

DSI Benefit: Main variant relates to speed management element (🚶 🚶 🚶 - 🚶 🚶 🚶 🚶)
Cost: $$
Route Availability: ✓✓

Safety
- Flush median to aid right turn into property accesses.
- Where possible increase footpath width to provide shared access.
- Main variance between the options relates to speed management and engineering to support lower speeds. Also Turangi has additional options.

Road User Facilities
- Typically improved accesses into lake side rest stops
- Removes conflict point for two heavies passing and provides opportunity to provides shared zone wide enough for fishing/cycling and pedestrians

Land
- Some sections may require land for some intersection treatments.
- Treatments within existing corridor.

Multi-Outcome Section Options MCA

Section	Option	Scores (1= Very Good Outcomes, 5 = Very Poor Outcomes)																	
		Investment Objectives				Assessment of Effects									Implementability				
		Safety	Route Availability	Competing Interests	Subtotal	Natural Hazards	Natural Envt - Terrestrial	Natural Envt - Freshwater	Property and Adjacent Land Use	Tangata Whenua Values	Visual and Landscape	Urban Design Opportunities	Contaminated Land	Community Cohesion	Subtotal	Engineering Degree of Difficulty	Operational / Maintenance	Cost	Subtotal	Grand total
1	1	2	2	2	6	n/a	4	4	5		4	2	n/a	n/a	19	3	3	3	9	11.22
	2a	3	3	3	9	n/a	2	2	2		2	2	n/a	n/a	10	2	2	2	6	8.25
	2b	3	3	2	8	n/a	2	2	2		2	3	n/a	n/a	11	2	2	2	6	8.25
2	1	3	4	2	9	n/a	3	4	3		3	2	n/a	2	17	3	2	3	8	11.22
	2	2	4	3	9	n/a	3	4	2		3	2	n/a	2	16	2	2	2	6	10.23
	3	3	5	4	12	n/a	3	4	2		3	3	n/a	2	17	2	2	2	6	11.55
3	1a	4	4	4	12	3	4	4	4		4	2	n/a	n/a	21	4	3	4	11	14.52
	1b	5	4	5	14	3	4	4	4		4	3	n/a	n/a	22	3	3	3	9	14.85
	2a	3	4	3	10	2	4	4	4		4	2	n/a	n/a	20	4	2	5	11	13.53
	2b	4	4	3	11	2	4	4	4		4	3	n/a	n/a	21	3	2	3	8	13.2
4	1	2	4	2	8	n/a	n/a	n/a	2		n/a	n/a	n/a	n/a	2	2	2	2	6	5.28
	2	3	5	3	11	n/a	n/a	n/a	2		n/a	n/a	n/a	n/a	2	2	2	2	6	6.27
5	1	2	3	3	8	n/a	4	n/a	4		3	2	n/a	3	16	3	2	4	9	10.89
	2a	3	4	4	11	n/a	3	n/a	2		2	3	n/a	3	13	2	3	2	7	10.23
	2b	3	4	4	11	n/a	3	n/a	2		2	3	n/a	3	13	2	3	2	7	10.23
6	1	2	4	2	8	4	4	4	2		n/a	n/a	n/a	2	16	2	2	2	6	9.9
	2	3	5	3	11	4	4	4	2		n/a	n/a	n/a	3	17	2	2	2	6	11.22
6a	1	3	4	4	11	5	1	1	1		n/a	2	n/a	3	13	1	1	2	4	9.24
	2	5	5	5	15	5	1	1	1		1	n/a	n/a	n/a	9	1	1	1	3	8.91
	3	4	5	4	13	5	1	1	1		1	n/a	n/a	n/a	9	1	1	1	3	8.25
	4	4	4	3	11	5	1	1	3		2	n/a	n/a	n/a	12	2	1	2	5	9.24
	5	2	1	1	4	3	4	4	3		5	4	n/a	1	24	4	2	5	11	12.87
	6	2	1	1	4	3	1	4	4		4	5	n/a	4	25	3	2	4	9	12.54
	7	2	1	1	4	5	1	1	3		3	2	n/a	3	18	3	1	3	7	9.57
	8	1	1	1	3	3	4	4	4		4	5	n/a	4	28	4	1	5	10	13.53
7	1	3	4	5	12	4	4	n/a	3		3	n/a	n/a	n/a	14	3	2	3	8	11.22
	2	4	5	5	14	3	2	n/a	2		2	n/a	n/a	n/a	9	2	3	2	7	9.9
8	1	2	4	4	10	n/a	3	n/a	2		n/a	2	n/a	2	9	2	2	2	6	8.25
	2	3	5	4	12	n/a	3	n/a	2		n/a	2	n/a	3	10	2	2	2	6	9.24
9	1	2	4	3	9	n/a	4	4	4		4	n/a	n/a	n/a	16	4	2	4	10	11.55
	2	3	5	4	12	n/a	3	4	3		2	n/a	n/a	n/a	12	3	3	3	9	10.89
	3	4	5	5	14	n/a	2	2	2		3	n/a	n/a	n/a	9	2	3	2	7	9.9
10	1	2	3	1	6	3	n/a	3	4		3	2	4	1	20	4	3	4	11	12.21
	2	3	5	3	11	3	n/a	3	2		2	2	4	2	18	4	3	3	10	12.87
	3	4	5	5	14	3	n/a	2	2		2	2	4	2	17	2	3	2	7	12.54
11	1	3	2	5	10	1	4	4	3		5	-	n/a	-	17	3	2	3	8	11.55
	2	3	4	5	12	4	3	2	3		4	-	n/a	-	16	2	3	2	7	11.55
12	1	3	4	5	12	2	3	3	3		4	-	n/a	-	15	3	4	2	9	11.88
	2	4	5	5	14	2	3	3	3		4	-	n/a	-	15	3	4	2	9	12.54
13	1	3	4	5	12	2	4	4	3		4	-	n/a	-	17	3	3	3	9	12.54
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15	1	3	4	2	9	2	4	n/a	2		5	-	n/a	-	13	2	4	3	9	10.23
	2	3	5	4	12	2	2	n/a	1		4	-	n/a	-	9	2	4	2	8	9.57

Tauranga Taupō Bridge Workshop 1

ID	Long List Options	Comment
1.1	50km/h speed limit through the township, with gateway planting and other design features to achieve this design speed	
1.2	Review speed limit through township and on curve advisory signs	
1.3	Improve communications with users if bridge shut e.g Variable Message Signs at key intersections with alternative routes (Tirau, Tokaroa, Turangi)	
1.4	Education campaign about safe speeds	
1.5	Improve pavement surface on 35km/h bend and bridge e.g. asphalt	
1.6	Widen and reshape carriageway and shoulder on 35km/h bend	
1.7	Provide larger and more prominent warning signs about bridge/bend combination	
1.8	Put rollers on the guardrail on the bridge	not sure how this fit with safety at the minute
1.9	Improve sightlines ahead of curve/bridge for traffic approaching from the north, so they can see the bridge better and understand/anticipate what they will need to do.	maybe we need a targeted safety improvements
1.10	Widen the bridge	
1.11	Reduce bridge to one lane only, with signal control	Ruled out due to level of service issues
1.12	Build a footbridge, and use the existing footpath on the bridge to provide a wider carriageway	
1.13	Realign to location A Figure 1	
1.14	Realign to location B Figure 1	
1.15	Realign to location C Figure 1	
1.16	Realign to location D Figure 1	
1.17	New bridge for soutbound traffic only, existing bridge for northbound traffic (note this could go with any of the realignment options)	

Tauranga Taupō Bridge

Tauranga Taupō Bridge Shortlist

PROBLEM:
Larger vehicles are unable to pass each other safely due to the road width and configuration.

Option 1 – Speed Management

DSI Benefit: ↟ ↟ ↟
Cost: $ $
Route Availability: ✓✓

Lower speed limit through township, with design features eg gateways, and review curve advisory speeds. Consider safety camera to ensure lower speeds.

Option 2 – Minor Improvements

DSI Benefit: ↟
Cost: $
Route Availability: ✓

Provide larger and more prominent warning signs about bridge/bend combination

Option 3 – Minor Improvements

DSI Benefit: ↟ ↟
Cost: $ $
Route Availability: ✓

Improve sightlines by clearing vegetation ahead of curve/ bridge for traffic approaching from the north, so drivers can see the bridge better and understand/ anticipate what they will need to do.

Option 4 – North Approach

DSI Benefit: ↟ ↟
Cost: $ $ $
Route Availability: ✓✓

Widen, resurface and reshape carriageway and shoulder on 35km/h bend so two trucks can pass

Option 5 and 6 – Realignment

Option 5 (alignment B)

DSI Benefit: ↟ ↟ ↟ ↟
Cost: $ $ $ $ $
Route Availability: ✓✓✓✓✓

Realign bridge to location B (existing designation)

Option 6 (alignment E)

DSI Benefit: ↟ ↟ ↟ ↟
Cost: $ $ $ $
Route Availability: ✓✓✓✓✓

Realign bridge to location E

Option 7 and 8 – Combination

Option 7

DSI Benefit: ↟ ↟ ↟ ↟
Cost: $ $ $ $ $
Route Availability: ✓✓✓✓✓

Option 1 + Option 2 + Option 3 + Option 4

Option 8

DSI Benefit: ↟ ↟ ↟ ↟ ↟
Cost: $ $ $ $ $
Route Availability: ✓✓✓✓✓

Option 1 + Option 5

Appendix E: Multi-Criteria Analysis Meeting Minutes

Meeting Notes

Corridor Options Multi Criteria Analysis

Taupō to Waiouru / 80509681

Date/Time:	July 4, 2019 / 8:30 AM
Place:	NZTA Hamilton
Attendees:	Anuradha Fitzwalter, Barry Dowsett, Mark Jack (part), Wayne Troughton, Phil Peet, Paula Hunter, James Caufield, Jeremy France
Absentees:	Alexios Kavallaris
Distribution:	As above

Purpose

Phil welcomed everyone to the meeting and outlined the agenda and purpose of the session, which is to undertake an initial Multi-Criteria Analysis (MCA) prior to a similar session with stakeholders and to determine if any options should be discarded at this time.

Option Development

Phil outlined the option development process to date by referring to previous documentation sent out (particularly email sent by Anuradha on 18 June 2019). This outlined the process to get to full Corridor Options from the options across the 15 sections.

Barry stated that he was happy to see that the options were adjusted to ensure consistency between adjacent sections as this is very important. Consistency across all settlements also important.

Option Description

Jeremy outlined the five corridor options, as per what was circulated in an email from Anuradha on 3 July 2019.

Barry asked us to re-consider the order of the options in relation to the intervention hierarchy, particularly in this constrained funding environment.

James noted that some element of speed management is included in all options. It was confirmed that the Speed Management option reinforces lower speeds rather than engineering up to allow higher speeds.

Criteria

Phil outlined the criteria that we are proposing. No changes were proposed

Scoring System

Phil outlined the scoring system, which is 1 to 5. 1 refers to high benefits/outcomes, low impacts and/or low difficulty, and 5 refers to low benefits/outcomes, high impacts and/or high difficulty. The lower the number the better the option for that criterion.

MCA process

For each criterion in turn, the person responsible outlined the way the criterion was evaluated and their proposed scores. In many cases the scores were developed by looking at each individual highway section before combining the scores for the entire corridor. The scores were then reviewed, altered (if necessary) and accepted by the workshop attendees. Any

discussion is reported below and the scores are presented together as an attachment.

Safety (JF)

The scores under this criterion focussed on how well the option would reduce deaths and serious injuries and/or improve the KiwiRAP star rating. This criterion relates to the safety impact once the project is open, rather than during construction.

The Benefits and Safety options scored the best, primarily due to the increased lengths of barrier, with Speed Management the worst performing as many of the interventions in that programme are also in the others.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	1	1	3	2

Route Availability (JF)

This highway is closed often due to weather, natural hazards or crashes. Scoring for this criterion was based on how well the option is likely to allow the highway to remain open when faced by the above events and in the case of crashes how well the Option reduces the likelihood of crashes (especially fatal and serious that can lead to lengthy closures).

It was noted that the two key problem areas are the Lakefront and the Desert Road. These two sections are best addressed by the Benefits Focussed and Balanced programmes, whilst the Speed Management and Effects Focussed programmes do little to improve resiliency in these areas.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	3	2	4	2

Competing Interests (JF)

Competing interests relates to townships, where through vehicles conflict with local movements, and rural areas, particularly at rest areas and along the lakefront where large slow trucks can conflict with cars and cycles.

Townships, for the most part, are treated similarly in all options with the major differences being the allowance for clip-on type structures at key bridges for pedestrians and cyclists. The rural sections are more variable in their treatment, as such they contribute more to the varying scores. The options which provide greater rural corridor width scored best.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	3	2	4	3

Natural Hazards

This criterion relates to whether the option improves or reduces the resiliency of the highway due to any natural hazards such as fault lines, geothermal areas, erosion / landslides, cliff edges adjacent to Lake Taupō and the Desert Road and flooding.

The Benefits Focussed option scores the best here due to it improving resilience on both the Lakefront and the Desert Road, whereas the other options do not have the same extent of improvement.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	4	3	4	4

Natural Environment - Terrestrial

This criterion considers any significant natural areas and habitats, outstanding natural features and protected areas. It was primarily scored by looking through the District Plans and identifying any "Significant Natural Areas" (SNA) or "Reserve" land, rather than looking at any direct effects of the options. Whilst this is considered appropriate at this level of investigation, these effects will need more refined analysis by an ecologist as the project progresses.

There are many SNAs adjacent to the state highway through the project extent and therefore any options which propose widening of the road corridor are likely to have an effect. The Benefits Focussed and Safety options therefore scored worst under this criterion.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
2	4	4	2	3

Natural Environment - Freshwater

This criterion addresses effects of construction works, and operation including hazardous spills from vehicle accidents on the water quality of freshwater bodies and wetlands including the Waikato River, Lake Taupō, Tongariro River and the various other streams and rivers that the highway crosses. It was primarily scored by considering the extent of works adjacent to the lakefront and any impact on streams over which the highway crosses (particularly when bridges are being widened). Whilst this is considered appropriate at this level of investigation, these effects will need more refined analysis by an ecologist as the project progresses.

The Benefits Focussed and Safety options have the most effect in that they are widening the highway over streams/rivers and widening adjacent to the lake where sediment runoff will be difficult to contain. They are also the only options to include a new realigned Tauranga Taupō bridge, which will have impacts on the river during construction. However, these two options also have a benefit in terms of the wider carriageway around the lakefront which will reduce the risk of trucks with potentially hazardous cargo falling into the lake.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
2	3	3	2	2

Property and Land Use

This criterion considers the number of properties from which land will be required, complexity of property negotiations and land title and ownership issues including Maori land, existing covenants and land held for special purposes such as reserves, existing infrastructure/services. It also considers other properties which will have changes to access arrangements and / or greater exposure to transport noise or will have reduced exposure to transport noise. It also covers effects on sensitive land uses (schools, early childhood centers, rest homes, hospitals etc.) and construction impacts on adjacent properties. Some initial information in this respect was gained from The Property Group early in the project.

It was noted that there is an outstanding issue in that the current highway designation is not shown in the District Plan so we have assumed that it follows the property boundaries, noting that in a few locations the highway straddles this boundary.

The Benefits Focussed and Safety options again are the options with the greatest effect here as these are the two with the greatest extent of widening and land take. These options may also require land from a recent treaty negotiation settlement which may be difficult, however this is unknown until more detailed consultation with local hapū is undertaken.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
2	4	4	3	2

Tangata Whenua Values

This criterion should take into account the range of cultural values including values relating to the natural environment in the area (water bodies, wetlands, geothermal areas, areas of indigenous vegetation) potential impacts on areas of settlement (marae, papakāinga), use (food gathering areas), wāhi tapu, statutory acknowledgement areas, and archaeological sites.

This criterion has not been progressed as discussions with local iwi have not occurred at the level of detail required at this point in time. The scores will be added once additional hui have been held and input received.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
TBD	TBD	TBD	TBD	TBD

Visual and Landscape Impacts

This criterion covers the visual impact on outstanding natural features, outstanding natural landscapes and on localities including amenity considerations from the perspective of both users of public spaces and nearby residents. The main source of information for this criterion was the “Outstanding Landscape Areas” identified by the Taupō District Plan. It was primarily scored by considering the extent to which any works have the potential to extend into these areas. Whilst this is considered appropriate at this level of investigation, these effects will need more refined analysis by a landscape architect as the project progresses

Again the options with the greatest extent of physical works score the worst due to their greater impact on the landscape.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
2	4	4	2	3

Urban Design Opportunities

This criterion covers the ability to strengthen gateway or identity opportunities and / or other values, spaces or places. As we also have an Community Cohesion criterion, it was agreed that this criterion needs to relate more to the wayfinding and storytelling elements of the options in the rural areas. Consideration will be given as to whether to rename this option to reduce confusion.

The Benefits Focussed and Balanced options scored better under this criterion, primarily as they included more investment in Road User Facilities, including new and improved rest stops and viewing spaces.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
3	3	2	3	2

Contaminated Land

This criterion addresses the likelihood of disturbance of contaminated land and the effects of this on the surrounding environment.

There is only one areas of contaminated land potentially affected by the options and this is located under the current highway at the northern end of Tūrangi. Until more detail is known about the exact nature of this potential contamination, and as all options are similar in nature in this location, all options have been scored the same.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	4	4	4	4

Community Cohesion

This criterion addresses the ability to improve the amenity of settlements traversed by the highway including enhancing connections to Lake Taupō, reserves, recreation and community facilities. Also includes severance of communities if affected e.g. by median barrier.

All options are relatively similar in the townships. The key differences are; a new roundabout in Tūrangi, the Tauranga Taupō Bridge and a clip on footpath to the bridge north of Tūrangi. All of these elements will provide better connectivity and safety for the local community. These elements are only present in the Safety and Benefits Focused options.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
3	2	2	3	3

Engineering Degree of Difficulty

This criterion addresses expected difficulties with construction, including matters such as likely geotechnical considerations, extent of structures and earthworks needed, relocation of existing infrastructure, sediment and erosion control, temporary traffic management and potential flooding and groundwater issues.

The highest scores have been given to those options with new bridges, bridge widening, cliff cutting, and widening around the lake. Work immediately adjacent to the lake was assessed as have the greatest impact on this criterion due to the limitations in safe working zone and sensitivity of the surrounding environment. However, they were not scored 5 as some of the effects will be able to be combined with rehab work (part of the Do Mimum). The Speed Management option has the lowest score as it has the lowest amount of new infrastructure.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
1	4	4	2	3

Operations and Maintenance

This criterion reflects the ongoing difficulty and cost associated with the operability and maintainability of the highway once the option is implemented. Particular areas of interest here again are the lakefront, where currently it is very difficult to undertake maintenance activities due to the very constrained corridor, and the Desert Road, which is a very complex operational environment due to the extreme weather conditions.

The Benefits Focussed and Safety options score the best as they address many of these existing issues in both locations (and will result in new pavements which need less maintenance) where as the other options only address one or none of these locations.

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
4	2	2	3	3

Cost

This criterion reflects the overall cost of the option. The analysis will be run with and without this criterion to determine whether it has an impact on the analysis.

With route length and alignment all being largely constant the cost closely follows the factors assessed in Engineering Degree of Difficultly

Speed Mgmt	Safety	Benefits Focussed	Effects Focussed	Balanced
1	4	4	2	3

Weighting

Each criterion is given a score between 1 and 10 which reflects how important it is. 1 being of low importance and 10 being of high importance.

It is acknowledged that importance can change depending on the assessor or the context. Phil noted that Stantec typically run a range of weighting scenarios to give a balanced view of what a preferred option could be. However, it is very important to have a "workshop weighting" scenario which presents the importance that the participants place on each of the criteria. The workshop weighting is often a very balanced outcome which reflects the project specific concerns across social, environmental cultural and economic aspects.

The workshop weighting was agreed as follows:

Criterion	Weight (out of 10)
Safety	10
Route Availability	9
Competing Interests	7
Natural Hazards	3
Nat Env – Terrestrial	7
Nat Env – Freshwater	7
Property and Land Use	8
Tangata Whenua Values	10*
Visual and Landscape Impacts	7
Urban Design Opportunities	7
Contaminated Land	5
Community Cohesion	2
Engineering Degree of Difficulty	5
Operations and Maintenance	4
Cost	8

The group discussed the weighting for Tangata Whenua Values and everyone agreed it was one of the most critical elements in deciding the preferred option. However, it was noted that the project will also be subject to a parallel decision making process to ensure our Treaty Partners views are incorporated; also many of the cultural concerns are also reflected in other categories. Nevertheless, as we have not received any significant feedback from iwi on the options to date, it was agreed that a weighting of 10 is appropriate at this stage.

Next Steps

The next steps for the project team are to prepare for the hui with Tūwharetoa on 25 July and the MCA workshop on 1 August. Agenda and workshop packs need to be sent out a week in advance.

Anuradha and Wayne to provide feedback on the option descriptions by the end of next week and Stantec to provide workshop packs to NZTA for review. Stantec will work with SafeRoads on the workshop pack for 1 August as it is a combined workshop.

The meeting adjourned at 12:00 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec NZ

Meeting Notes

Phil Peet
8 July 2019
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Attachment: Attachment

Appendix F: Multi-Outcome Section Options Workshop Feedback

Multi-Outcome Section Options Workshop Feedback

General

Investment Objectives / Options

Safety

Urban areas - Have we considered physical vertical measures?

- Feels counter-intuitive to widen by trying to slow down
- RTA – not fit for purpose. Not safe. Need to state case for realignment. This is SH1
- Waitahanui and Turangi; Narrow bridges, facilities for pedestrians; Also parking especially Waitahanui (Lake side – northern is okay but southern is not)
- Can we use a centreline treatment to account for overtracking on curves – the centreline can give the impression that the lane is wider? Make the curve gentler using markings and trucks can then overtrack
- Inconsistent speed management
- Opportunities for pedestrian refuges
- Seasonal issues with young children
- Number of marae (4-5) – gatherings of large number of people – problems with entering and exiting
- Lot needs to be done with signage – need an audit on signage

Resilience

- Need more VMS boards
- Advertising Western Bypass (other side of Lake) – is this an option? Still issues but spread load. Many trucks prefer via ETA
- There are currently some other resilience projects underway (on the lake side) along the lake front to stabalise

Competing Interests

- Develop separate cyclist path, issues combining vulnerable road users with trucks; E.g. SH 5 – use of off-road cycling
- Cyclists want to use the SH to train
- Could construct a pontoon walkway along the lake.
- Problems with villages and campgrounds that straddle the SH
- Need to designate areas for people to stop and take photos – or provide road widening for people to stop
- Settlements across the road from the lake – lots of pedestrian movements across the SH to the lake
- Lack of passing opportunities; People slow down – views passing lane northbound doesn't seem right. Right turn bays to get lake side especially Hallets Bay; Not enough passing lanes.
- Improving journeys- Toilet facilities between Tokoroa and Turangi. Important for truckies
- Cycle lanes – actual mark on road

	• Engine braking – generally not too much of issue • Rotorua; Events disqualifying training on road; Talk to Round the Lake; Proposed shoulders will help; Train on Baldens Road?? • Turangi through to Hatape has so many competing interests • Investment objectives – need to differentiate between freight and tourism • Two trucks passing; Increasing number of large motor homes facing same issues and they do not have CBs

Impacts	• Archaeological
	  ○ up (and within) cliffs
	  ○ Tight corridor constrained – won't know trade off until check out site
	• Lot of pa sites on cliff tops – issues where widening proposed

Implementability	• Urban areas - How to do treatments consistently • Perhaps the team has not looked enough at tourism as part of the project as a key economic enabler. What has the greatest weighting in terms of the competing interests? Tourism trade-offs with national values (freight etc) • The rockfaces on the lakefront is tough. On the one hand we want to help trucks, on the other we don't want to cut too much off as it won't look good • Treat each village the same way, same speed limits same infrastructure, same look – this would assist drivers
Section 1	
Investment Objectives / Options	• On Hatape Hill there is a passing lane, and there has been several overlays of seal which has now created a reasonable drop from the seal down to the kerb and channel • There is no shoulder up Hatape Hill (so the new cross section would be good)
Impacts	• Gum trees at Hapete need to be removed – were planted to commemorate something
Section 2	
Investment Objectives / Options	• Make it look more urban – pedestrian refuges • Waitahanui from the southern end – speeding cyclists and marae entrance • Urupa / cemetery – no adequate parking, dangerous for people crossing the road • Bridge is a problem for truck and trailer units heading south • The option in Waitahanhui will mean we will lose some of the grass berm (general comment). Another said, that the wide-open space (grass area) may be contributing to the speeds. • There is a safety issue related to the road and the entrance to the marae in Waitahanui. It relates to: Kids walking across the road; and Walking to school and koounga, and swimming pool. • The alignment of the road where the bridge is and heavy vehicles swinging wide

	• There is already ample room to pull over in the town (Waitahanui) • Vehicle speeds are also a general issue. Some come driving through very fast and do not like being slowed down. • What about putting a roundabout in Waitahanui. Would reduce speeds. Might not have balanced traffic volumes. • With the zoning in Waitahanui there is potential for another 26 dwellings to appear on one side of the road. • There is only one footpath in Waitahanhui so this means that people walk down on one side and then cross at the least desirable place • At the Northcroft end there is high speeds and people trying to cross. • At the southern end of Waitahanui there is also a kerb and channel which has the edge line right up against it (on the uphill side) • Local being killed • Tried changing speed limit • Crossing road to urupa / cemetery – what will road widening mean – wider for people to cross – island in the middle – pedestrian crossing not a solution • Bridge very close even for cars • Marae at southern end – cars and cyclists speed downhill – dangerous entering and exiting marae • Old SH1 – Snake Gully – cyclist could use this, but now in private ownership • Need to change the speed limit at both ends of the village
Section 3	
Investment Objectives / Options	• Bulli Point parking? - not being progressed as part of this programme, part of TDC's Taupō Turangi cycleway • Lots of complaints from truck companies about cars parked at Bulli Point • Project team needs an update from TDC about the carpark • Just north of Bulli Point it is also difficult for trucks to pass (rocky outcrop). • Lots of people are currently parking at Bulli Point. Ideally, they wouldn't be there. • One option that isn't there is to cut through Bulli Point and use some of the revoked road as a car park. This may have a few issues though (cultural significance?) • At Bulli Point is there an angle for us to explore resilience funds? i.e. can funds be found from other pots? If we can solve just one section (using alternative funds) then it is still a win.
Section 4	
Investment Objectives / Options	• Changeable area between summer and winter • Speed change depending on the holiday season • At the Motutere camping area: consider removing of one side of the camping ground? • Motutere camping ground – introduce seasonal speed limit

	• Motutere particularly bad – drivers use cross hatching for passing opportunities – particularly crossing from lake side – vehicles come around the been at 100km/hr
Implementability	• There is a development of the Motutere Reserve proposed. They had sourced the information from the District Council's website. Looks like there is going to be an expansion – possibly on both sides of the road?
Section 6A	
Investment Objectives / Options	• Tauranga-Taupō not so much of an issue?? (is this right?) Self managing. • Tauranga Taupō – heading north, road off to the right (Rawhini Road?) – limited visibility for southbound traffic
Section 7	
Investment Objectives / Options	• Route consistency • Townships create changing environments
Section 10	
Investment Objectives / Options	• There is flooding north of Turangi every year. Korokea. • There is flooding just north of Turangi, and it usually lasts for around 24hrs. The problem here is that HPMVs can't turn around when they get stuck, and sometimes they are very close to Turangi. One of the best things would be to advise truck drivers (and others) as soon as an incident occurs.
Section 12	
Investment Objectives / Options	• Crashes on curves – how will speed management address these – already going slow • Out of context – nothing to tell you change is coming • Often ice and snow causing crashes
Impacts	• Rest area at Three Sisters is on private land - Māori land
Section 15	
Investment Objectives / Options	• Widening will result in increased speed – already have a speed problem through here • Run off road rather than head on crashes • Section 15 – would be good to have the option of the 1.5m wide centreline. And, in addition to this, a 1.5m wide centreline for the whole corridor.

Appendix G Taupō to Waiouru Archaeology Desk-top Assessment

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3 October 2019

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Re: SH1 Piarere to Taupō Archaeological Desktop Study

Prepared by Isaac McIvor and Siân Keith.

PURPOSE AND SCOPE

NZTA are currently assessing safety improvements for State Highway One (SH1) from Taupō to Waiouru. The project is at the design stage. Stantec, on behalf of the NZTA, has commissioned Sian Keith Archaeology Ltd. to provide a desktop study of known and potential archaeological sites and heritage sites registered on relevant district plans within proximity to the road reserve within the study area (Figure 1).

This assessment is based on a review of 200 m and 1000 m buffers around the road reserve of SH1. The main focus of the study was to identify heritage sites which should be avoided at the design stage of the project. Of immediate concern are sites within the existing road reserve, or immediately adjacent to it. Sites which have high archaeological values (i.e. pā and urupā) should be excluded from earthworks that would otherwise adversely affect those values.

STATUTORY REQUIREMENTS

There are two main pieces of legislation in New Zealand that control work affecting archaeological sites. These are the *Heritage New Zealand Pouhere Taonga Act 2014* (HNZPTA) and the *Resource Management Act 1991* (RMA).

The purpose of the HNZPTA is to promote the identification, protection, preservation, and conservation of the historical and cultural heritage of New Zealand (HNZPTA section 3). Emphasis is placed on avoiding effects on heritage.

The *Resource Management Act 1991* (RMA) requires City, District and Regional Councils to manage the use, development, and protection of natural and physical resources including historic heritage. Historic heritage is defined as those natural and physical resources that contribute to an understanding and appreciation of New Zealand's history and cultures, derived from archaeological, architectural, cultural, historic, scientific, or technological qualities.

METHODOLOGY

This assessment has used the following sources to provide an archaeological background of the project area:

- The NZAA's online database ArchSite
- The New Zealand Heritage List/Rārangi Kōrero (The List)

- Historic survey plans using the program QuickMaps (sourced from LINZ)
- Historic aerial photographs
- Relevant District Plans

All data layers were filtered by location using a 200 m buffer from the road reserve of SH1. For an overall understanding of the landscape around this section of SH1 a 1 km buffer was also included to ensure that extended cultural landscapes were fully accounted for. The 1 km buffer was also used to avoid errors based on-site location data, which can be unreliable, as well as the fact that recorded sites are given as point data in the GIS layer which may not account for the full extent of a site.

The data for archaeological sites was obtained from ArchSite, the New Zealand Archaeological Association's (NZAA) site recording scheme[1]. ArchSite contains the location and information for all recorded archaeological sites in New Zealand. There were no additional pending sites[2] within the 1 km SH1 buffer.

The recorded location of archaeological sites is generally provided as a point, and these points can have up to a 100m margin of error. Sites which were originally recorded c.20 years ago or more are recorded with a 100m site accuracy grid. Site locations were adjusted according to site location plans present in the site record forms.

Survey plans were viewed to assess our understanding of the cultural landscape and settlement predating 1900. The focus of the research was over areas where historical heritage predating 1900 might be present.

Georeferenced historical aerial photographs from the 1940s and 1950s were obtained from the Retrolens website. These were used to visually identify the location or extent of archaeological sites. The observations were compared with Waikato Regional Aerial Photos (WRAP) from 2012 to assess the current status.

PRESENTATION

The research is presented in GIS form with layers indicating archaeological sites and historic places registered in The List, on District Plans, plus the aerial and cartographic data.

A description of the provided shapefiles is given below to provide some context and detail regarding the supplied files. For a general understanding of the risk areas an overlay showing high (Red GIS layer) to medium (Orange GIS layers) is provided.

A generalised risk assessment related to the GIS is provided below. This research details the known archaeological sites along SH1 from Taupō in the north to Waiouru in the south.

RESULTS

Historical Survey Plans & Aerial Imagery

The survey plans and aerial imagery provided in the GIS are only those which held potential archaeological information. Other plans and images were viewed, but are not provided if they were not considered to be of use. The survey plans were georeferenced and added to the GIS manually. Previously unrecorded heritage places of interest are described in relation to risk areas below. They are also listed in the Appendix and are included as a shapefile in the provided GIS package.

Archaeological Sites

There are 126 recorded archaeological sites within the scope of works (the latter provided by Stantec). Of these 126 sites:

[1] Data was last checked on 28 September 2019, any sites added to ArchSite after this date are not included.
[2] These are sites on the database which have been recently added or changed and do not appear on the downloadable database set.

- 39 are within 200 m of SH1,
- 30 are within 1000 m of SH1 (but outside of the 200 m buffer) and
- 57 sites were outside the 1000 buffer.

The sites recorded within the 200m buffer are predominantly pā (15) and "pit/terrace" (10) sites. The majority of these are situated on the banks above and east of SH1. The exception to this is T18/11, which is a low-lying pā on the riverside, west of SH1. There is one recorded burial, T19/49.

Most of the 30 sites recorded from the 200- 1000 m buffer (i.e. excluding the 200 buffer) are pā sites (12), these are sitting on the ridges above SH1. One of these pā, U18/81, is also recorded as an urupā.

Most of the sites appear to have been initially recorded in the 1970s and 1980s with some seemingly not surveyed (see U18/35 and U18/36). Some sites were visited/ revisited in the 2000s, although not all were re-located such as T18/118. The reasons sites were not revisited were mostly the result of dense scrub preventing access.

A series of site record forms mention that the sites have either been previously disturbed by road widening (see T18/122, U18/18-road widening revealed ovens and worked soils, U18/91-site destroyed for pumice recovery for road fill) or are were at risk of destruction by future road realignment (see T18/19, T18/121, T18/118, and U18/34).

Sites are mostly located around the south-eastern shoreline and adjacent hills of Lake Taupō. Sections 1, 3, 5 and 9 of planned works having the greatest concentration of recorded sites. Sites in these areas are largely on hillslopes and ridgelines. This is a factor of culturally modified slopes being more readily visible than subsurface archaeological remains in flatter topography. There are likely expansive areas of unrecorded archaeological remains along the eastern shoreline of Lake Taupō and along the banks of its tributaries.

Appendix 1 includes a summary of recorded archaeological sites within the 200m *and* 1000m SH1 buffer areas. Previously unrecorded heritage places identified during this desktop assessment within the 200m buffer zone are also listed.

The following is a summary of the sites within or close to the existing road reserve. These have been assessed to be at medium to high risk of being impacted by safety measures. A set of reference plans is provided following the text.

HIGH-RISK: These include pā, urupā and other recorded sites considered currently to be of high heritage and/or cultural significance that possibly or definitely overlap within with the SH1 road reserve. For these sites, it has been identified that works within the road reserve would modify or have a high-risk of modifying archaeological remains. A site visit to each place is required at the early stages of this project to determine the current condition and extent of these sites, and any risks associated with roading improvements. These sites should be carefully considered during the design phase of this project.

Urupā (unrecorded)

Historical survey plan ML11542 has a noted urupā on the western side of SH1, between the road and lakeside, in Waitahanui (Figure 2). The plan is dated to the year 1919. However, it is possible that the urupā was in use much earlier. Current aerial photographs show the urupā to be in use today. Depending on when the urupā was established, it is possible that burials continue within the road reserve. Further research would be required to assist in determining this.

U14/41 and U14/81 pā

Site U14/41 was first recorded in 1978 by P.T. Fletcher as a pā located on the north side of Hinemaiaia Stream, east of what is now SH1 (Figure 3). The name, Urukapua, is assigned to the site, however it is not clear from where this information was sourced. An older road was described to have cut the western side of the pā. In 1978 the site was considered to be well preserved despite the modification by the road construction and was under dense scrub.

Site U14/81 (Figure 3) was recorded the following year, again by Fletcher, as a "large and older pa that was converted into a burial ground". It appears from the site description that this site is east of U14/41. Although, this is not explicit and U14/81 may indeed include U14/41. Burials are noted throughout the area, which is defined by 5 meter high banks. The high-risk area provided on the GIS includes where U18/81 may be located based on the site record form description.

There are no further updates to the site record form and there is no site plan. As early road construction modified the western pā, it is possible that U14/41 extends into the road reserve. However, it is not clear how far along SH1 the pā may overlap, further research would be required to try and establish this.

U14/42 pā

The site was recorded in 1978 by Fletcher as pā located southwest of a bend in the Hinemaiaia Stream and now north of SH1 (Figure 3). The site had well-defined ditches, scarps and terraces. The site had been modified by a vehicle track through one side.

A revisit to the site in 2007 by K. Rabarts did not relocate the site. This is likely the result of dense vegetation cover. The southern margin of the pā is not clear and therefore the distance from SH1 is not clear. Further research is required.

U14/88 pā

The site was recorded in 1984 by Fletcher as a pā on the east side of SH1, south of Hatepe (Figure 3). The site consisted of banks and terraces with surface exposures of modified soils, and burnt stones. The site had been modified by road widening and pumice quarrying.

The site was then revisited in 2007 by Rabarts, who it appears confused the site with U14/86, which is located on a ridge further east. Her updates to U14/86 are, therefore, interpreted to relate to U14/88, which is more consistent with her site plan and description. The name Urukapua Kāinga is given to both U14/86 and U14/88 (as well as U14/41, mentioned above). Rabarts recorded a number of pits, banks, terraces, earthen walls and a ditch.

It should be noted that Rabarts describes the site to be approximately 50 m from SH1, which is a discrepancy from the site being modified by road construction prior to 1984, as described earlier by Fletcher.

U18/36 pā

The site was recorded in 1977 by K Moore as Orona Pā. The site is located at the northeast end of Hallett's Bay, on the eastern side of SH1 (Figure 3). It is not clear if the site has ever been visited by an archaeologist. There are some apparent ground surface irregularities visible an aerial photograph from 1947 (Crown_172_1186_1) in the recorded area of the site. A site visit will be necessary to help determine the nature and extent of the site.

U18/35 pā and **Orona Cemetery** (unrecorded)

Site U18/35 was recorded in 1977 by K. Moore as Te Totara Pā at Hallett's Bay and east of SH1 (Figure 3). Like U14/36, there is no further information in the site record form. There are dark shades in the area of the site present in the 1947 photograph, which may indicate the location of earthwork features. However, this would need clarifying during a site visit.

Approximately 50 m north of the recorded location of U18/35, Orona Cemetery was marked on history survey plan, ML15528, surveyed in 1934 (Figure 3). The age of the cemetery is yet unknown. However, it is possible that it predates 1900. The survey plan does not illustrate the extent of the cemetery. Further research is required.

U18/34, U14/60 and U14/91 pā and burials

K. Moore recorded site U14/34 as Operua Pā in 1977 to be directly north of Ngāmōkai Pā. The site was then visited in 1984 by Fletcher, who recorded the site to be above a 10 m high pumice bank on the south-west side of a stream outlet to SH1 to the north (Figure 4). The site consisted of high natural banks on the northern side and a deep ditch on the southern side. "Fireplace" and "house sites" were observed. The site measured 117 meters long (east-west) by up to 80 meters wide (north-south). Proposed Ministry of Works road widening was to modify a section of the site. Lack of reliable georeferenced points makes it difficult to determine whether these works took place after 1984 based on aerial photographs. Regardless, the site is within the SH1 road reserve.

Site U14/60 was recorded in 1978 by G.E. Nevin. The site is located c. 100 m east of U14/34 on the south side of SH1 (Figure 4). It was recorded to comprise of charcoal and broken stones in the roots of an uprooted Macrocarpa tree. Three karaka trees were also noted, which Nevin suggests were the same trees planted by Tamamutu – first son of Te Rangiita – and to have been camped under by Bishop Selwyn in 1843. Further research is needed to explore these hypotheses. The site plan provided in the site record of U14/34 identifies an urupā in the area of U14/60. The extent of the urupā indicated in the plan cannot be relied upon as the burials will largely be not visible, below the surface.

Fletcher recorded U18/91 in 1984 as a pā, on a sheer bank above SH1, directly west of U14/34 (Figure 4). The previous year Ministry of Works destroyed 80% of the site for pumice recovery. A ditch on the eastern bank remained in good condition and by 1984 measured 36 meters long. It is not clear what remains of the pā on the northern side, close to SH1. All three sites are above the sheer bank but overlap with the road reserve to the north.
Site U18/90 is a further pā recorded by Fletcher in 1984 within this identified high-risk zone (Figure 4). It is located further southeast of U14/34 and U18/91 at a distance of 90 m from the SH1 road reserve. The site consists of a large flat plateau measuring 50 x 30 m on a ridge with terraces on the adjacent slopes. A defensive ditch and undercutting bell-shaped pits are recorded.

T18/96 pā

Moore recorded this site in 1977 to be above and south of SH1 at Te Toki Point (Figure 4). There is no further information in the site record form and it was apparently never visited by an archaeologist. A broad flat terrace, measuring c. 50 m long (northwest-southeast) by 35 m wide, is visible on a 1947 aerial photograph (Crown_172_1187_6) at the site's recorded location (as recorded in the location plan of U14/89). The site appears to be located 10 m above and south of the SH1 corridor. However, it is not clear whether the site extends into the road reserve. A site visit is required to determine the extent of the site.

T18/11 pā

The site was recorded by R.A.L. Batley in 1980 as Motutere Pā. The site is located on Motutere Point, as the southwestern end of Motutere Bay, north of SH1 (Figure 5). The landward end of the point, up to SH1 is now covered in residential buildings and gardens, while the northern margin may have receded as a result of the control gates installed at the Waikato River. Batley associated the site with that described by Ernest Dieffenbach in 1841 as a "large pā and site of early Christian Church belonging to that period." No archaeological features are described in the site record form and the extent of the site is unknown. It is possible that it overlaps with the SH1 road reserve. Further research is required.

T18/12 and T18/121 pā

Moore recorded T18/12 in 1977 as Pouto Pā, located on the ridgeline above Motutere Point (Figure 5). The site was visited the following year by Nevin and Nevin, who considered the site to be in excellent condition under self-sown pines. The Nevins recorded three pits and noted that scrub cover may have obscured other features. They referred to Grace's *Tuwharetoa* book to associate T18/12 with Pouto Pā, which was occupied by Ngāti Hotu.

In 1984 Fletcher recorded T18/121 as a pā in the same location as T18/12. The lack of useful archaeological survey plans included in the site record forms makes it impossible to determine whether T18/12 and T18/121 record two different sites.

Fletcher observed that T18/121 had been modified by pumice quarrying on its south side. He also indicated there was a threat that road realignment would affect the pā, suggesting that it overlaps with or is directly adjacent to SH1. However, a location plan included in the record of T18/117 shows the pā at the toe of the ridgeline above SH1. The extent of the pā is yet unclear.

Hamokano and Te Koropupu (?) Pā (unrecorded)

Two pā are noted on historical survey plan ML5649, prepared in 1886, west of SH1, along the bay encompassed by Oruatua and Motuoapa (Figure 7). The northern pā has the name Hamokano Pā (also recorded on historical survey plan, ML15544) and the southern may be noted as Te Koropupu, or this name may only refer to the headland – the notation on the plan is unclear.
Neither pā are recorded on ArchSite nor are defensive earthworks visible on aerial photographs. Further research and site visits are necessary to determine the nature and extent of these sites. It is possible that these sites extend into the road reserve.

Kahotea and urupā (unrecorded)

Located directly west of SH1 and 2.5 km south of the Taupahi Road intersection, historic survey plans ML4083 (approved 1928) and ML3611 (surveyed 1922) note a building titled "Kahotea" and an urupā (Figure 9). Neither place is recorded on NZAA's ArchSite. Their age is unknown. However, it is possible that they predate 1900. The full extent of the urupā is not clear from the survey plan and it is possible that it overlaps with SH1. Further research is required.

T19/86 settlement and **Pouronga Kāinga** (unrecorded)

Site T19/86 is recorded 500 m from the road reserve, west of SH1 and a further kilometre south of the unrecorded building, Kahotea, and urupā described above (Figure 9). The site was recorded in 1978 by M. Newman as the "undefended settlement", Wanakau. The site was noted on a "Lowes survey map WD14534 of 1900" and an old plough had been observed at the site dated by Hosking to be from 1914-1920.

The site location is 340 m west of two clusters of buildings on historical survey plan ML3611 (surveyed 1922). The northern cluster of four three buildings is noted to be "whare", while the southern cluster is noted to be "Pourongo Kainga". These buildings have not been recorded on ArchSite. It is not yet known whether Pourongo Kāinga is related to the settlement recorded by Newman (following Lowes) to be Wanakau. The extent of the settlement is unknown. However, it is possible that it overlapped with the road reserve of SH1. Further research is required.

MEDIUM RISK: These are recorded archaeological sites located within or with a possible extension into the SH1 road reserve. These sites are deemed medium risk as they are either known to occupy an adjacent property to the road reserve or they are not a site of high heritage and cultural significance (i.e., not pā, urupā, cemetery, kāinga etc.). A site visit would also be needed to determine the current status and extent of these sites, this should be done following the release of initial design drawings.

U18/92 findspot and **U18/89** kōhatu tapu (sacred rock outcrop)

Site U18/92 was recorded by Fletcher in 1984 as a number of burnt stones and obsidian flakes exposed in the side of Te Heuheu road, which intersects SH1 to the west (Figure 3). The surface exposures are indicative of a larger area of subsurface archaeological remains, which may extend into the road reserve of SH1.

Site U18/89 was also recorded by Fletcher as a "Sacred Rock" rising out of the ground in two sections, measuring 12.8 m long and up to 2.6 m high (Figure 3). Fletcher associates the rock with an account in J. Grace's *Tuwharetoa* (1959, as referenced in site record form) involving the tūpuna (ancestor), Tia. The rock outcrop in itself does not fall under the HNZPTA definition of an archaeological site. However, it is indicative of subsurface archaeological remains being nearby associated with practices around the stones. The rock outcrop and surrounding area may hold cultural values to the tangata whenua, who should be consulted for comment. The site record form is also given the name, Hikurangi Urupā. However, neither the urupā nor any burials are mentioned anywhere else in the record form.

The area has been planted in pine and been through at least one harvest rotation as indicated by aerial photographs.

T18/137 mounds

Fletcher recorded T18/137 in 1984 as a series of low circular mounds measuring c. 2.5 m diameter and 0.7 m high. Some were noted to contain pumice and rock. What past practice may have made these mounds is not clear. They are located on a natural terrace above SH1, east of Toki Point (Figure 4). It is not clear how close to the road reserve the mounds are located.

T18/118 settlement

Fletcher recorded the site in 1984 as a well-defined bank and terrace between rock bluffs to the south and the Waipehi Stream to the north, south of SH1 (Figure 5). The area covers measures c. 400 m long (southwest-northeast) by 150 m wide (as indicated by D. Wilton's plan in 2007). It was noted by Fletcher to contain burnt stones, "hut sits and cleared areas with other related evidence." The site was not relocated by D. Wilton in 2007. The extent of the site is not clearly defined as it is possible that subsurface remains extend outside the area defined by Wilton. It is possible that archaeological remains extend into the road reserve of SH1.

T18/119 pā

Recorded in 1984 by Fletcher and revisited by Rabarts in 2007, T18/199 is a pā located on the ridgeline above Bulli Point and south of the hairpin bend in SH1 (Figure 5). The site plan included in the record form indicates the site is on the ridge top and well clear of SH1. The site is unlikely to be modified unless work requires c. 30-40 m excavations into the slopes above SH1.

T18/15 pits

The site was recorded in 1979 by Nevin and Nevin to five pits carved into a 3 m high pumice cliff face above a 10 m precipitous bank (Figure 5). The pits were recorded to be in excellent condition with names carved into some of the surfaces. The pits are located 50 m from the road reserve and will unlikely be modified. However, the exact location of the pits in relation to the works should be clarified by a site visit.

T18/122 canoe landings

Fletcher recorded T18/122 in 1984 as over 30 "landings" extending for 1.1 km south from the Motutere settlement (Figure 5). The nature of these features is not described. However, a series of linear mounds are visible along the lake shoreline. Road widening works modified three of these features in 1983, suggesting that further road works within SH1 may modify similar features.

T18/123 made soil

Site T18/123 was recorded by Fletcher in 1984 as a strip of land apparently between SH1 and Motutere Road extending some 300 m (Figure 5) and containing broken stones, water rolled stones, argued to indicate soil modification for cultivation and the presence of campsites (larger water-worn stones). Further investigation is required to determine whether these soils are archaeological.

Church, cemetery and other buildings (unrecorded)

Historical survey plans ML15544 (surveyed in 1934) and SO26778 (surveyed in 1932) note a church, cemetery and a series of other buildings within lot ML17862, located directly south of SH1 at Mission Point (Figure 6). The property is now Waiteteko Marae (the principal hapū is Ngāti Te Rangiita of Ngāti Tūwharetoa). The age of the buildings is not yet determined.

T18/1 findspot

Site T18/1 was recorded by M. Newman in 1978 as an adze findspot that was retrieved during excavations for a prefab classroom at Tauranga Taupō School in 1962 (Figure 6). It is possible that further subsurface archaeological remains are extant in the area.

T19/202 pits, **Whakaangiangi Urupā, Te Oku-a-Rakeipoho Urupā, Waikakahi Urupā and Matauhip Urupā** (unrecorded)

Site T19/202 was recorded in 1984 by Fletcher as an area of numerous pit features covering 700 m along SH1 and up to 85 m (sloping distance) south of the road reserve (Figure 8). Road realignments in 1983 may have modified the site. Undercut or "bell pits" dominate the pit forms. The area between the swamp to the north and the bluff to the south, including the road reserve, was intensively used for storage and possibly cultivation.

Historical survey plan ML 3575, surveyed in 1921, shows the subdivision of four urupā lots within Hautu IB No. 3 Block (Figure 8). All four urupā are on the south side of SH1 and north of Waimarino River. The urupā lots range from 65 to 80 m from the SH1 road reserve. Whakaangiangi and Te Oku-a-Rakeipoho are the two closest. Although the lots were surveyed in 1921, it is possible that older burials are present outside of the lots.

Sites T19/48 and T18/49 are located southward of the urupā and are unlikely to be affected by the earthworks (Figure 8). Site T19/48 is a pā located on a northeast-southwest oriented ridgeline laying parallel to SH1. The site's extent has not been recorded. However, its centre point shown in a location plan is 170 m from the SH1 road reserve. Site T18/49 was recorded in 1978 as five collections of kōiwi tāngata concealed within a rock face, 20 m above the Waimarino River. The site is c. 160 m from the SH1 road reserve.

Hut and Stables (unrecorded) at Mangamate Stream

Historical survey plan SO16199, dated 1910, shows a hut and stable marked directly east of SH1 and north of the Mangamate and Mangatawai Stream hairpin bend crossings (Figure 10). Patches of erosion are visible in a 1947 aerial photograph indicating the location of the buildings. Their construction dates are unknown. They may be associated with Tongariro Farm (T19/221), established c. 1905. The driveway to the farm connects to SH1 directly across the road from the huts' location. Neither building appears to be still standing. However, subsurface archaeological remains associated with their construction and use may be extant. The buildings were 50-60 m from the current road reserve of SH1.

House and Stables (unrecorded) at Waiouru

A further house and stables are visible on the historical survey plan SO13776, surveyed in 1895, which displays Waiouru (Figure 11). The two buildings are located 50-100 m west of SH1 and 450 m north of the SH29 intersection. The buildings are no longer standing. However, subsurface archaeological remains may be extant.

New Zealand Heritage List/Rārangi Kōrero and Taupō and Ruapehu District Plans

There are no historic heritage places on the New Zealand Heritage List/Rārangi Kōrero nor the Taupō and Ruapehu District Plans within the 1000 m SH1 buffer (including scheduled archaeological and built heritage sites).

PROVIDED GEOSPATIAL DATA

- Shapefiles of NZAA recorded sites within a 1 km buffer including pending sites (manually entered). Locations updated based on desktop research discussed in the assessment.
- Shapefiles of mentioned unrecorded heritage places (including their description, source historical survey plan and date of the plan).
- Georeferenced historical aerial photographs from the 1940s and 1950s, sourced from Retrolens
- WRAP from 2012
- Topographic layers
- Georeferenced survey plans (limited to areas of known or probable archaeological value)

SUMMARY & RECOMMENDATIONS

This desktop study has identified 39 recorded archaeological sites and 24 other unrecorded places of heritage interest from historical survey plans within the 200 m SH1 road reserve buffer. There are 27 areas identified where the known archaeological landscape indicates a high to medium risk of encountering remains of heritage value. These are outlined in the provided GIS package[3] with the NZAA recorded archaeological sites and unrecorded places of heritage interest.

The identified risk areas will need to be surveyed in advance of any finalised design plans to better assess the risk and any limitations to proposals based on heritage values.

It is recommended that at the planning stages of safety works for SH1 Piarere to Taupō all 14 high-risk areas are avoided. It is further recommended that any works planned within medium risk areas are planned carefully and in consultation with an archaeologist.

This is a brief and broad-scaled assessment of known archaeological sites, and sites which could be identified from available sources. Areas outside of the identified risk areas within the project footprint may also contain unrecorded archaeological remains not identifiable from this desk-top assessment.

A full archaeological assessment should be commissioned of the corridor once draft design plans are provided.

[3] Red and orange GIS layers

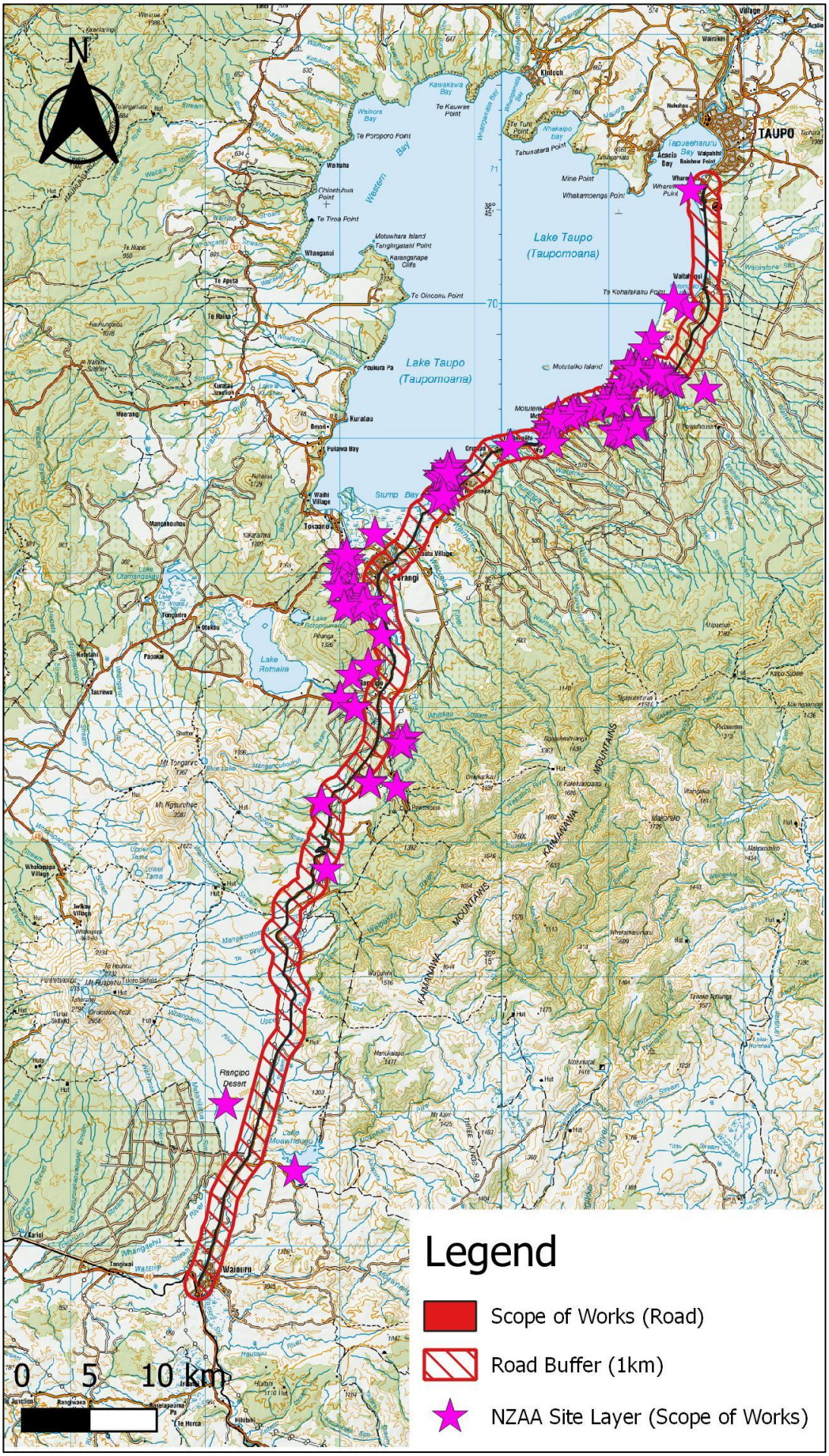


Figure 1: Overall Plan of Project Area

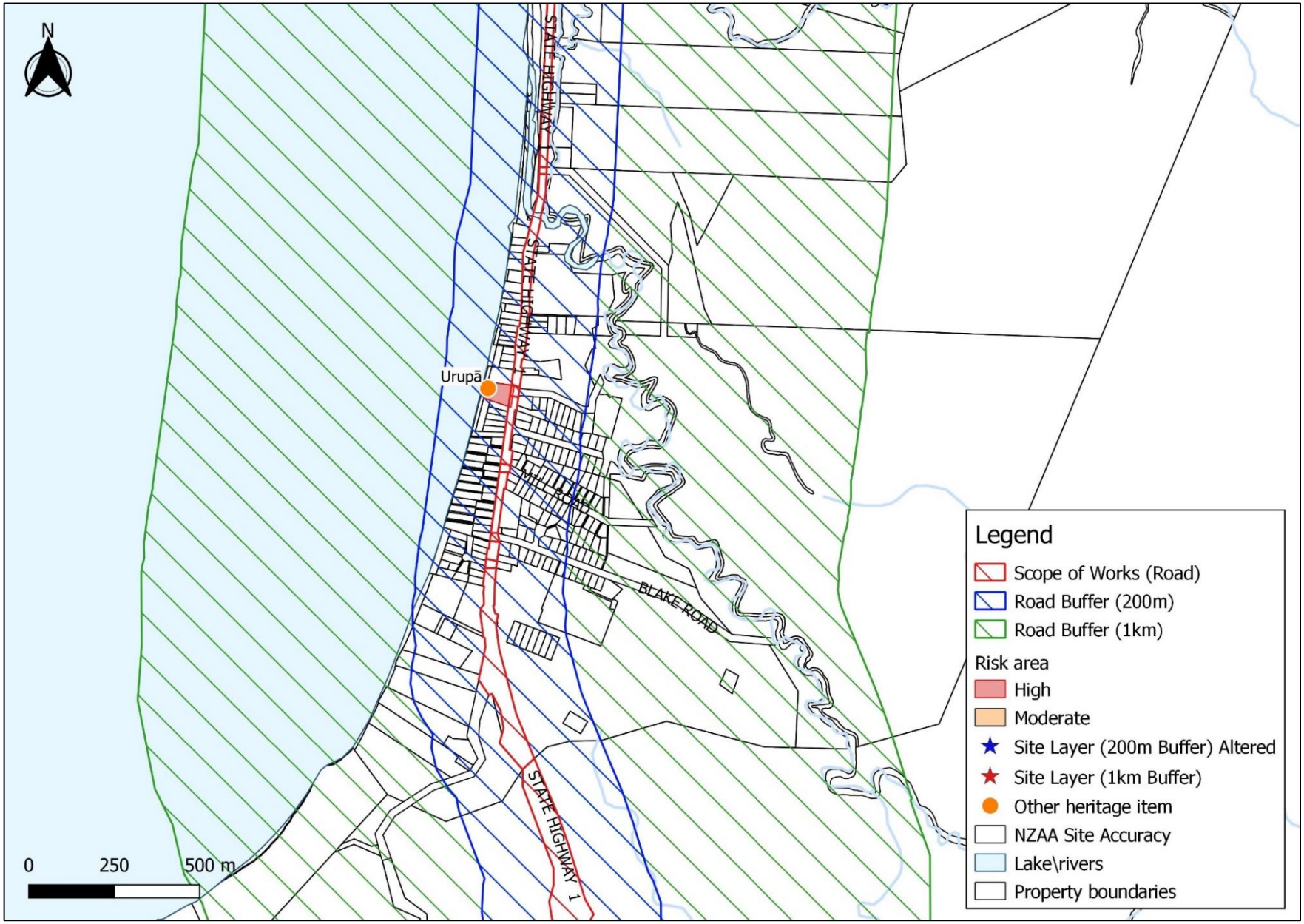


Figure 2. Plan of risk areas: unrecorded urupā at Waitahanui.

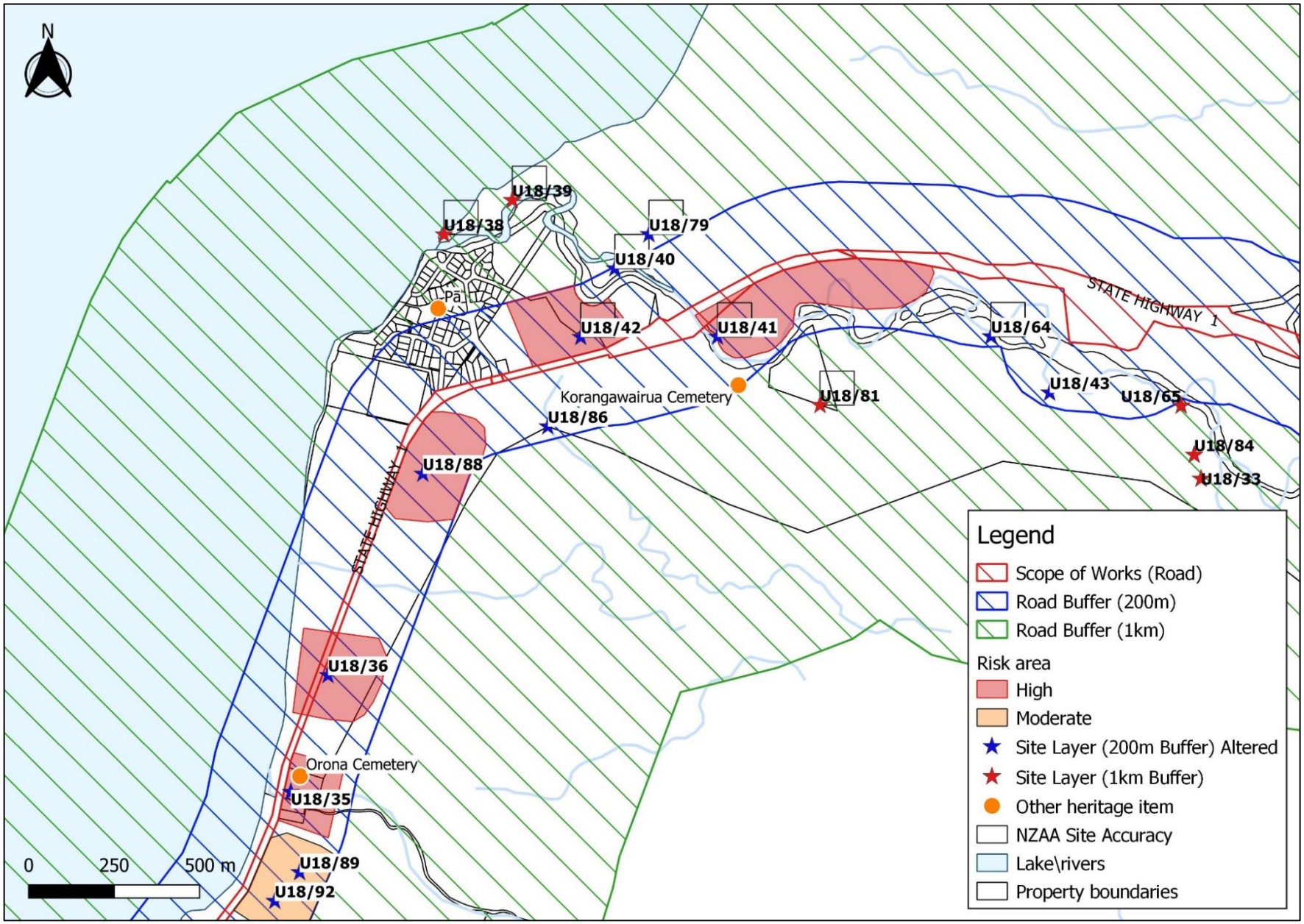


Figure 3. Plan of risk areas: U18/35, U18/36, U14/41, U14/42, U18/88, U18/89, U18/92, Orona Cemetery.

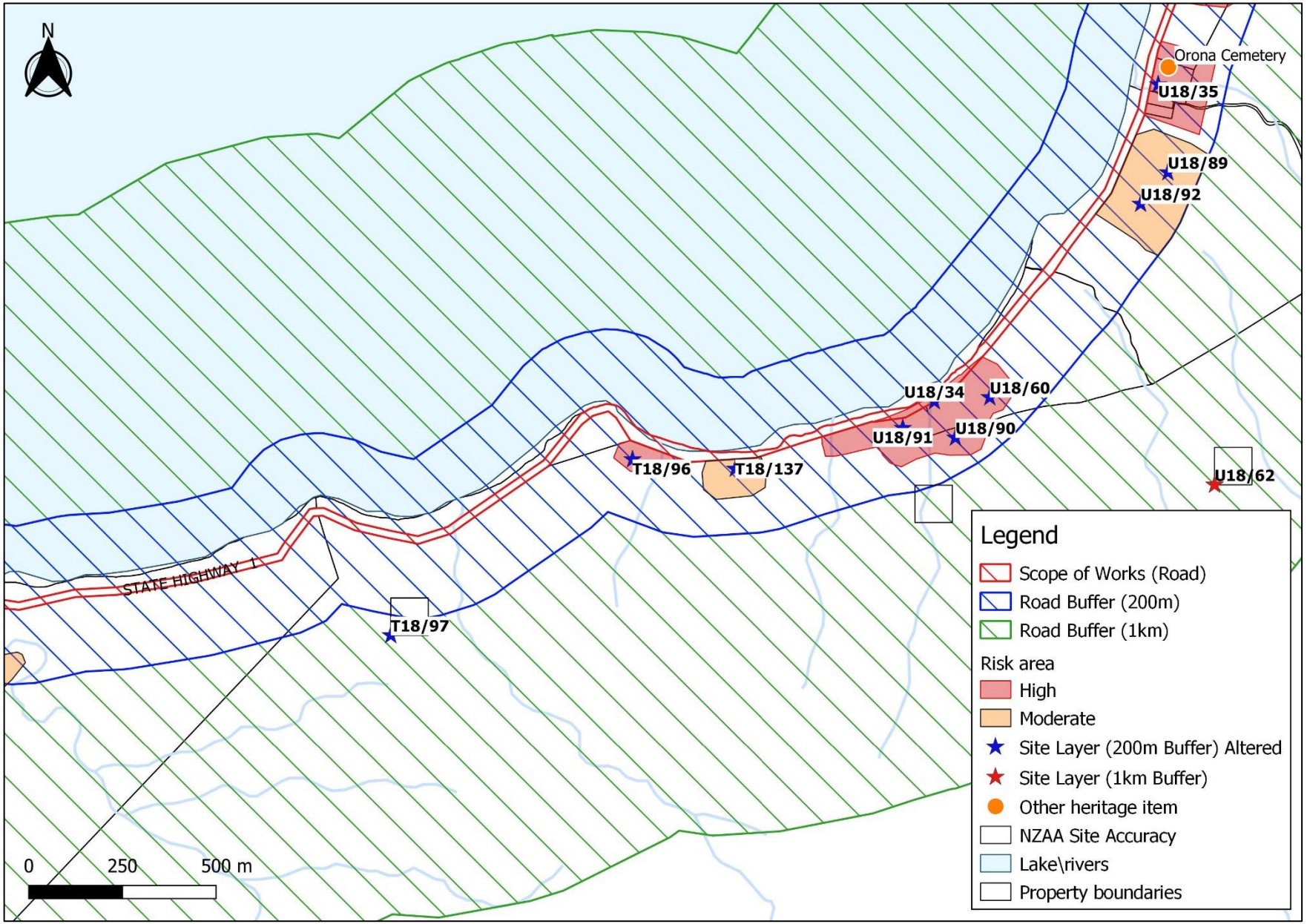


Figure 4. Plan of risk areas: U18/34, U18/60, U18/90, U18/91, T18/96, T18/137.

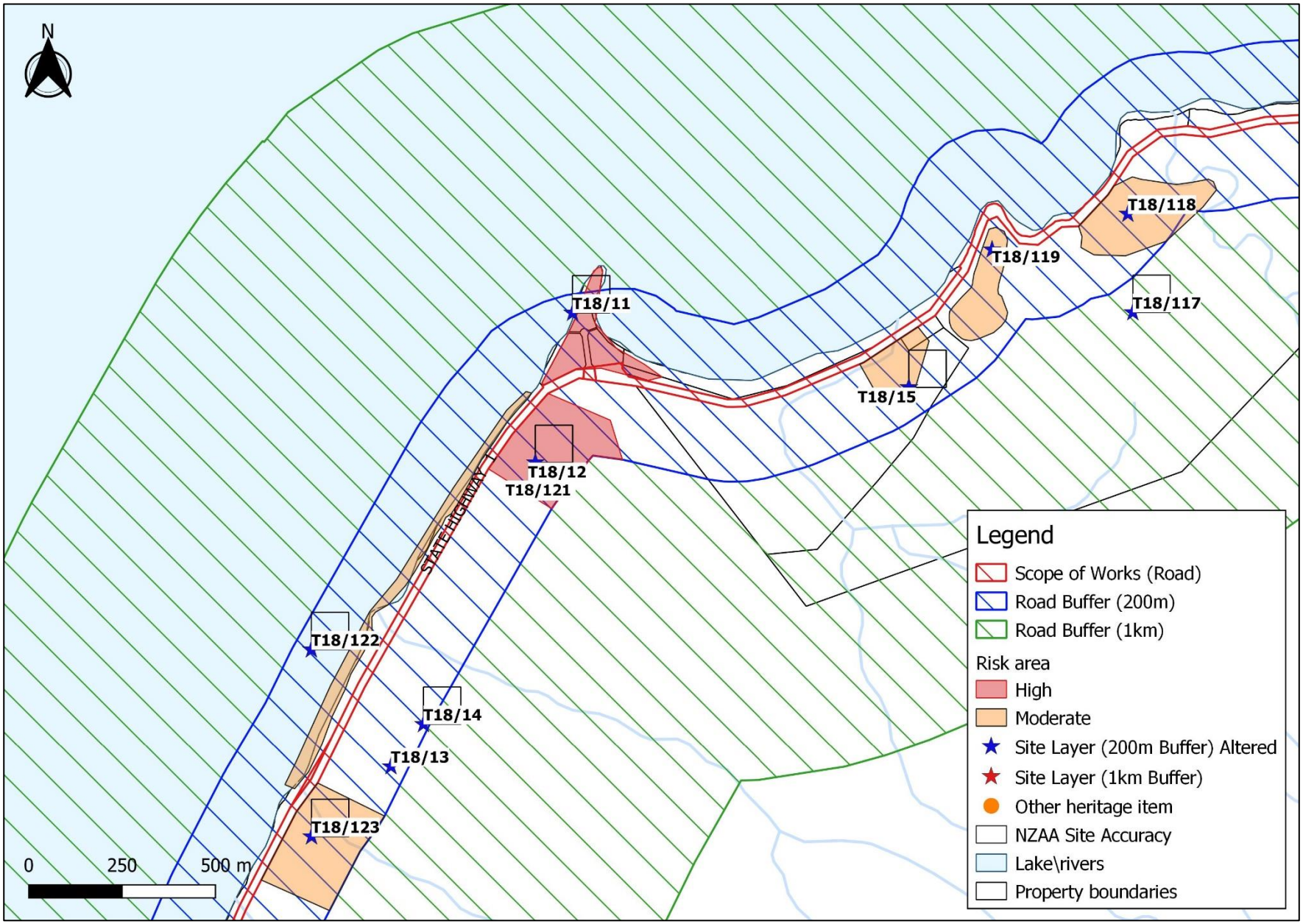


Figure 5. Plan of risk areas: T18/11, T18/12, T18/15, T18118, T18/119, T18/121, T18/122, T18/123.

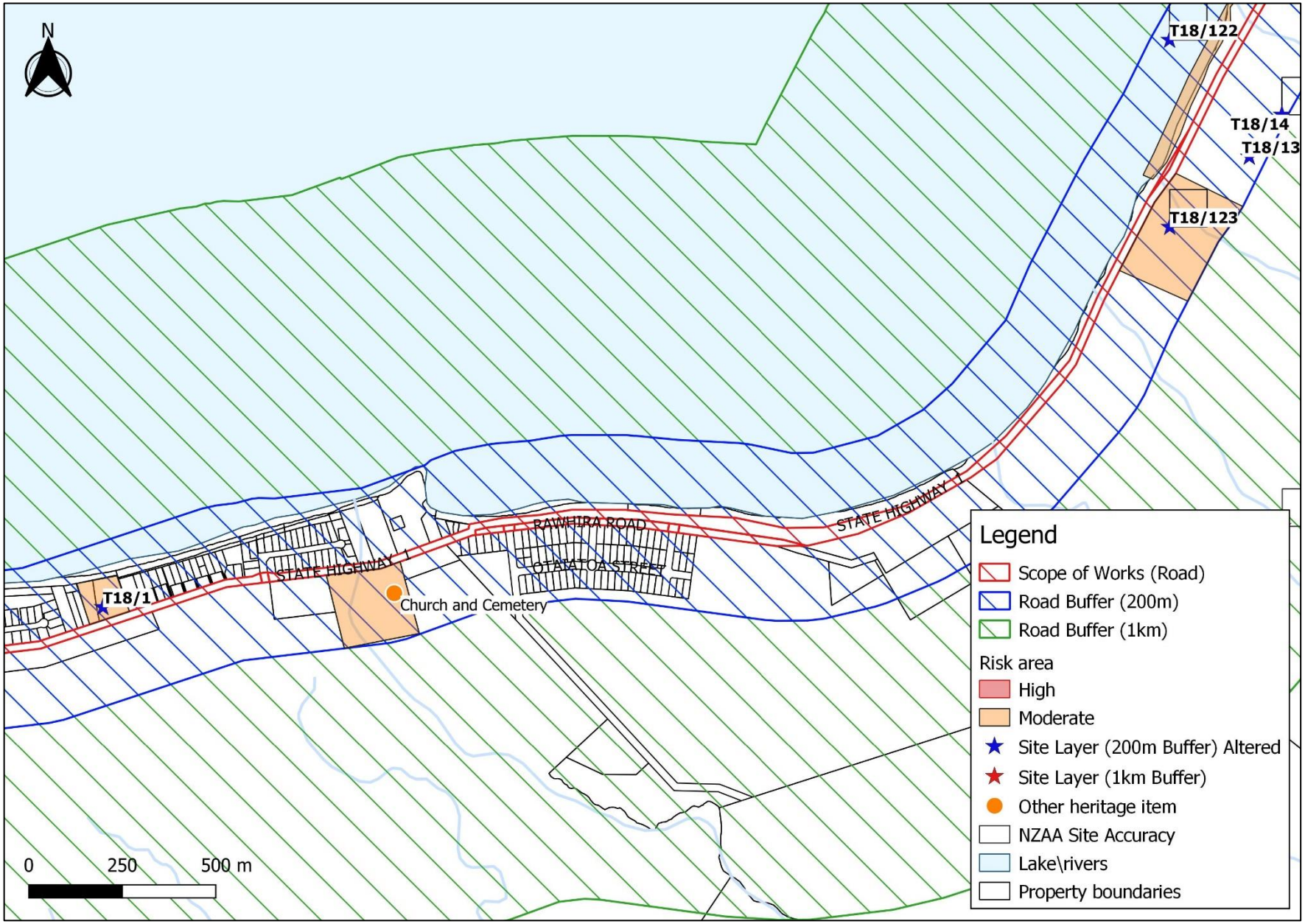


Figure 6. Plan of risk areas:T18/1, unrecorded Church and Cemetery.

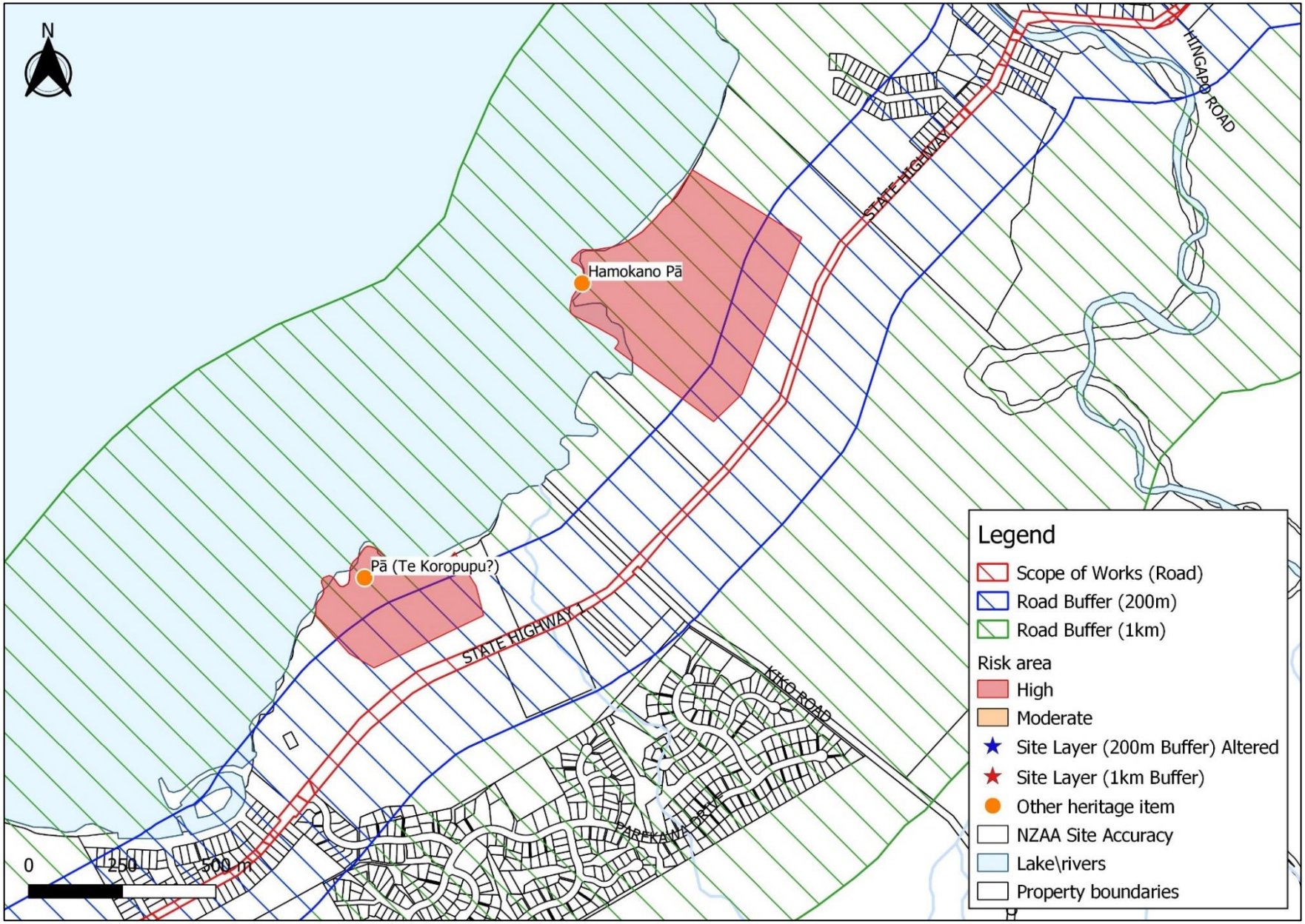


Figure 7. Plan of risk areas: unrecorded Hamokano and Te Koropupu Pā.

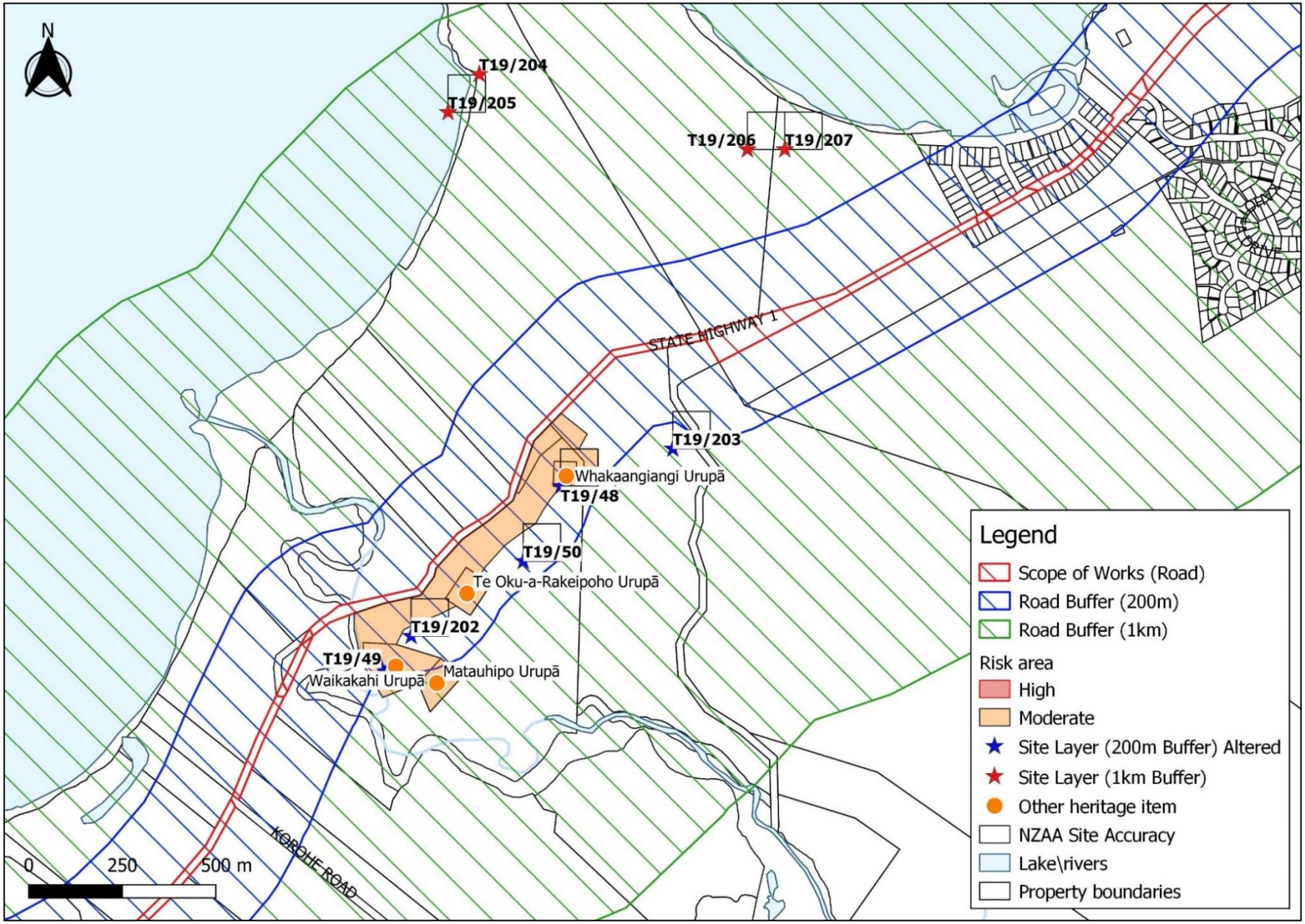


Figure 8. Plan of risk areas: T19/48, 49, 202, Waikakahi Urupā, Matauhipo Urupā, Te Oku-a-Rakeipoho Urupā, Whakaangiangi Urupā.

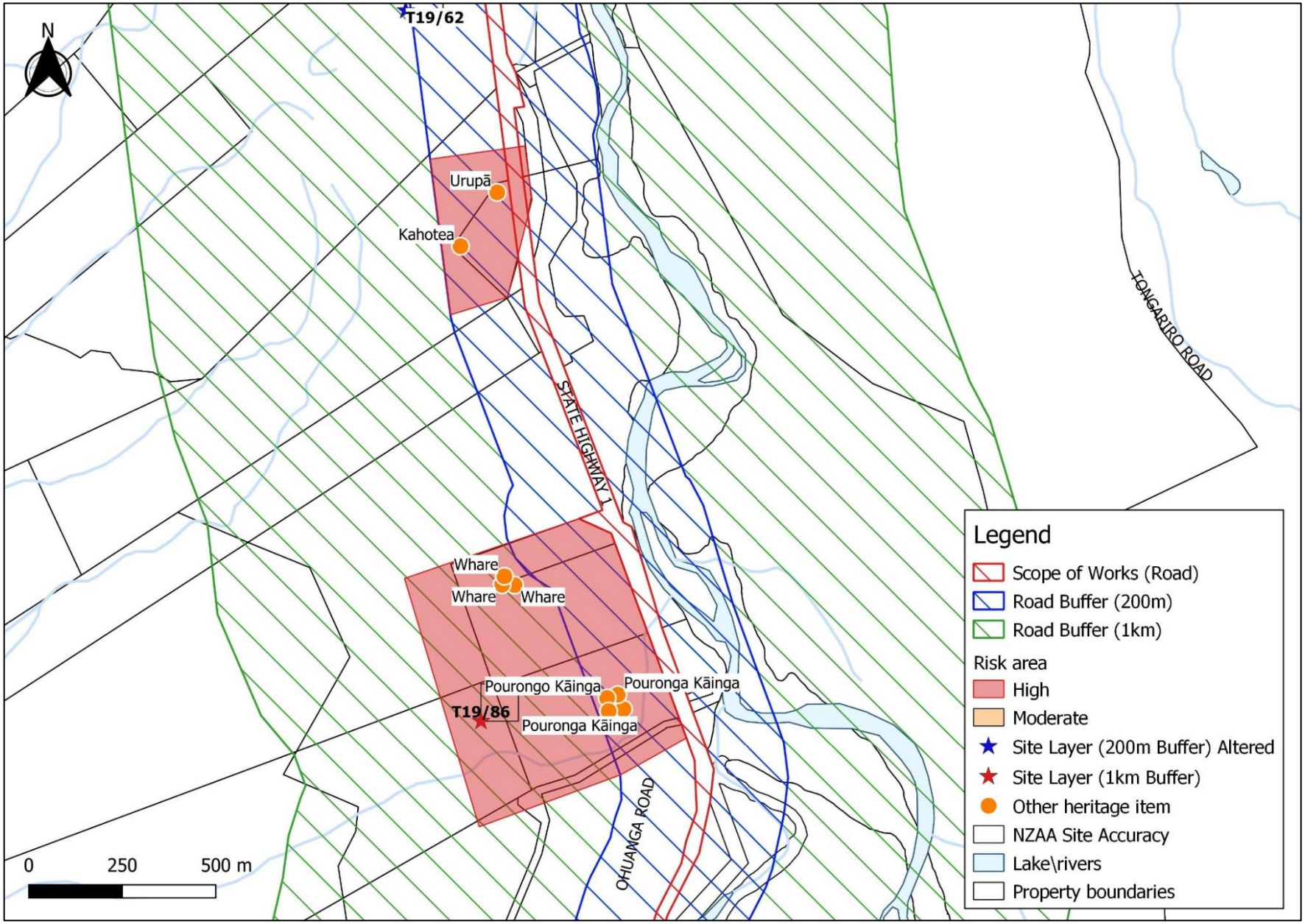


Figure 9. Plan of risk areas: T19/86, unrecorded urupā, Kahotea building, Pourongo Kāinga.

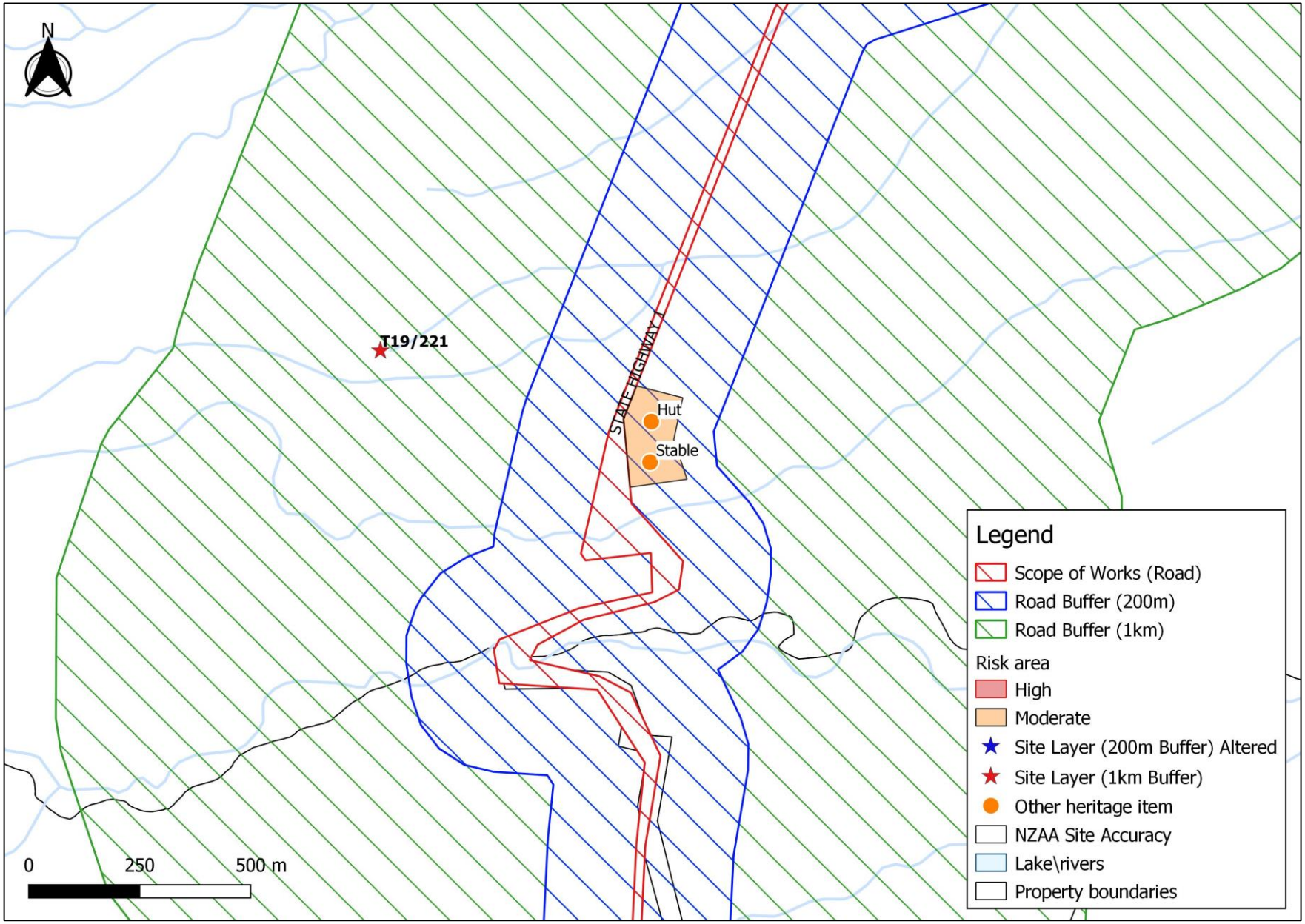


Figure 10. Unrecorded hut and stables at Mangamate Stream.

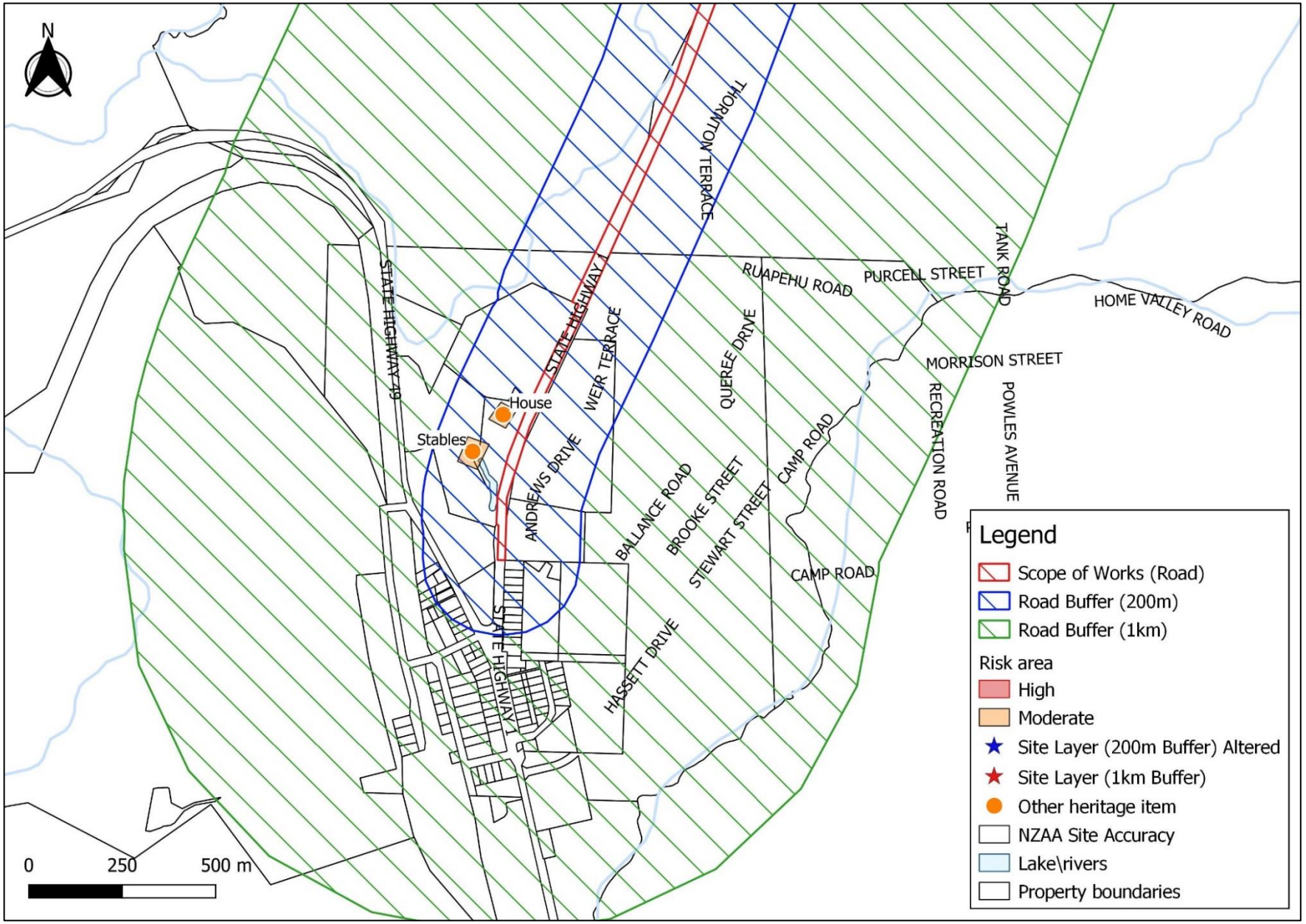


Figure 11. Plan of risk areas: Unrecorded house and stables at Waiouru.

Appendix

NZAA Sites 200m Buffer

NZAA ID	Site type	Short description
T18/1	Artefact find	A row of pits along a terrace.
T18/11	Pa	Pa
T18/12	Pit/terrace	Pits
T18/13	Pit/terrace	Pit/ditch
T18/14	Artefact find	Find spot
T18/15	Pit/terrace	Pits
T18/96	Pa	Pa
T18/97	Pa	Pa
T18/117	Pit/terrace	A row of pits along a terrace.
T18/118	Pit/terrace	Terraces and ovens.
T18/119	Pa	Pa site.
T18/120	Pit/terrace	Terrace/oven
T18/121	Pa	Pa/pits/ditch
T18/122	Canoe landings	Landings (canoe)
T18/123	Maori horticulture	Made soil
T18/137	Mounds	Mounds
T19/48	Pa	Pa
T19/49	Burial/ cemetery	Burials/findspot
T19/50	Pit/terrace	Terrace
T19/62	Unclassified	Habitation
T19/202	Pit/terrace	Pits/terraces
T19/203	Cave/ rock shelter	Cave
U18/34	Pa	Pa
U18/35	Pa	Pa
U18/36	Pa	Pa
U18/40	Maori horticulture	Ditches and worked soils.
U18/41	Pa	Pa
U18/42	Pa	Pa site.
U18/43	Pa - gunfighter	Gunfighter pa with rifle pits.
U18/60	Botanical evidence	Botanical/oven
U18/64	Pit/terrace	Pits.
U18/79	Maori horticulture	Scarps/pits/soils
U18/86	Pa	Pa with pits.
U18/88	Pit/terrace	Terrace/bank
U18/89	Sacred stone	Sacred rock outcrop
U18/90	Pa	Pa/ditch/tces/pit
U18/91	Pa	Pa/ditch
U18/92	Artefact find	Oven/findspot

Unrecorded heritage places within 200 m buffer

Description	Source survey plan	Survey plan date	Location
Urupā	ML11542	1919	Waitahanui
Korangawairua Cemetery	ML15528	1934	Hatepe, south of Hinemaiaia River
Pā	ML1545	1867	Hatepe
Orona Cemetery	ML15528	1934	Hallet's Bay (Hamuria)
Church and Cemetery	ML15544; SO26778	1932	Mission Point, Waiteteko
Hamokano Pā	ML15544; ML5649	1886	Rewarewa Point, south of Oruatua
Pā (Te Koropupu?)	ML5649	1886	Motuoapa Bay
Waikakahi Urupā	ML3575	1921	North of Waimarino River
Matauhipo Urupā	ML3575	1921	North of Waimarino River
Te Oku-a-Rakeipoho Urupā	ML3575	1921	North of Waimarino River
Whakaangiangi Urupā	ML3575	1921	North of Waimarino River
Urupā	ML4083; ML3611	1922	South of Tūrangi
Kahotea	ML4083; ML3611	1922	South of Tūrangi
Pourongo Kāinga	ML3611	1922	South of Tūrangi
Pouronga Kāinga	ML3611	1922	South of Tūrangi
Pourongo Kāinga	ML3611	1922	South of Tūrangi
Pouronga Kāinga	ML3611	1922	South of Tūrangi
Whare	ML3611	1922	South of Tūrangi
Whare	ML3611	1922	South of Tūrangi
Whare	ML3611	1922	South of Tūrangi
Hut	SO16199	1910	Mangamate Stream
Stable	SO16199	1910	Mangamate Stream
Stables	SO13776	1895	Waiouru
House	SO13776	1895	Waiouru

NZAA Sites 1000m Buffer

NZAA Id	Site type	Short description
T18/16	Transport/ communication	Track
T19/63	Pa	Ridge end pa
T19/86	Historical - domestic	Settlement
T19/204	Pa	Pa site.
T19/205	Unclassified	Stake alignment
T19/206	Unclassified	Stake alignment
T19/207	Midden/oven	Midden/ovens
T19/209	Pa	Pa/pits
T19/210	Military (non-Maori)	Pit (gun)
T19/211	Midden/oven	Findspot/oven
T19/212	Pit/terrace	Pits (raised)
T19/213	Pit/terrace	Pits (bell)
T19/221	Agricultural/ pastoral	Tongariro farm established about 1905. Features include concrete sheep dip, three old buildings, fences and broken crockery and glass.
T20/2	Artefact find	Findspot
U18/9	Traditional site	Originally recorded as a traditional pa although no defensive features were identified. A large sub-rectangular depression with earthen banks and charcoal-rich soils may indicate the remains of a whare.
U18/33	Pa	Pa
U18/38	Pit/terrace	Middens/pits
U18/39	Pa	Pa/pits
U18/62	Pit/terrace	Pits
U18/65	Pa	Pa - walls & pits beside Hinemaiaia Stream
U18/66	Pa	Pa site.
U18/67	Source site	Stoneworking area.
U18/68	Pa	Pa site.
U18/69	Pit/terrace	Pits.
U18/70	Pit/terrace	Raised rim pit.
U18/71	Pit/terrace	Two pits.
U18/72	Pa	Pa with pits.
U18/73	Pa	Pa
U18/81	Pa	Pa/urupa
U18/84	Pa	Small rectangular pa.

Appendix H: Planning Assessment Stormwater

Stantec

Memo

To:	Phil Peet, James Caufield, Jeremy France	From:	Paula Hunter
	Recipient's Office		Auckland
File:	SH1 Taupō to Waiouru	Date:	November 6, 2019

SH1 Taupō to Waiouru Preliminary Planning Assessment – Stormwater Discharges and Earthworks

Purpose

The purpose of this preliminary planning assessment is to:

1) identify the provisions in the Waikato Regional Plan 2007 (Regional Plan) that would apply to earthworks and the management of stormwater associated with any potential works and activities required for future roading and safety improvements along the SH1 corridor between Taupō and Waiouru;

2) determine whether resource consents could be required for the discharge of stormwater from and earthworks associated with any potential works and activities;

3) provide a preliminary assessment of the implications of the draft National Policy Statement for Freshwater Management (draft NPS-FM) and the proposed National Environmental Standard for Freshwater Management (proposed NES-FM).

Note: This preliminary planning assessment only relates to stormwater and earthworks within that part of the SH1 corridor located within the Waikato Region.

Waikato Regional Plan 2007

Background

Under the Regional Plan the SH1 corridor between Taupō and Waiouru is located within the Lake Taupō Catchment Management Zone. Lake Taupō, and the Waitahanui, Tauranga-Taupō, Tongoriro and Henemaiaia Rivers are all classified as Outstanding Freshwater Bodies. Numerous streams and rivers that drain into Lake Taupō have water classifications of "Trout Habitat", "Indigenous Fish Habitat" or "Natural State". Lake Taupō has a water classification of "Contact Recreation".

The SH1 corridor between Taupō and Waiouru is also located within the area subject to Variation No. 5 or the "Taupo Variation", a variation to the proposed Regional Plan to protect water quality in Lake Taupo by managing land use and nutrient discharges. The Variation was made operative in 2011 and became Chapter 3.10 of the Regional Plan.

Plan Change 1 Healthy Waters to the Regional Plan does not apply to the Lake Taupō Catchment.

The Regional Plan also identifies the Central Volcanic Area including the pumice land around Taupō and river and lake banks as erosion prone areas.

Policy direction - stormwater

Note: the policies and rules assessed below relate to the discharge of stormwater from the operation of the roading and safety improvements. The management of stormwater associated with the construction of the works and activities is covered by the earthworks policies and rules.

The Regional Plan sets a strong policy direction relating to:

- ensuring that activities do not adversely affect the significant characteristics of Lake Taupo that make it an outstanding water body in the Waikato region;

- recognising that Lake Taupō and land owned by Ngati Tuwharetoa including the bed of Lake Taupō is a tribal taonga;
- encouraging at-source management and treatment of stormwater discharges to reduce water quality and water quantity effects of discharges on receiving waters.

Key relevant policies are reproduced in full in Attachment 1.

Rules and other methods - stormwater

The Regional Plan sets a clear policy direction relating to the identification and management of outstanding freshwater bodies and the management of stormwater. However, the rules relating to stormwater discharges are confusing and ambiguous. They also focus on the characteristics of catchment generating the stormwater with no regard to the characteristics or quality of receiving environment that the stormwater is discharged into.

The rules relating to stormwater discharges include the following advice note *"For stormwater discharges in the Lake Taupo Catchment, refer to Policy 13 in section 3.10.3 and Method 7 in section 3.10.4"*.

Policy 13 and Method 7 are set out in full in Attachment 1 to this Memo. They do not relate in anyway to stormwater discharges. In the absence of any specific rules within Chapter 3.10 Lake Taupō Catchment relating to stormwater discharges, the region wide rules relating to stormwater discharges have been relied on.

Rule 3.5.11.4 provides for the discharge of stormwater to water[1] as a permitted activity and Rule 3.5.11.5 for the discharge of stormwater onto or into land, provided various conditions included in the rule are complied with.

The key relevant permitted activity conditions that apply to discharges of stormwater to water are set out below. The full set of the conditions is reproduced in Attachment 1.

> *a) The discharge shall not originate from a catchment that includes any high risk facility, contaminated land*, operating quarry or mineral extraction site unless there is an interceptor system* in place.*
>
> *b) Any erosion occurring as a result of the discharge shall be remedied as soon as practicable.*
>
> *e) The discharge shall comply with the suspended solids standards in Section 3.2.4.6.* (This standard is reproduced in Attachment 1)
>
> *f) The discharge shall not contain any material which will cause the production of conspicuous oil or grease films, scums or foams, or floatable suspended materials at any point downstream that is a distance greater than three times the width of the stream at the point of discharge.*
>
> *g) The discharge shall not contain concentrations of hazardous substances that may cause significant adverse effects on aquatic life or the suitability of the water for human consumption after treatment.*

The key relevant permitted activity conditions that apply to discharges of stormwater onto or into land are set out below. The full set of the conditions is reproduced in Attachment 1.

> *a) The discharge shall not originate from a catchment that includes any high risk facility or contaminated land* unless there is and interceptor system* in place.*
>
> *b) The discharge shall be below a rate that would cause flooding outside the design discharge soakage area, except in rain events equivalent to the 10% Annual Exceedence Probability design storm or greater. Any exceedence shall go into designated overland flow paths.*
>
> *c) There shall not be any overland flow resulting in a discharge to surface water, except in rain events equivalent to the 10% Annual Exceedence Probability design storm or greater; then there shall be no adverse surface water effects as a result of the discharge.*

[1] Given the constraints and sensitivities associated with the SH1 corridor it is assumed that treatment at source of stormwater will not be a viable option. Consequently, any stormwater will be discharged either directly to water or onto or into land.

d) Any erosion occurring as a result of the discharge shall be remedied as soon as practicable.

e) The discharge shall not contain concentrations of hazardous substances that may cause significant adverse effects on aquatic life or the suitability of the water for human consumption after treatment.

Assessment - stormwater

Despite the SH1 corridor between Taupō and Waiouru being located in a highly sensitive environment and the strong policy direction of the Regional Plan relating to the protection of this environment, from this preliminary assessment the discharge of stormwater generated by any potential future works and activities associated with future roading and safety improvements along the SH1 corridor is unlikely to require resource consent.

This conclusion is made with the following caveats:

- there have been not discussions with the Waikato Regional Council consent officers regarding the management of stormwater in the Lake Taupō Catchment and the interpretation of the confusing and ambiguous provisions in the Regional Plan.
- it is assumed that Rules 3.5.11.4 and 3.5.11.5 will apply to discharges of stormwater Lake Taupō Catchment; and
- it is assumed that stormwater discharges generated by any potential works and activities can meet the permitted activity conditions in Rules 3.5.11.4 and 3.5.11.5.

Note: where the discharge of stormwater is determined to be a permitted activity (i.e. allowed as of right without requiring a resource consent) the objectives and policies of the Regional Plan, no matter how directive they are about protecting the water quality and special values of outstanding freshwater bodies and recognising these water bodies as tribal taonga have no further influence over the discharge. They only come into play where a resource consent for the discharge is required.

Policy direction - earthworks

A key policy focus of the Regional Plan is on reducing accelerated erosion across the region, particularly in High Risk Erosion areas so that:

- there are no adverse effects on water quality;
- no increase in the adverse effects of flooding or land instability hazards;
- significant adverse effects on the relationship tangata whenua as Kaitiaki have with their identified ancestral taonga such as ancestral lands, water and waahi tapu are avoided;
- accelerated infilling of lakes and rivers is minimised.

The following is the definition contained in the Regional Plan of a "High Risk Erosion" area

High risk erosion area: Means any part of any activity area (where the activity is not otherwise permitted):

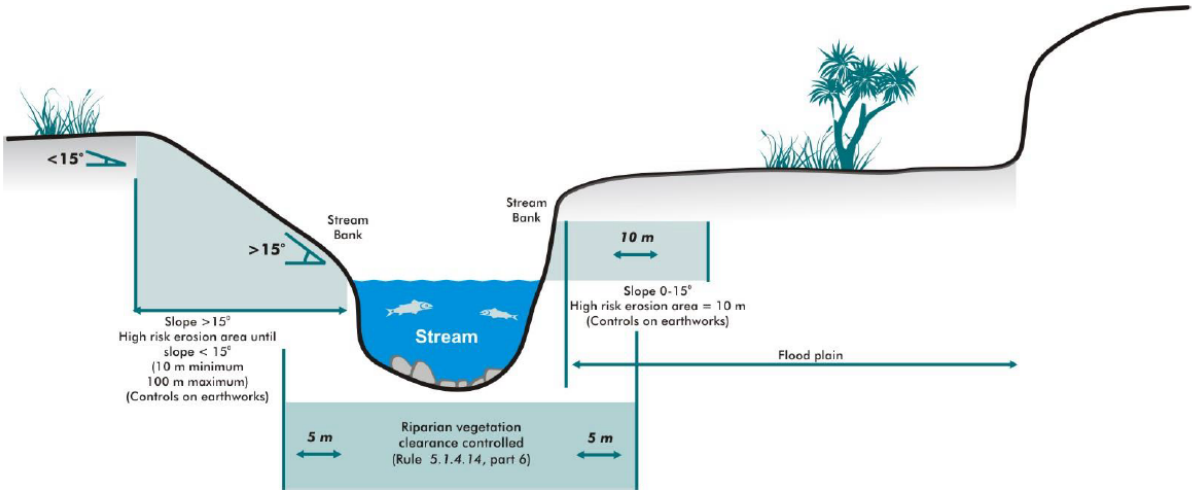
a) where the pre-existing slope of the land exceed 25 degrees; or

e) adjacent to water bodies (including ephemeral watercourses draining catchments greater than 100 hectares, but excluding any other ephemeral rivers or streams), where:

i) the land slope is between 0 degrees to 15 degrees – within 10 metres from any lake, wetland or the bed of a river or lake, or

ii) the land slope is greater than 15 degrees – within that distance from the wetland, the bed of a river or lake, or from mean high water springs to the first point at which the slope reduces to 15 degrees or less, or 100 metres (whichever is the lesser, outside the minimum distance described in i)

The definition is illustrated in the diagram below



Given the characteristics of the environment that the SH1 corridor traverses including the proximity to Lake Taupō and numerous streams and rivers it is highly likely that potential works and activities will be located in High Risk Erosion areas and will be subject to additional controls under the Regional Plan.

Rules and other methods - earthworks

Soil disturbance, roading and tracking and vegetation clearance activities in high risk erosion areas require resource consent where they are within the following thresholds:

1. Roading and tracking activities between 100 and 2,000 metres in length, or

2. Soil disturbance activities between 250 and 1,000 cubic metres in volume (solid measure), or

3. Soil disturbance activities between 0.2 and 2.0 hectares in area, or

4. Soil disturbance activities resulting in a cut slope batter exceeding three metres in vertical height over a cumulative distance between 30 and 120 metres in length, or

5. Vegetation Clearance of between one and five hectares

6. Vegetation clearance which is within five metres on either side, of the banks of a water body

Activities within these thresholds are classified as controlled activities[2] (i.e. they require a resource consent but the application cannot be declined). Activities that exceed these thresholds are classified as discretionary activities[3] (i.e. require a resource consent and can be declined).

Soil disturbance, roading and tracking and vegetation clearance activities that are under these thresholds or that are not within High Risk Erosion areas are permitted activities[4] provided they meet specific conditions. These conditions also apply to activities classified as controlled activities.

The key relevant permitted and controlled activity conditions[5] that apply to soil disturbance, roading and tracking and vegetation clearance activities are set out below. The full set of the conditions is reproduced in Attachment 1.

> *b) Erosion/sediment controls shall be installed and maintained on all earthworks during and on completion of the works to avoid the adverse effects of sediment on water bodies.*

[2] Rule5.1.4.14
[3] Rule5.1.4.15
[4] Rule5.1.4.11
[5] Rule5.1.4.5

g) The activity shall not disturb any archaeological site or waahi tapu as identified at the date of notification of this Plan, in any district plan, in the New Zealand Archaeological Association's Site Recording Scheme, or by the Historic Places Trust except where Historic Places Trust approval has been obtained.

h) The concentration of suspended solids in any point source discharge arising from the activity shall comply with the suspended solids standards as set out in Method 3.2.4.6. This condition applies only to permitted activity rules and excludes any non-point source discharges from roading, tracking and vegetation clearance activities (refer condition o) below).

Assessment - earthworks

Given the characteristics of the environment that the SH1 corridor traverses including the proximity to Lake Taupō and numerous streams and rivers it is highly likely that potential works and activities involving soil disturbance, roading and tracking and vegetation clearance will be located in High Risk Erosion areas and will require resource consent. However, if these activities can comply with the relevant conditions[6] applications will be assessed as controlled activities which is the most favourable consent activity status under the RMA. Decision makers cannot decline applications for controlled activities they can only impose consent conditions.

Soil disturbance, roading and tracking and vegetation clearance activities that cannot comply with the relevant conditions whether within or outside High Risk Erosion areas will be classified as discretionary activities. Given that there are 39 recorded archaeological sites within the 200m road reserve buffer of SH1 between Taupō and Waiouru there is a reasonable probability that Condition g) listed above which specifies that activities shall not disturb any identified archaeological site or waahi tapu will not be complied with, thus triggering the need for a resource consent for a discretionary activity.

Waikato Stormwater Management Guideline 2018

It is unclear what the relationship of the Waikato Stormwater Management Guideline 2018 (the Guideline) is with the Regional Plan and when and how the Guideline should be applied.

The Guideline is primarily urban focussed and generally provides guidance on stormwater management for new urban development and the retrofitting of existing / brownfield development. It makes very few references to stormwater associated with state highways but does acknowledge that "*highway projects are different from normal development projects and the ability to provide source control is limited*"[7].

Stormwater Treatment Standard for State Highway Infrastructure 2010

The NZ Transport Agency has prepared its own guidance manual to assist roading practitioners with the selection and design of roading stormwater management practices. It is assumed that the management of stormwater generated from any potential works and activities associated with future roading and safety improvements along the SH1 corridor between Taupō and Waiouru would be undertaken in accordance with this guidance manual.

Draft National Policy Statement for Freshwater Management and Proposed National Environmental Standard for Freshwater Management

As part of the Government's work programme for improving the quality of fresh water a draft NPS-FM and proposed NES-FM has been released for consultation. While these documents have no statutory basis and may be subject to change, they signal they types of policy and standards that could be imposed in the future in terms of the management of freshwater. Once they have been gazetted the policies must be implemented by regional councils and the standards complied with.

The draft NPS-FM has very directive policies relating to no further loss or degradation of natural inland wetlands and no further net loss of streams. The draft NPS-FM requires that regional policy statements and plans include provisions to ensure that the permanently diverting a stream or culverting a stream will not result in a net loss in the extent or ecosystem health of a stream. It also requires that regional policy statements and plans include

[6] Rule5.1.4.5

[7] Page 72

provisions to ensure that the infilling of river or stream beds is avoided unless it is necessary to enable the development, operation, maintenance and upgrade of nationally significant infrastructure[8].

The NES-FM classifies the following activities as discretionary activities where they are associated with the building, maintaining, or operating any new or existing nationally significant infrastructure (includes state highways)[9]:

1) vegetation destruction carried out in, or within 10 m of, any part of a natural wetland
2) general earth disturbance in, or within 10 m of, any part of a natural wetland
3) disturbance for drainage in or within 100 m of any part of a natural wetland
4) infilling of the bed of a river

The future NPS-FM and NES-FM will be significant national planning instruments that must be given effect to and complied with. Any potential works in proximity to natural wetlands or that could involve the infilling of a bed of a river will be subject to the requirements of these planning instruments. The progression of these documents through consultation and to their final gazettal will need to be monitored.

Key relevant policies and standards of the draft NPS-FM and the proposed NES-FM are reproduced in full in Attachment 2.

Conclusion

1) The Waikato Regional Plan is the key planning instrument relating to stormwater management and earthworks.
2) The stormwater provisions in 3 Water Module of the Regional Plan apply to stormwater discharges from the operation of the state highway.
3) Stormwater discharges associated with construction activities are covered by the soil disturbance, roading and tracking and vegetation clearance provisions in 5 Land and Soil Module of the Regional Plan.
4) Lake Taupō, and the Waitahanui, Tauranga-Taupō, Tongoriro and Henemaiaia Rivers are all classified as Outstanding Freshwater Bodies. Numerous streams and rivers that drain into Lake Taupō have water classifications of "Trout Habitat", "Indigenous Fish Habitat" or "Natural State". Lake Taupō has a water classification of "Contact Recreation"
5) Despite the SH1 corridor between Taupō and Waiouru being located in a highly sensitive environment and the strong policy direction of the Regional Plan relating to the protection of this environment, from this preliminary assessment the discharge of stormwater generated by any potential future works and activities associated with the operation of future roading and safety improvements along the SH1 corridor is unlikely to require resource consent.
6) Given the characteristics of the environment that the SH1 corridor traverses including the proximity to Lake Taupō and numerous streams and rivers it is highly likely that potential construction works and activities involving soil disturbance, roading and tracking and vegetation clearance will be located in "High Risk Erosion" areas and will require resource consent.
7) Given that there are 39 recorded archaeological sites within the 200m road reserve buffer of SH1 between Taupō and Waiouru there is a reasonable probability that the conditions specifies that construction works and activities involving soil disturbance, roading and tracking and vegetation clearance shall not disturb any identified archaeological site or waahi tapu will not be complied with, thus triggering the need for a resource consent for a discretionary activity. This condition applies to all areas of the region not just "High Risk Erosion" areas.

[8] Nationally significant infrastructure is defined in the NES-FM and includes state highways

[9] All other activities are classified as non-complying activities

8) The future NPS-FM and NES-FM will be significant national planning instruments that must be given effect to and complied with. Any potential works in proximity to natural wetlands or that could involve the infilling of a bed of a river will be subject to the requirements of these planning instruments.

Attachment 1: Extracts from the Waikato Regional Plan 2007

3 Water Module

3.5.3 Policies

Policy 7: Stormwater Discharges

Encourage at-source management and treatment of stormwater discharges to reduce water quality and water quantity effects of discharges on receiving waters.

Policy 7 refers to statutory and non-statutory means which Waikato Regional Council can use to encourage methods of managing stormwater at its source and treating stormwater prior to its discharge to receiving waters. These include the resource consent process and the development and implementation of stormwater management plans. These detail the way in which stormwater networks are operated and include methods to avoid, remedy or mitigate the adverse effects of stormwater discharge.

3.5.11 Implementation Methods – Stormwater Discharges

3.5.11.3 Stormwater Management

Waikato Regional Council will work with resources users (including territorial authorities) to:

1. Find ways to mitigate adverse effects of existing stormwater discharges;

2. Promote the development of stormwater management plans which record the way in which the stormwater network is operated, including methods to avoid, remedy or mitigate the adverse effects of stormwater discharge; and

3. Promote alternative methods for the treatment and disposal of stormwater from existing and new subdivisions and development.

Advisory Note:

• For stormwater discharges in the Lake Taupo Catchment, refer to Policy 13 in section 3.10.3 and Method 7 in section 3.10.4.

3.10 Lake Taupo Catchment

3.10.3 Policies

Policy 13: Effectiveness of the Public Fund

Review progress of the public fund after 2010 and initiate changes to the mechanism for achieving Objective 4 if substantial progress has not been made on Policies 4 and 12 by that time. The following factors will be considered during the review:

a) The extent to which agreements in process have achieved the 20 percent Nitrogen reduction target

b) The extent to which the fund has been efficient and effective in achieving permanent nitrogen removal and whether modifications to the criteria are necessary

c) The extent to which the administration of the fund has been efficient and effective and whether modification to the representation, structure or reporting are necessary.

3.10.4 Non-regulatory implementation methods

3.10.4.7 Wastewater Management (to achieve Policies 4, 9 and 10)

Develop and implement in conjunction with Taupo District Council a management system for on-site wastewater in the Taupo Catchment that is consistent with Australia/New Zealand Standard 1547:2000.

3.5.11.4 Permitted Activity Rule – Discharge of Stormwater to Water

permitted activity subject to the following conditions:

a) The discharge shall not originate from a catchment that includes any high risk facility, contaminated land*, operating quarry or mineral extraction site unless there is an interceptor system* in place.

b) Any erosion occurring as a result of the discharge shall be remedied as soon as practicable.

c) The catchment shall not exceed one hectare for discharges that originate from urban areas.

d) There shall be no adverse increase in water levels downstream of the discharge point which causes flooding on neighbouring properties, as a result of the discharge.

e) The discharge shall comply with the suspended solids standards in Section 3.2.4.6.

f) The discharge shall not contain any material which will cause the production of conspicuous oil or grease films, scums or foams, or floatable suspended materials at any point downstream that is a distance greater than three times the width of the stream at the point of discharge.

g) The discharge shall not contain concentrations of hazardous substances that may cause significant adverse effects on aquatic life or the suitability of the water for human consumption after treatment.

h) There shall be no discharge to any Significant Geothermal Feature.

For the purposes of conditions a) and g) levels of hazardous substances in stormwater or sediments that comply with the following guidelines and standards, in relation to the substances that they address will be deemed to be complying with the conditions:

i) Licences under the Hazardous Substances and New Organisms Act 1996 for the use of the substance in New Zealand specifying discharge and receiving water standards for the substance.

ii) Health and Environmental Guidelines for Selected Timber Treatment Chemicals (Ministry for the Environment, Ministry of Health, 1997).

iii) Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand (Ministry for the Environment, 1998).

iv) Guidelines for Assessing and Managing Contaminated Gasworks Sites in New Zealand (Ministry for the Environment, August 1997).

v) Australian/New Zealand Water Quality Guidelines For Fresh And Marine Waters, (Australian & New Zealand Environment & Conservation Council, 2001).

For the purposes of this Rule, 'urban area' includes the inner city or town and built up environments, irrespective of local body administrative boundaries, that are serviced by roads where the speed limit is 80 kilometres an hour or less.

3.10 Lake Taupo Catchment

3.10.3 Policies

Policy 1: Tangata whenua values and interests

Recognise:

a) That Lake Taupo and land owned by the tribe within the Lake Taupo catchment is a tribal taonga for Ngati Tuwharetoa, who is the owner of the Lake bed.

b) The role of Ngati Tuwharetoa as kaitiaki of the Lake and owners of the Lake Bed, and that, accordingly, groups and individuals within Ngati Tuwharetoa ought to be able to participate in decision making processes related to adverse effects on the environment which impinge on tangata whenua values.

c) That Ngati Tuwharetoa has a unique cultural and spiritual relationship with Lake Taupo and their ancestral lands within the catchment of Lake Taupo.

d) That historical factors have inhibited Ngati Tuwharetoa's ability to develop their ancestral lands within the catchment of Lake Taupo.

e) That the nature of Ngati Tuwharetoa's relationship with and the form of its tenure of the land in the catchment of Lake Taupo are such that members of the iwi are unlikely and in some cases legally unable voluntarily to relinquish their interest in that land and have comparatively less ability to transfer their interests to land outside the catchment than do landowners generally.

f) That the unique relationship described in matters (a) – (e) above mean that it is appropriate to enable Ngati Tuwharetoa to develop their currently undeveloped or forested lands in a manner and to an extent that has no long term adverse effect on the water quality of Lake Taupo.

Policy 2: Identification of Lake Taupo as an Outstanding Waterbody in the Waikato Region

Ensure that activities do not adversely affect the significant characteristics of Lake Taupo that make it an outstanding water body in the Waikato region:

a) New Zealand's largest clear blue lake resulting from exceptional water quality (as defined by water quality characteristics) in that it, in most locations and most times, surpasses the New Zealand drinking water standards and is of higher quality than all Waikato Regional Council's ecological health and recreation standards.

b) High level of natural character of the margins of the Lake and inflowing streams due to the extent of wilderness, surrounding landscape and geological features and lack of built environment around much of the Lake.

c) Status as tribal taonga for Ngati Tuwharetoa.

d) Internationally renowned trout fishery.

e) Ability to support a wide range of indigenous fauna and flora.

f) Commercial opportunities based on the Lake's natural features and values, which provide local and national economic benefit.

3.10.4 Non-regulatory implementation methods

3.10.4.8 Integrated Management of Wastewater (to achieve Policies 4, 9 and 10)

Work with Taupo District Council and other stakeholders to:

e) Promote practices to ensure non-domestic point source discharges such as stormwater and industrial discharges do not adversely affect Lake water quality

3.2.4 Implementation Methods – Water Management Classes and Standards

3.2.4.6 Suspended Solids Standards

The environmental effects of suspended solids discharges for activities requiring consent will be assessed on a case-by-case basis and appropriate standards set.

The following suspended solids standards must be met where referred to in relevant permitted activity rules relating to discharges, or activities that may result in a discharge, to surface water bodies:

a) The activity or discharge shall not increase the concentration of suspended solids in the receiving water by more than 10 percent; and either

b) The suspended solids concentration of the discharge shall not exceed 100 grams per cubic metre; or

c) The activity or discharge shall not result in any of the following receiving water standards being breached:

i) in Indigenous Fisheries and Fish Habitat Class waters – 80 grams per cubic metre suspended solids concentration

ii) in Significant Trout Fisheries and Trout Habitat Class waters – 25 grams per cubic metre suspended solids concentration

iii) in Contact Recreation Class waters – black disc horizontal visibility greater than 1.6 metres.

Standards a), b) and c) apply, except where the suspended solids concentration in the receiving water is greater, at the time and location of discharge or of undertaking the activity, than the standards specified. Then there shall not be any increase (i.e. further deterioration) in the receiving water suspended solids concentration as a result of the activity or discharge.

The point at which compliance with this standard shall be measured is:

i) For rivers and streams (including Hydro Electricity Reservoirs): at a distance downstream of the discharge point (or site of the activity) which is no more than three times the width of the river or stream and which in any instance does not exceed 200 metres from the point of discharge.

ii) For lakes (other than Hydro Electricity Reservoirs): at a distance no more than 15 metres from the location of the discharge or the activity.

5 Land and Soil Module

5.1 Accelerated Erosion

5.1.3 Policies

Policy 1: Managing Activities that Cause or Have the Potential to Cause Accelerated Erosion and Encouraging Appropriate Land Management Practices

Through permitted activities and non-regulatory methods manage activities that cause or have the potential to cause accelerated erosion, with particular regard to:

a) the potential for the activity to adversely affect the purpose of the water management classes as identified in the policies in Section 3.2.2, and the coastal marine area

b) the risk of downstream sedimentation leading to accelerated infilling of lakes, estuaries, artificial watercourses, rivers, wetlands and caves

c) the erosion potential of soil when it is disturbed or vegetation is cleared

d) the potential to increase the adverse effects of flooding

e) the potential to adversely affect waahi tapu and archaeological sites or other identified sites of importance to tangata whenua as Kaitiaki

f) the potential to adversely affect natural character of the coastal environment and the margins of rivers, lakes and wetlands and areas of significant indigenous vegetation and significant habitats of indigenous fauna28

g) the potential to compromise air quality objectives as identified in Module 6 Air

h) the potential to damage property and infrastructure.

Policy 2: Use of Regulatory and Non-Regulatory Approaches of Management for Soil Disturbance/Vegetation Clearance Activities in High Risk Erosion Areas

Waikato Regional Council will use a mixture of regulatory and non-regulatory approaches to:

a) minimise the adverse effects of soil disturbance and vegetation clearance in high risk erosion areas

b) minimise the accelerated infilling of Coromandel estuaries that are listed as areas of significant conservation value in the Regional Coastal Plan

c) minimise adverse effects of soil disturbance activities in karst environments on cave ecosystems.

5.1.4.11 Permitted Activity Rule – Soil Disturbance, Roading and Tracking and Vegetation Clearance

1. Unless otherwise provided for by Rules 5.1.4.14, 5.1.4.15, 5.1.4.16 or 5.1.4.17, soil disturbance, roading and tracking, and vegetation clearance and any associated deposition of slash into or onto the beds of rivers and any subsequent discharge of contaminants into water or air;

2. Any roading and tracking activities associated with the installation of bridges or culverts permitted by Rules 4.2.8.1, 4.2.9.1 and 4.2.9.2, within 20 metres of that bridge or culvert and any associated deposition of slash into or onto the beds of rivers and any subsequent discharge of contaminants into water or air;

3. Vegetation clearance of planted production forest as planted at the date upon which this Plan becomes operative;

are permitted activities subject to the conditions in Section 5.1.5.

5.1.5 Conditions for Permitted Activity Rule 5.1.4.11 and Standards and Terms for Controlled Activity Rules

a) Organic material shall not be placed in fill where its subsequent decomposition will lead to land instability.

b) Erosion/sediment controls shall be installed and maintained on all earthworks during and on completion of the works to avoid the adverse effects of sediment on water bodies.

c) Cut-offs or culverts shall be designed and installed to prevent scour, gullying or other erosion.

d) Any erosion or instability of the coastal environment, or the beds of rivers and lakes or wetlands shall be avoided or remedied if it does occur.

e) The activity shall not result in neighbouring land becoming subject to flooding.

f) All disturbed vegetation, soil or debris shall be deposited or contained to prevent the movement of disturbed matter so that it does not result in:

i) the diversion, damming or blockage of any river or stream, or

ii) the passage of fish being impeded, or

iii) the destruction of any habitat in a water body or coastal water, or

iv) flooding or erosion.

g) The activity shall not disturb any archaeological site or waahi tapu as identified at the date of notification of this Plan, in any district plan, in the New Zealand Archaeological Association's Site Recording Scheme, or by the Historic Places Trust except where Historic Places Trust approval has been obtained.

h) The concentration of suspended solids in any point source discharge arising from the activity shall comply with the suspended solids standards as set out in Method 3.2.4.6. This condition applies only to permitted activity rules and excludes any non-point source discharges from roading, tracking and vegetation clearance activities (refer condition o) below).

i) Any discharge of contaminants into air arising from the activity shall comply with the permitted activity conditions in Section 6.1.8 except where the matters addressed in Section 6.1.8 are already addressed by conditions on resource consents for the site.

j) In the event of any waahi tapu that is not subject to g) above being identified by the Waikato Regional Council to the person undertaking the activity, the activity shall cease insofar as it may affect the waahi tapu. The activity shall not be recommenced without the approval of the Waikato Regional Council.

k) No storage or mixing of fuels, oils, or agrichemicals shall be undertaken in areas where deliberate or inadvertent discharge is likely to enter any permanent natural surface water body.

l) All vegetation that is being felled within five metres of a perennial water body shall be felled away from the water body, except edge vegetation, or vegetation leaning over a water body, which if necessary may be felled in accordance with safety practices.

m) All exposed areas of soil resulting from the activity shall be stabilised against erosion by vegetative cover or other methods as soon as practical following completion of the activity and no later than six to twelve months from the date of disturbance to avoid the adverse effects of sediment on water bodies.

n) The activity shall not be located within 20 metres of a Significant Geothermal Feature.

o) The concentration of suspended solids in any non-point discharges from roading, tracking and vegetation clearance activities shall meet the following standards;

i) The activity or discharge shall not result in any of the following receiving water standards being breached:

ii) in Waikato Region Surface class waters - 100 grams per cubic metre suspended solids concentration

iii) in Indigenous Fisheries and Fish Habitat class waters - 80 grams per cubic metre suspended solids concentration

iv) in Trout Fisheries and Trout Spawning Habitat class waters - 25 grams per cubic metre suspended solids concentration

v) in Contact Recreation class waters - black disc horizontal visibility greater than 1.6 metres

vi) in Natural State class waters - the activity or discharge shall not increase the concentration of suspended solids in the receiving water by more than 10 percent

Standard a) shall apply, except where the suspended solids concentration or black disc horizontal visibility in the receiving water is greater than the standards specified, at the time and location of discharge or of undertaking the activity. Then there shall not be any increase (i.e. further deterioration) in the receiving water suspended solids concentration or black disc horizontal visibility of more than 20% as a result of the activity or discharge.

The point at which compliance with this standard shall be measured is after reasonable mixing has occurred which in any instance does not exceed 200 metres from the point of discharge.

p) Soil disturbance associated with the construction of a road or track within 20 metres of a culvert or bridge provided for in Rules 4.2.8.1, 4.2.8.2, 4.2.9.1, 4.2.9.2 and 4.2.9.3;

i) Shall not occur adjacent to Significant Indigenous Fisheries and Fish Habitat Class waters during August to December inclusive and Significant Trout Fisheries and Trout Habitat class waters during May to September inclusive; and,

ii) Shall be stabilised against erosion by vegetative cover or other methods as soon as practical following completion of the activity and no later than two months from the date of disturbance to avoid the adverse effects of sediment on water bodies; and

iii) The location of the proposed soil disturbance shall be notified to the Waikato Regional Council in writing at least 10 working days prior to commencing construction.

5.1.4.13 Discretionary Activity Rule – Soil Disturbance, Roading and Tracking and Vegetation Clearance

1. Any soil disturbance, roading and tracking, and vegetation clearance and any associated deposition of slash into or onto the beds of rivers and any subsequent discharge of contaminants into water or air that does not comply with the conditions of Permitted Activity Rule 5.1.4.11;

2. Soil cultivation within two metres of the bed of a river or lake that does not comply with Rule 5.1.4.12;

are discretionary activities (requiring resource consent).

5.1.4.14 Controlled Activity Rule – Soil Disturbance, Roading and Tracking and Vegetation Clearance, Riparian Vegetation Clearance in High Risk Erosion Areas[10]

Except as restricted by Rule 5.1.4.16, the following activities, occurring in any continuous 12 month period and located in a high risk erosion area:

1. Roading and tracking activities between 100 and 2,000 metres in length, or

2. Soil disturbance activities between 250 and 1,000 cubic metres in volume (solid measure), or

3. Soil disturbance activities between 0.2 and 2.0 hectares in area, or

4. Soil disturbance activities resulting in a cut slope batter exceeding three metres in vertical height over a cumulative distance between 30 and 120 metres in length, or

5. Vegetation Clearance of between one and five hectares with the exclusion of planted production forests, plant pests as specified in the Waikato Regional Council's Regional Pest Management Strategy and vegetation clearance adjacent to a Natural State water body as shown on the Water Management Class Maps

6. Vegetation clearance which is within five metres on either side, of the banks of a water body excluding an ephemeral stream, and which is between 50 to 100 metres in length per kilometre of that water body, with the exclusion of planted production forests and vegetation in riparian margins adjacent to planted production forest, riparian enhancement and replanting programmes and plant pests as specified in the Waikato Regional Council's Pest Management Strategy.

7. Vegetation clearance within five metres on either side of the banks of a water body excluding an ephemeral stream of greater than 50 metres in length per kilometre of that water body of: a) Planted production forest (except as provided for in Rule 5.1.4.11(3) and/or vegetation in riparian margins adjacent to planted production forest; or b) Vegetation associated with riparian enhancement programmes.

8. Any roading and tracking activities associated with the installation of a bridge or culvert controlled by Rules 4.2.8.2 and 4.2.9.3, within 20 metres of that bridge or culvert; and any associated deposition of slash into or onto the beds of rivers and any subsequent discharge of contaminants into water or air are controlled activities (requiring resource consent) subject to the standards and terms as specified in Section 5.1.5.

5.1.4.15 Discretionary Activity Rule – Soil Disturbance, Roading, Tracking, Vegetation Clearance, Riparian Vegetation Clearance in High Risk Erosion Areas

Except as restricted by Rule 5.1.4.16 the following activities, occurring in any continuous 12 month period and located in a high risk erosion area:

1. Roading and tracking activities exceeding 2,000 metres in length

2. Soil disturbance activities exceeding 1,000 cubic metres in volume (solid measure)

3. Soil disturbance activities exceeding two hectares in area

4. Soil disturbance activities resulting in a cut slope batter exceeding three metres in vertical height over a cumulative distance exceeding 120 metres in length

[10] High risk erosion area: Means any part of any activity area (where the activity is not otherwise permitted):
a) where the pre-existing slope of the land exceed 25 degrees; or
e) adjacent to water bodies (including ephemeral watercourses draining catchments greater than 100 hectares, but excluding any other ephemeral rivers or streams), where:
i) the land slope is between 0 degrees to 15 degrees – within 10 metres from any lake, wetland or the bed of a river or lake, or
ii) the land slope is greater than 15 degrees – within that distance from the wetland, the bed of a river or lake, or from mean high water springs to the first point at which the slope reduces to 15 degrees or less, or 100 metres (whichever is the lesser, outside the minimum distance described in i).

5. Vegetation clearance exceeding five hectares with the exclusion of planted production forests (except those restricted by Rule 5.1.4.16), and plant pests as specified in the Waikato Regional Council's Regional Pest Management Strategy

6. Riparian vegetation clearance which is within five metres on either side of the banks of a perennial water body which exceeds 100 metres in length per kilometre, with the exclusion of planted production forests, riparian enhancement programmes and plant pests as specified in the Waikato Regional Council's Regional Pest Management Strategy

7. Any riparian vegetation clearance within five metres of a Natural State water body as shown on the Water Management Class Maps except: i) that which is required as part of the construction of a walking track no greater than two metres width, and ii) the control of plant pests as specified in the Waikato Regional Council's Regional Pest Management Strategy

8. Any activity specified in Rules 5.1.4.14 and 5.1.4.16, that does not comply with the conditions and standards and terms in Section 5.1.5;

and any associated deposition of slash into or onto the beds of rivers and any subsequent discharge of contaminants into water or air are discretionary activities (requiring resource consent).

Attachment 2: Extracts from the Draft National Policy Statement for Freshwater Management and the Proposed National Environmental Standard for Freshwater Management

Draft National Policy Statement for Freshwater Management

Part 2: Objectives and policies

2.2 Policies

Policy 8: There is no further loss or degradation of natural inland wetlands;
Policy 9: There is no further net loss of streams;

Subpart 3 Specific requirements

3.15 Inland wetlands

(2) Every regional council must include in its regional policy statement the following policy (or words to the same effect):
"The loss or degradation of all or any part of a natural inland wetland is avoided."

(3) However, the policy required by subclause (2):

a) must be read subject to any rules that give effect to the requirements of the National Environmental Standards for Freshwater, or to any more stringent rules that the council, as permitted by those Standards, includes in its regional plan; and

3.16 Streams

(1) Every regional council must include the following policy (or words to the same effect) in its regional policy statement:
"The extent and ecosystem health of rivers and streams in the region, and their associated freshwater ecosystems, are at least maintained".

(2) However, the policy must be read subject to any rules that give effect to the requirements of the National Environmental Standards for Freshwater, or to any more stringent rules that the council, as permitted by those Standards, includes in its regional plan.

(4) Every regional council must make or change its regional policy statement and plans to ensure that the following do not result in a net loss in the extent or ecosystem health of a stream:
a) permanently diverting a stream;
b) culverting a stream, where that is allowed and as far as practicable.

(5) Every regional council must make or change its regional policies and plans to ensure that the infilling of river or stream beds is avoided, unless there are no other practicable alternative methods of providing for the activity, and it is part of an activity:
a) designed to restore or enhance the natural values of the stream or of any adjacent or associated ecosystem; or
b) necessary to enable the development, operation, maintenance and upgrade of nationally significant infrastructure; or
c) required for the purposes of flood prevention or erosion control.

(6) However, subclause (5) is subject to any rules that give effect to the requirements of the National Environmental Standards for Freshwater, or to any more stringent rules that the council, as permitted by those Standards, includes in its regional plan.

net loss means the point at which measurable positive effects from targeted environmental management activities match the environmental losses due to the impacts of a specific development project, so that compared to a baseline there is no net reduction in environmental values over space and time

Proposed National Environmental Standard for Freshwater Management

Part 2 Wetlands, rivers, and fish passage

Subpart 1 – Wetlands
nationally significant infrastructure means all or any of the following:
a) State highways;

7 Vegetation destruction – discretionary activities
Vegetation destruction carried out in, or within 10 m of, any part of a natural wetland is a discretionary activity if it is carried out:
e) for the purpose of building, maintaining, or operating any new or existing nationally significant infrastructure.

10 General earth disturbance – discretionary activity
(1) Engaging in general earth disturbance in, or within 10 m of, any part of a natural wetland is a discretionary activity if it is undertaken:
d) for the purpose of building, maintaining, or operating any new or existing nationally significant infrastructure.

12 Earth disturbance for drainage – discretionary activities
(3) Engaging in earth disturbance for drainage in or within 100 m of any part of a natural wetland is a discretionary activity if it is undertaken:
a) for: i. public flood control or drainage; or
ii. building, maintaining, or operating any new or existing nationally significant infrastructure; and

b) the work will:
i. result in a greater than 0.1 m change beyond the natural wetland's annual median water level; and
ii. cause changes in the natural wetland's seasonal (summer to winter) water level fluctuations (minimum or maximum water levels) that have a detrimental effect on the extent, ecological quality (type and diversity of aquatic plant and animal communities) or functioning of the natural wetland.

Subpart 2 – River bed infilling
18 Infilling bed of river
Discretionary activity
(1) The infilling of the bed of a river is a discretionary activity if it is part of an activity:
b) done for the purpose of building, maintaining, or operating new or existing nationally significant infrastructure;

Appendix I1: Scheme Drawings

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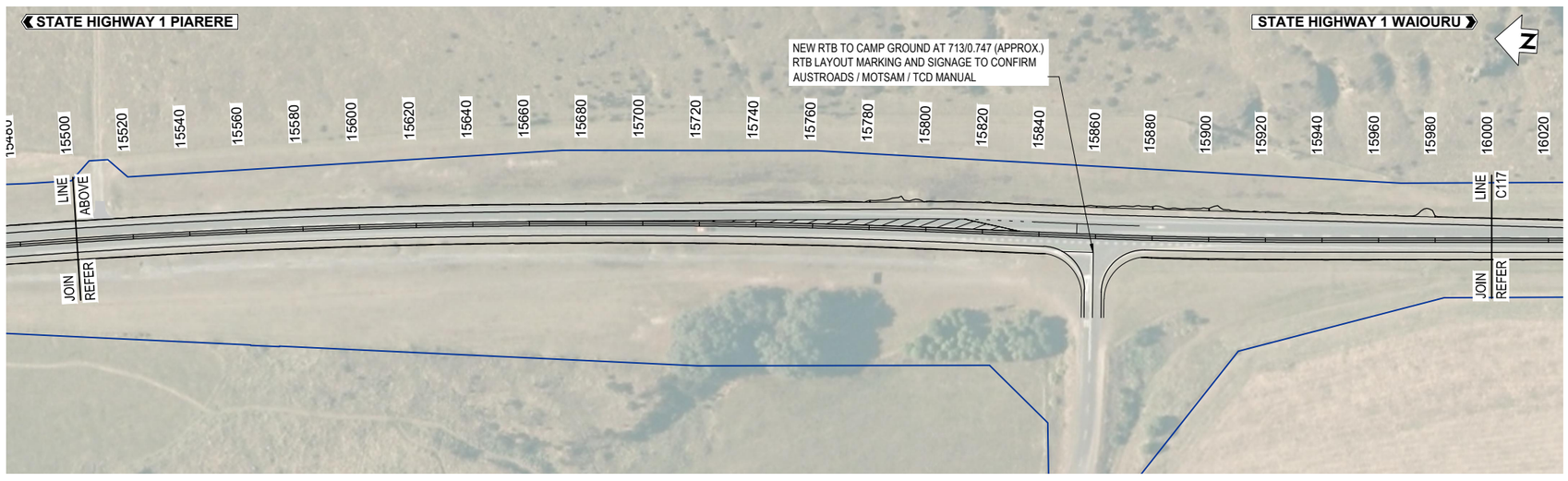
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS



PLAN
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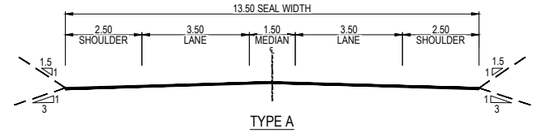
LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
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CH 21400 TO CH 31600
(SCALE NTS)

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SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

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DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 15000m TO 16000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C116
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
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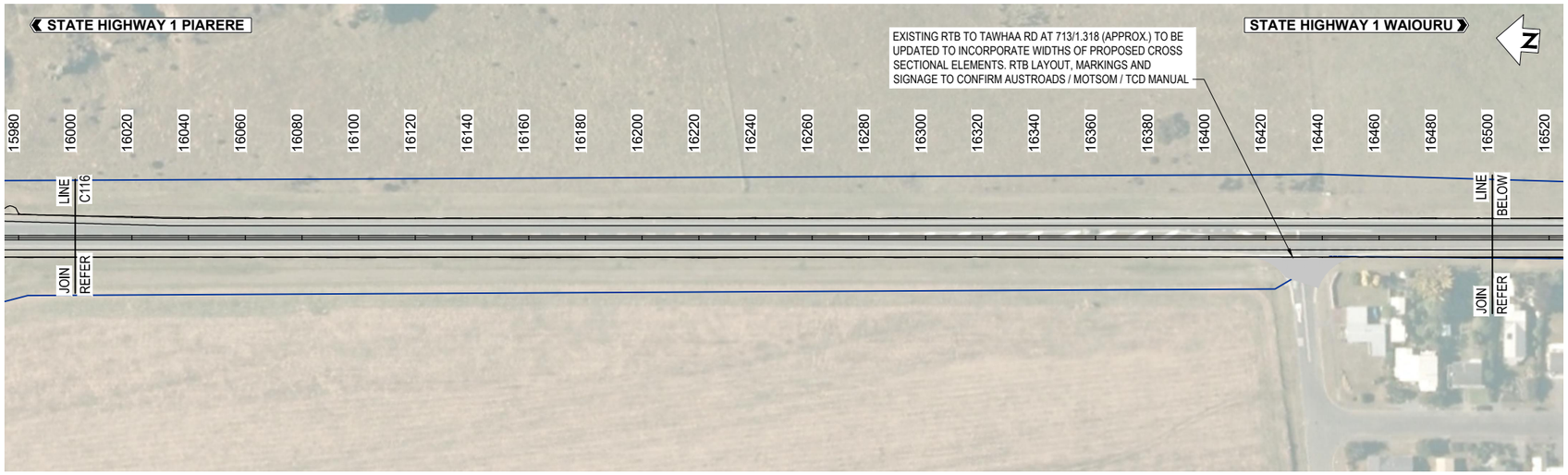

PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
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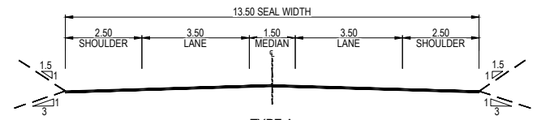

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CH 21400 TO CH 31600
(SCALE NTS)

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SCALE 1:1000

NOT FOR CONSTRUCTION

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APPROVED		
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 16000m TO 17000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C117
Rev.: A

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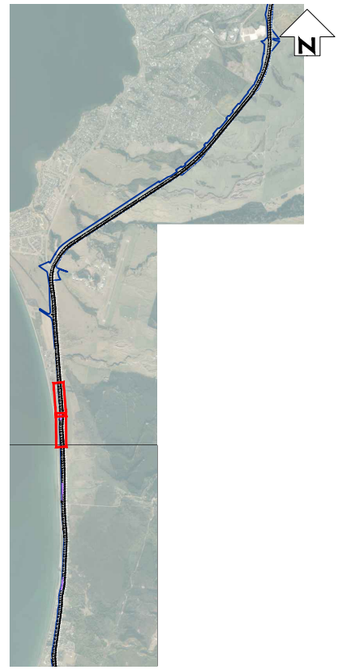

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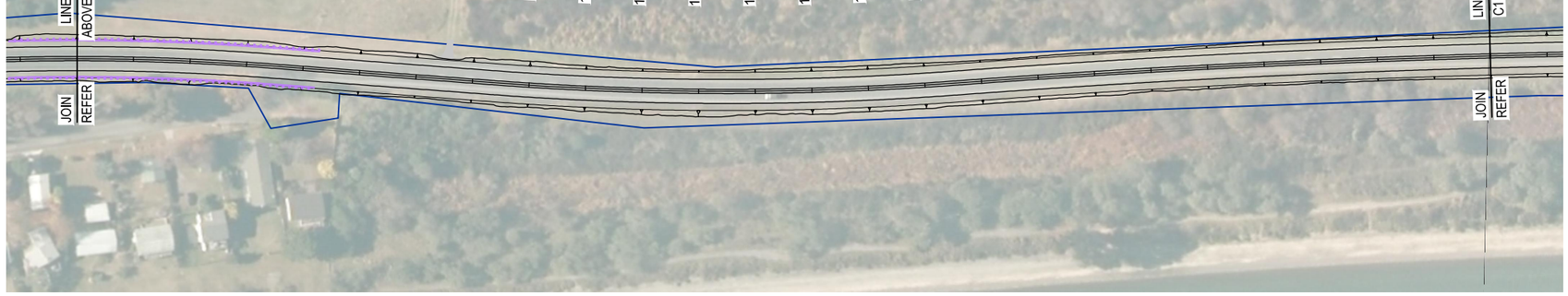

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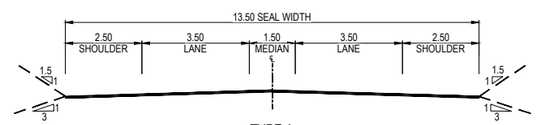
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
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CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

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SCALE 1:1000

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REV	REVISIONS	DRN	CHK	APP	DATE

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DESIGN CHECK		
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APPROVED		
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 17000m TO 18000m

Status Stamp: **WORKING PLOT**
Date Stamp: **15.01.20**
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C118
Rev.: A

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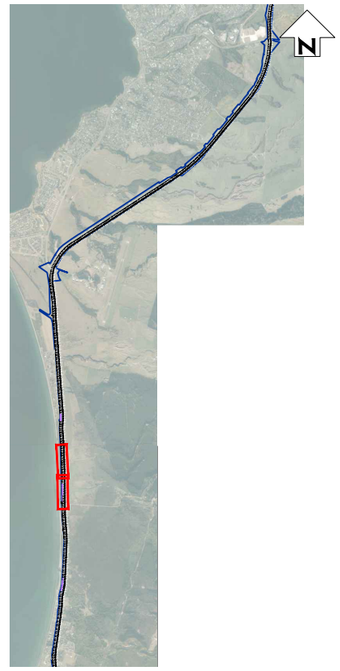

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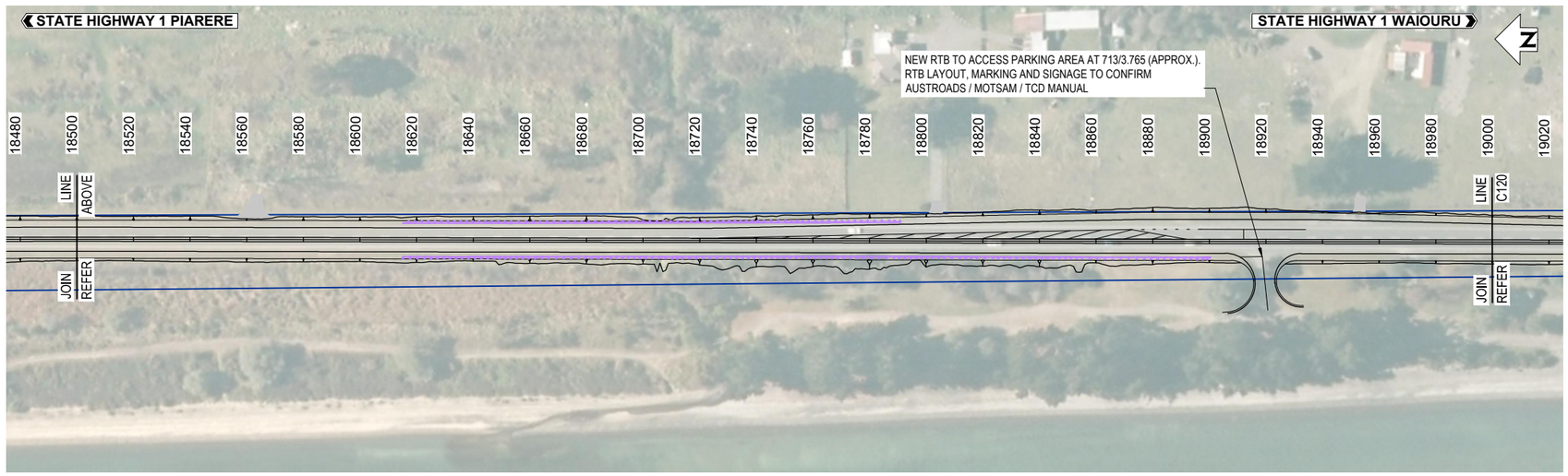

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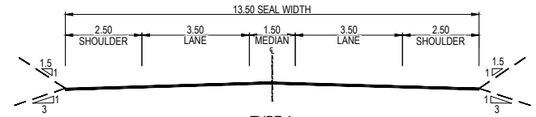
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



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CH 21400 TO CH 31600
(SCALE NTS)

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SCALE 1:1000

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REV	REVISIONS	DRN	CHK	APP	DATE

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DESIGN CHECK	
DESIGN REVIEW	
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 18000m TO 19000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C119
Rev.: A

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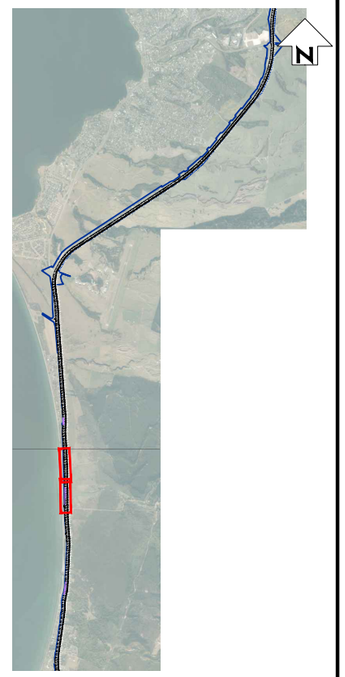

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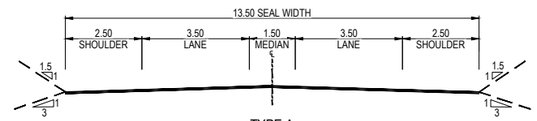
PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
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CH 21400 TO CH 31600
(SCALE NTS)

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NOT FOR CONSTRUCTION

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APPROVED		
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 19000m TO 20000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C120
Rev.: A

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PLAN

SCALE 1 : 1000

LOCATION PLAN

SCALE : NTS

PLAN

SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

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SCALE 1:1000

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APPROVED		
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 20000m TO 21000m

Status Stamp: **WORKING PLOT**

Date Stamp:

Scales: AS SHOWN

Drawing No.: 310201099-00-100-C121

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Last modified: Feb 17 2020 By Dattatray Ghundre

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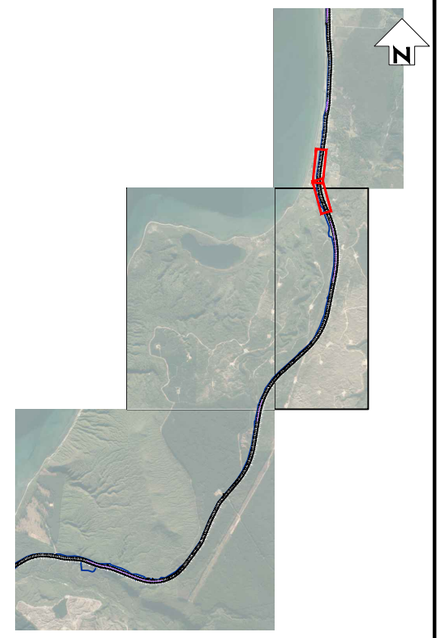

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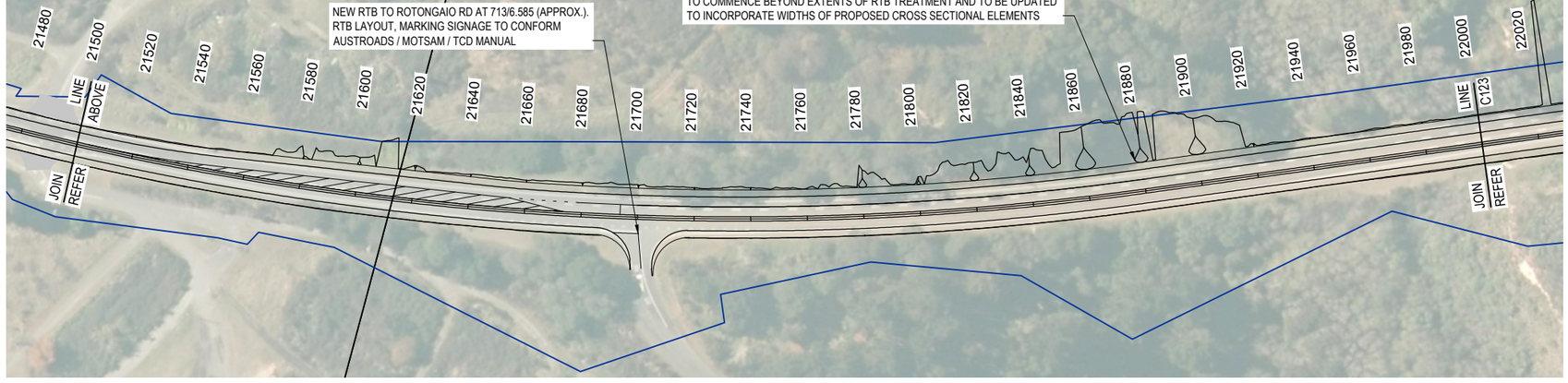

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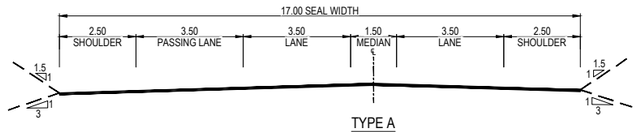

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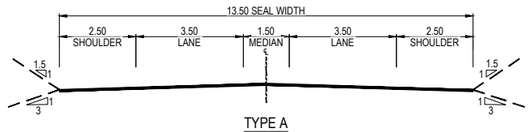

TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

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CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 21000m TO 22000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C122
Rev.: A

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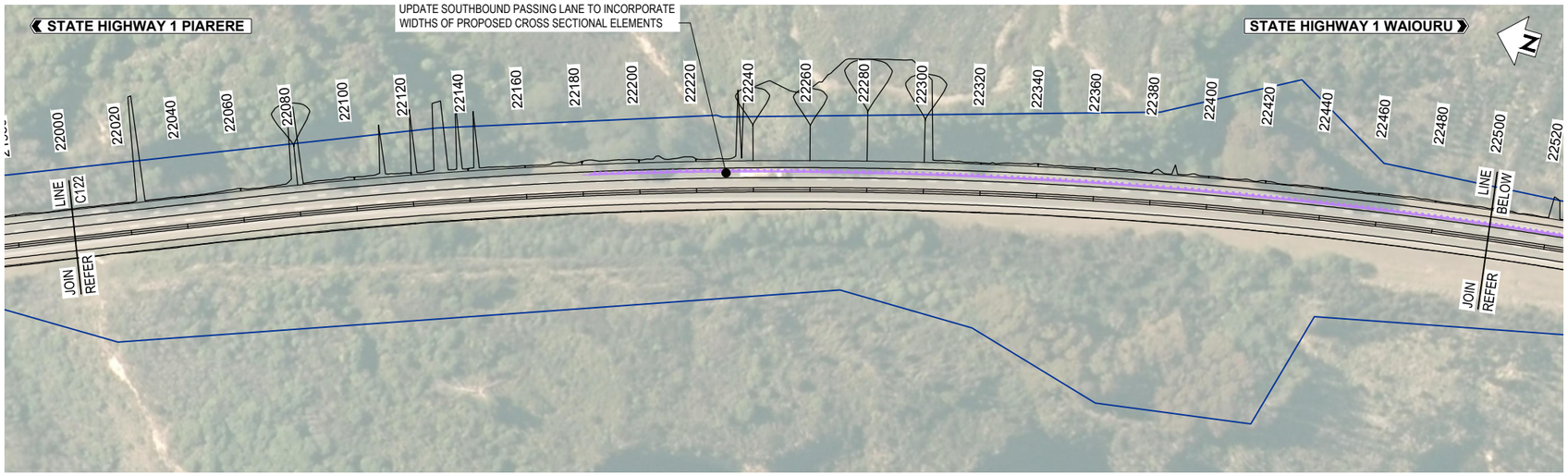
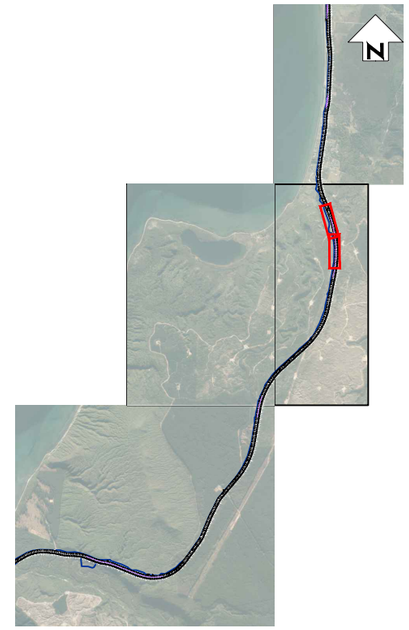
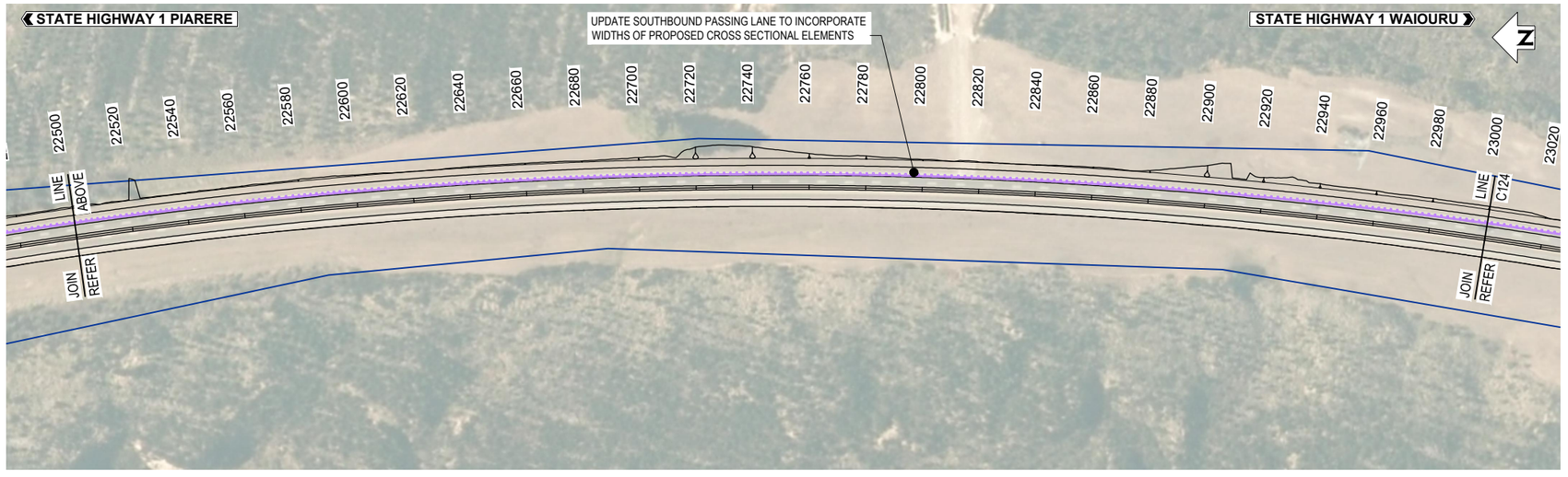
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



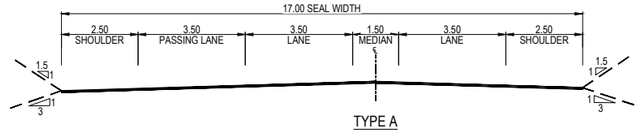
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 22000m TO 23000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C123
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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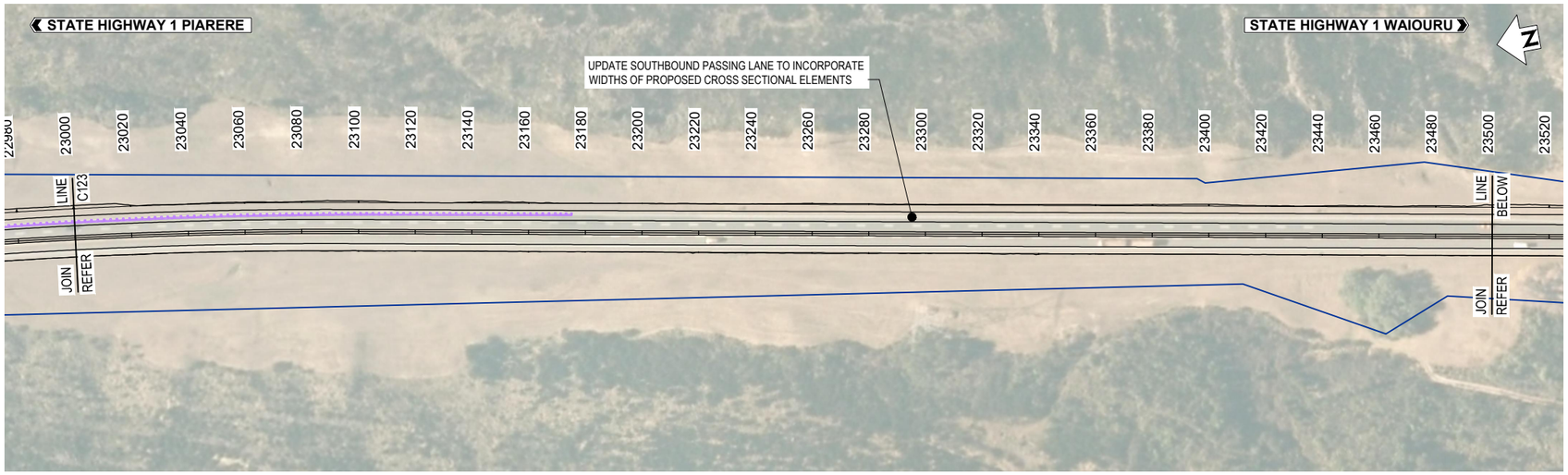


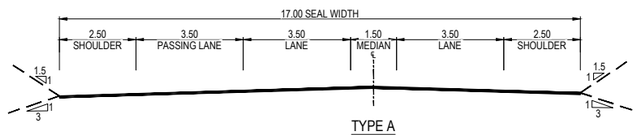
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

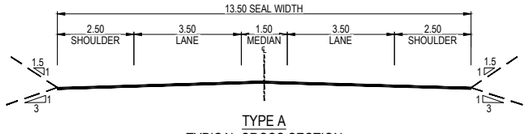
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 23000m TO 24000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C124
Rev.: A

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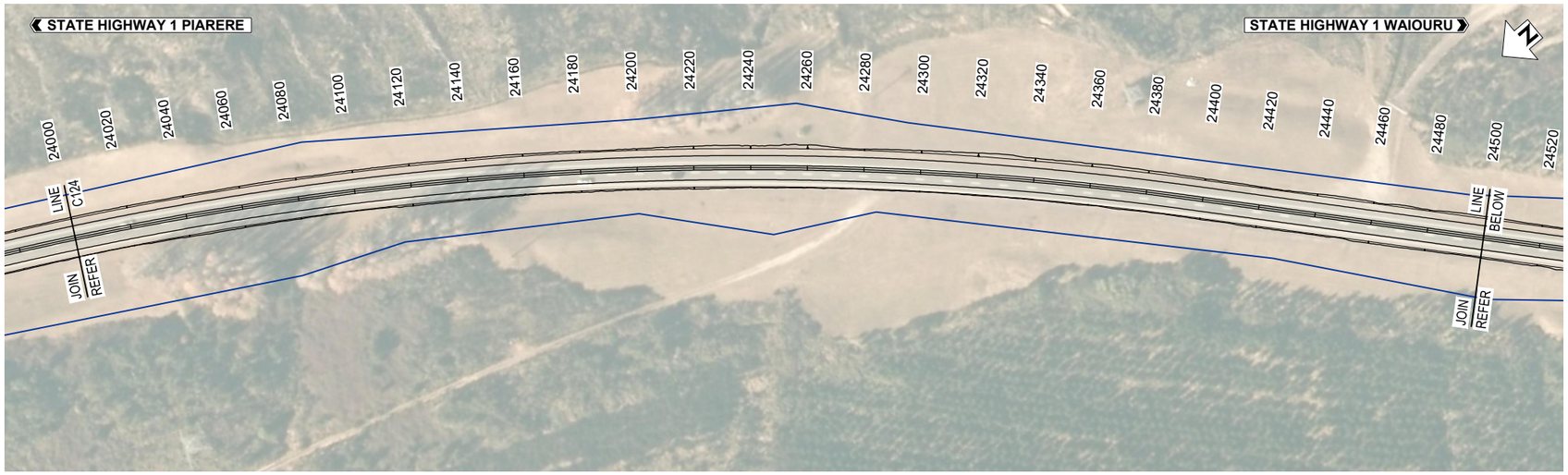
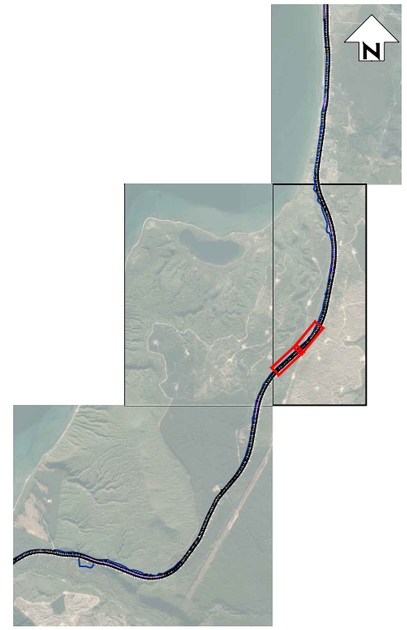
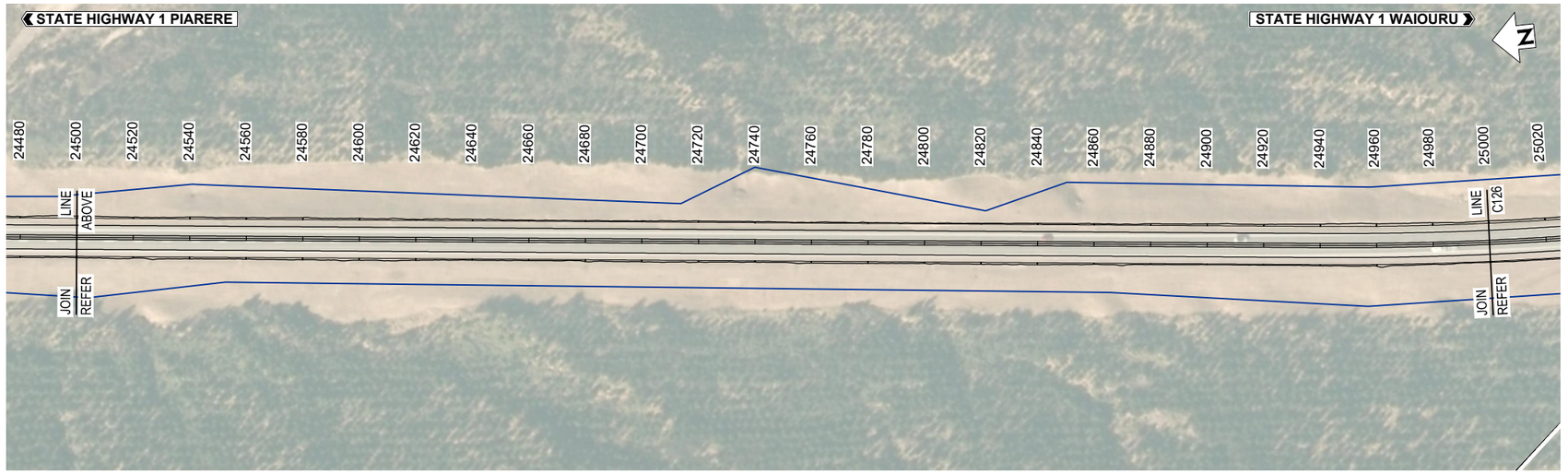
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 11 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



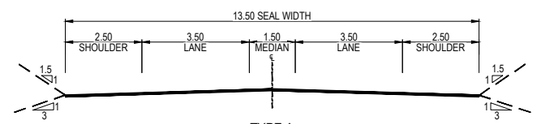
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 24000m TO 25000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C125
Rev.: A

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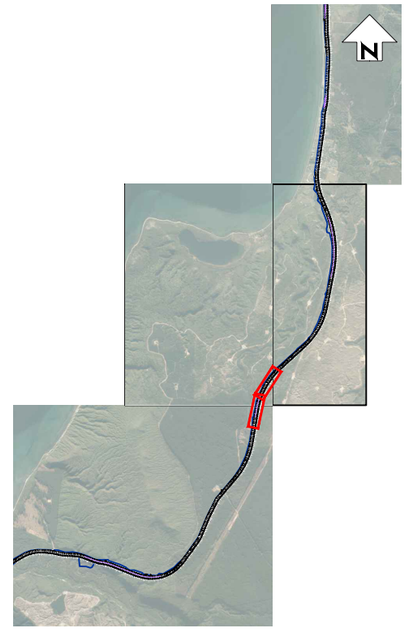
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

PLAN
SCALE 1 : 1000

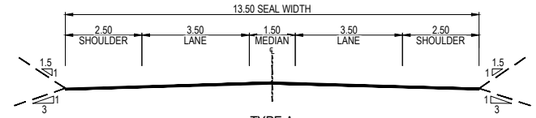


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 25000m TO 26000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C126
Rev.: A

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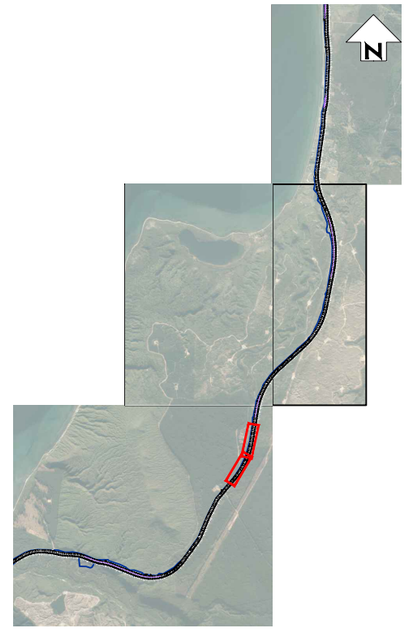
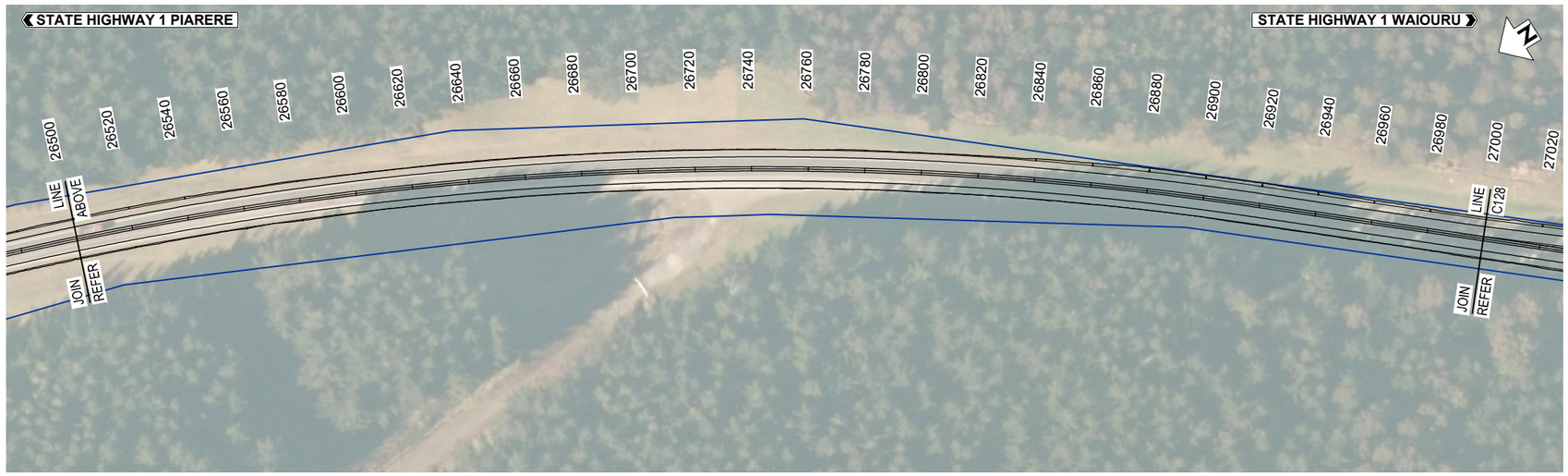
PLAN
SCALE 1 : 1000



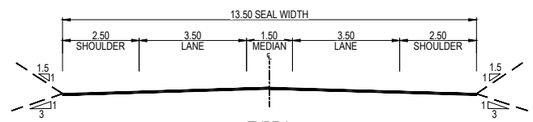
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 26000m TO 27000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C127
Rev.: A

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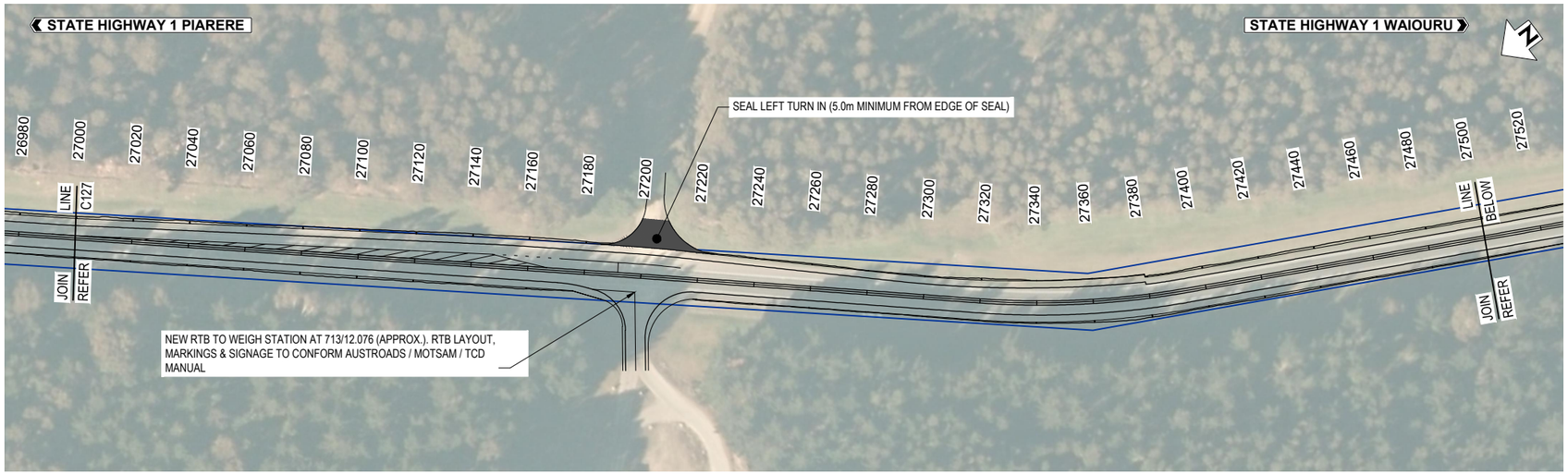
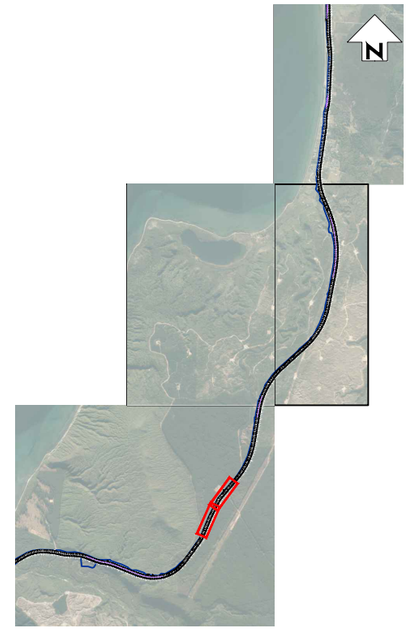
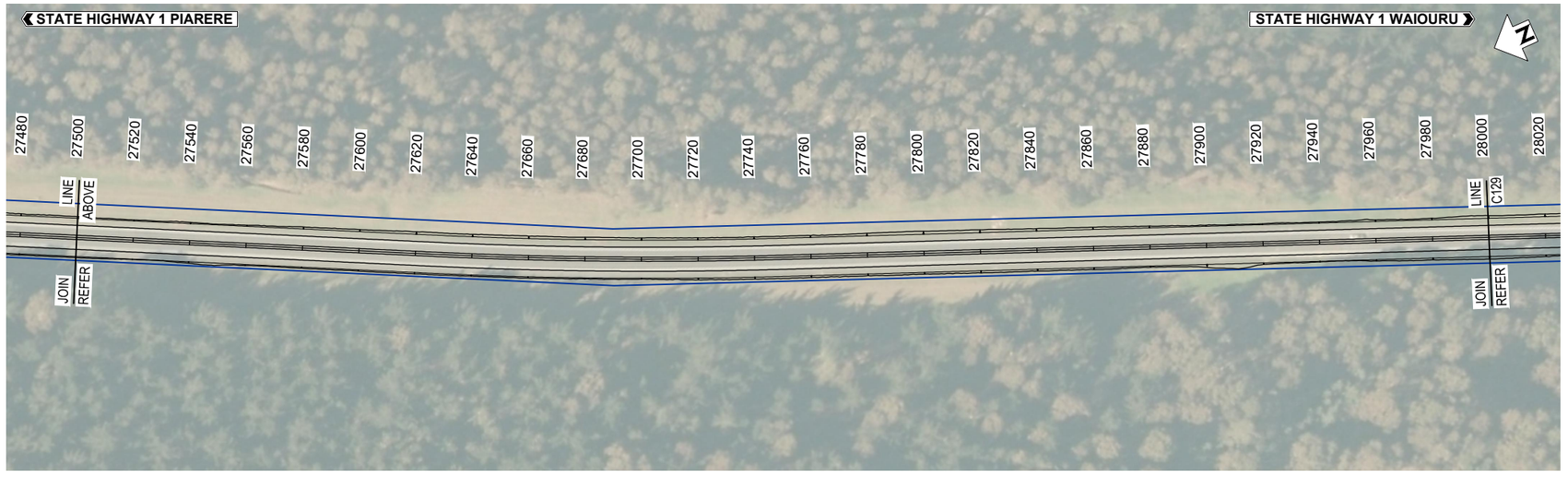


PLAN
SCALE 1 : 1000

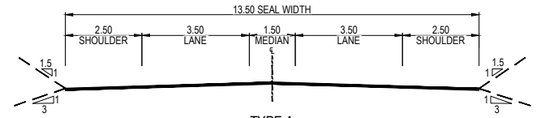


LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 27000m TO 28000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C128
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre

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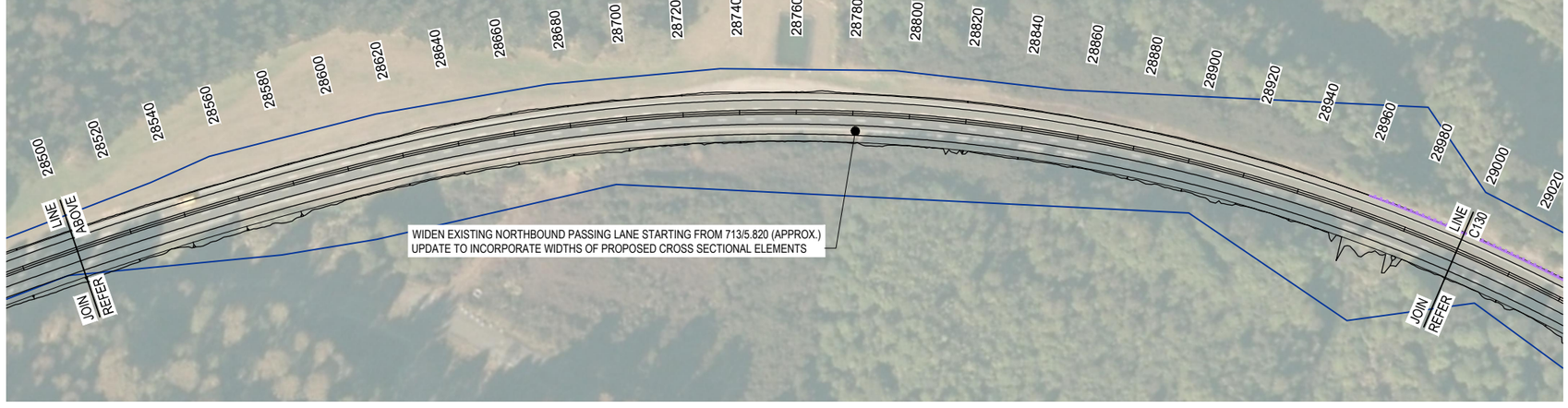
PLAN
SCALE 1 : 1000

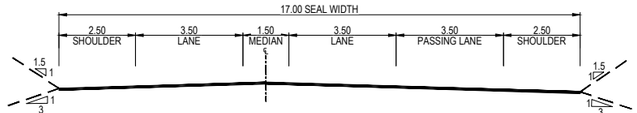
LOCATION PLAN
SCALE : NTS



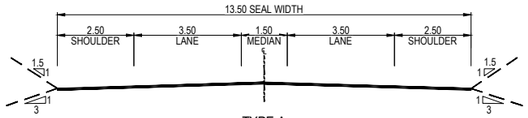
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 28000m TO 29000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C129
Rev.: A

ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre
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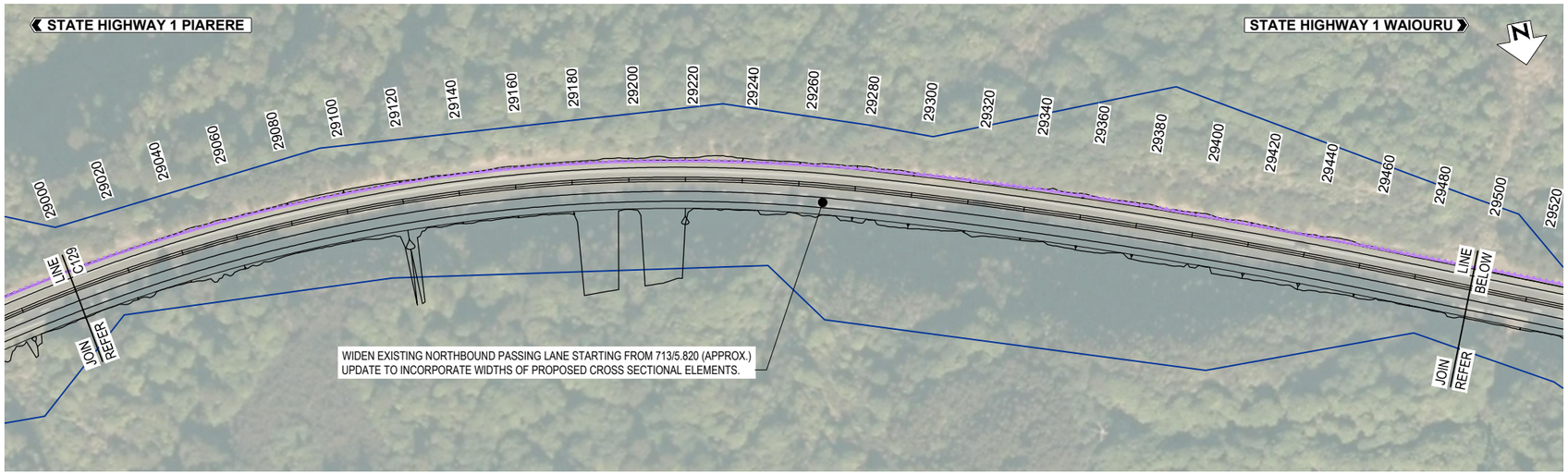
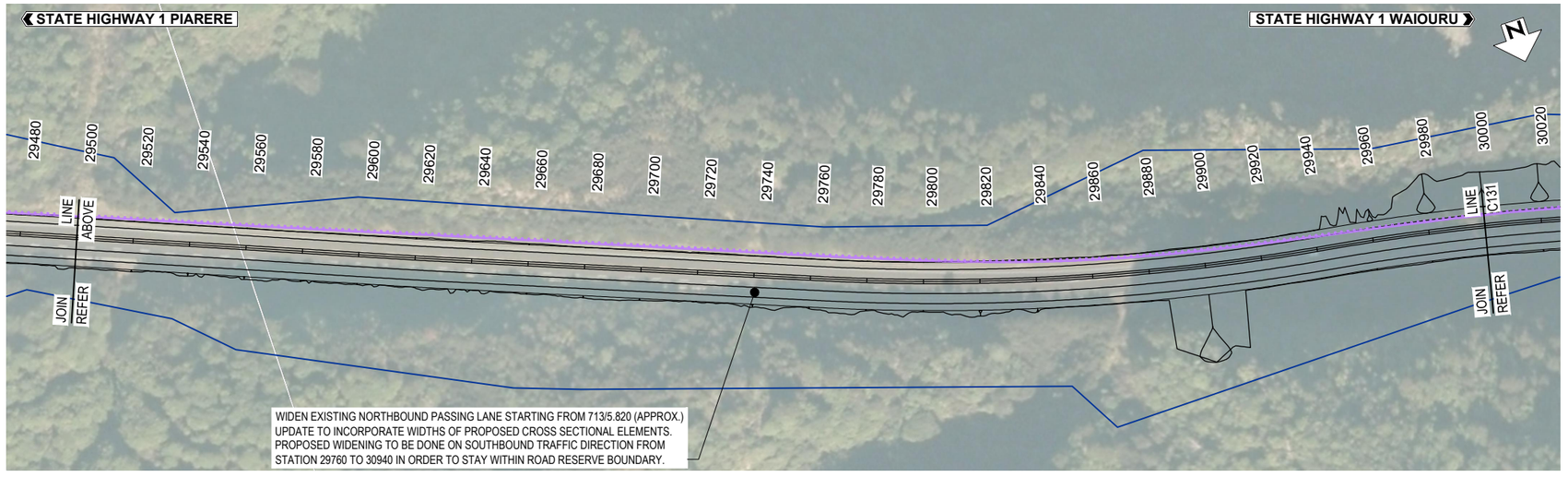


PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

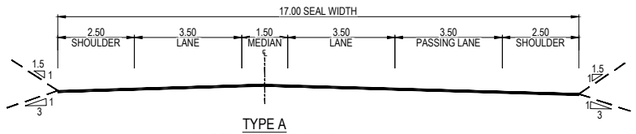
SCALE 1:1000



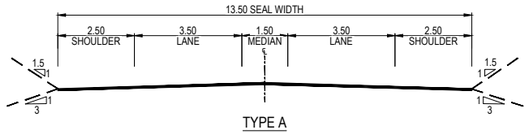
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 29000m TO 30000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C130
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
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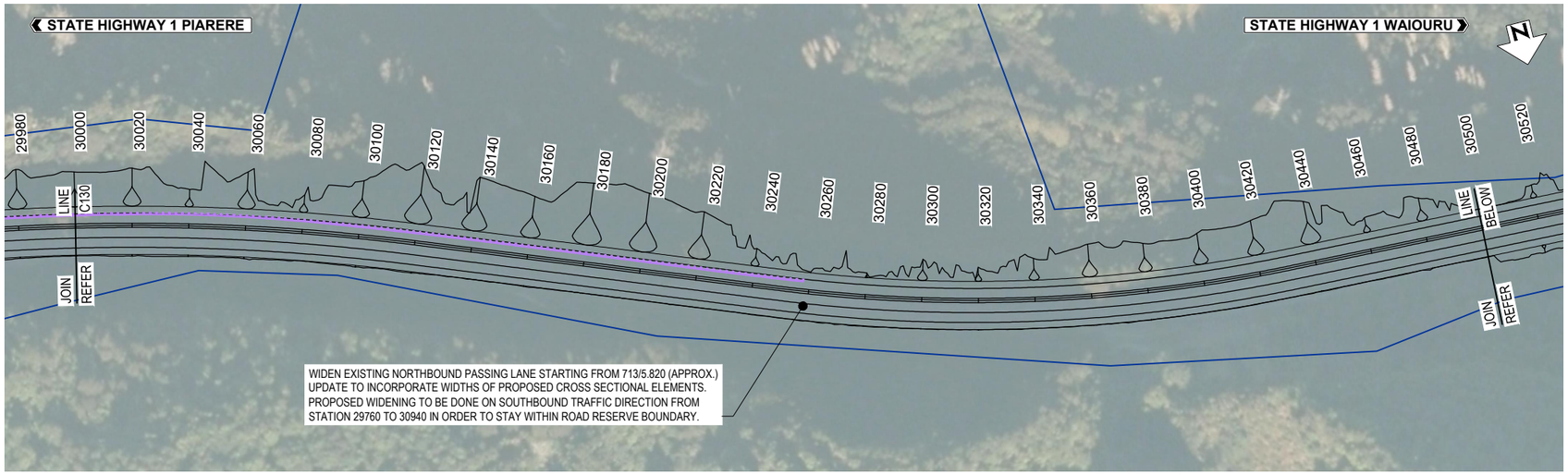
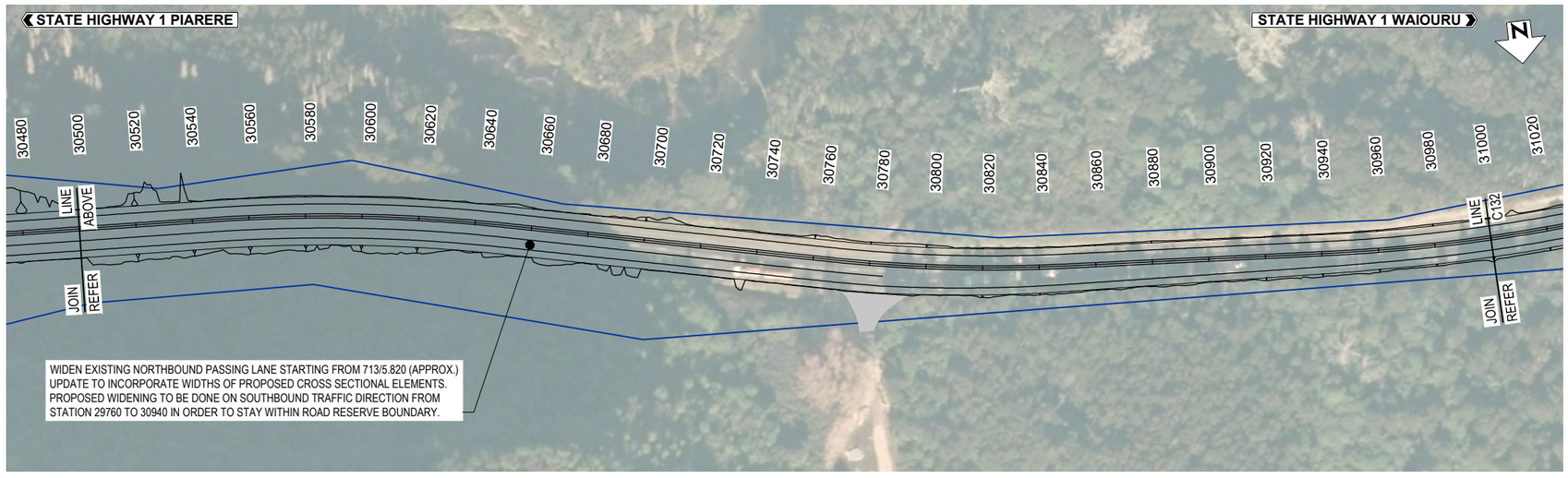


PLAN
SCALE 1 : 1000

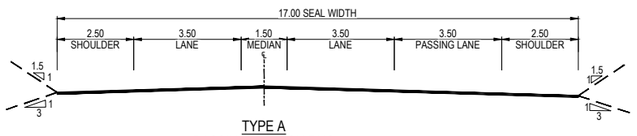
LOCATION PLAN
SCALE : NTS



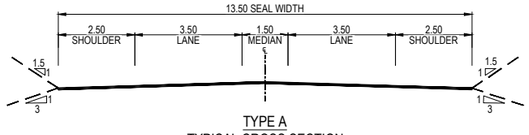
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 30000m TO 31000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C131
Rev.: A

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ORIGINAL SIZE A1
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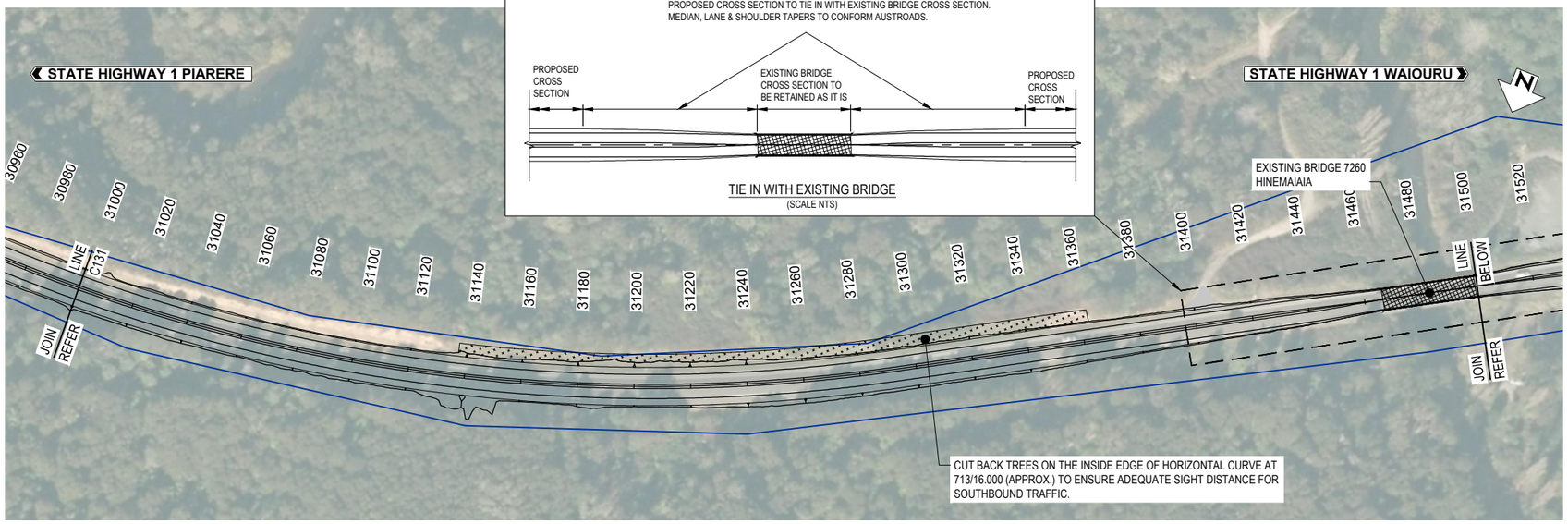
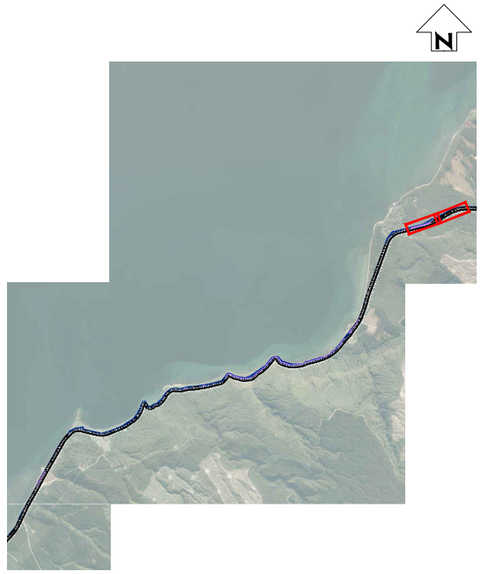


PROPOSED CROSS SECTION TO TIE IN WITH EXISTING BRIDGE CROSS SECTION.
MEDIAN, LANE & SHOULDER TAPERS TO CONFORM AUSTROADS.

TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

PLAN
SCALE 1 : 1000

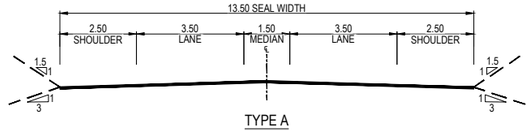


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE A
TYPICAL CROSS SECTION
CH 15200 TO CH 19500
CH 21400 TO CH 31600
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 31000m TO 32000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C132
Rev.: A

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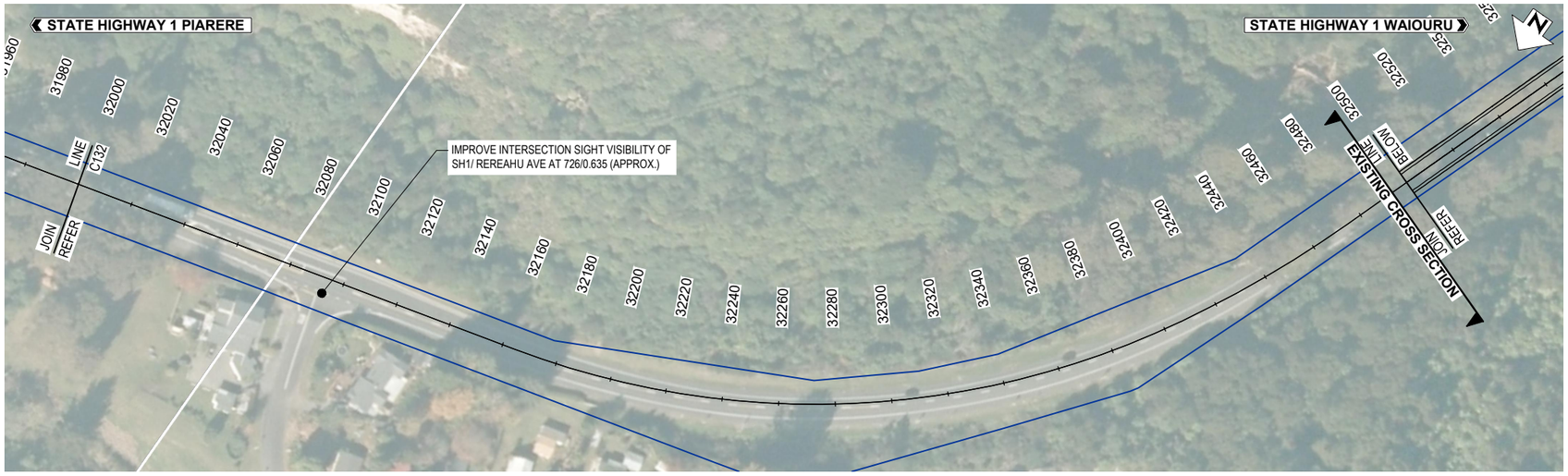
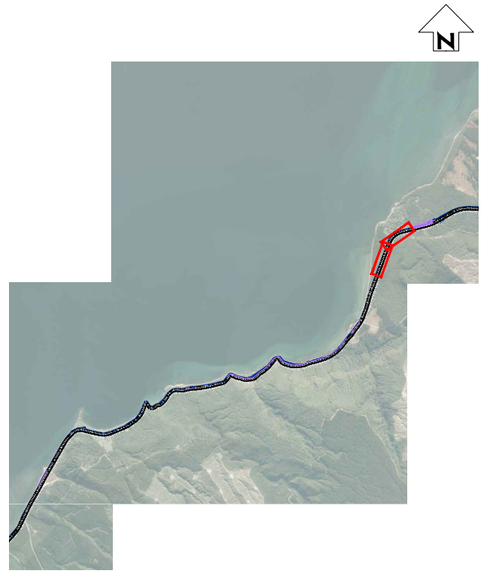
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 32000m TO 33000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C133
Rev.: A

ORIGINAL SIZE A1

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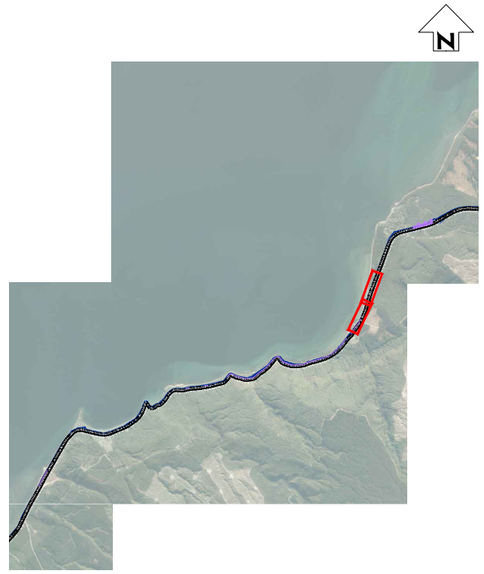
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 33000m TO 34000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C134
Rev.: A

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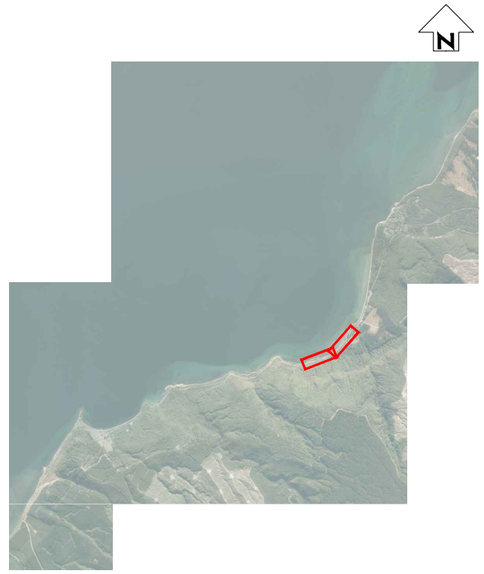
DO NOT SCALE - IF IN DOUBT, ASK
200 mm
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By: Dattatray Ghundre

PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 34000m TO 35000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C135
Rev.: A

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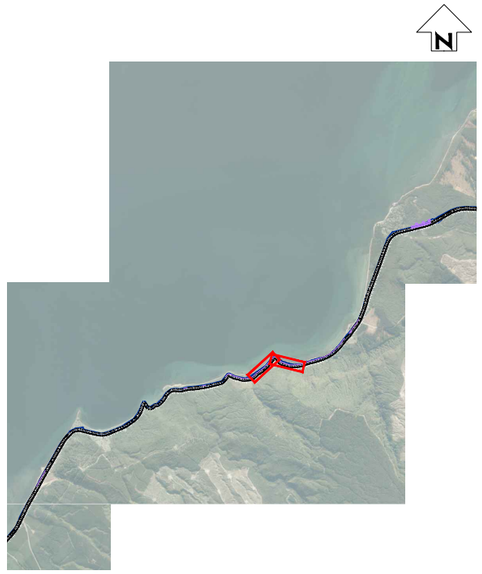
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 35000m TO 36000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C136
Rev.: A

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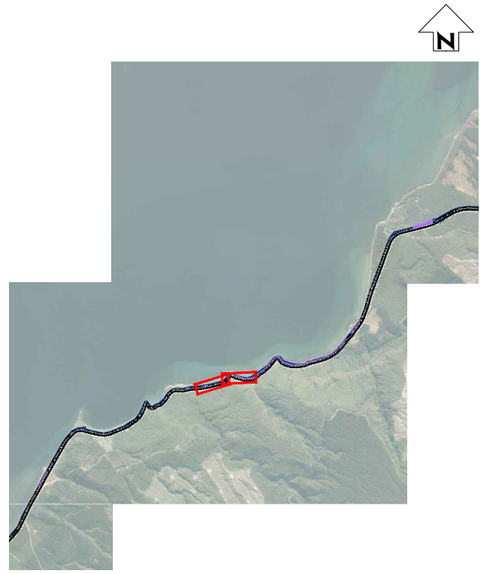
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 36000m TO 37000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C137
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
200mm 150 100 90 80 70 60 50 40 30 20 10 0
ORIGINAL SIZE A1
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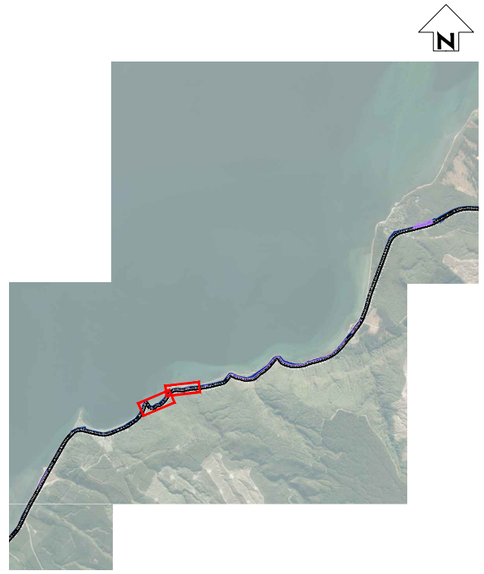
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - PIARERE TO WAIOURU

PLAN
STATION 37000m TO 38000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C138
Rev.: A

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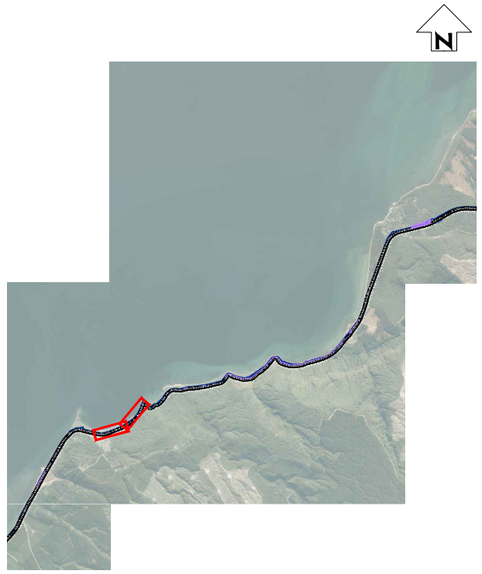
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
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Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 38000m TO 39000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C139
Rev.: A

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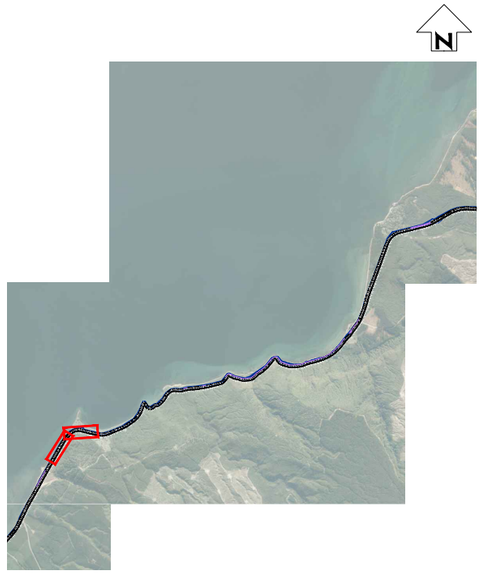
PLAN
SCALE 1 : 1000

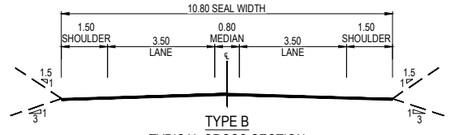


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 39000m TO 40000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C140
Rev.: A

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ORIGINAL SIZE A1
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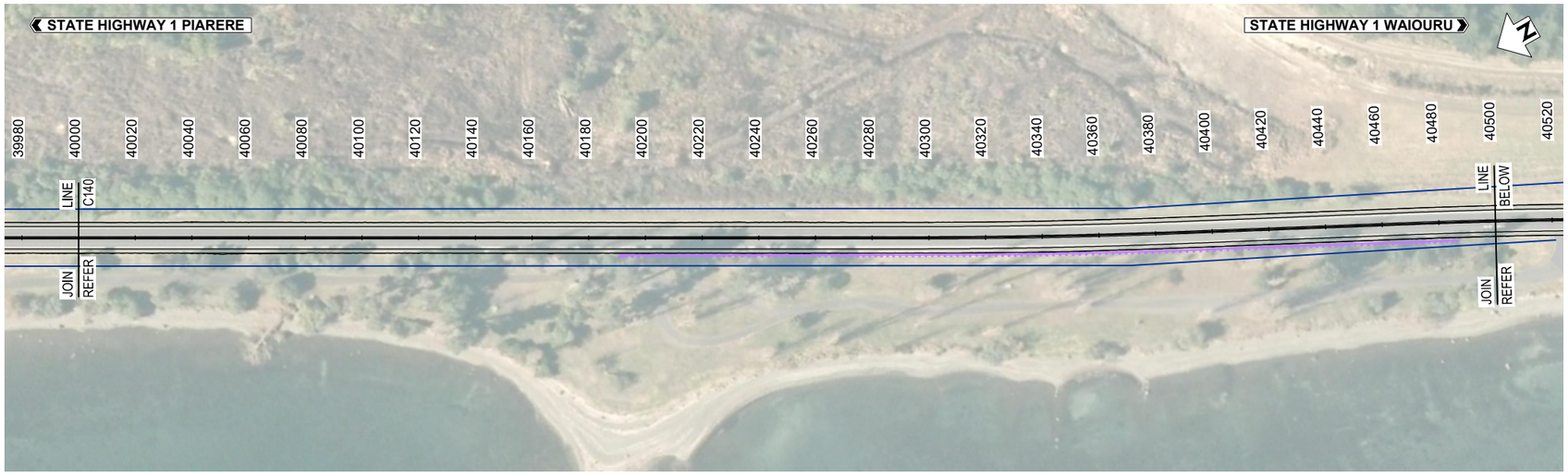
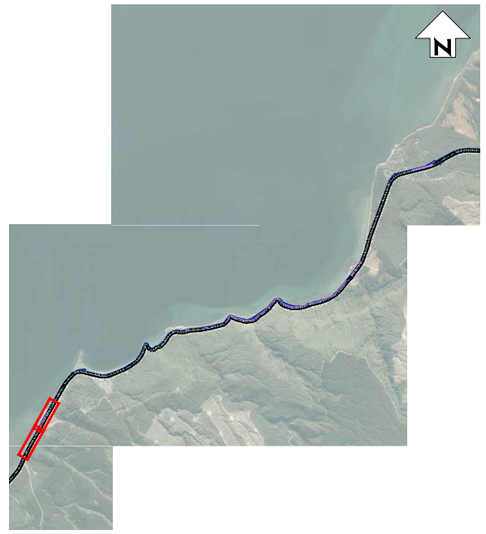


PLAN
SCALE 1 : 1000

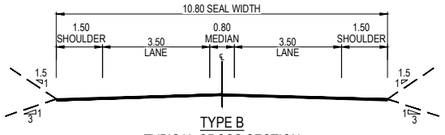


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 40000m TO 41000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C141
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre

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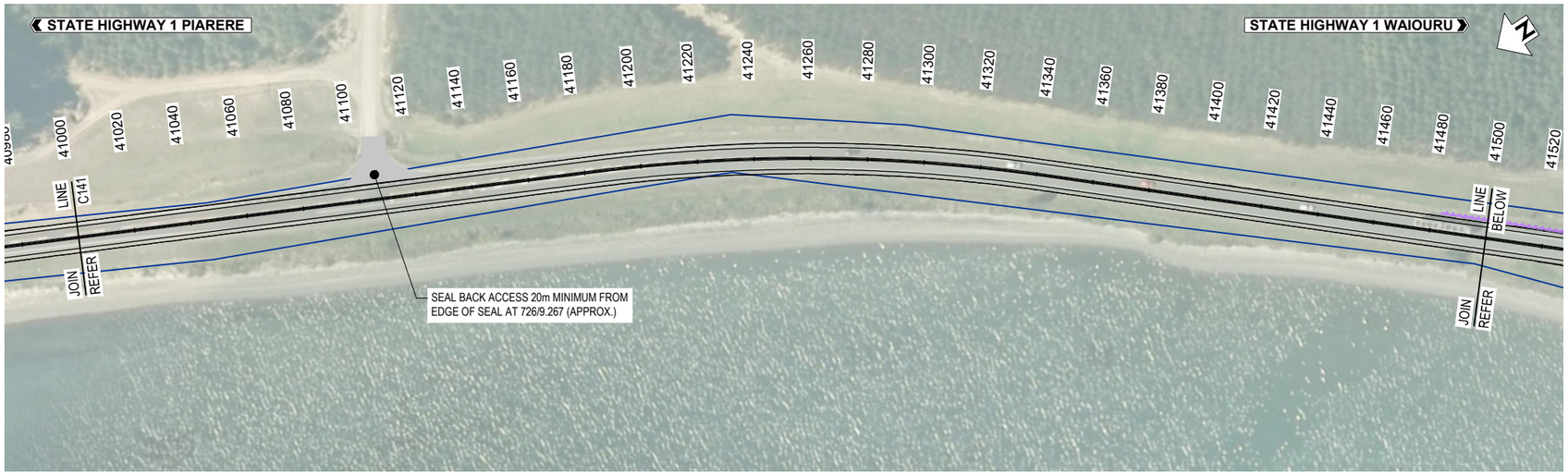


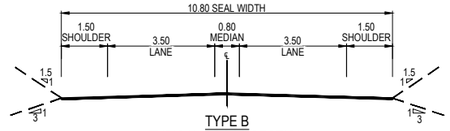
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 41000m TO 42000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C142
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre

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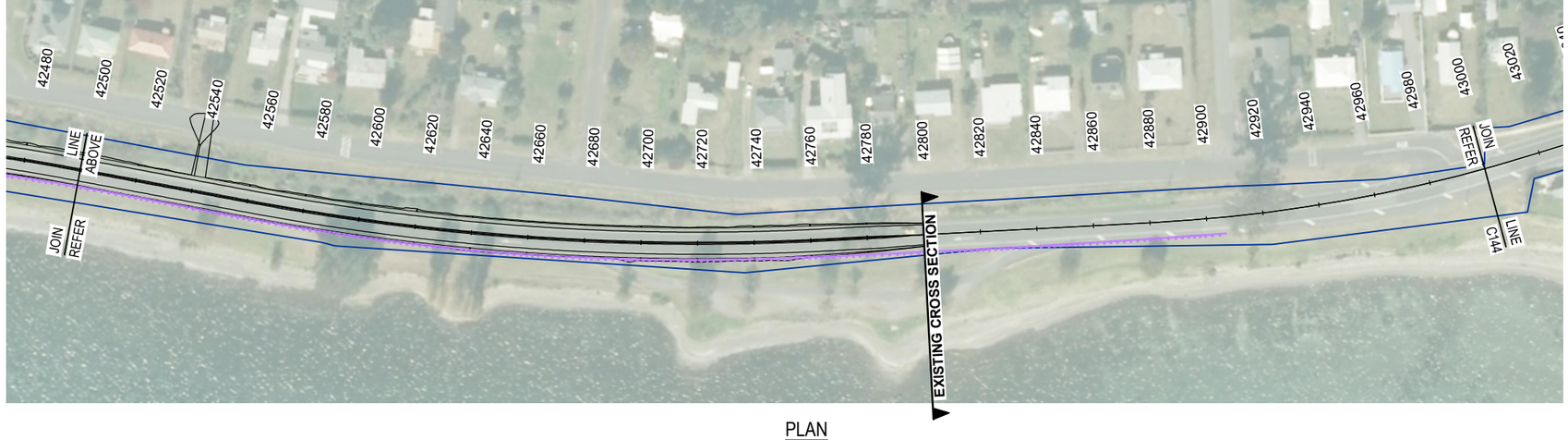
PLAN
SCALE 1 : 1000

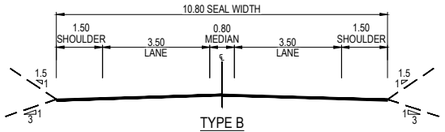
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 42000m TO 43000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C143
Rev.: A

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ORIGINAL SIZE A1
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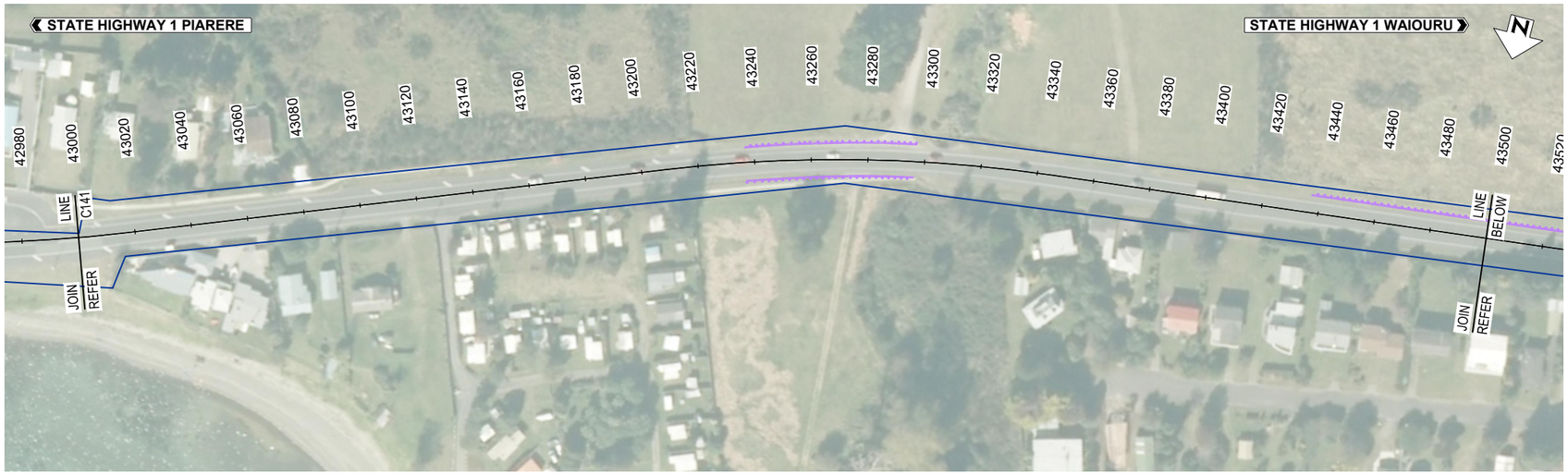
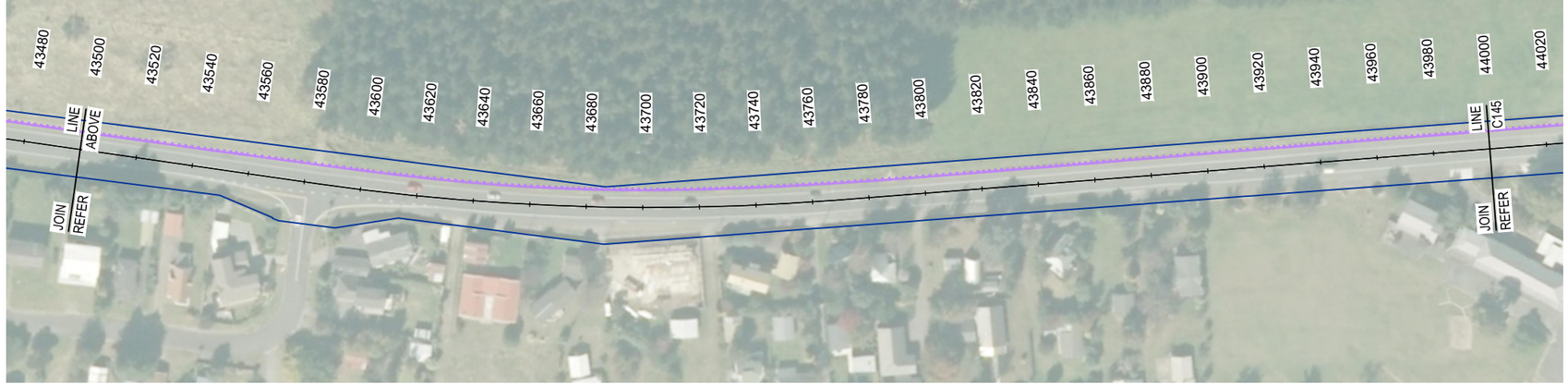


PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 43000m TO 44000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C144
Rev.: A

ORIGINAL SIZE A1
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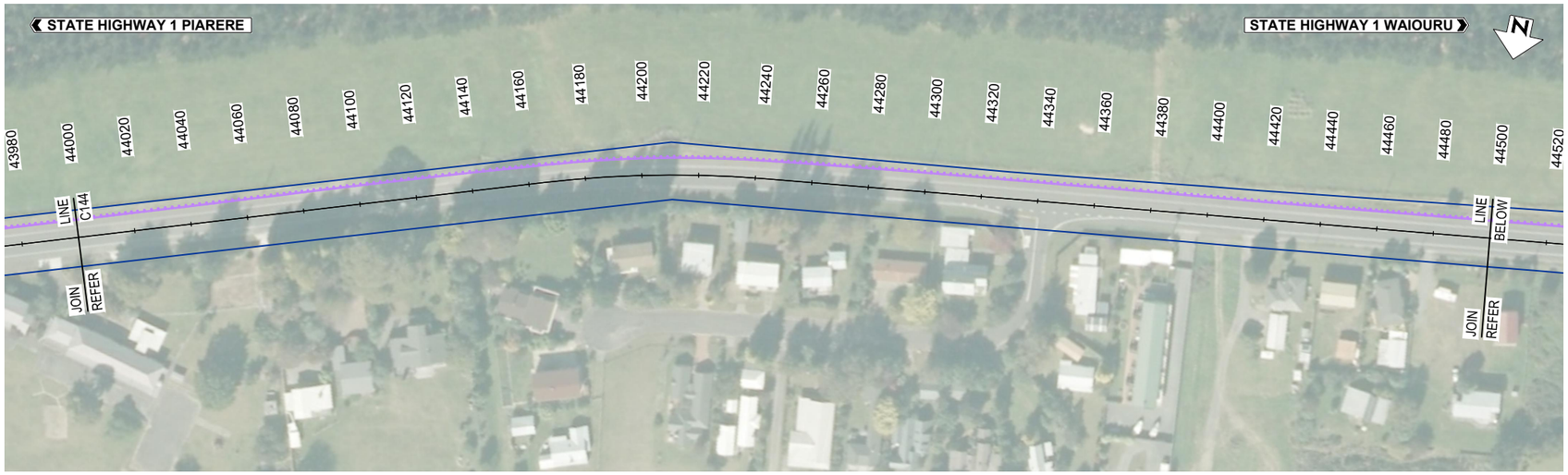

PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 44000m TO 45000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C145
Rev.: A

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ORIGINAL SIZE A1
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PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 45000m TO 46000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C146
Rev.: A

ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre
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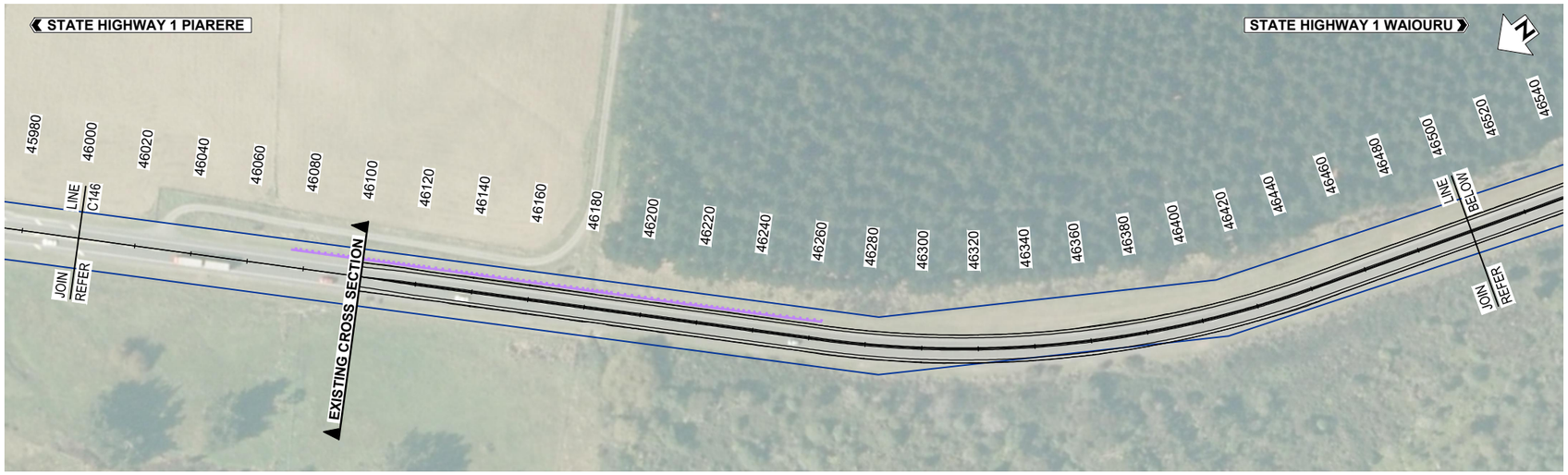
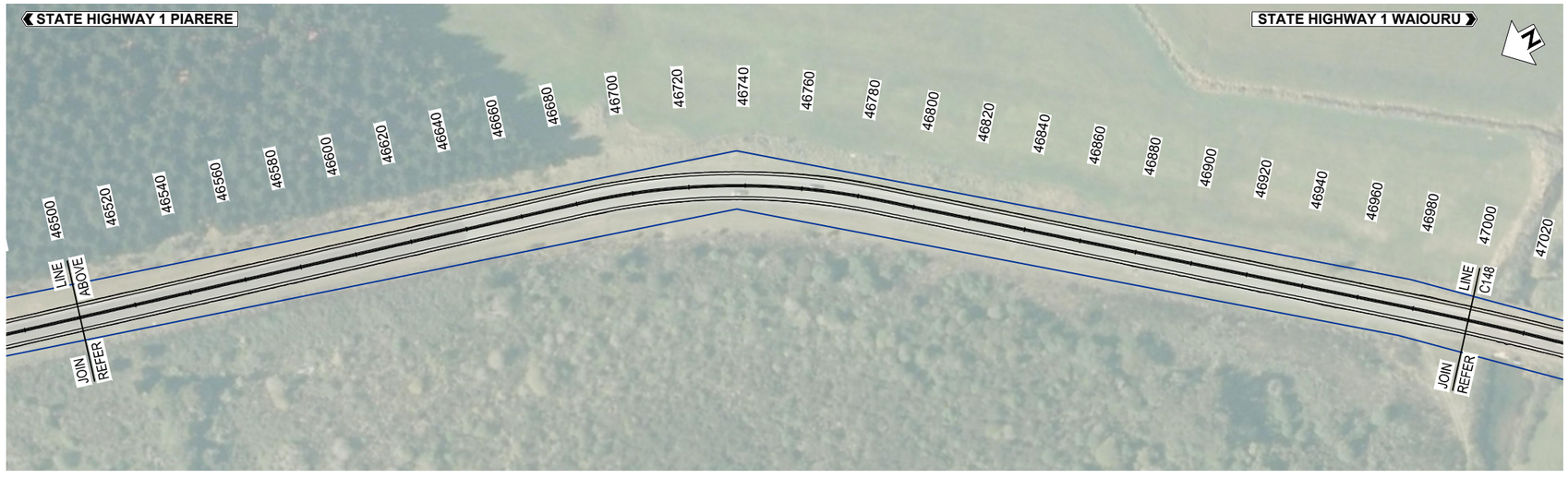


PLAN
SCALE 1 : 1000

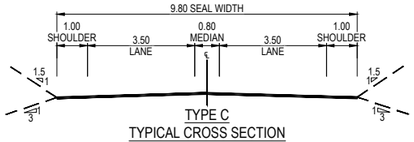
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 46000m TO 47000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C147
Rev.: A

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ORIGINAL SIZE A1
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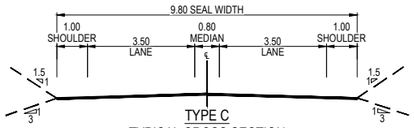
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 47000m TO 48000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C148
Rev.: A

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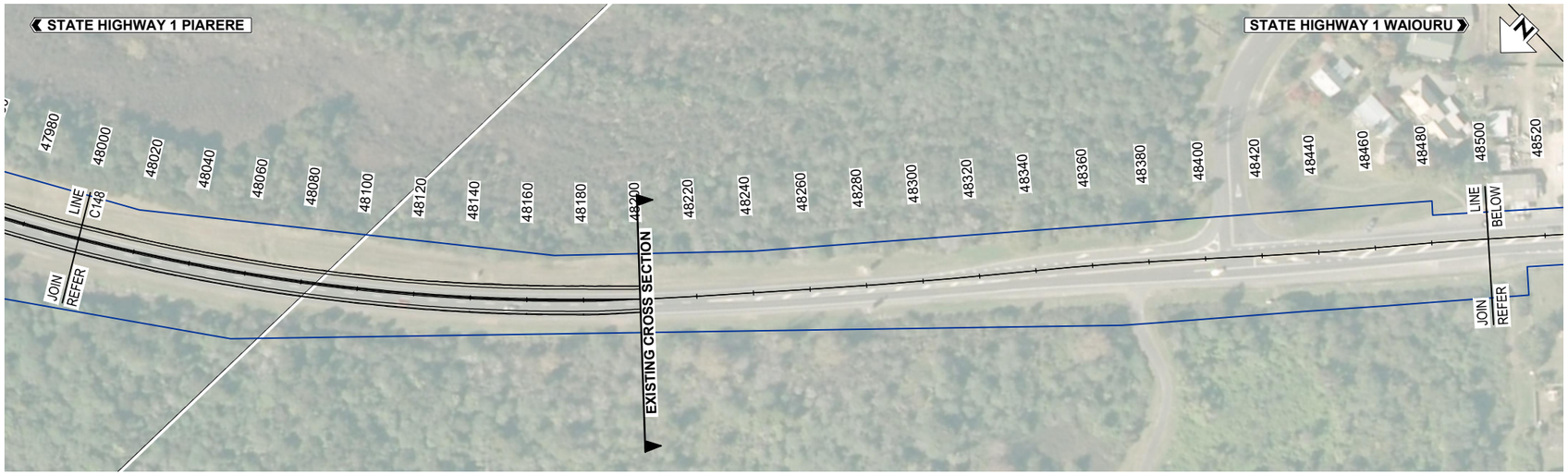
DO NOT SCALE - IF IN DOUBT, ASK

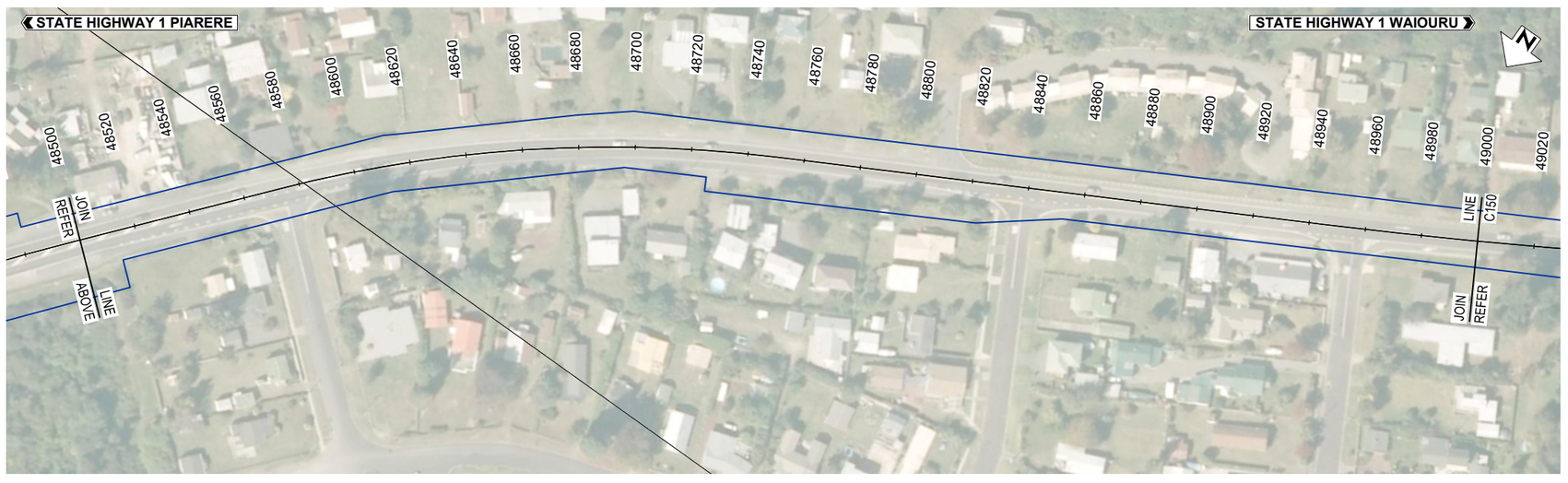
ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000

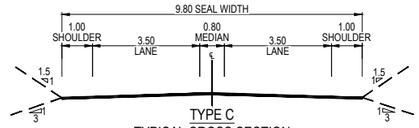
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 48000m TO 49000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C149
Rev.: A

Last modified: Feb 17 2020 By Dattatray Ghundre
ORIGINAL SIZE A1
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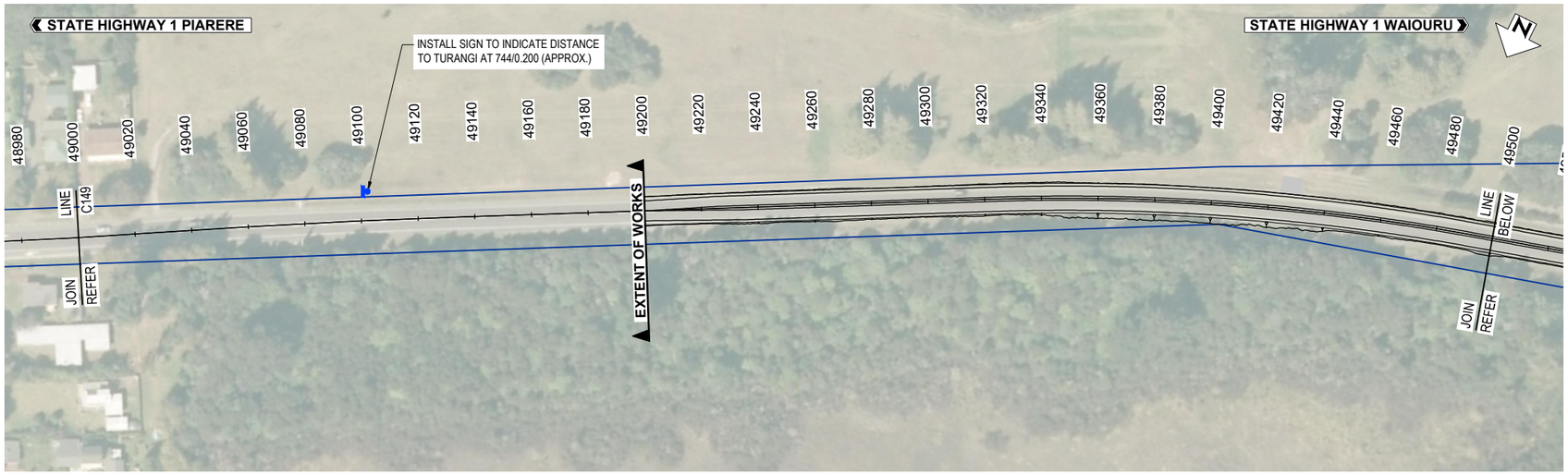
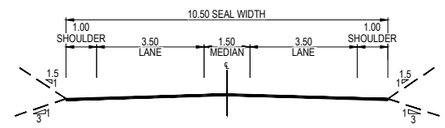


PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 49000m TO 50000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C150
Rev.: A

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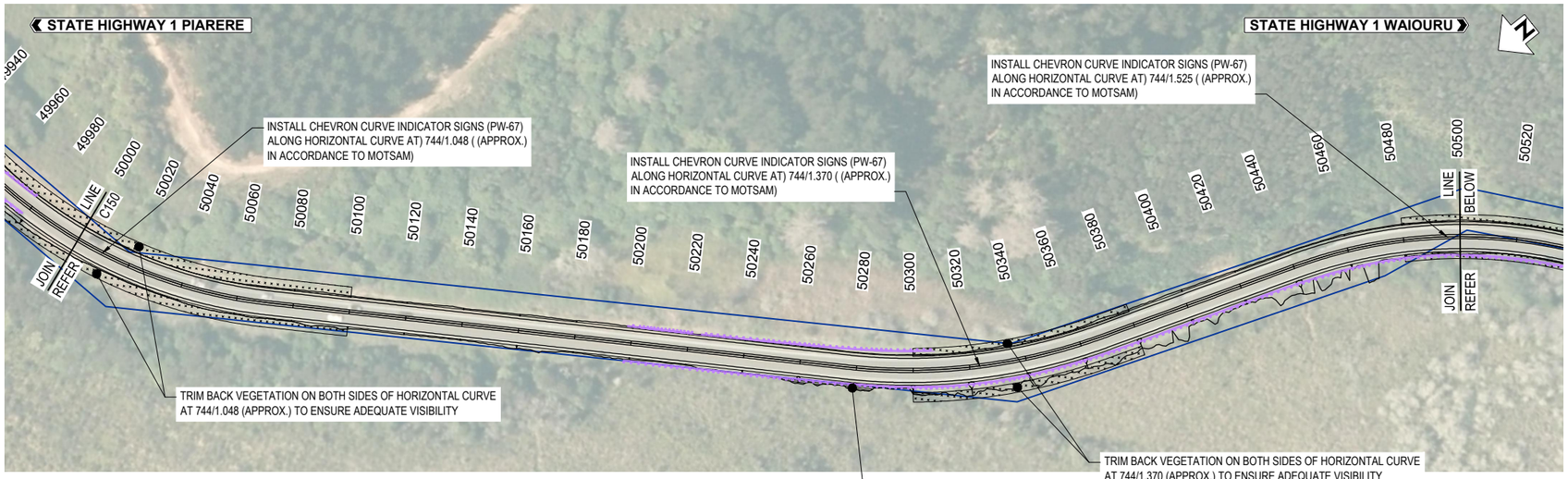
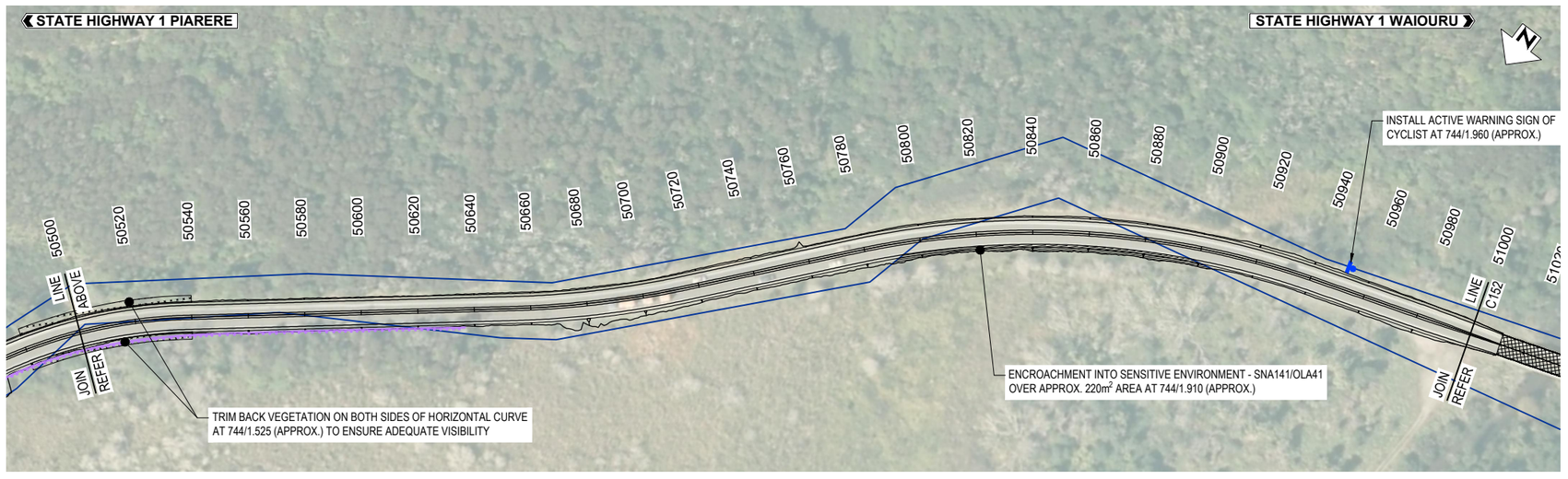
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000

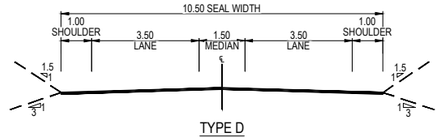
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 50000m TO 51000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C151
Rev.: A

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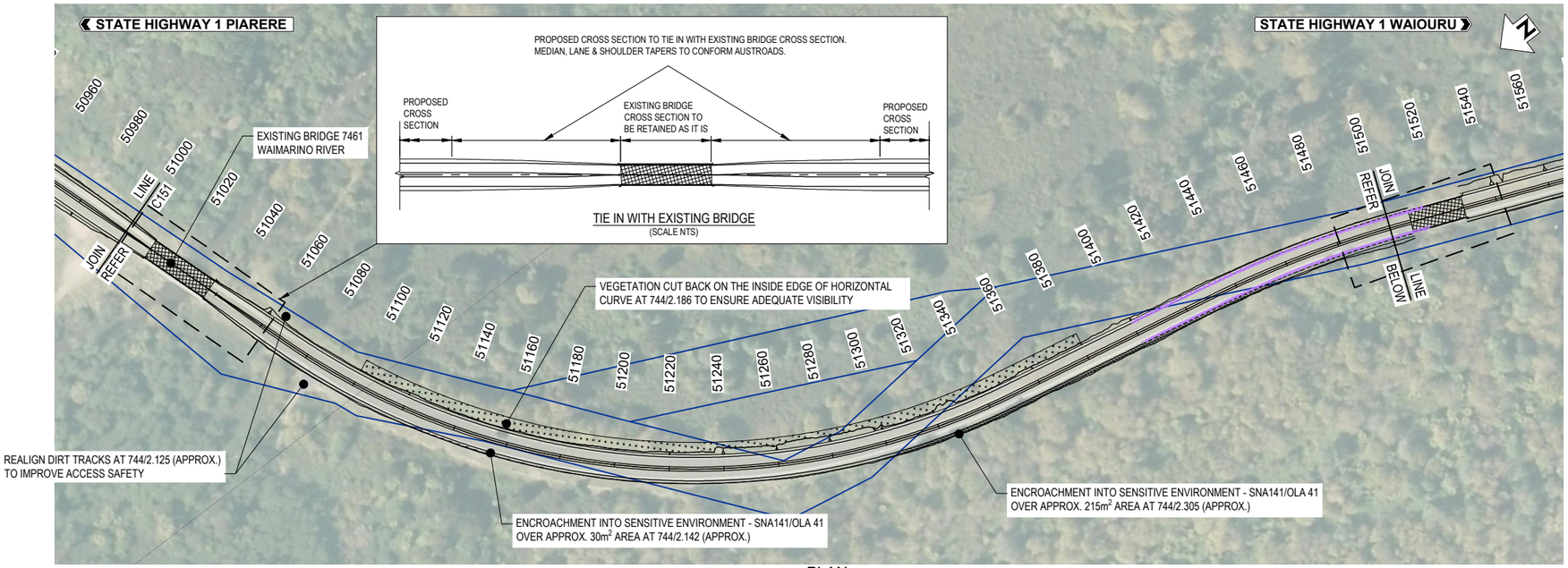
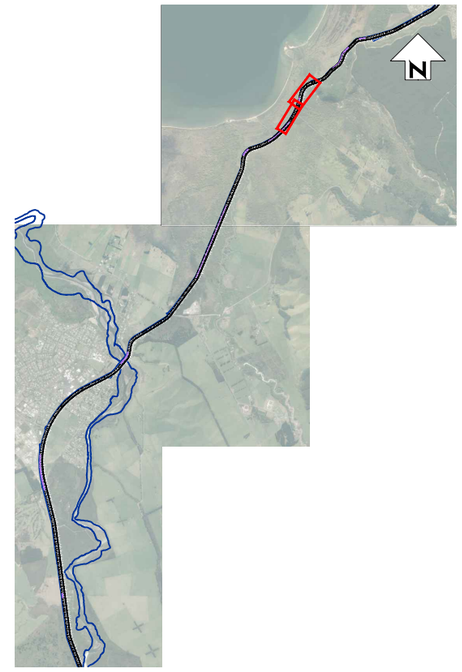
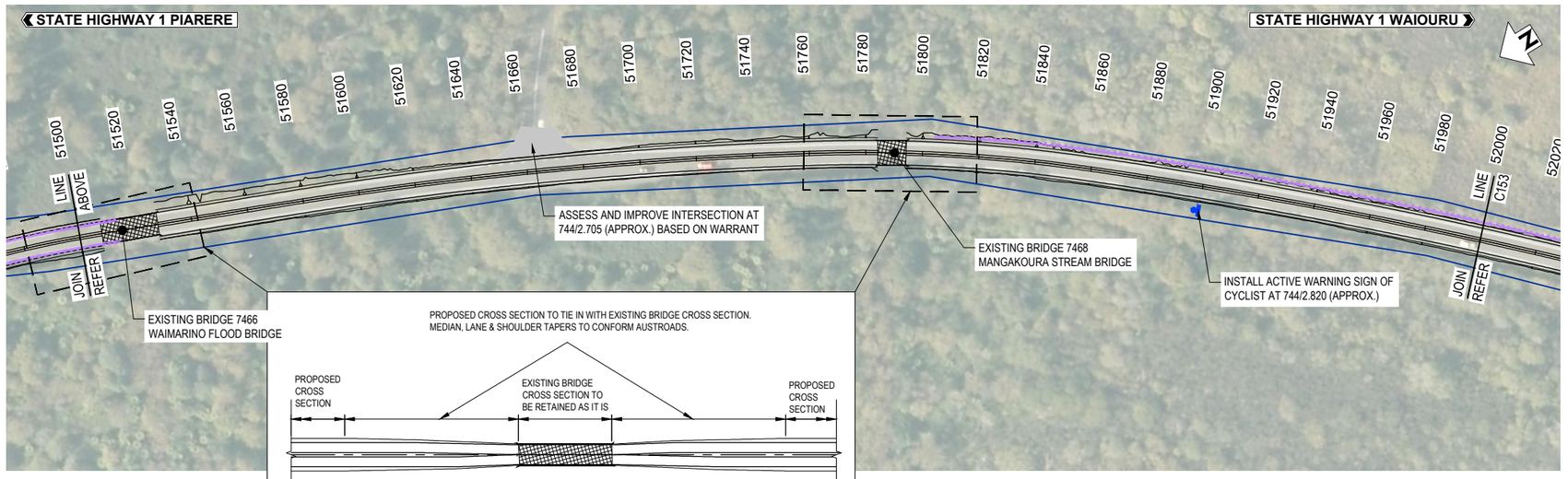
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb. 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



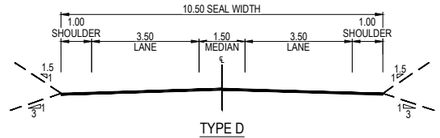
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 51000m TO 52000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C152
Rev.: A

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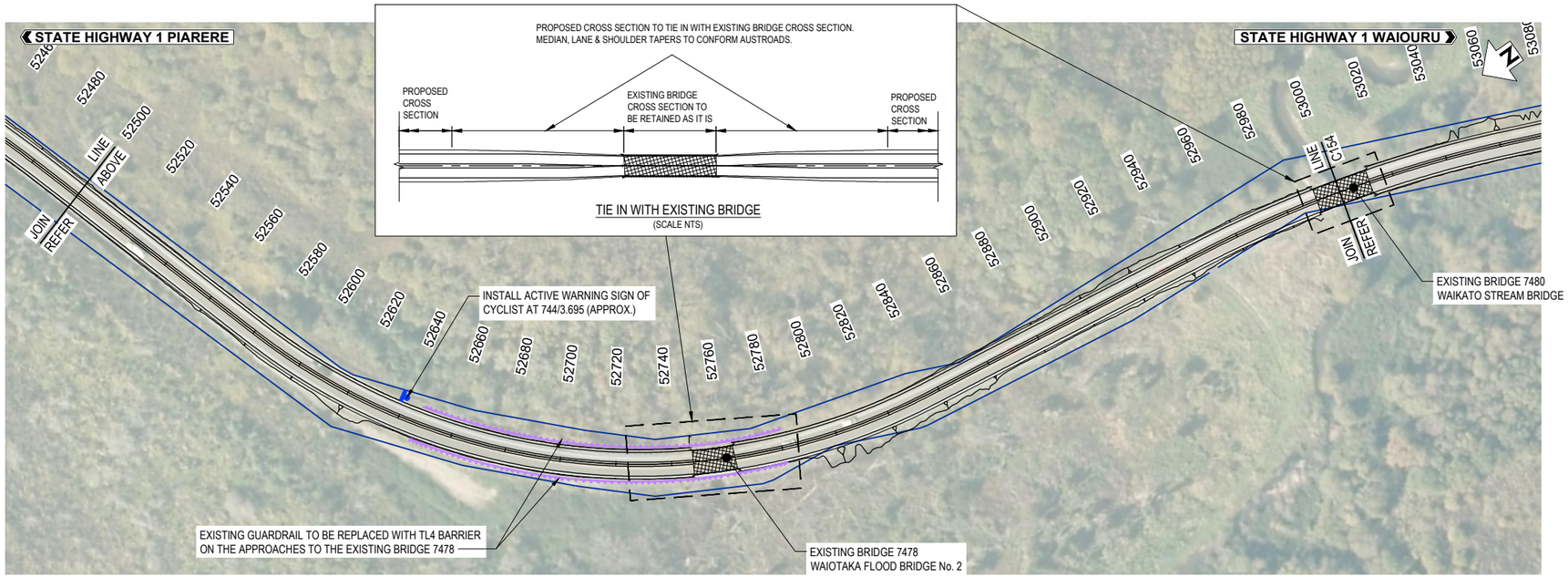
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

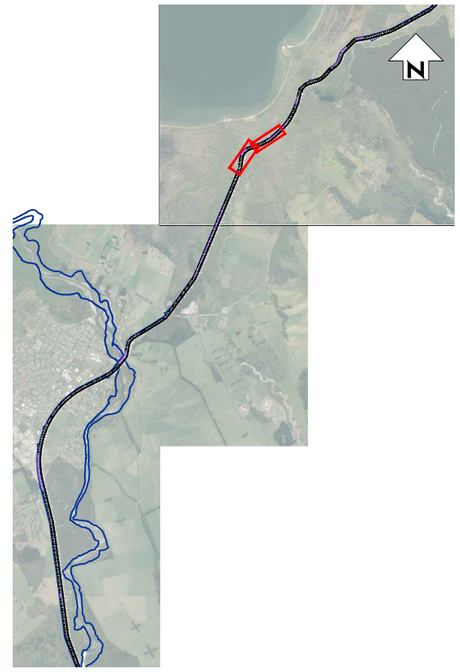
PLAN
SCALE 1 : 1000



PROPOSED CROSS SECTION TO TIE IN WITH EXISTING BRIDGE CROSS SECTION.
MEDIAN, LANE & SHOULDER TAPERS TO CONFORM AUSTROADS.

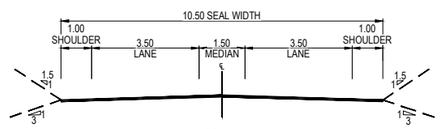
TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 52000m TO 53000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C153
Rev.: A

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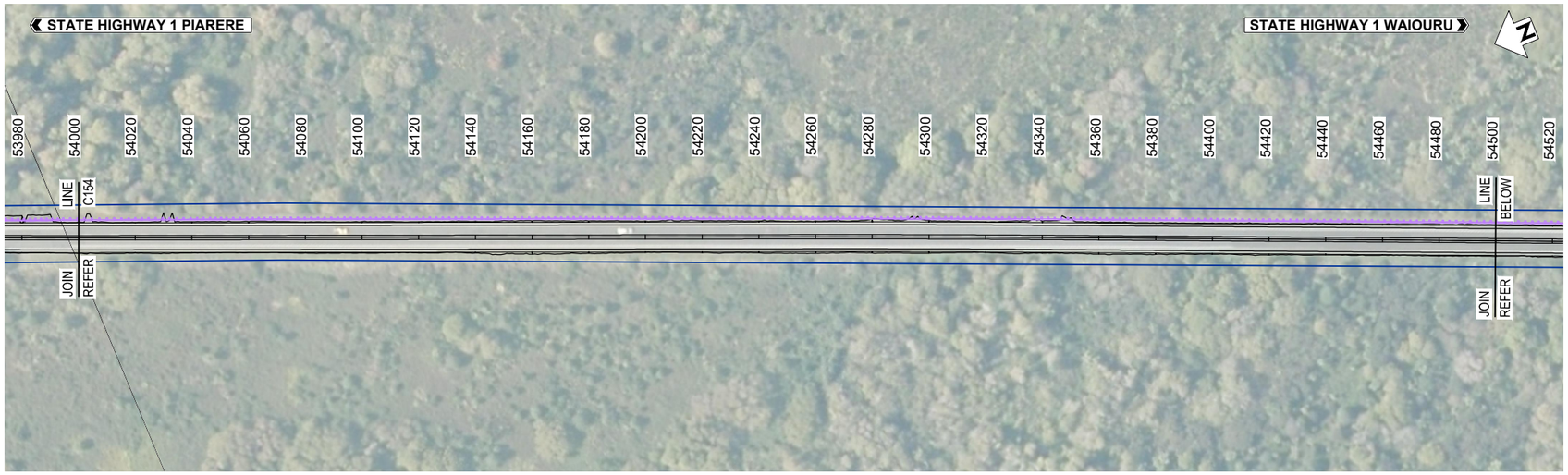
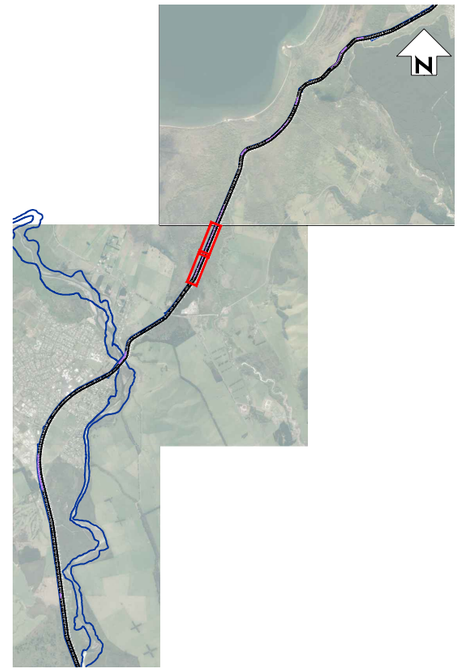
DO NOT SCALE - IF IN DOUBT, ASK

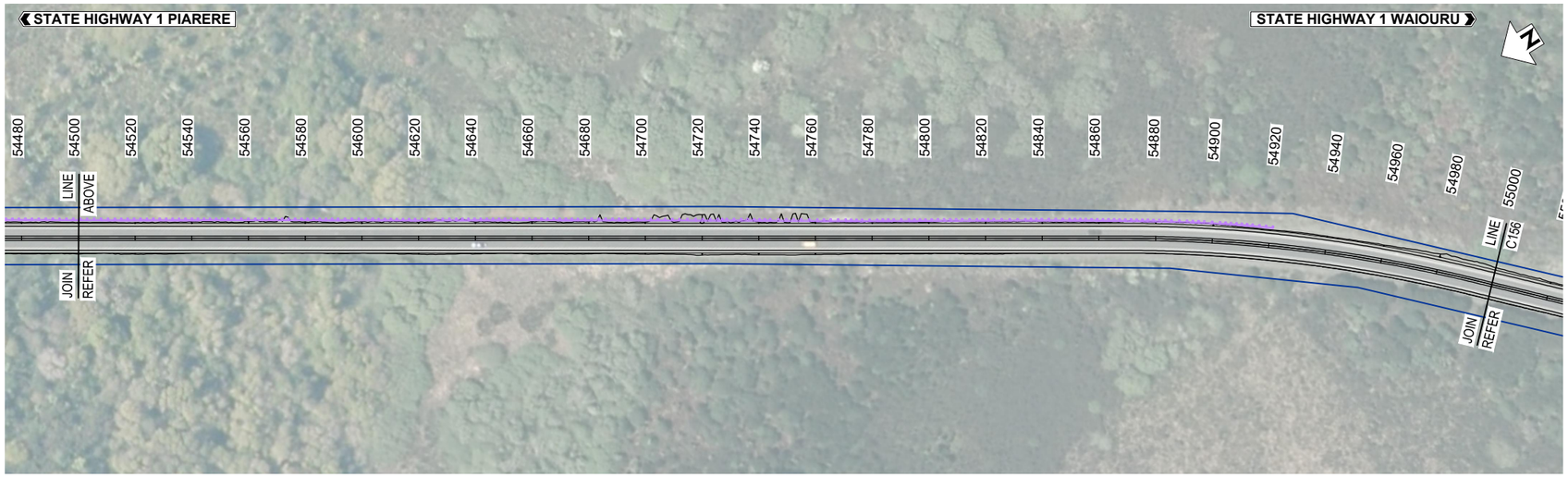
ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000

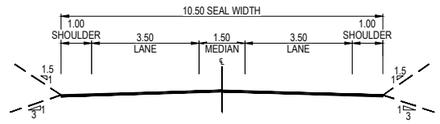




PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 54000m TO 55000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C155
Rev.: A

ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre
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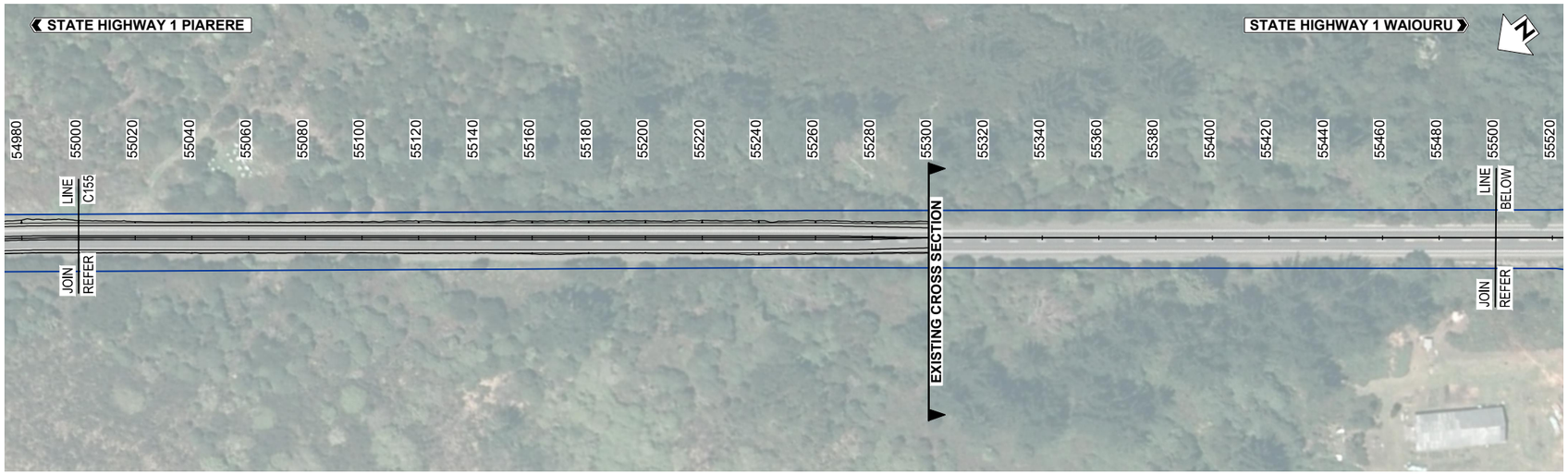
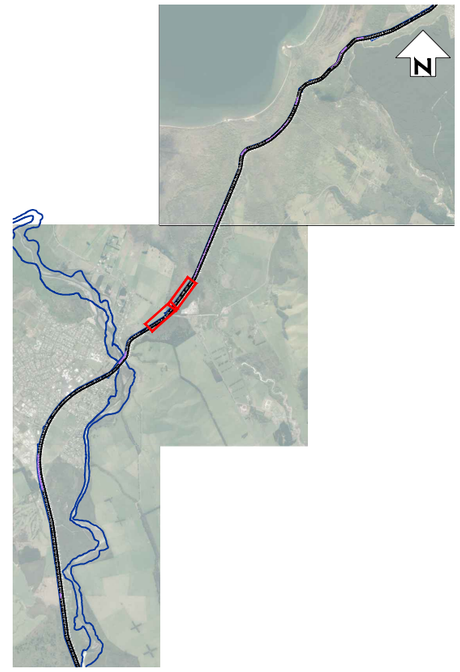


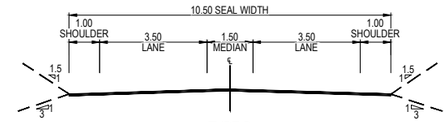
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE D
TYPICAL CROSS SECTION
CH 49200 TO CH 55300
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 55000m TO 56000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C156
Rev.: A

ORIGINAL SIZE A1
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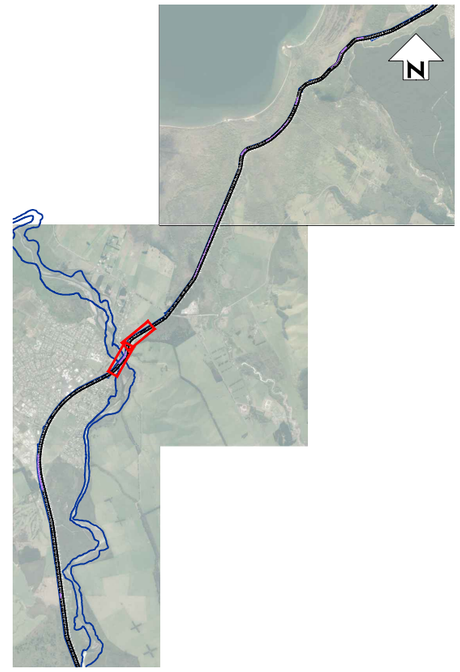
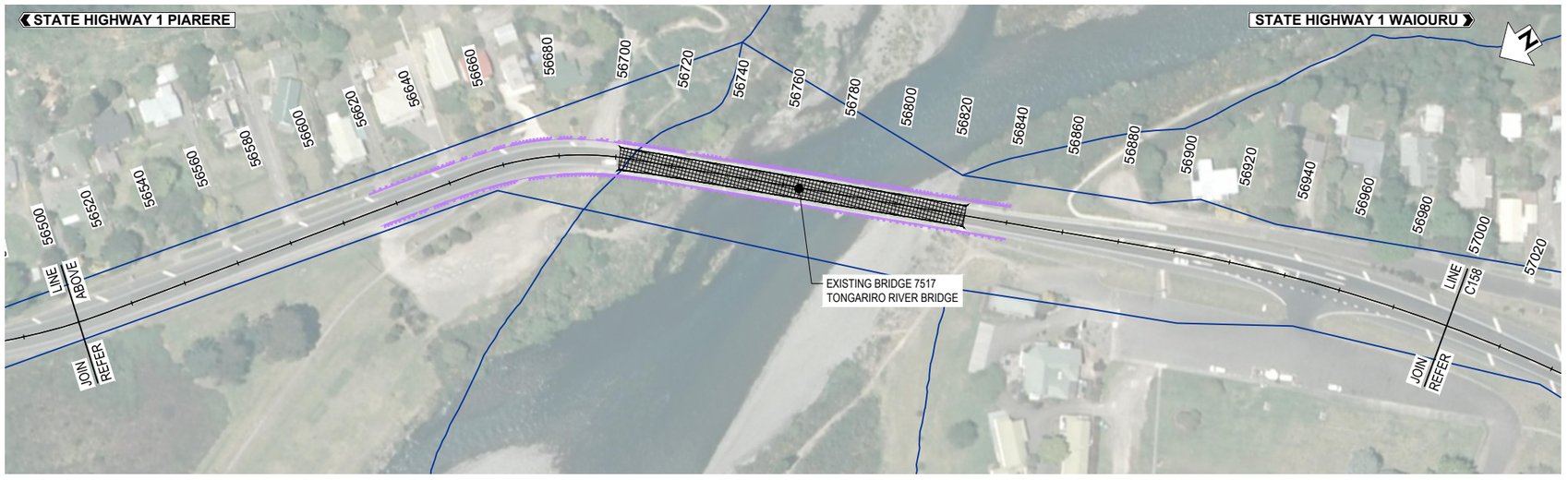
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 56000m TO 57000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C157
Rev.: A

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ORIGINAL SIZE A1
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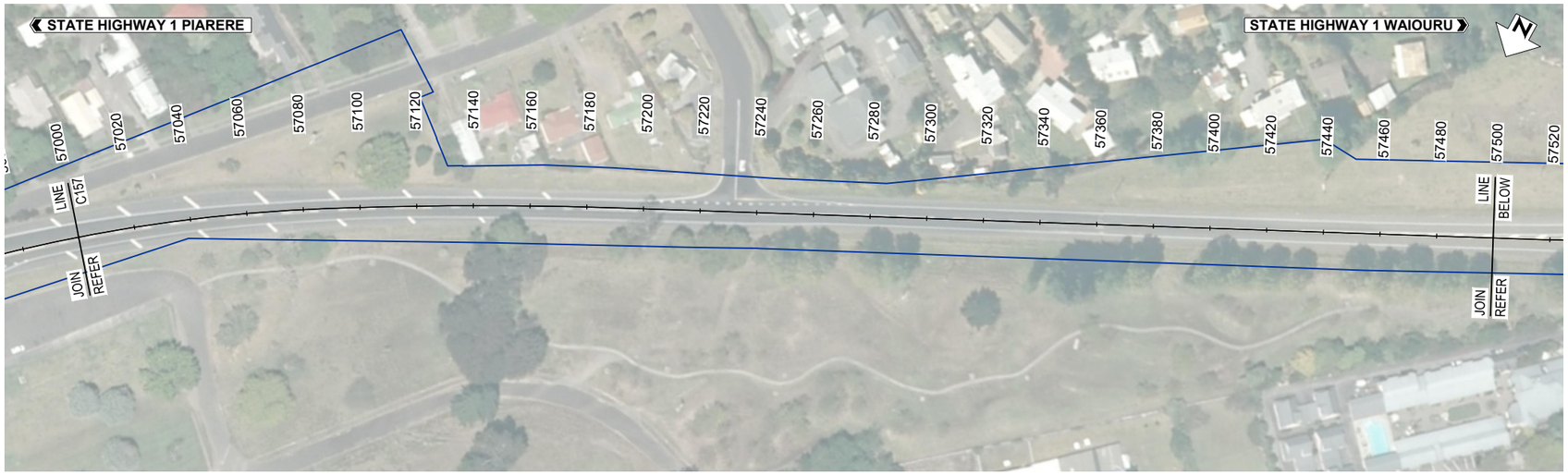

PLAN
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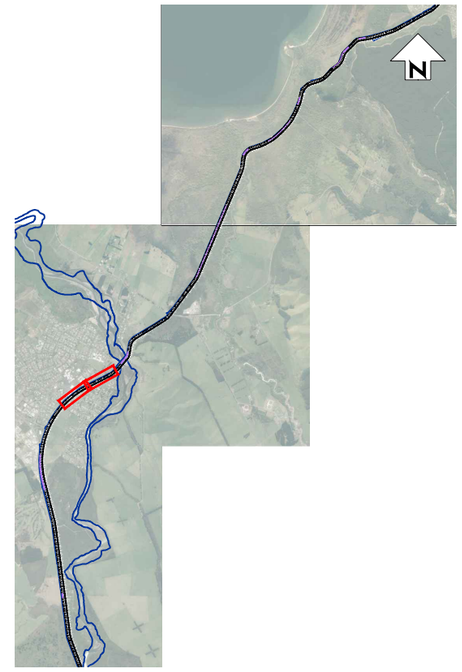
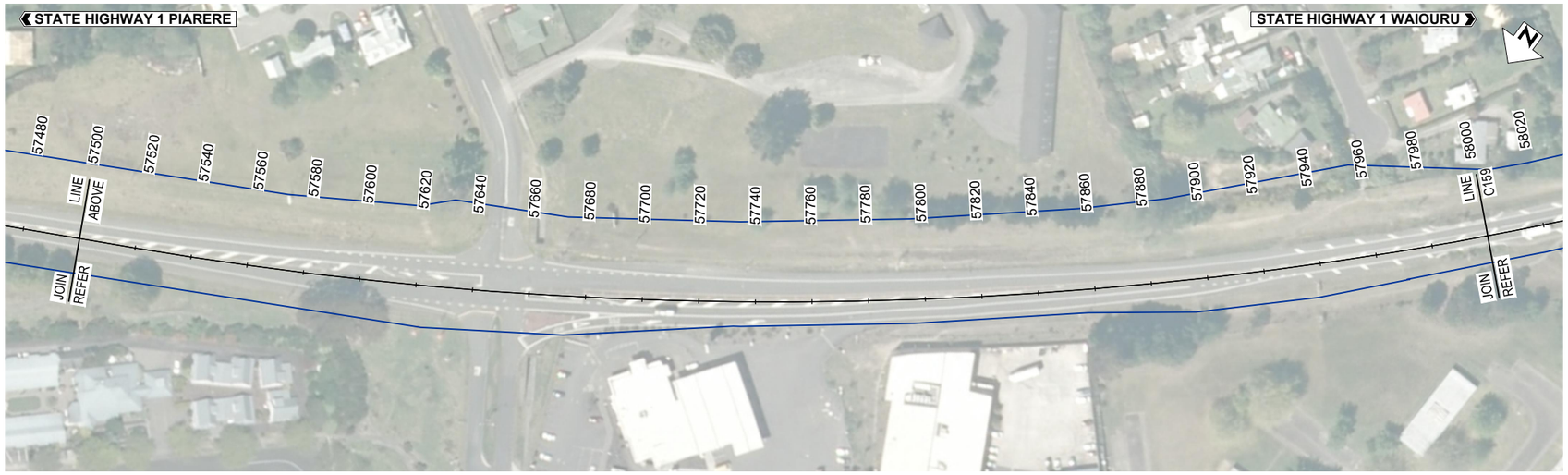


LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 57000m TO 58000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C158
Rev.: A

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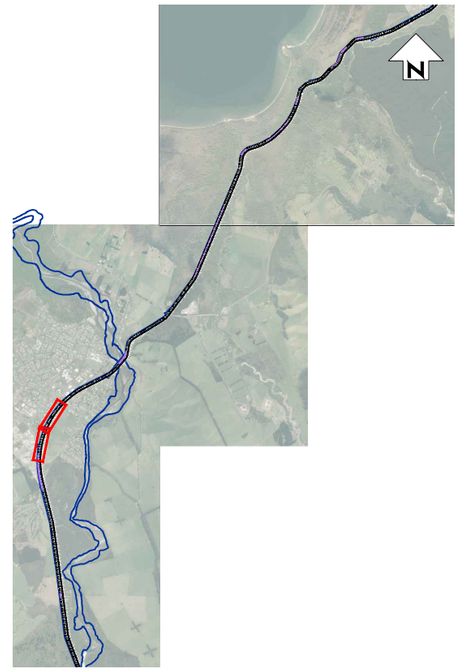
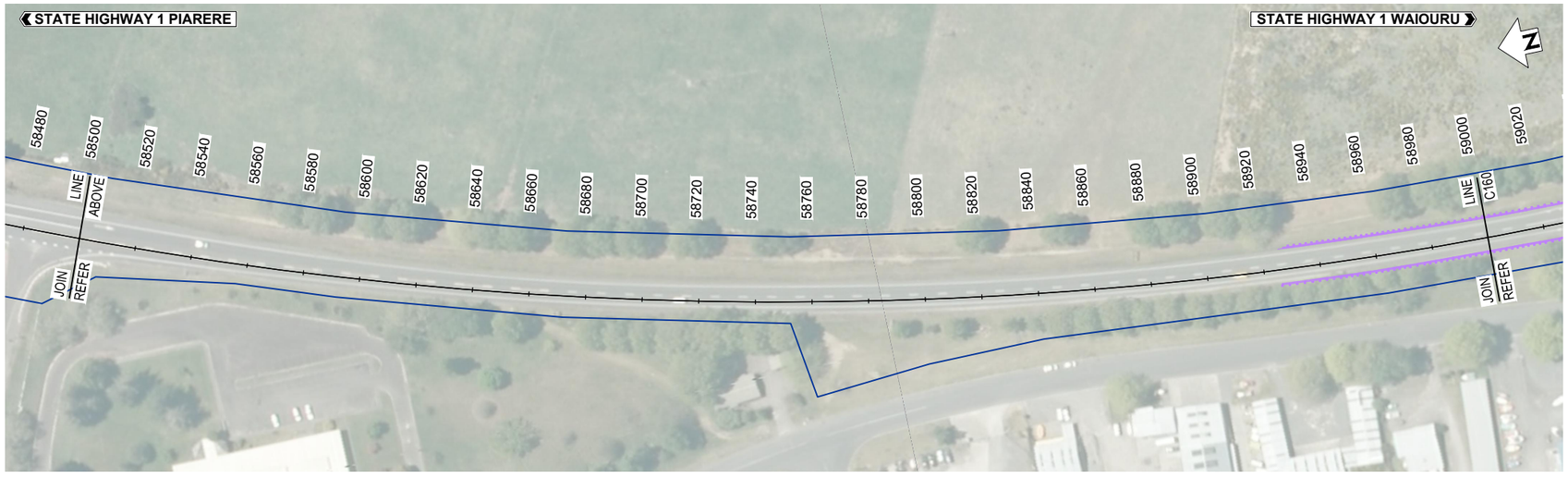
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 58000m TO 59000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C159
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
200mm 150 100 90 80 70 60 50 40 30 20 10 0
ORIGINAL SIZE A1
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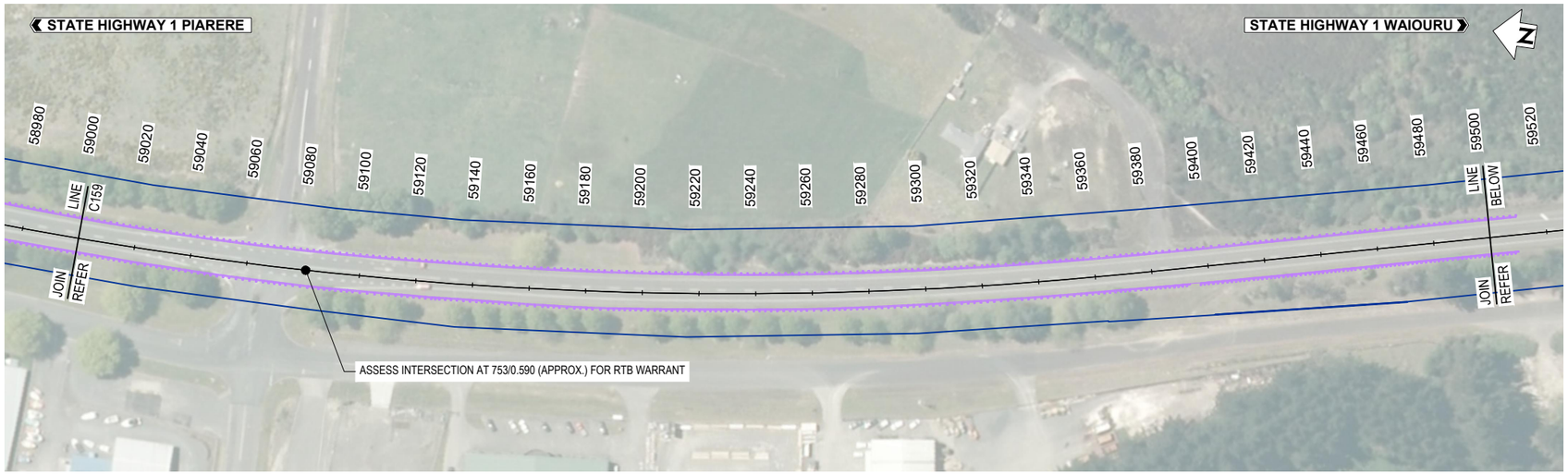
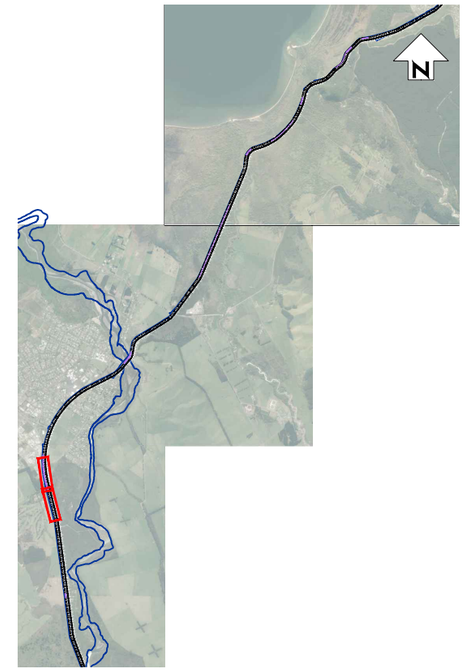
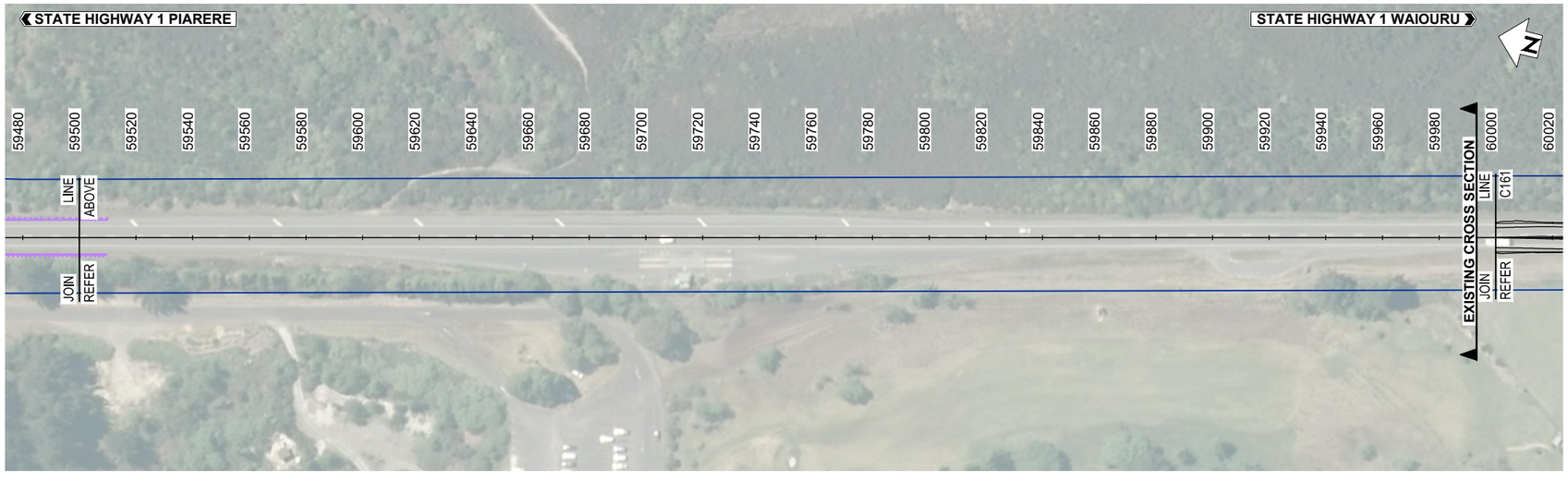


PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 59000m TO 60000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C160
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

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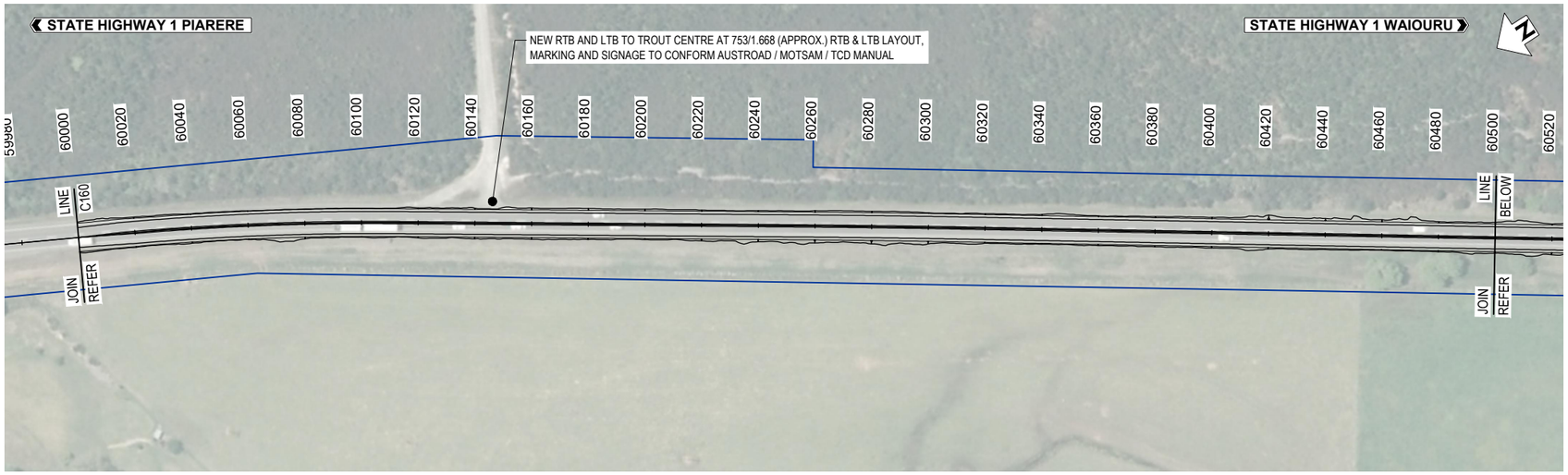
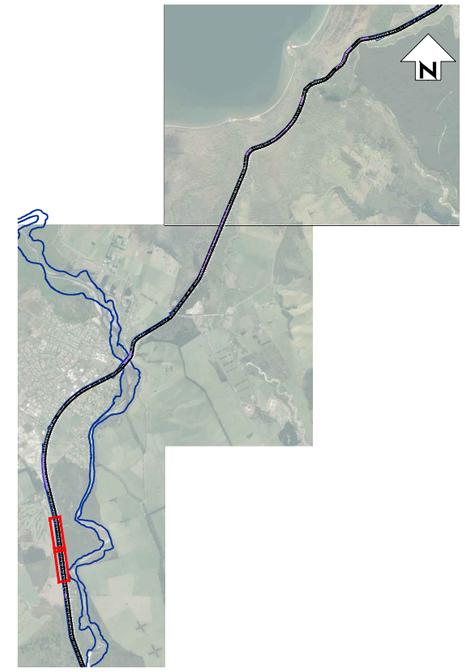
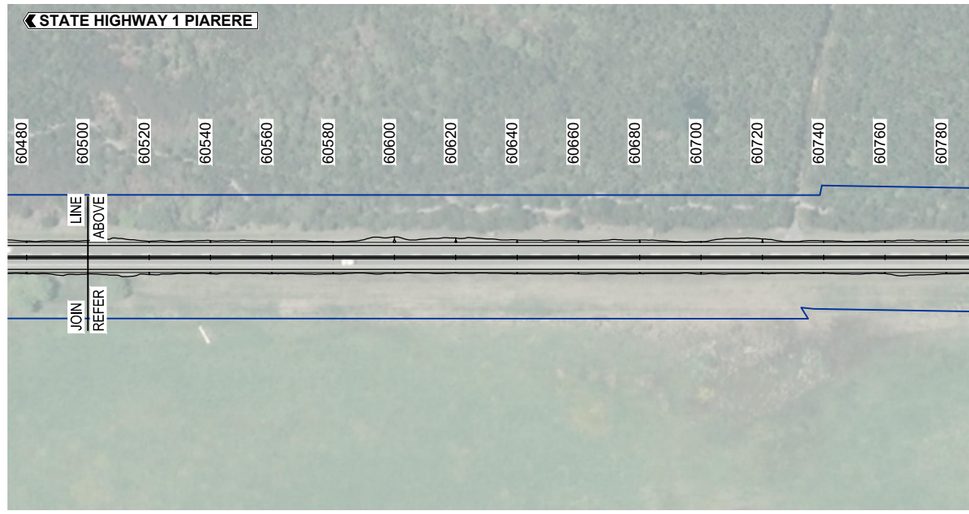


PLAN
SCALE 1 : 1000



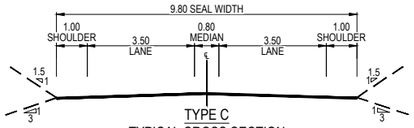
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 60000m TO 61000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C161
Rev.: A

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

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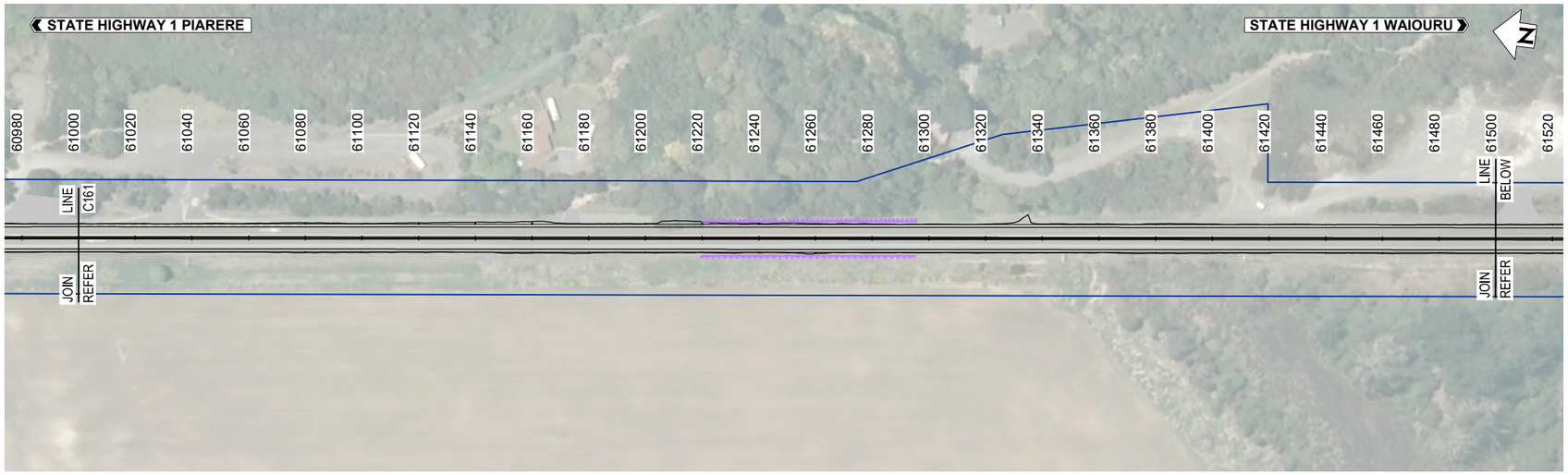
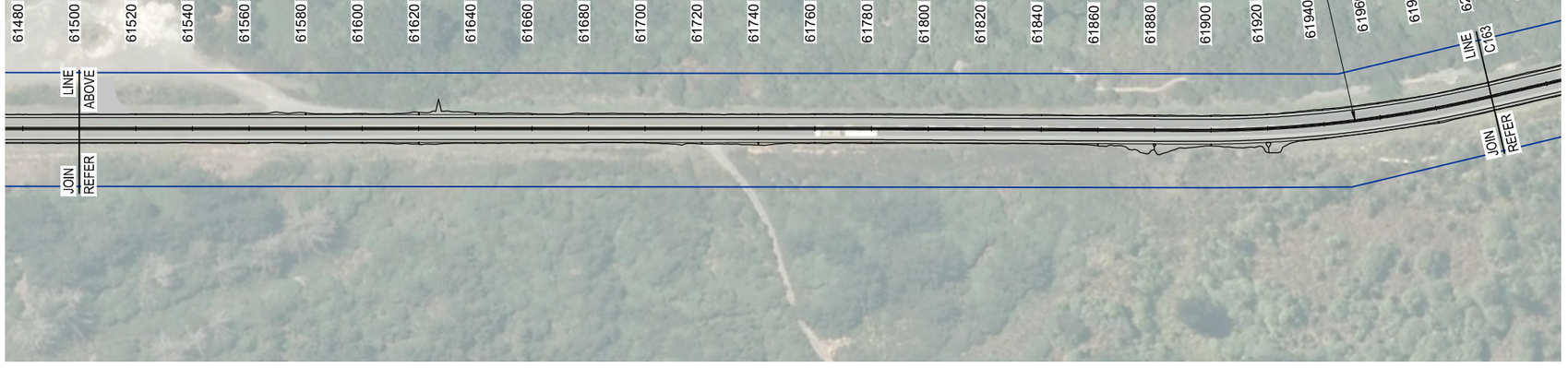


PLAN
SCALE 1 : 1000

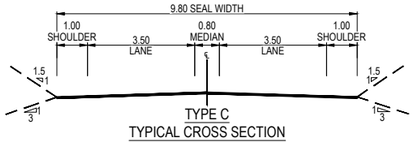
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 61000m TO 62000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C162
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb. 17 2020 By Dattatray Ghundre

DO NOT SCALE - IF IN DOUBT, ASK

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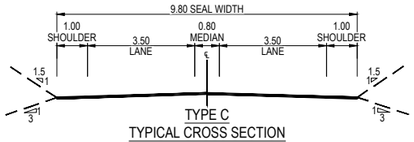
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 62000m TO 63000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C163
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

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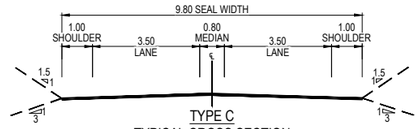
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 63000m TO 64000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C164
Rev.: A

ORIGINAL SIZE A1

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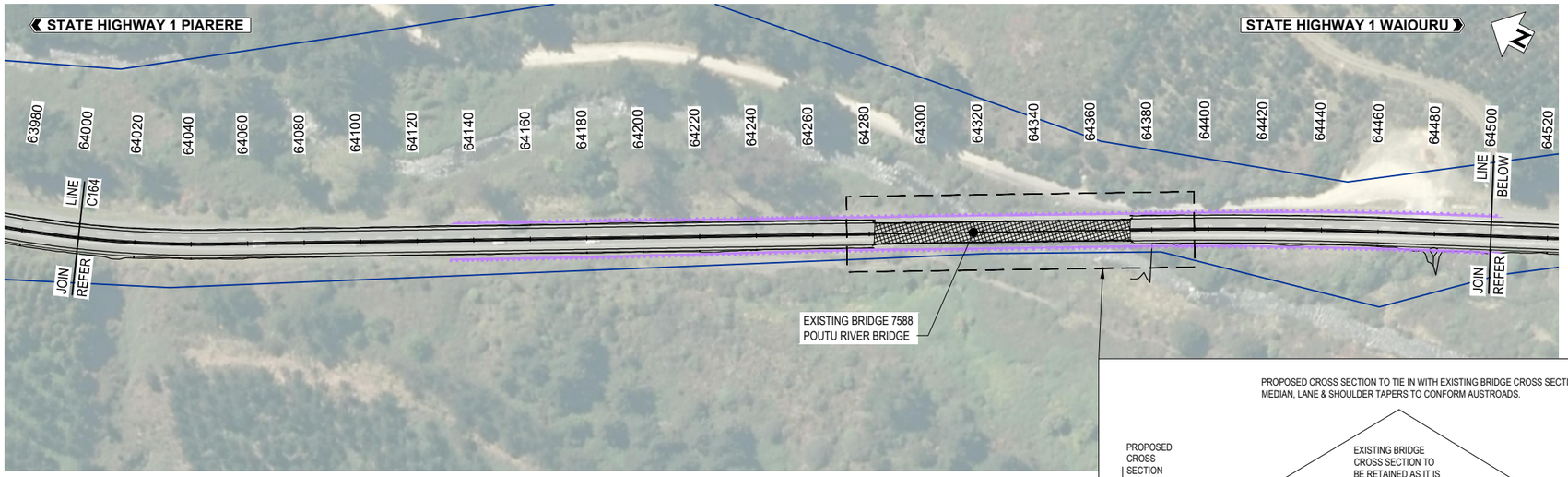
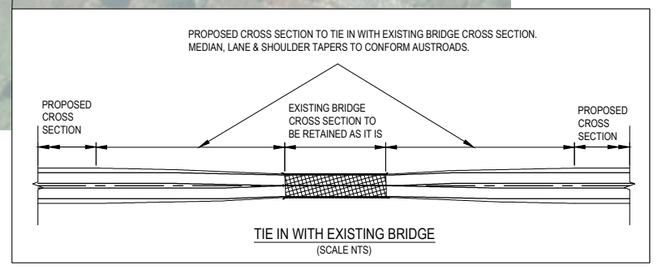
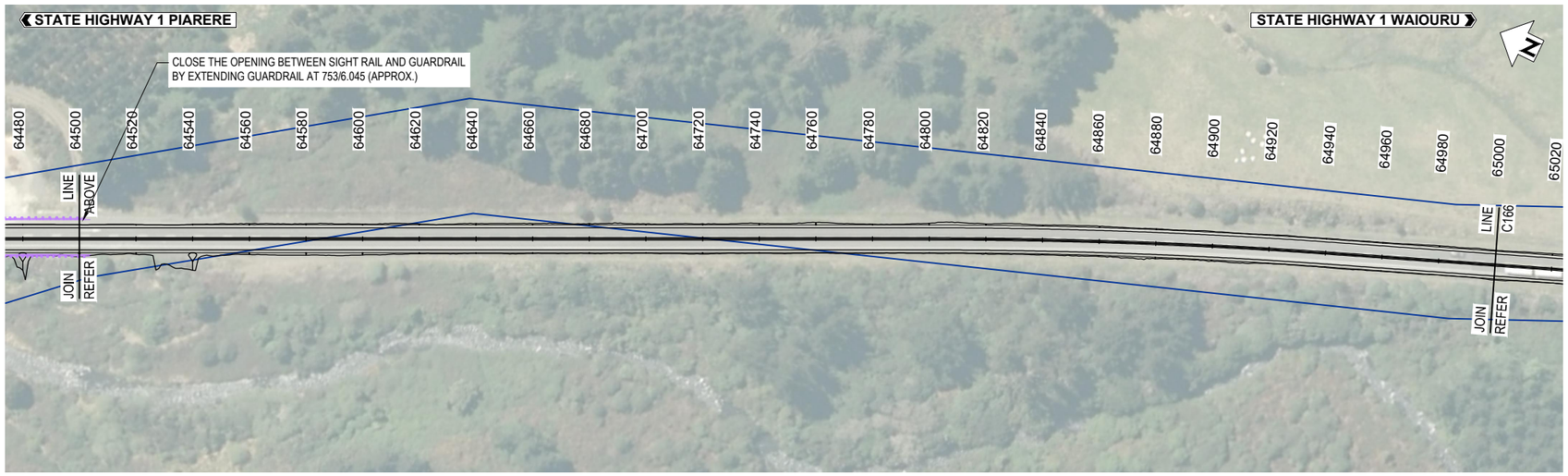


PLAN
SCALE 1 : 1000



TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

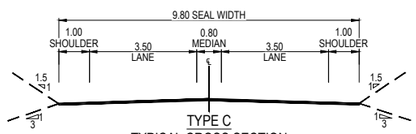
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 64000m TO 65000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C165
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

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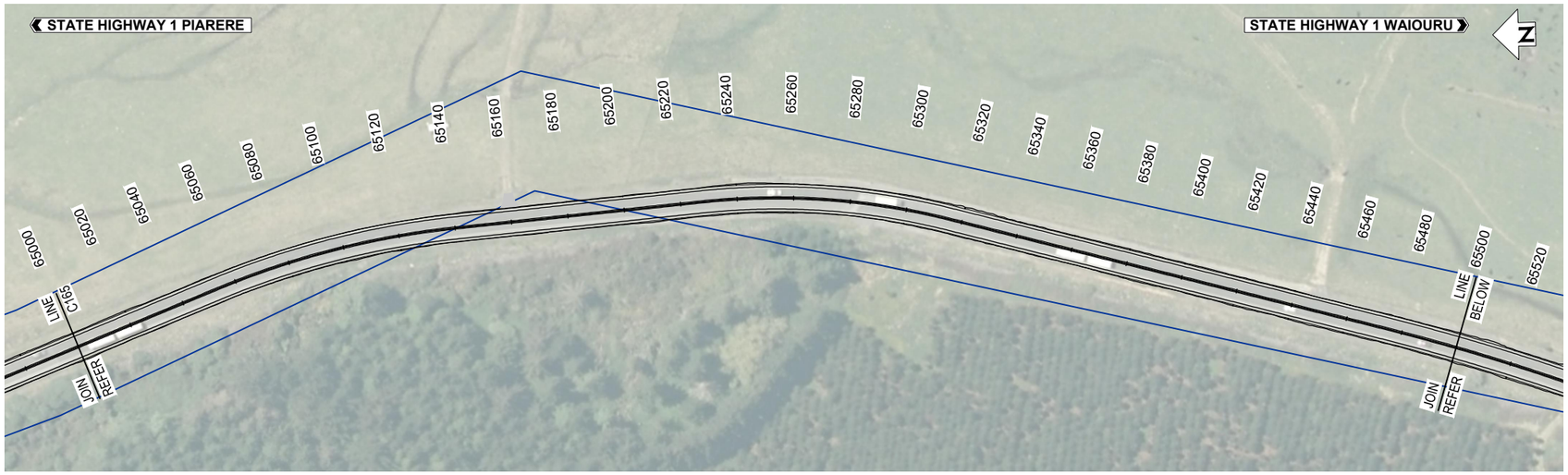


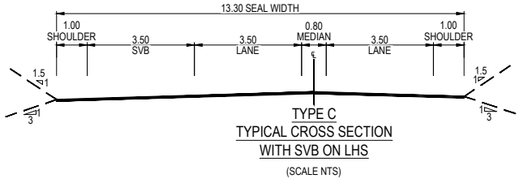
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

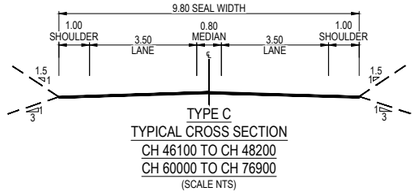
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
WITH SVB ON LHS
(SCALE NTS)



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 65000m TO 66000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C166
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre

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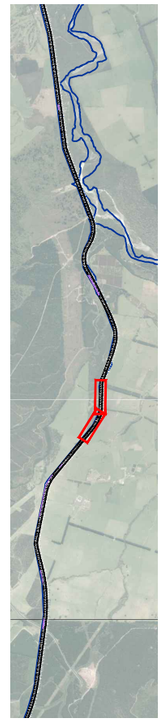
PLAN
SCALE 1 : 1000

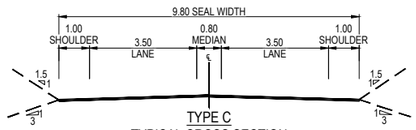


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 66000m TO 67000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C167
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb. 17 2020 By Dattatray Ghundre

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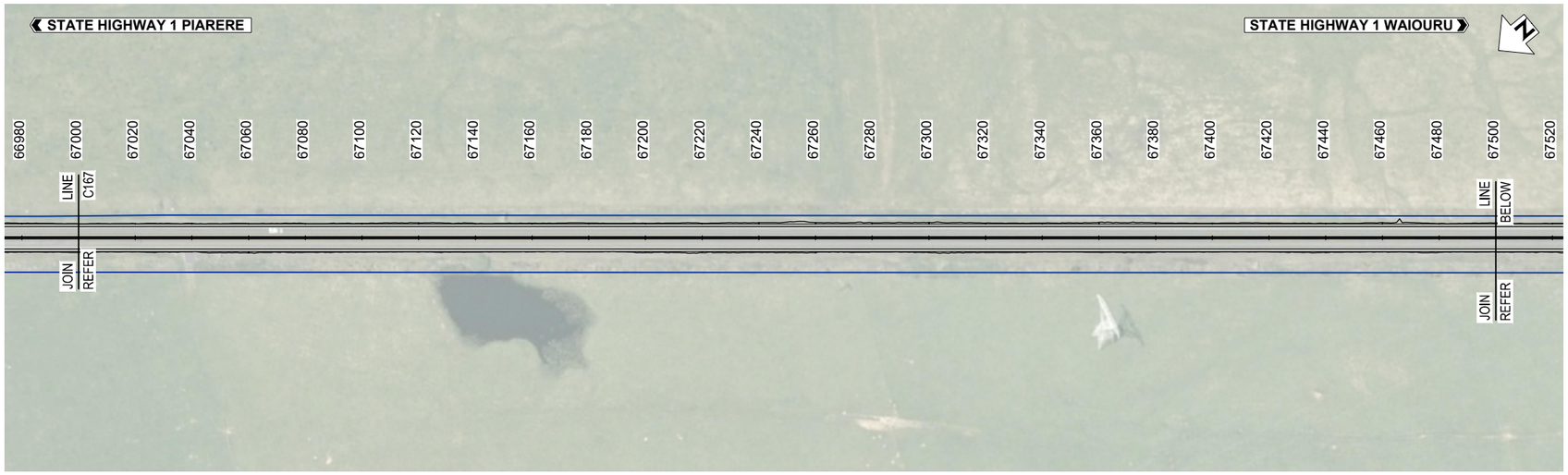
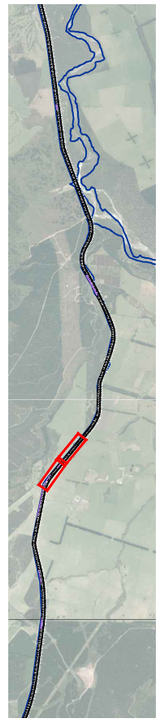
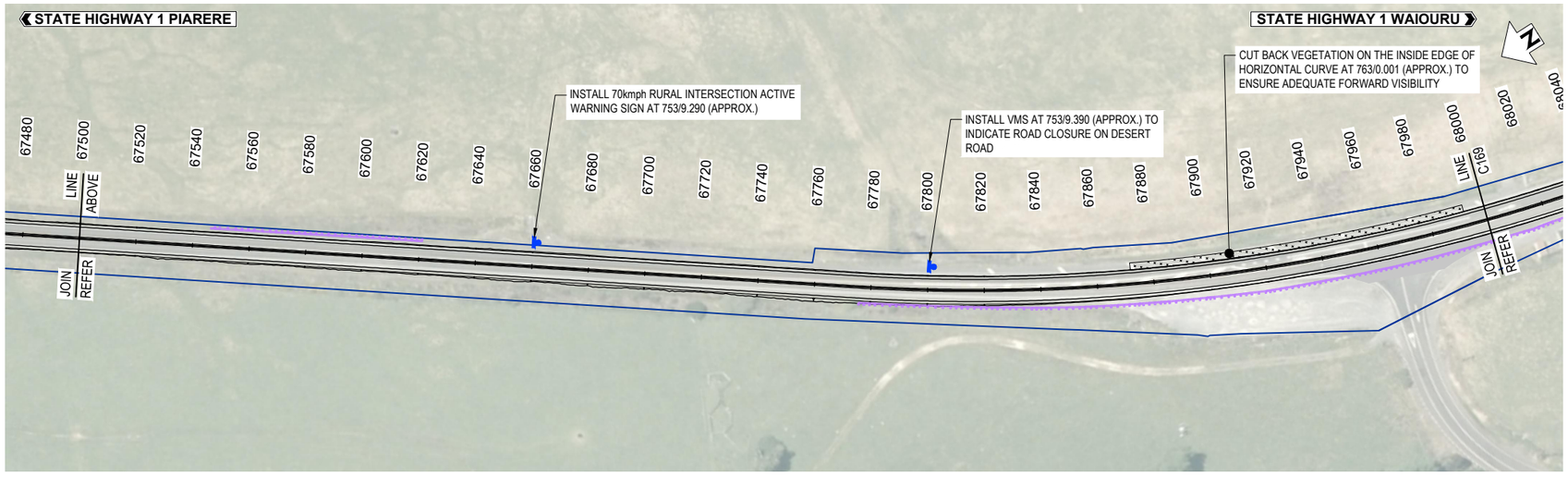


PLAN
SCALE 1 : 1000



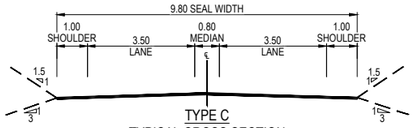
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 67000m TO 68000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C168
Rev.: A

ORIGINAL SIZE A1

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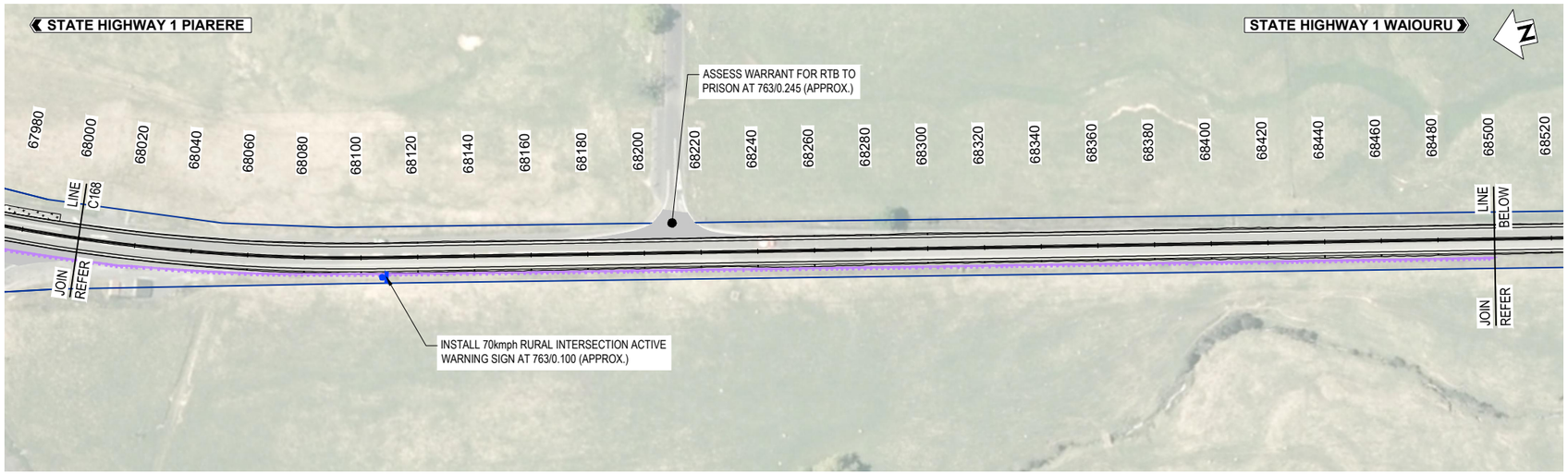
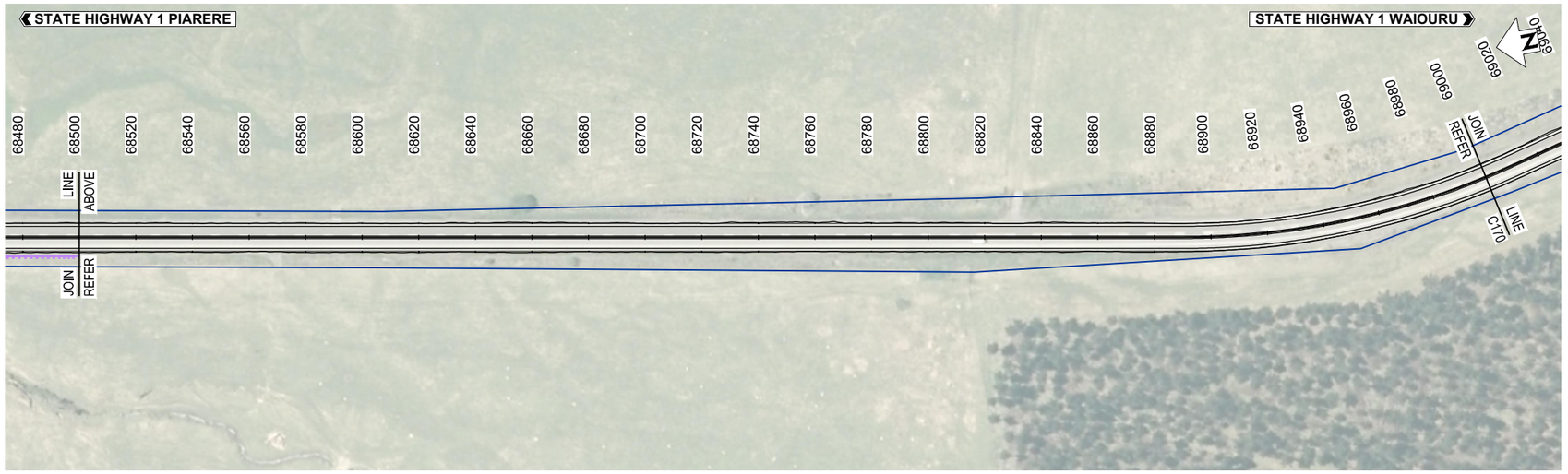


PLAN
SCALE 1 : 1000

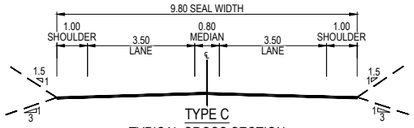
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 68000m TO 69000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C169
Rev.: A

ORIGINAL SIZE A1

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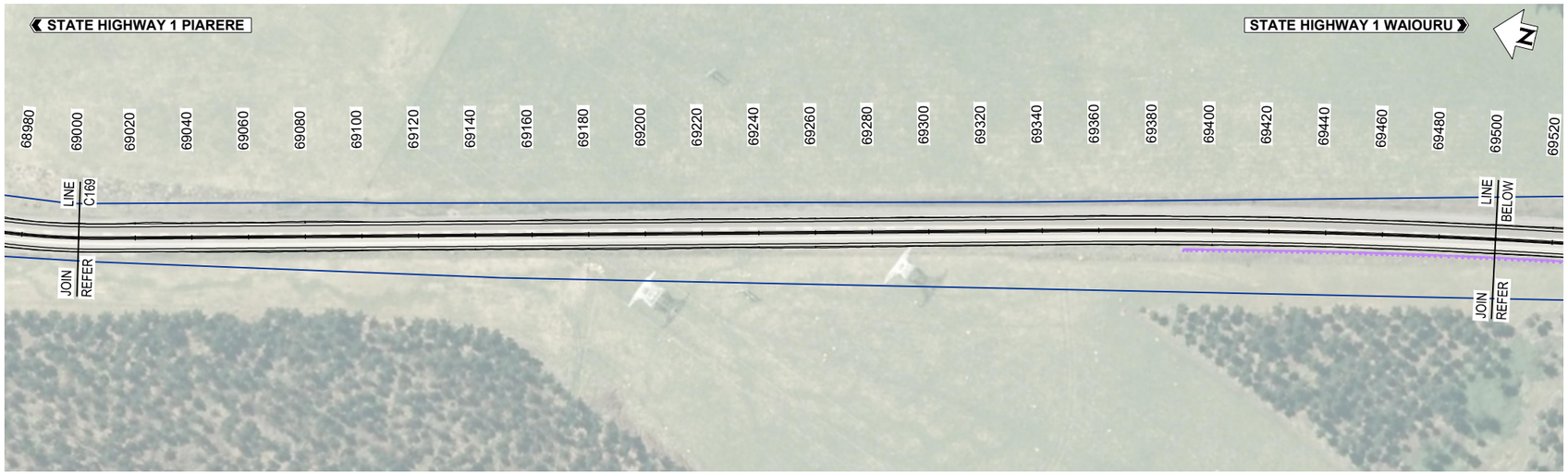


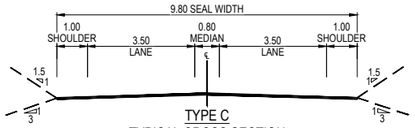
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 69000m TO 70000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C170
Rev.: A

ORIGINAL SIZE A1
Last modified: Feb 17 2020 By Dattatray Ghundre
DO NOT SCALE - IF IN DOUBT, ASK

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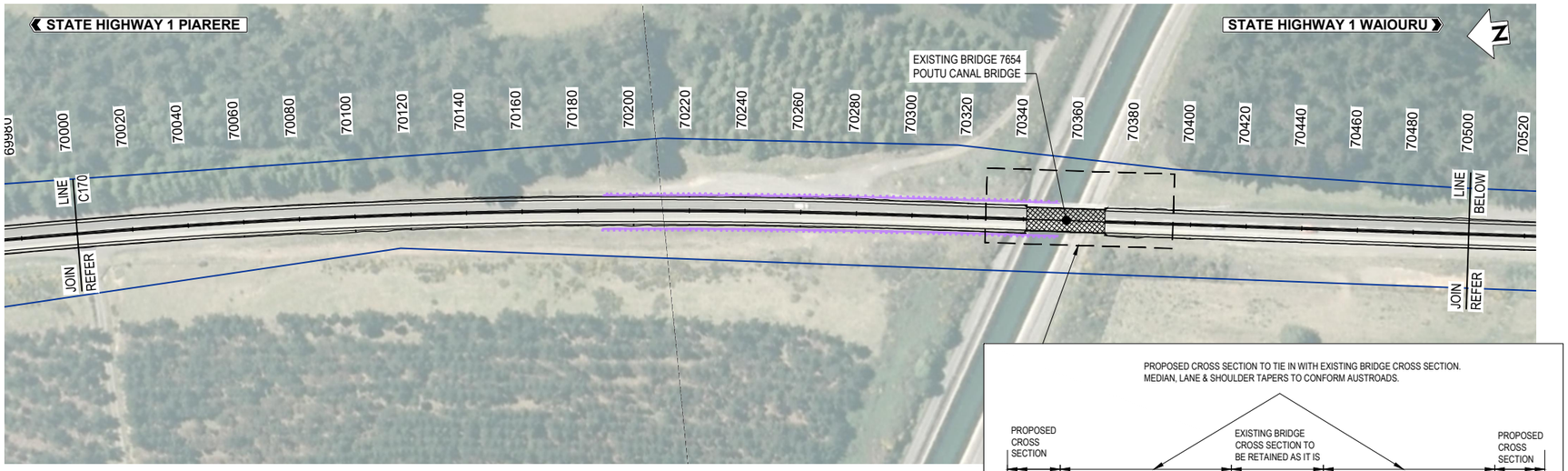
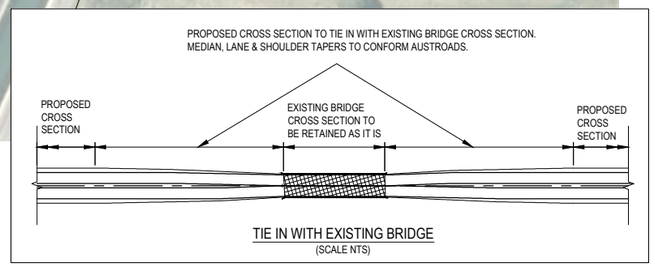


PLAN
SCALE 1 : 1000

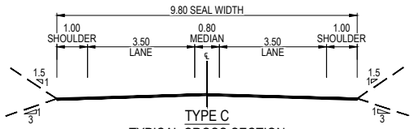


TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 70000m TO 71000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C171
Rev.: A

ORIGINAL SIZE A1
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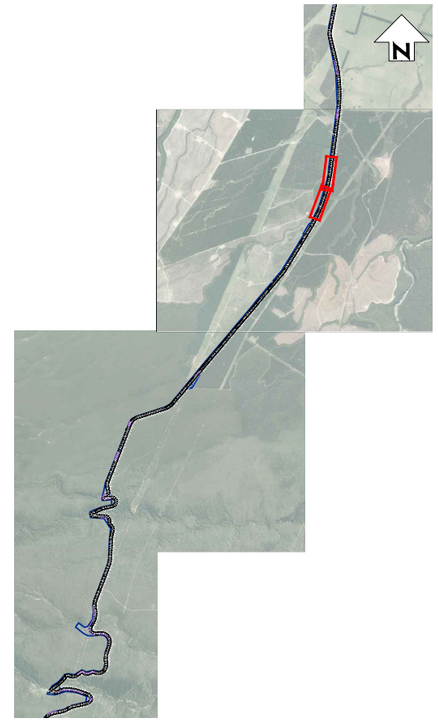
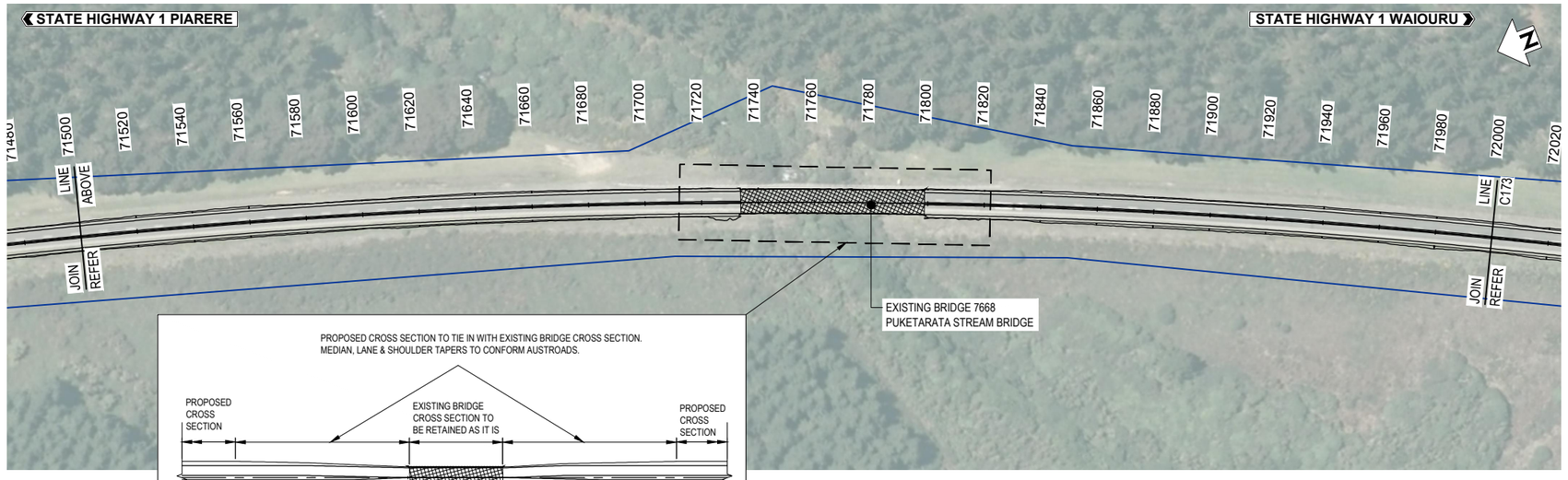
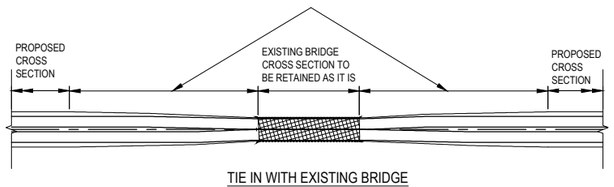
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS



PROPOSED CROSS SECTION TO TIE IN WITH EXISTING BRIDGE CROSS SECTION.
MEDIAN, LANE & SHOULDER TAPERS TO CONFORM AUSTROADS.

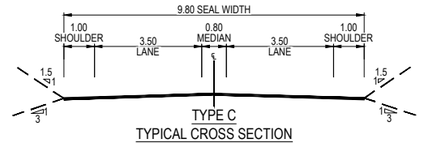


TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 71000m TO 72000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C172
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 17 2020 By Dattatray Ghundre

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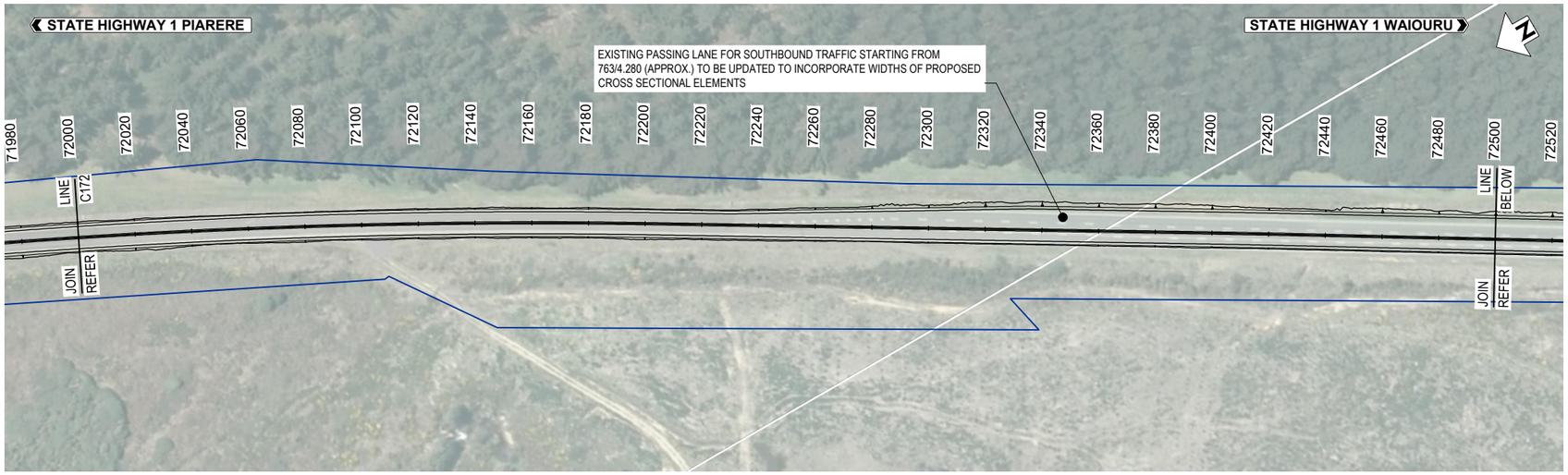
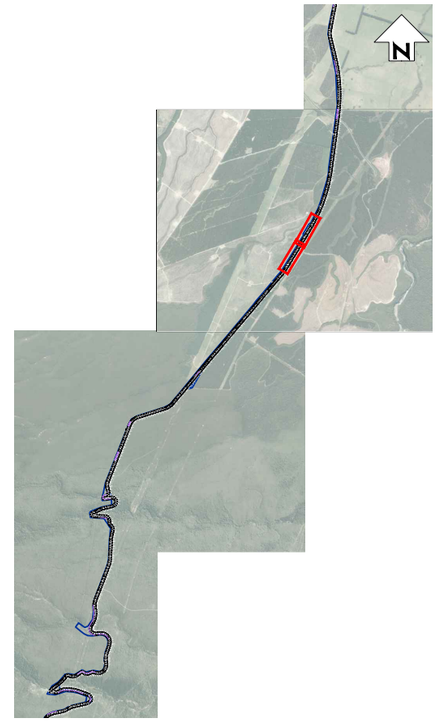
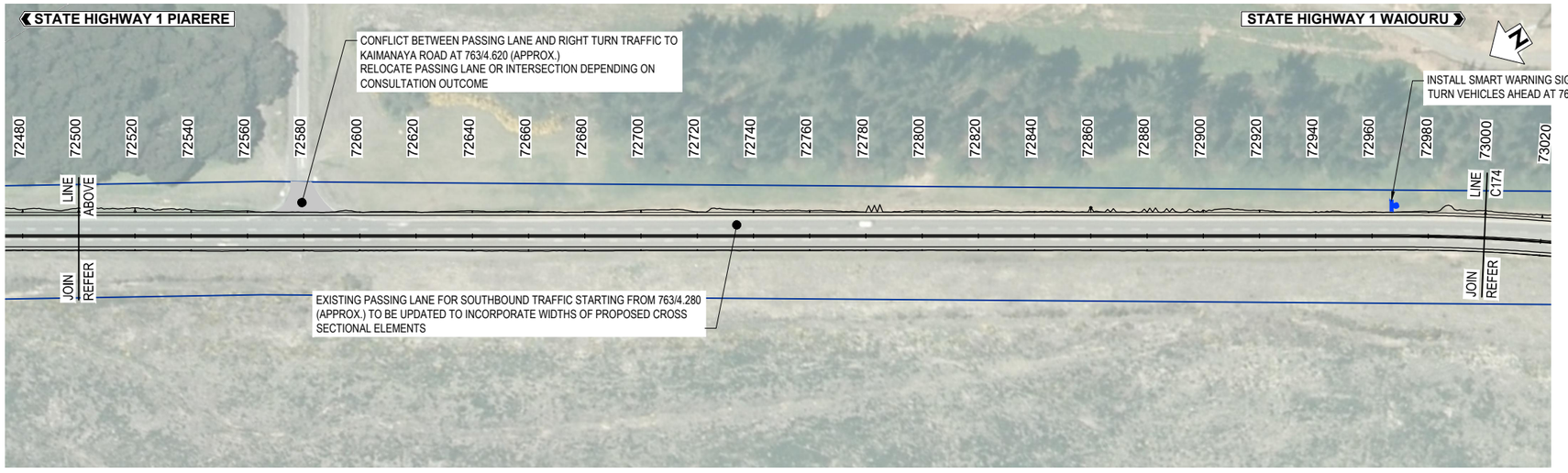


PLAN
SCALE 1 : 1000

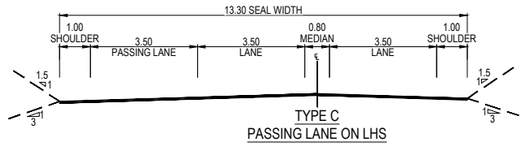


LOCATION PLAN
SCALE : NTS

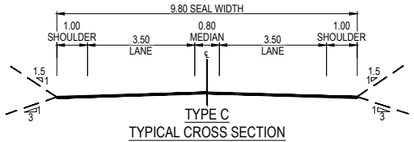


PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 72000m TO 73000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C173
Rev.: A

ORIGINAL SIZE A1
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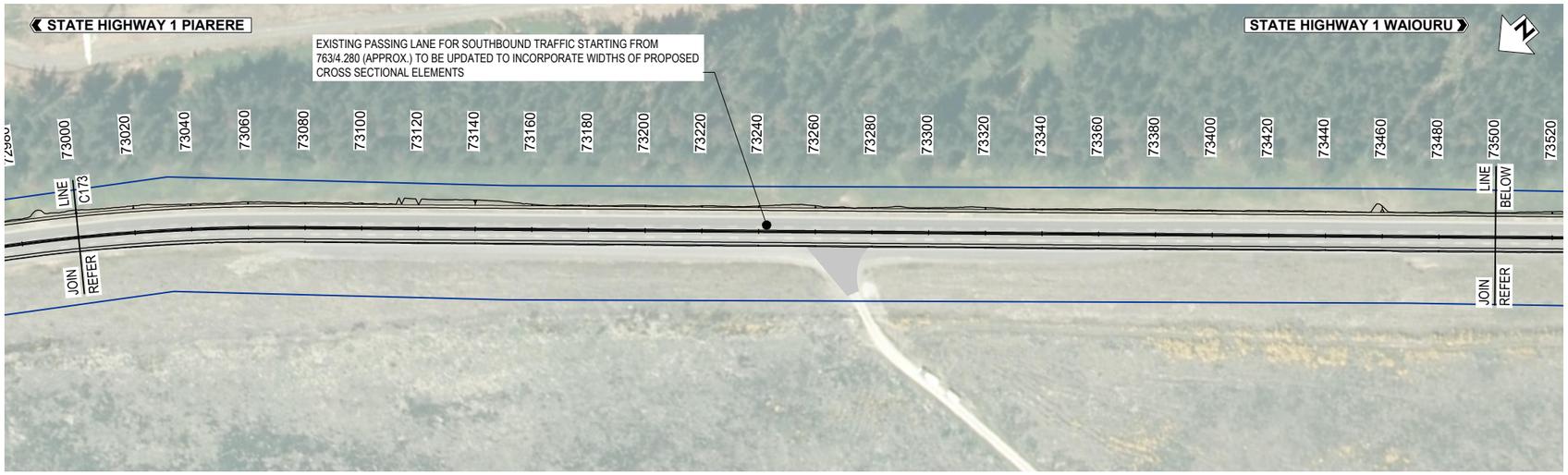
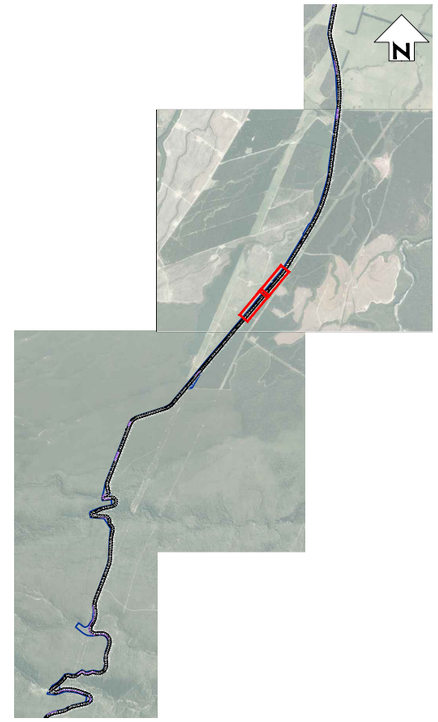
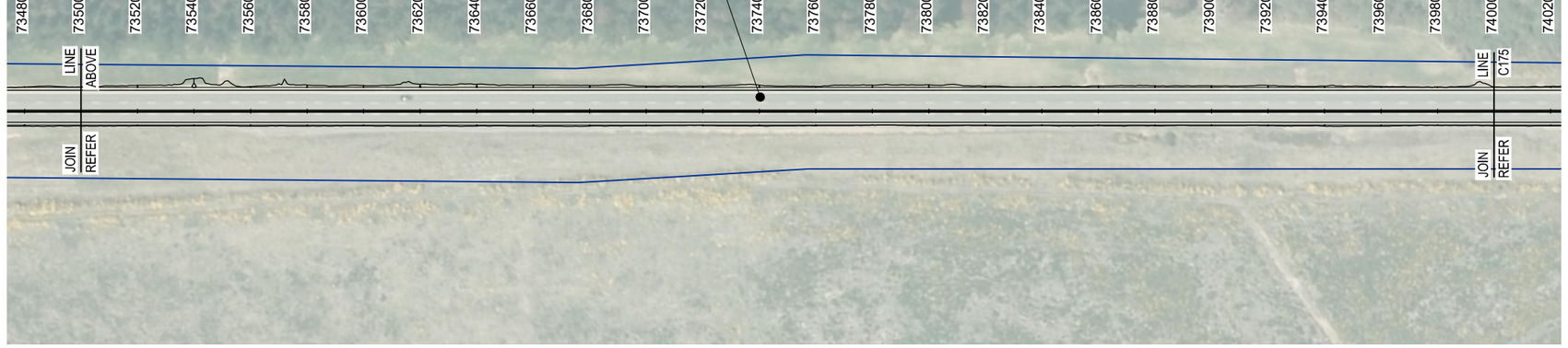


PLAN
SCALE 1 : 1000



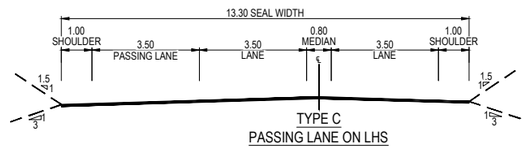
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 73000m TO 74000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C174
Rev.: A

ORIGINAL SIZE A1
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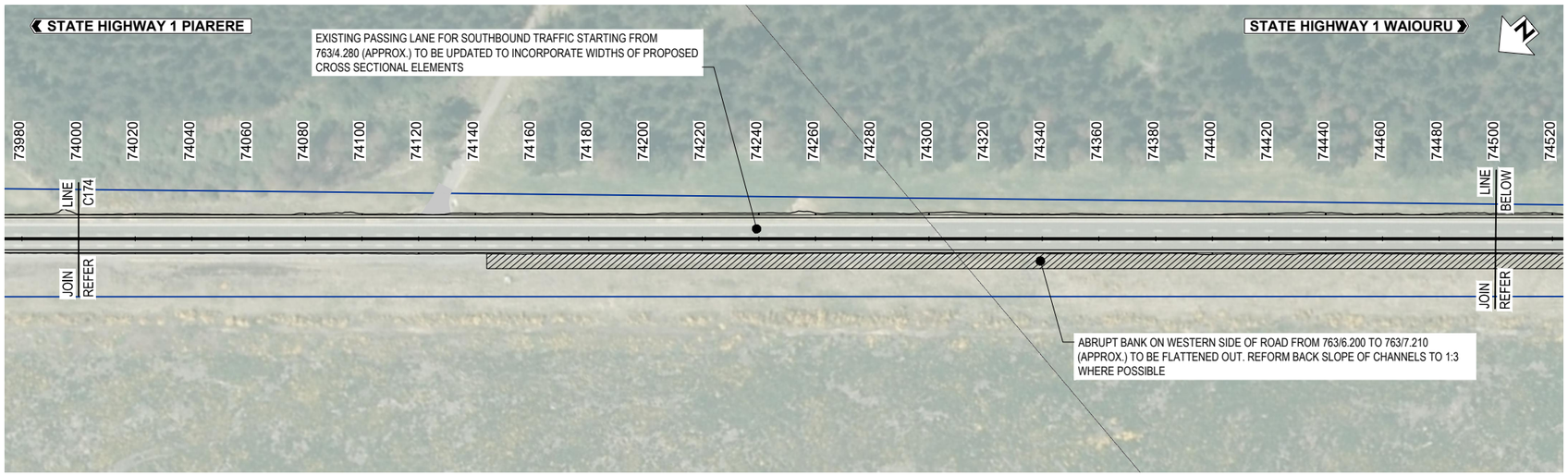
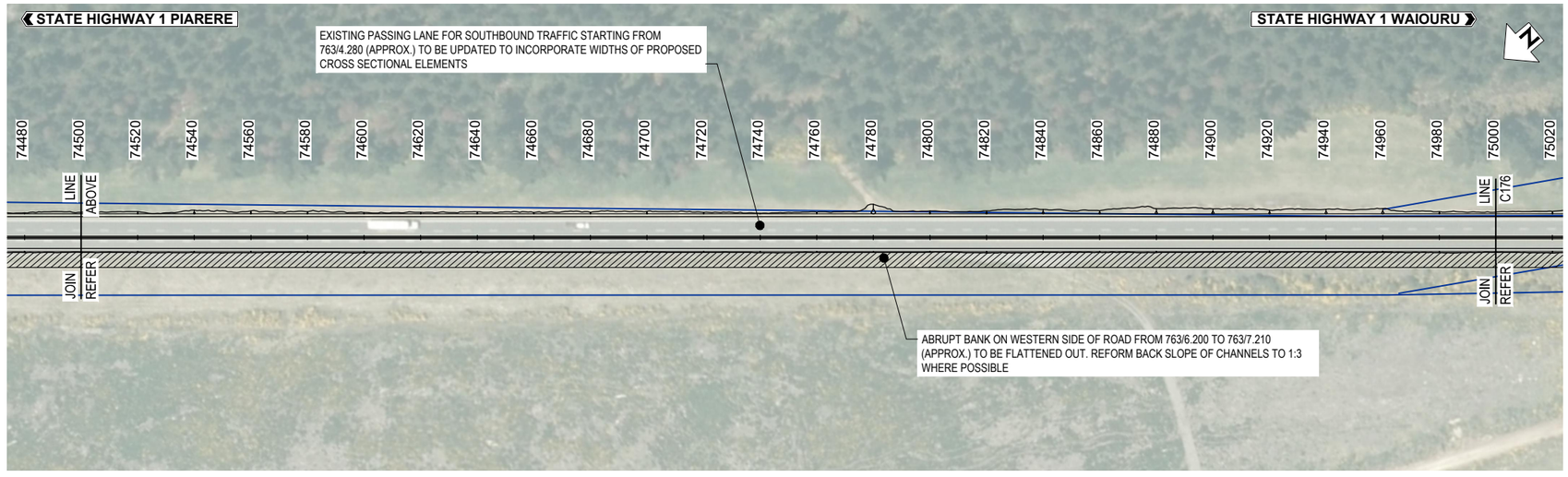


PLAN
SCALE 1 : 1000

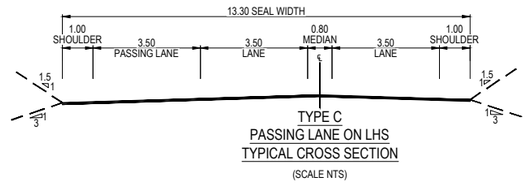
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 74000m TO 75000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C175
Rev.: A

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ORIGINAL SIZE A1
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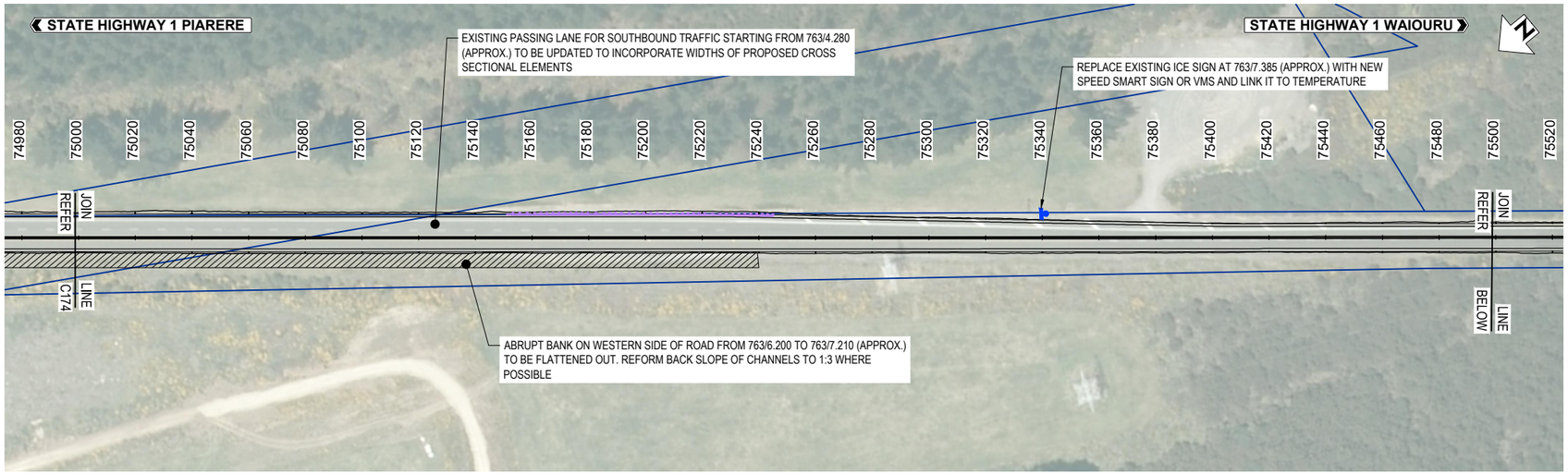
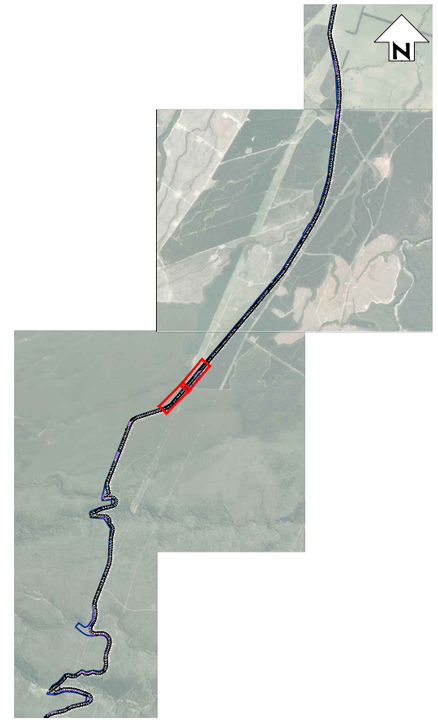


PLAN
SCALE 1 : 1000

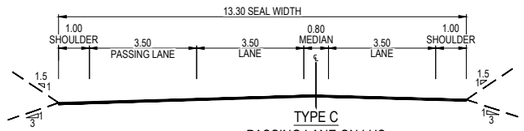


LOCATION PLAN
SCALE : NTS

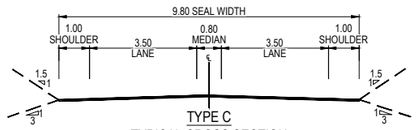
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE C
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE C
TYPICAL CROSS SECTION
CH 46100 TO CH 48200
CH 60000 TO CH 76900
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 75000m TO 76000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C176
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
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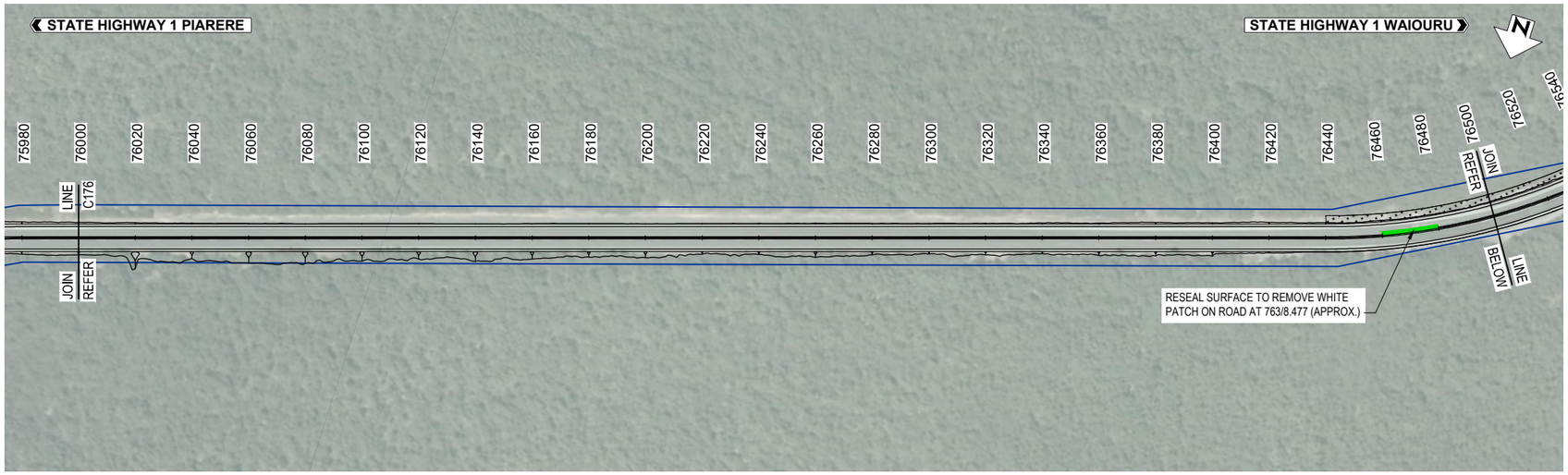
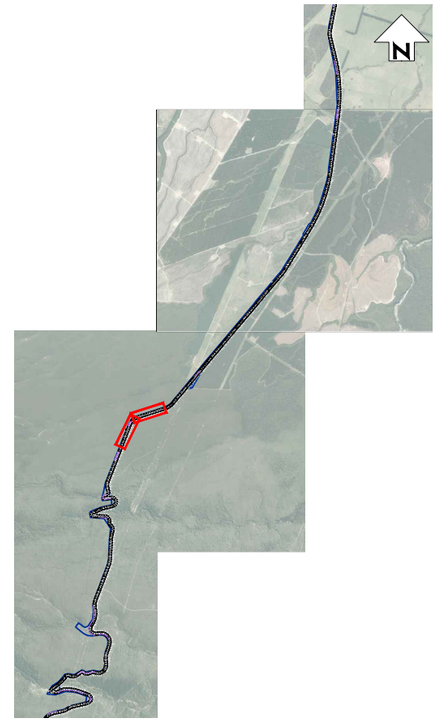
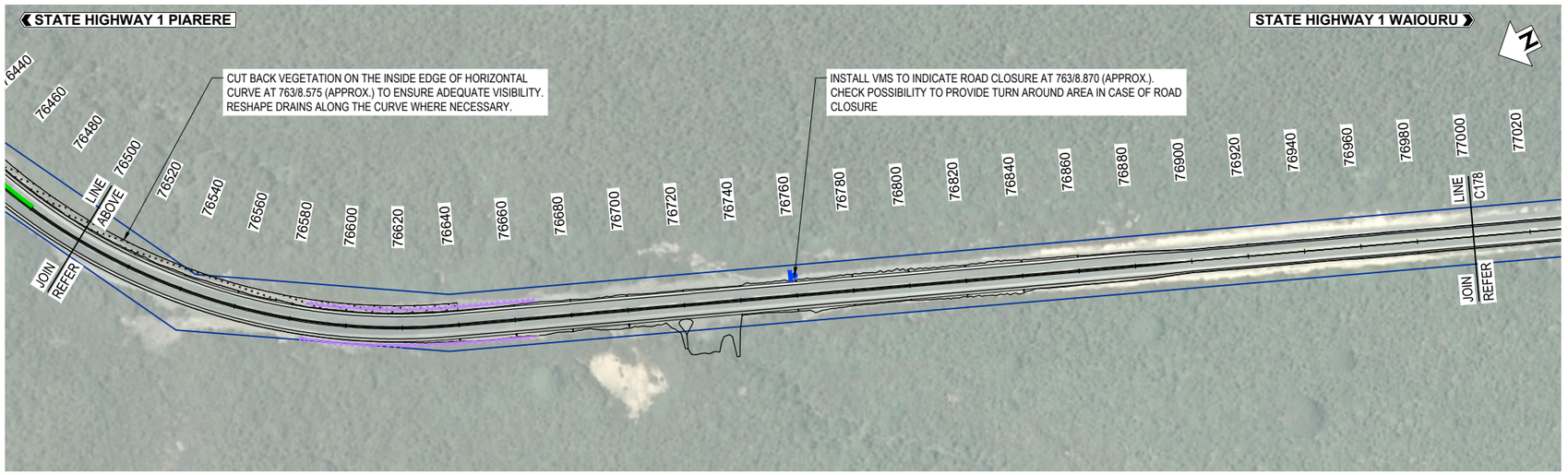


PLAN
SCALE 1 : 1000



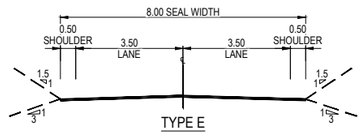
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 76000m TO 77000m

Status Stamp: WORKING PLOT
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C177
Rev.: A

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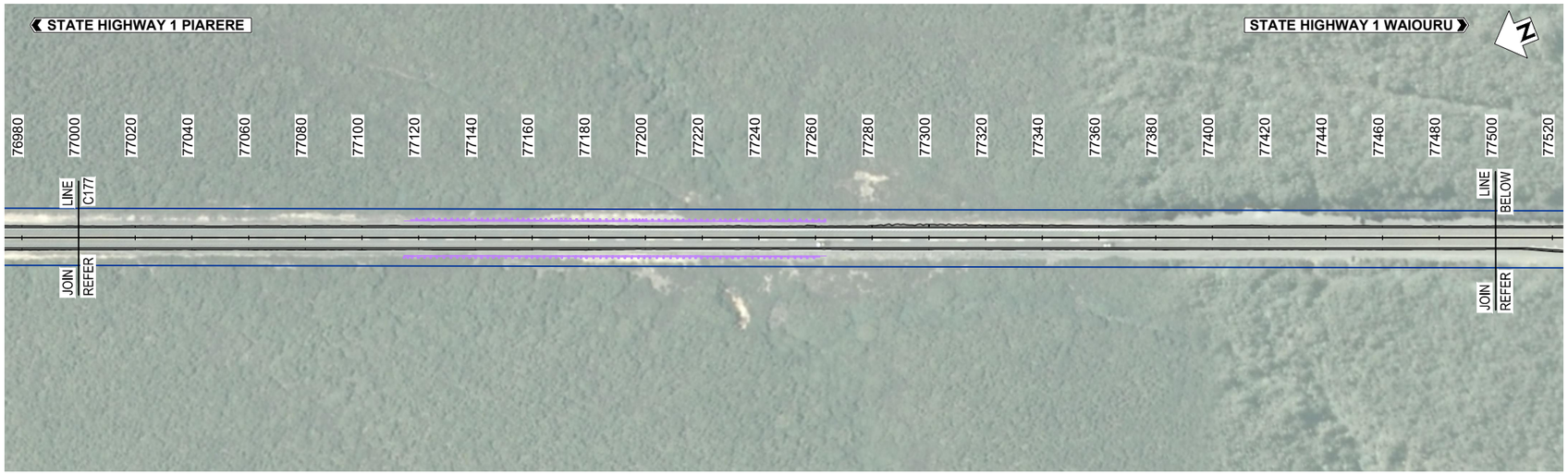
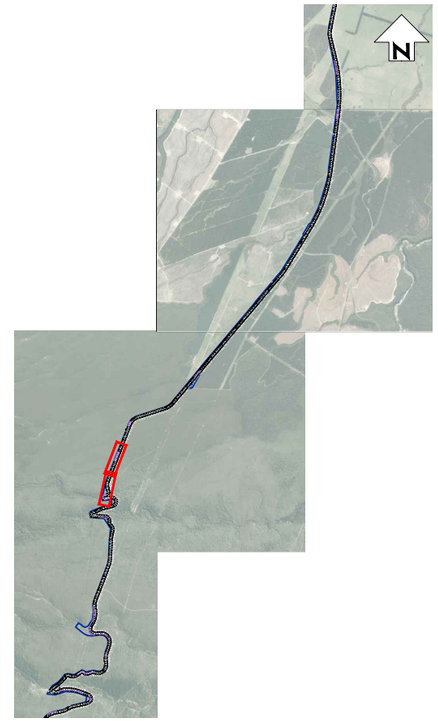
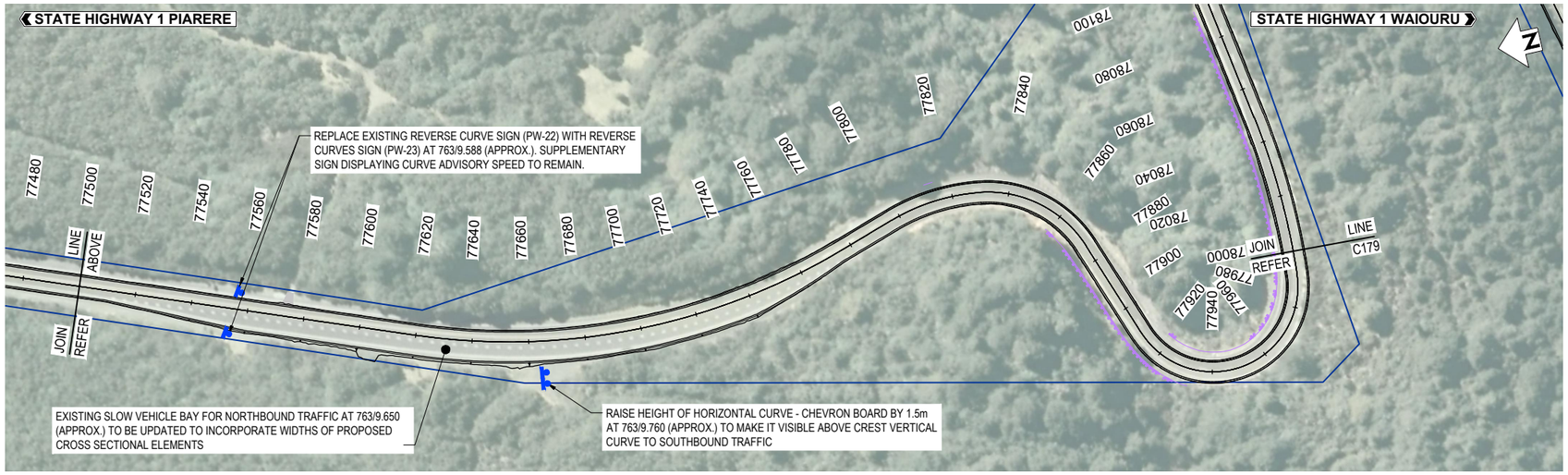
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



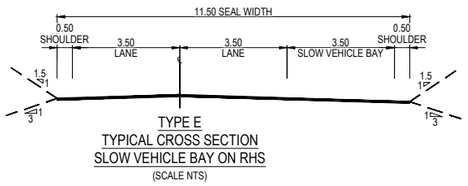
PLAN
SCALE 1 : 1000



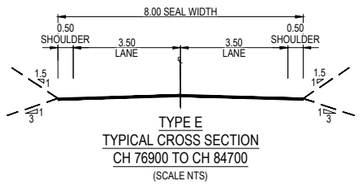
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000



TYPE E
TYPICAL CROSS SECTION
SLOW VEHICLE BAY ON RHS
(SCALE NTS)



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 77000m TO 78000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C178
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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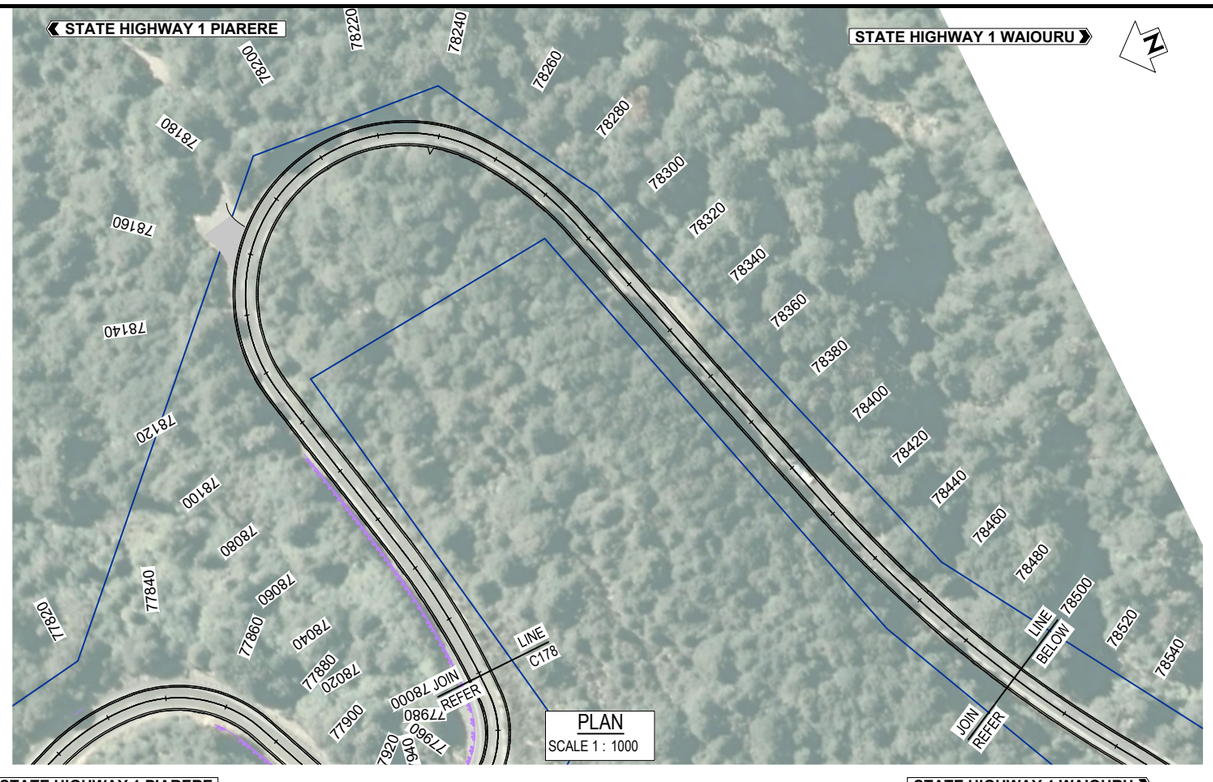
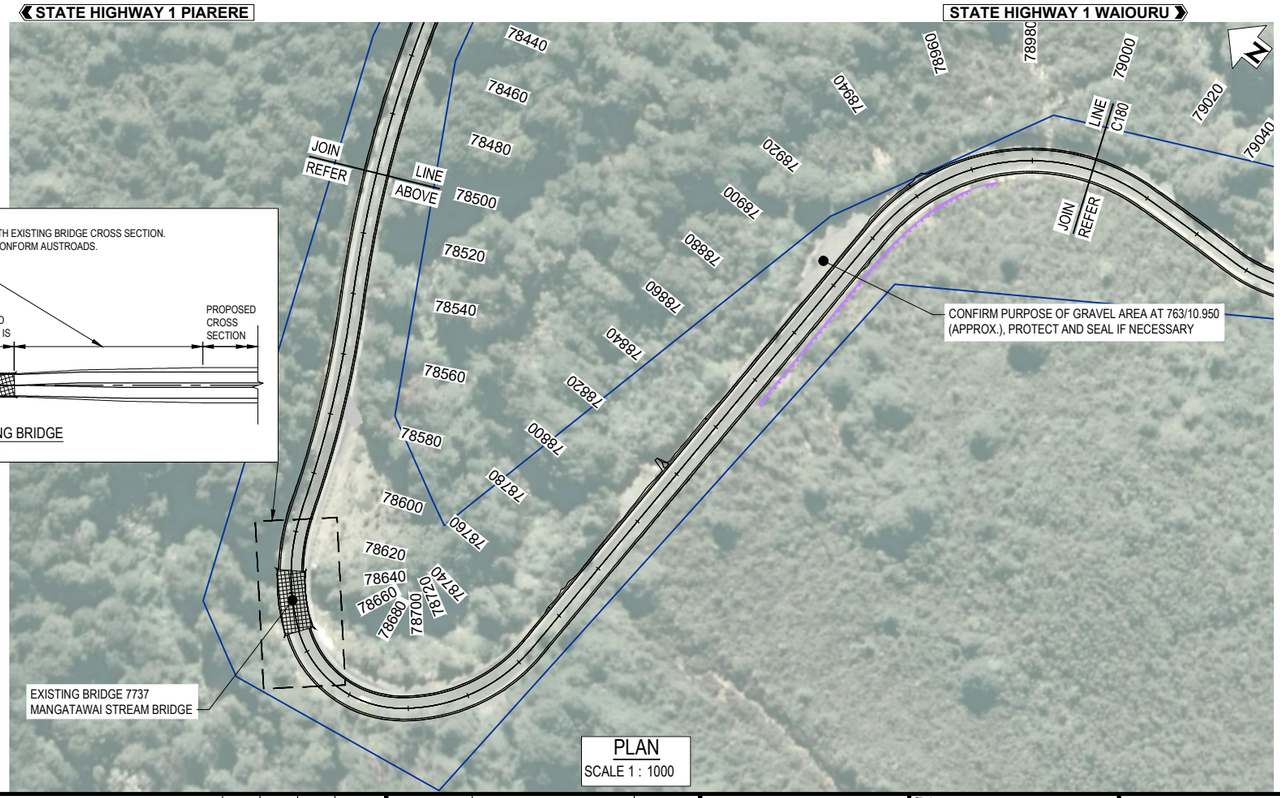


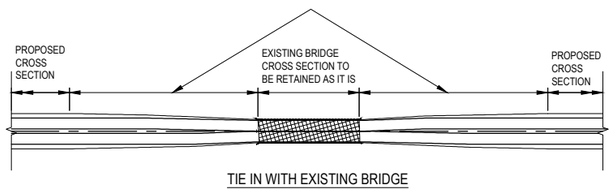
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

PROPOSED CROSS SECTION TO TIE IN WITH EXISTING BRIDGE CROSS SECTION.
MEDIAN, LANE & SHOULDER TAPERS TO CONFORM AUSTROADS.

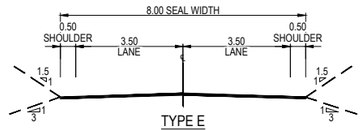


TIE IN WITH EXISTING BRIDGE
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN-
STATION 78000m TO 79000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C179
Rev.: A

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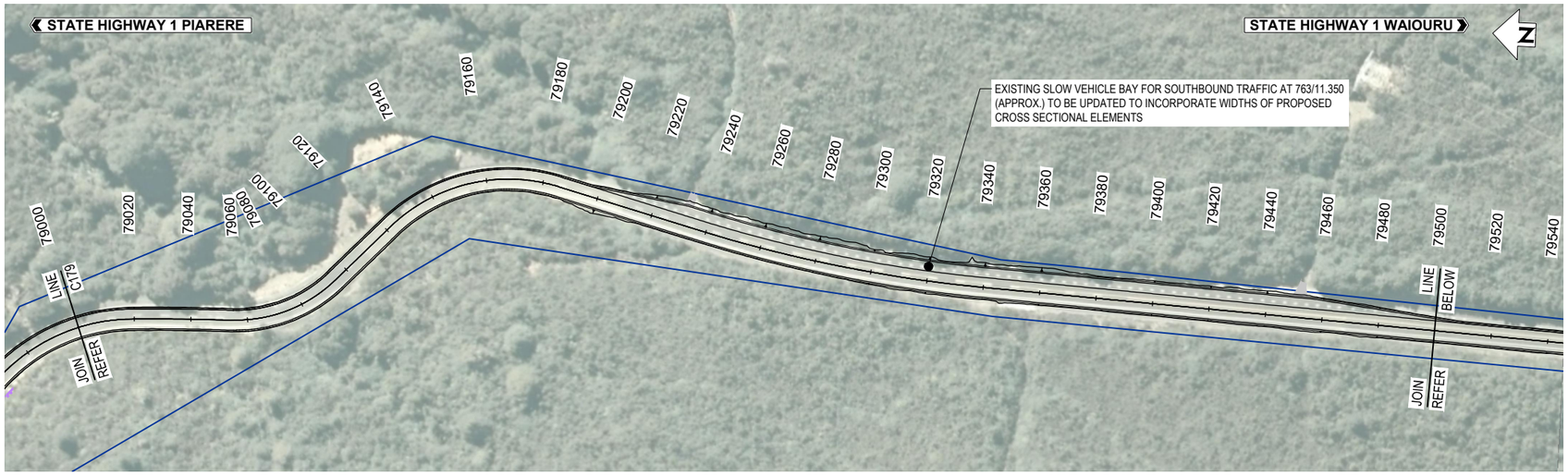
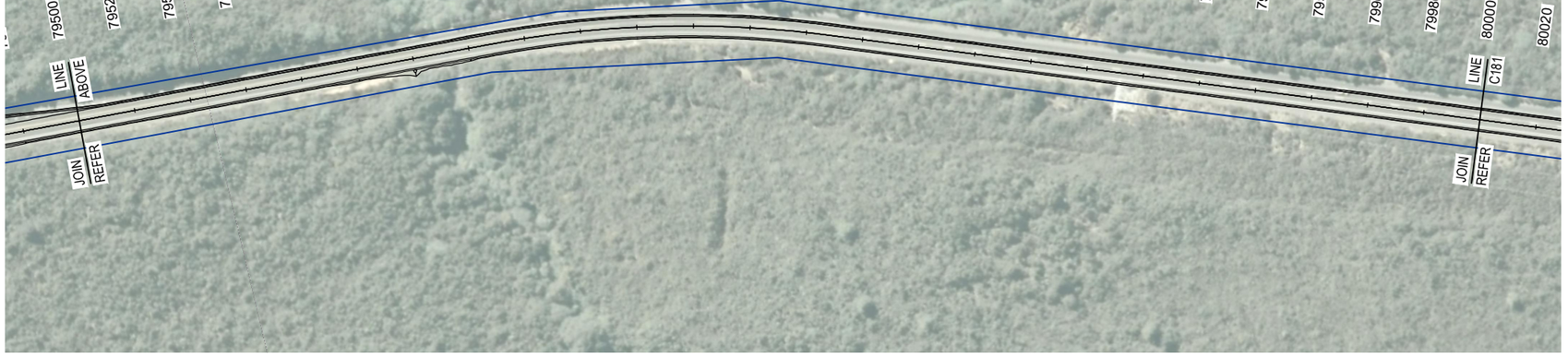
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

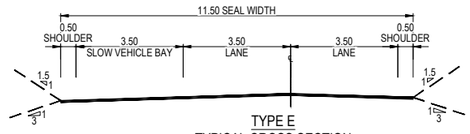


PLAN
SCALE 1 : 1000

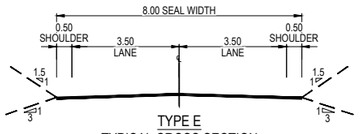
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000



TYPE E
TYPICAL CROSS SECTION
SLOW VEHICLE BAY ON LHS
(SCALE NTS)



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	**NOT APPROVED**	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 79000m TO 80000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C180
Rev.: A

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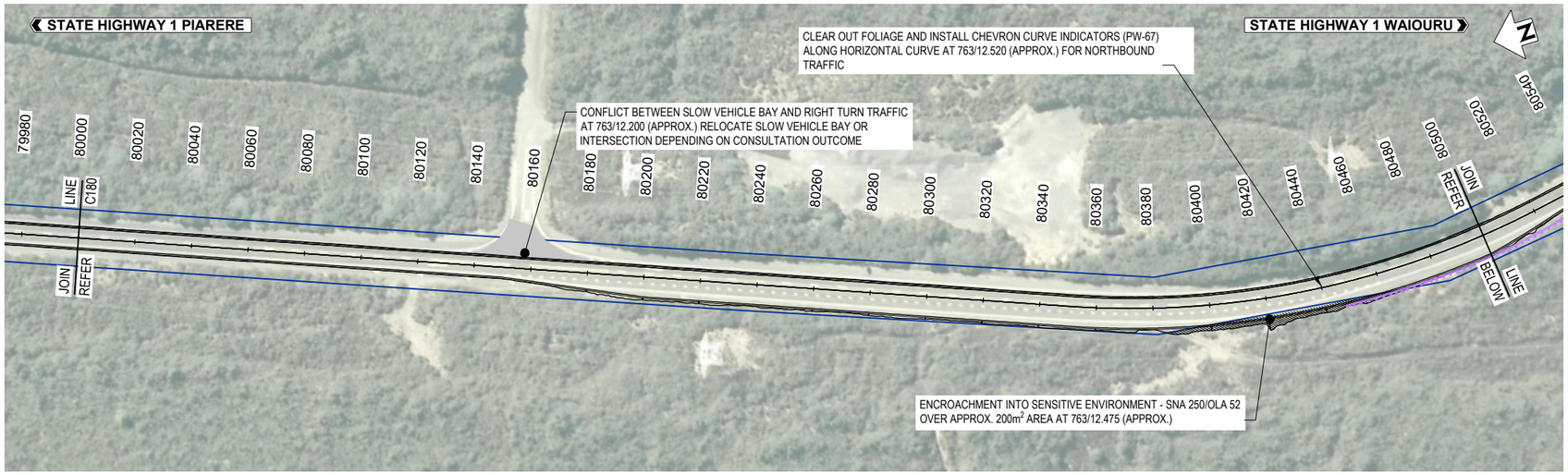
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
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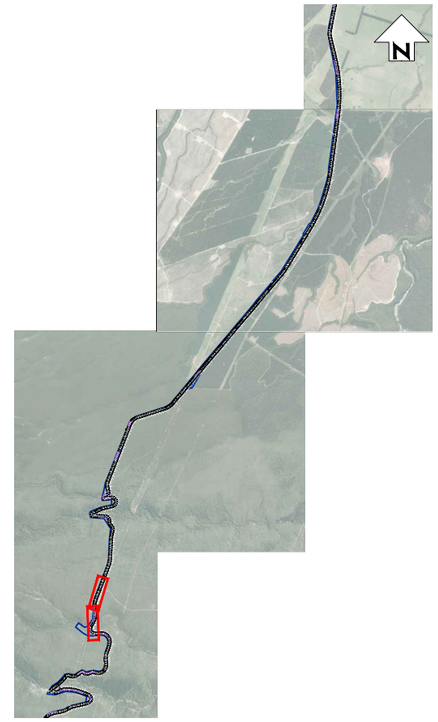
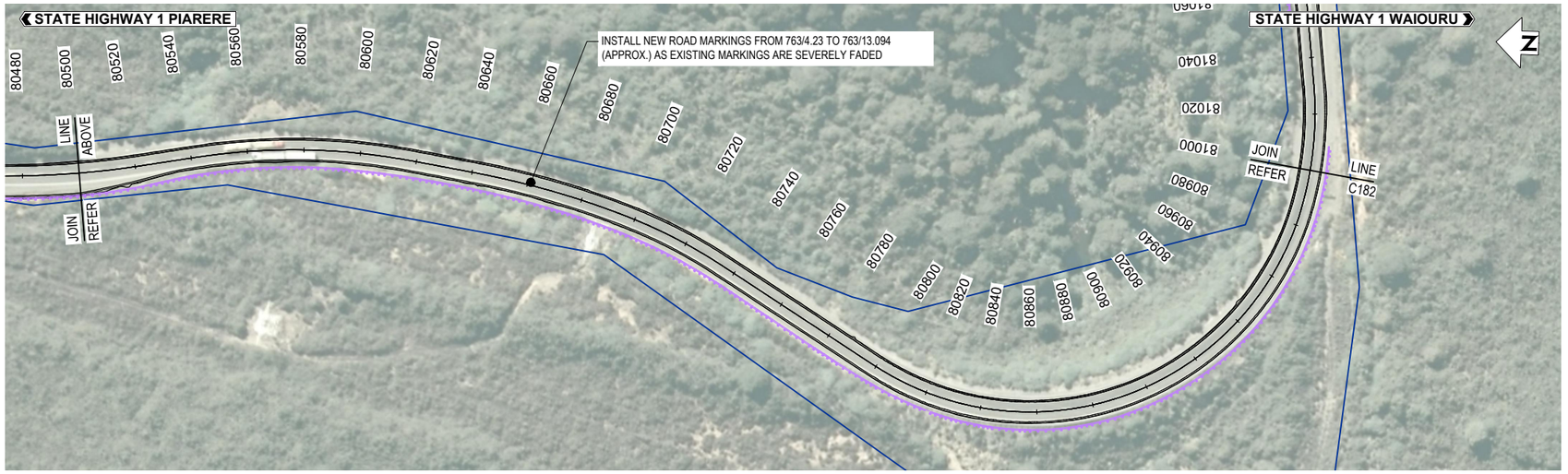


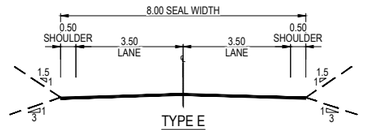
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 80000m TO 81000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C181
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
200 mm 150
ORIGINAL SIZE A1
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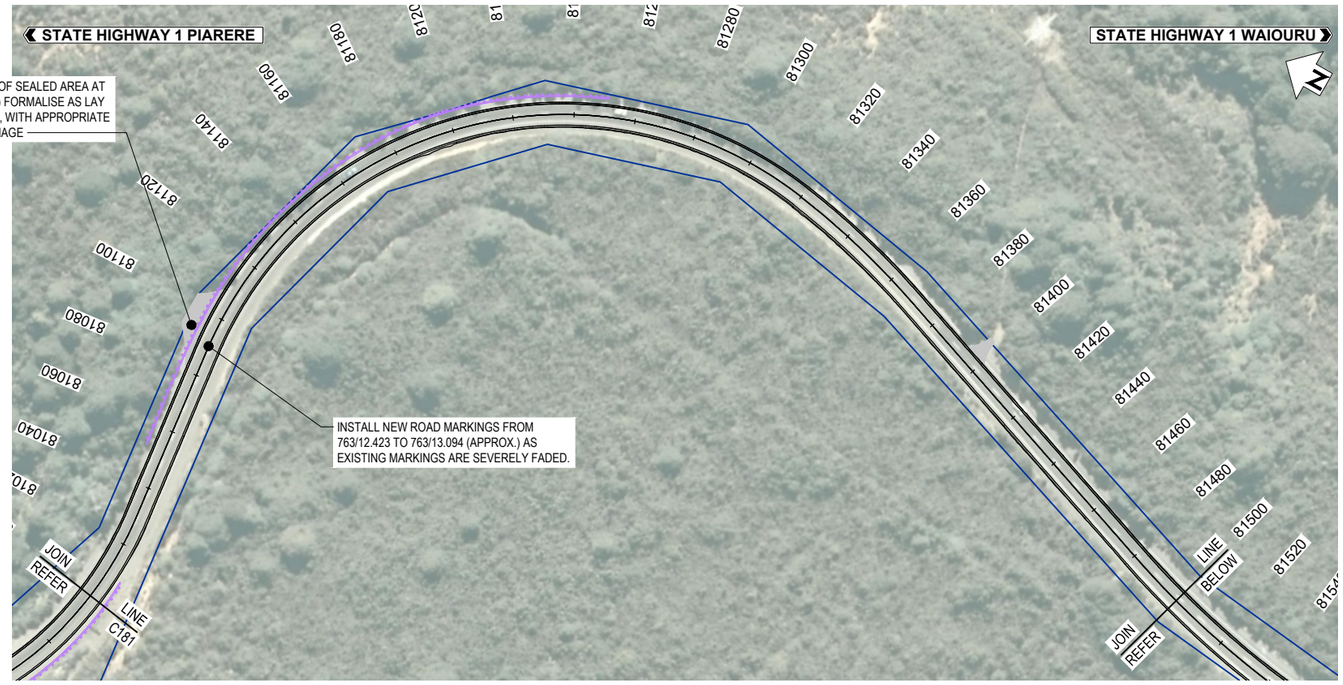
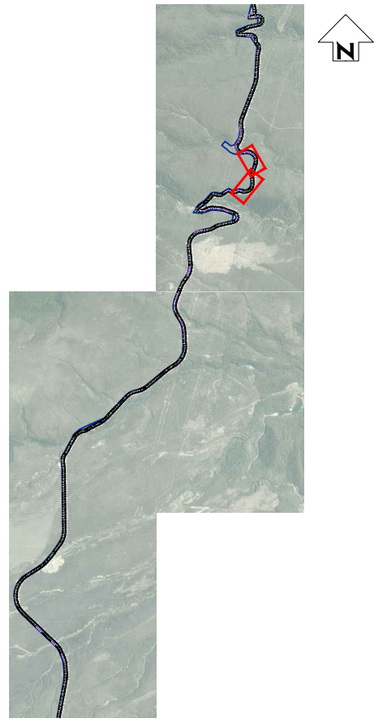


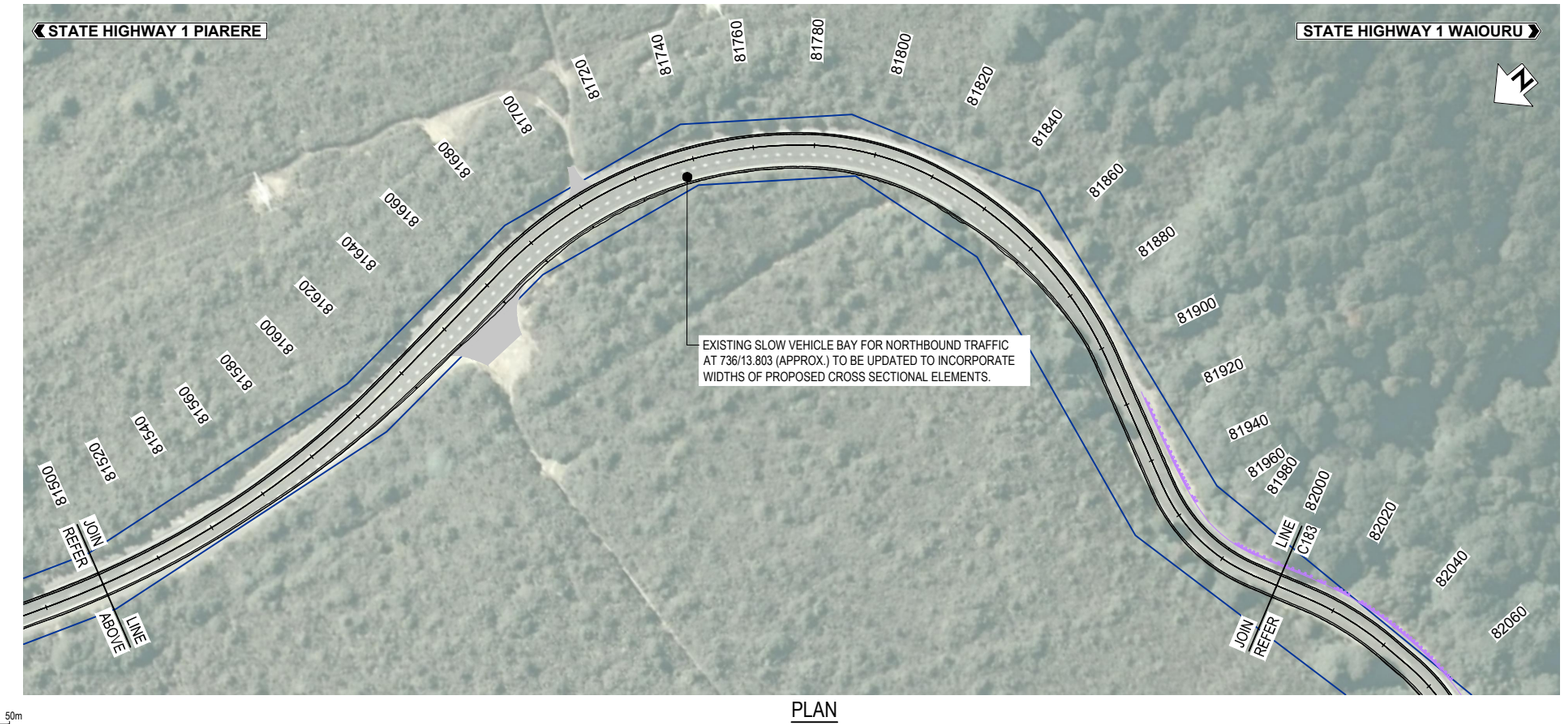
PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

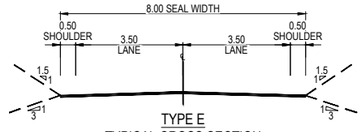
LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

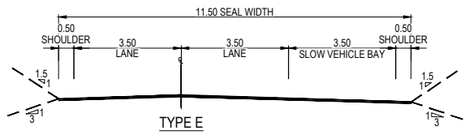


PLAN
SCALE 1 : 1000

10 0 10 20 30 40 50m
SCALE 1:1000



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)



TYPE E
TYPICAL CROSS SECTION
SLOW VEHICLE BAY ON RHS
(SCALE NTS)

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 81000m TO 82000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C182
Rev.: A

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ORIGINAL SIZE A1
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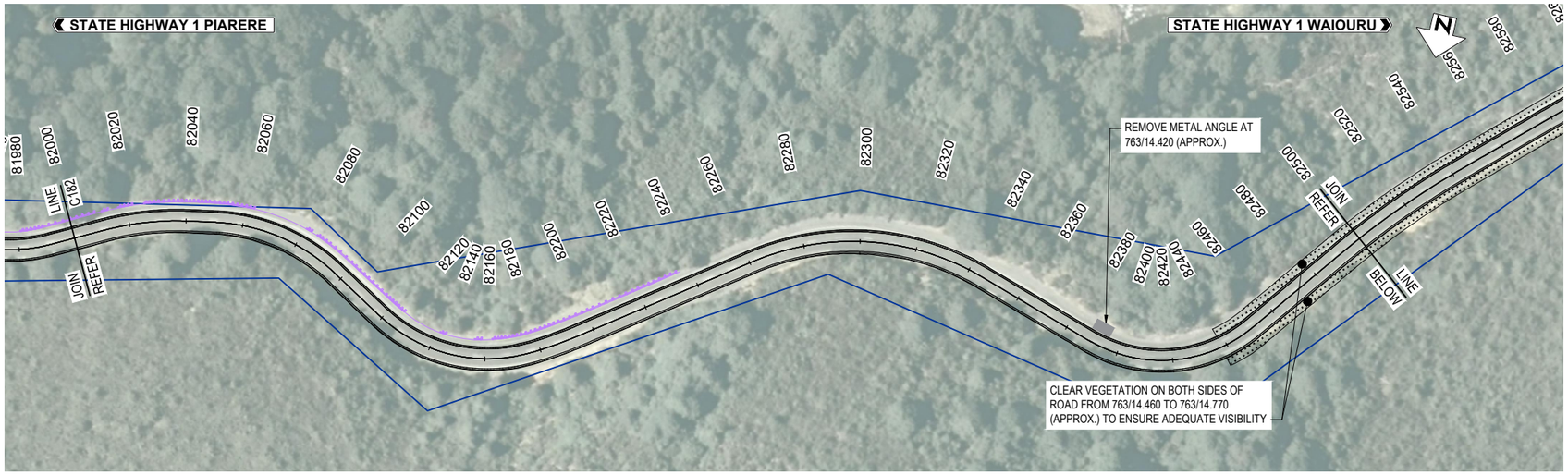
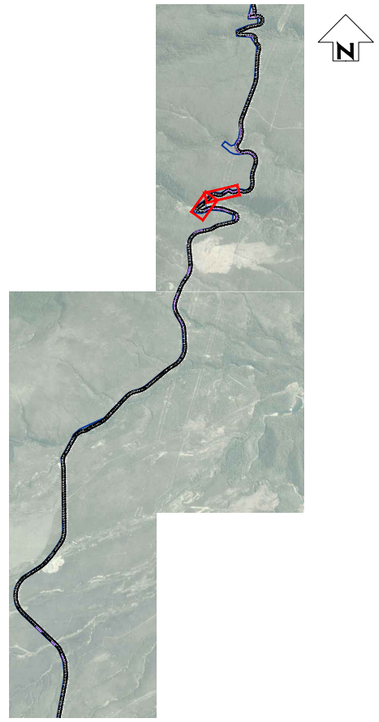
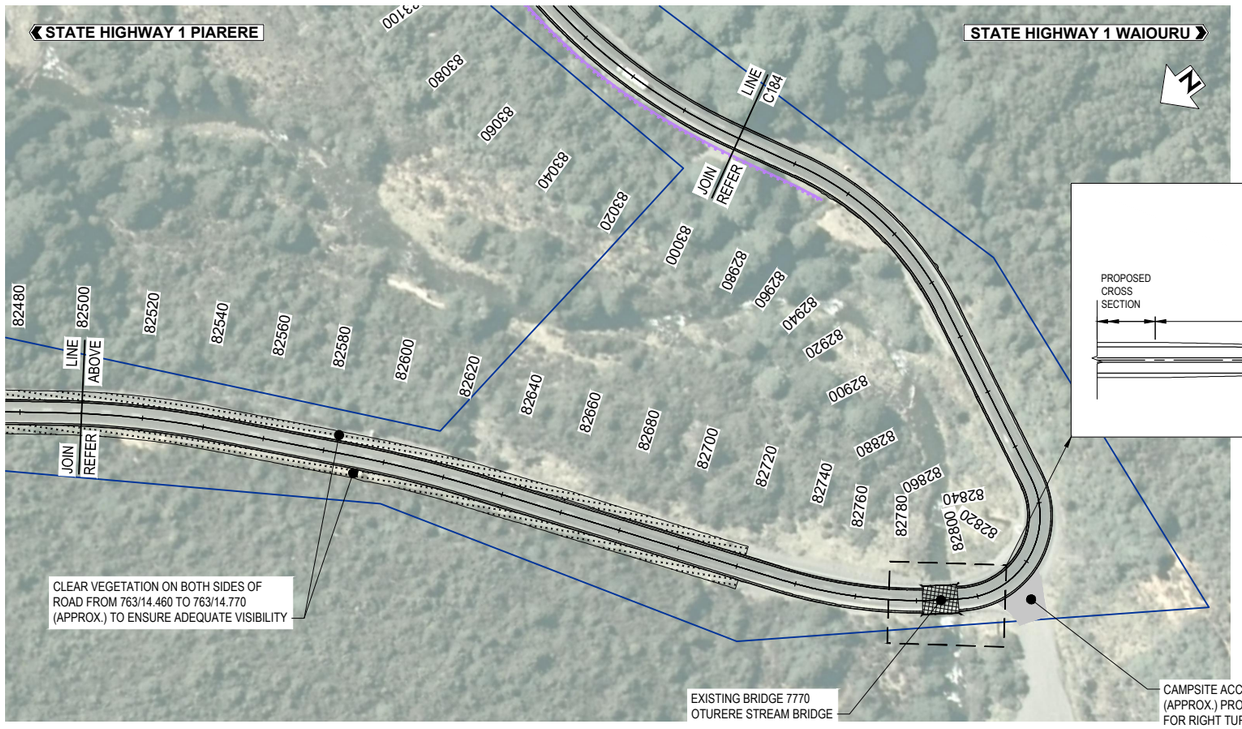


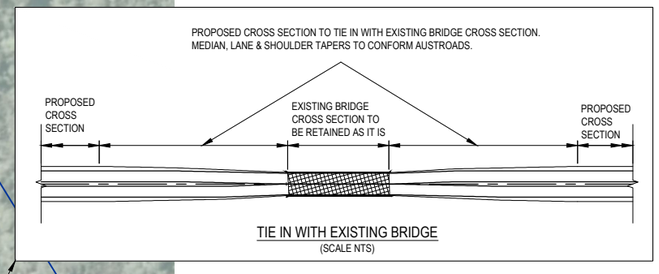
PLAN
SCALE 1 : 1000



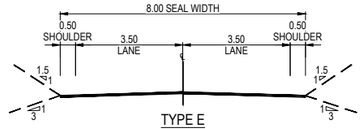
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000



TIE IN WITH EXISTING BRIDGE
(SCALE NTS)



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN-
STATION 82000m TO 83000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C183
Rev.: A

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ORIGINAL SIZE A1
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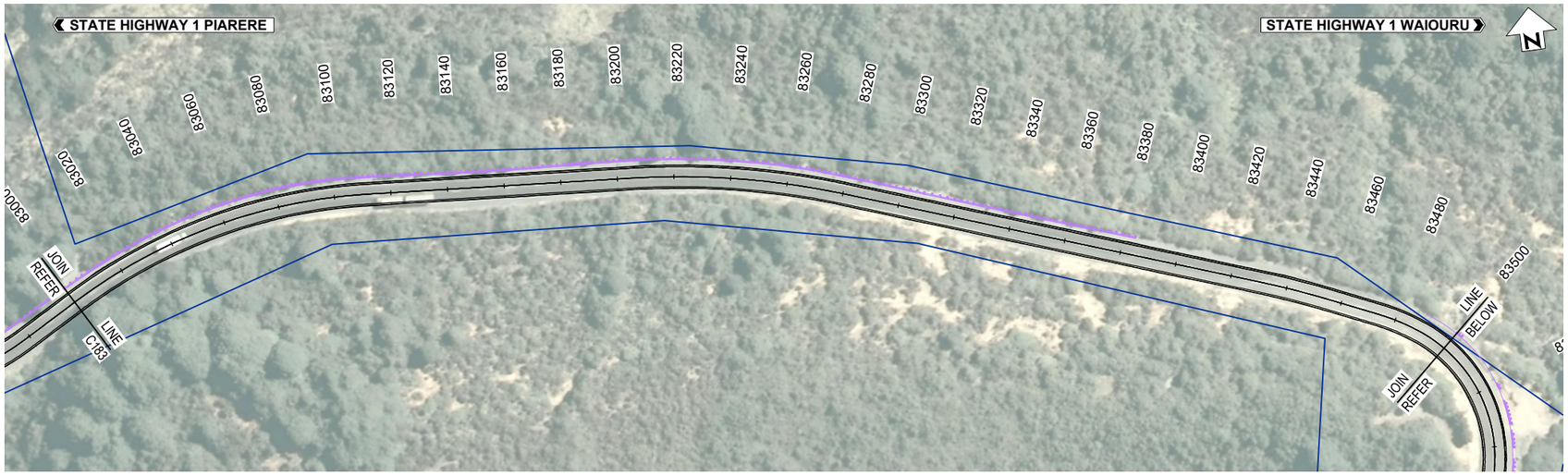
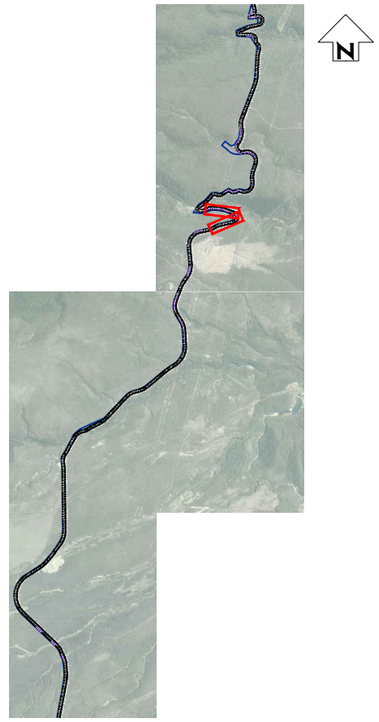
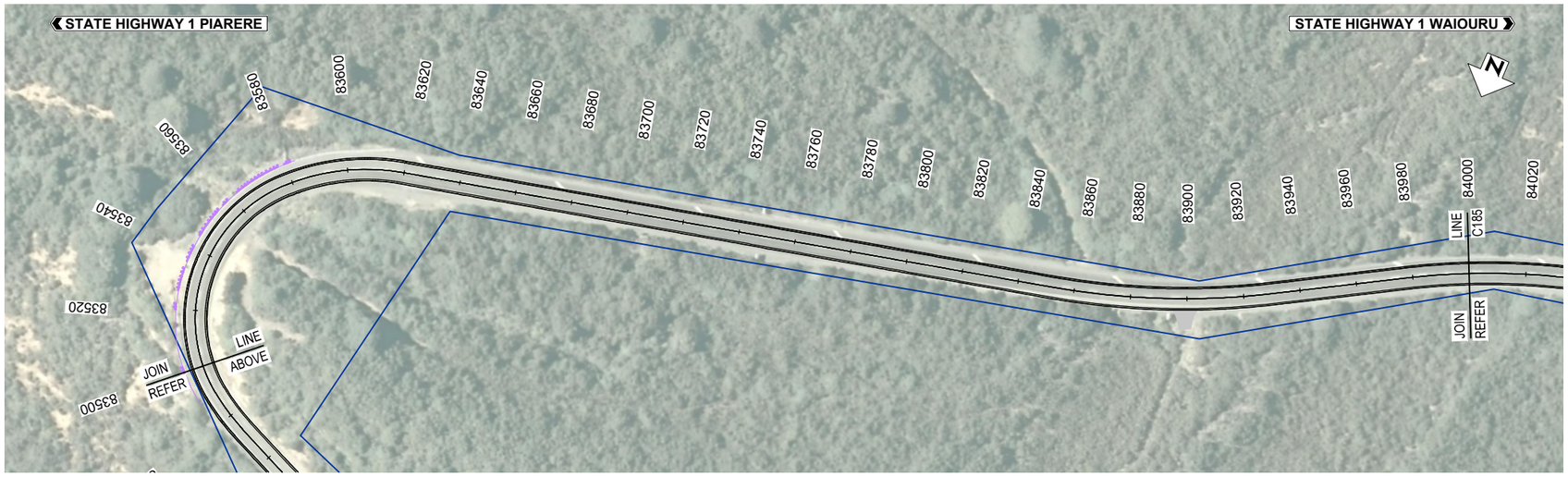


PLAN
SCALE 1 : 1000

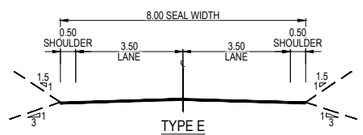


LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	NOT APPROVED
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 83000m TO 84000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C184
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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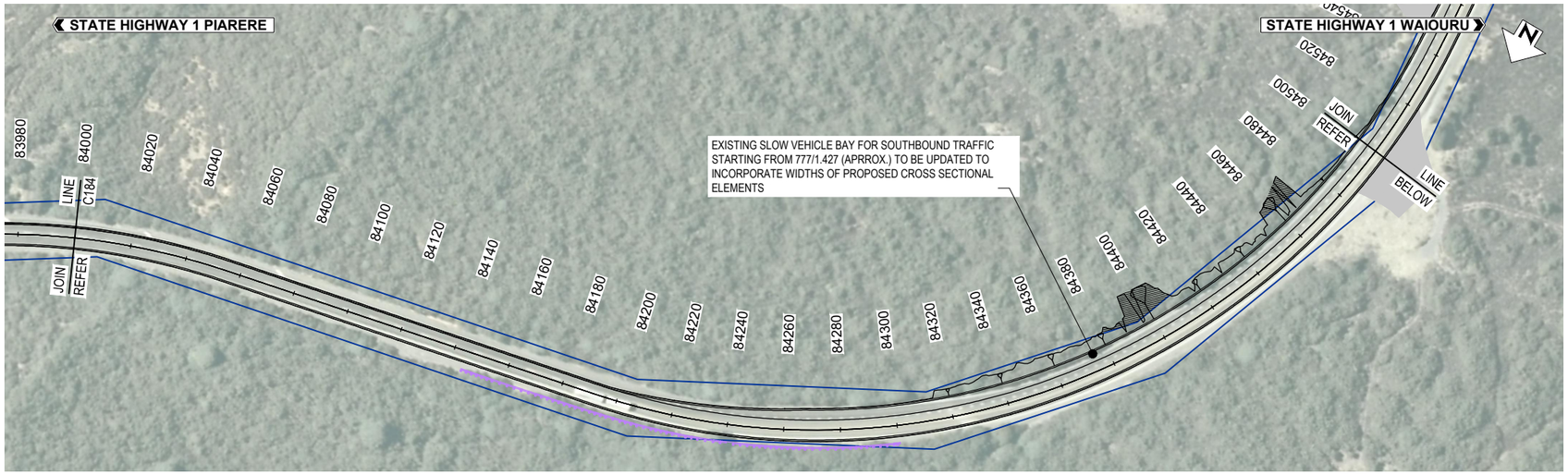
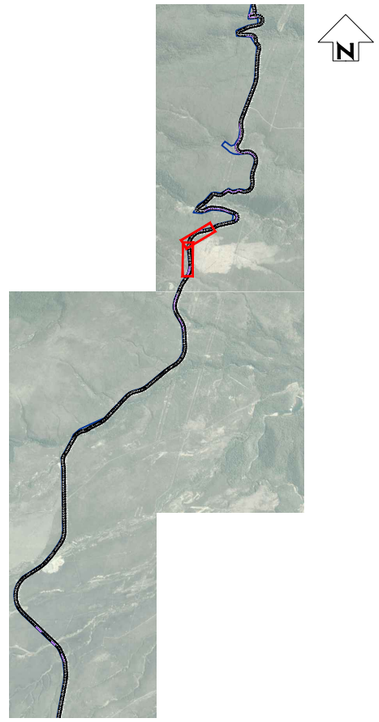
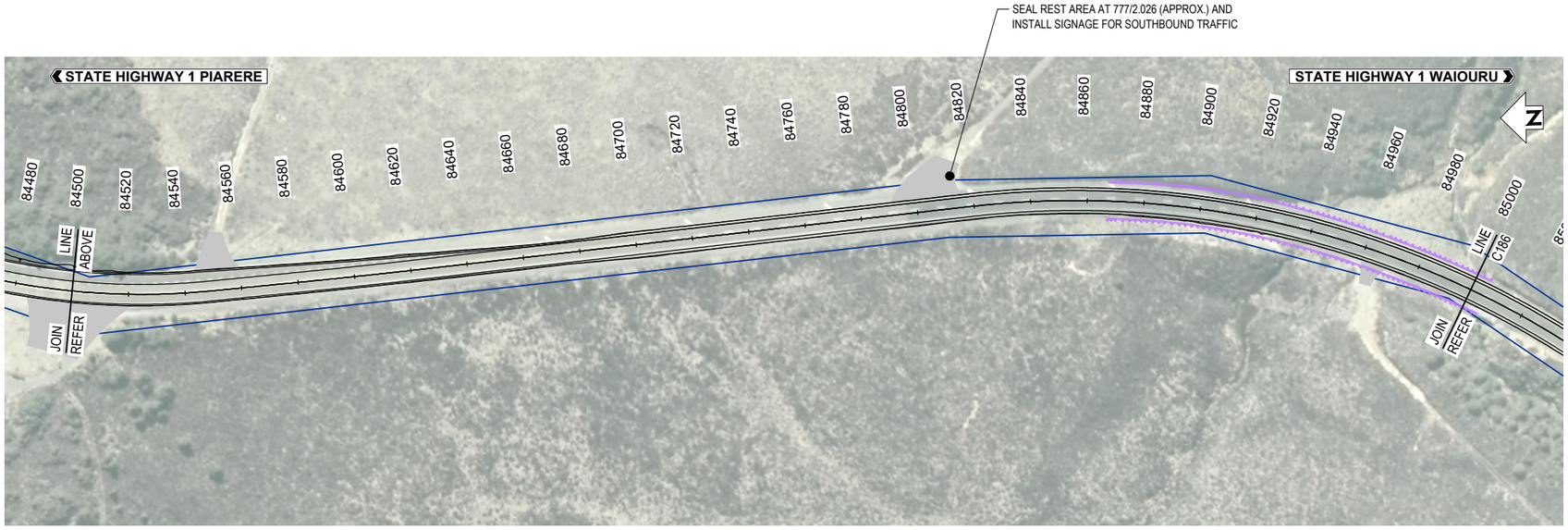


PLAN
SCALE 1 : 1000



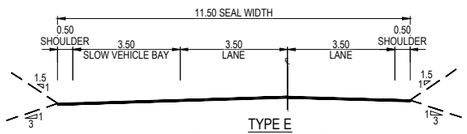
LOCATION PLAN
SCALE : NTS



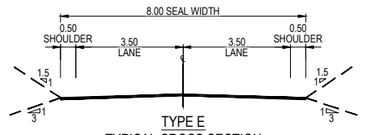
PLAN
SCALE 1 : 1000

LEGEND

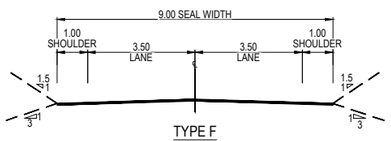
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE E
TYPICAL CROSS SECTION
SLOW VEHICLE BAY ON LHS
(SCALE NTS)



TYPE E
TYPICAL CROSS SECTION
CH 76900 TO CH 84700
(SCALE NTS)



TYPE F
TYPICAL CROSS SECTION
CH 84700 TO CH 86100
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 84000m TO 85000m

Status Stamp: WORKING PLOT
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C185
Rev.: A

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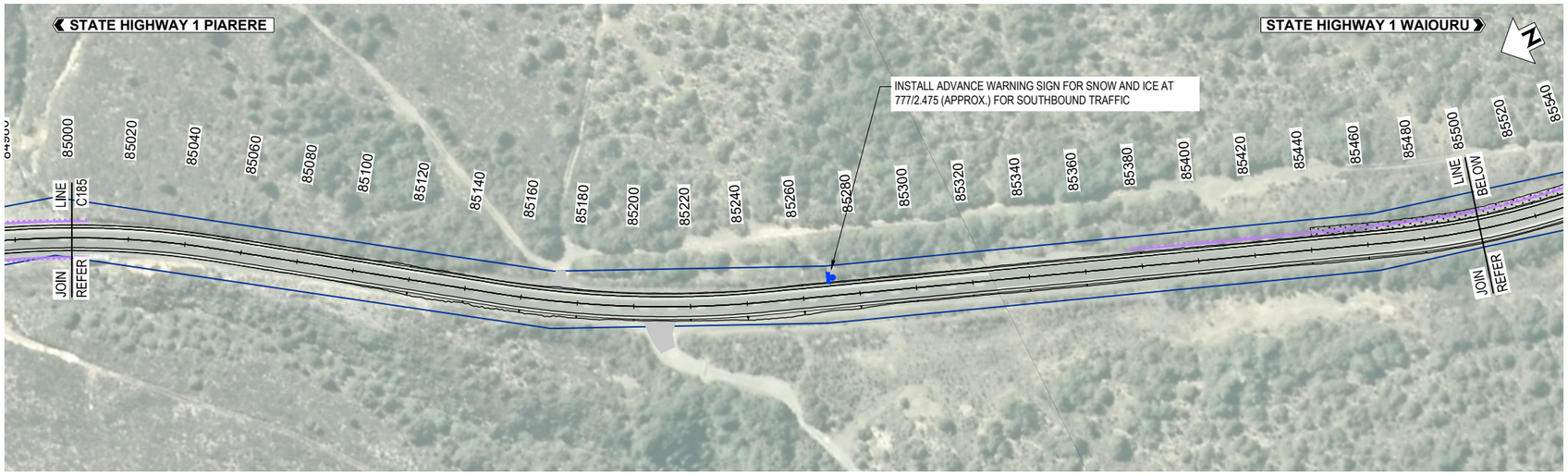
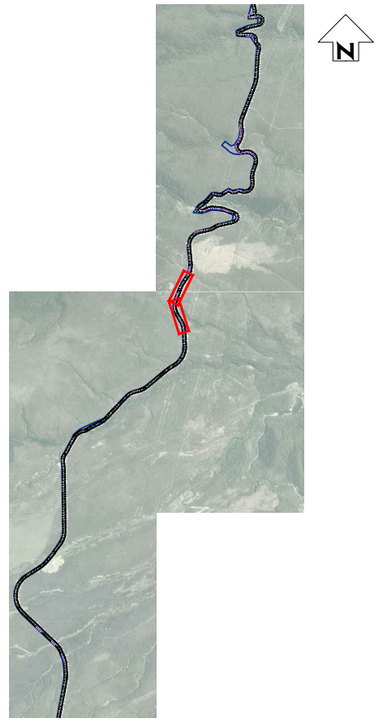
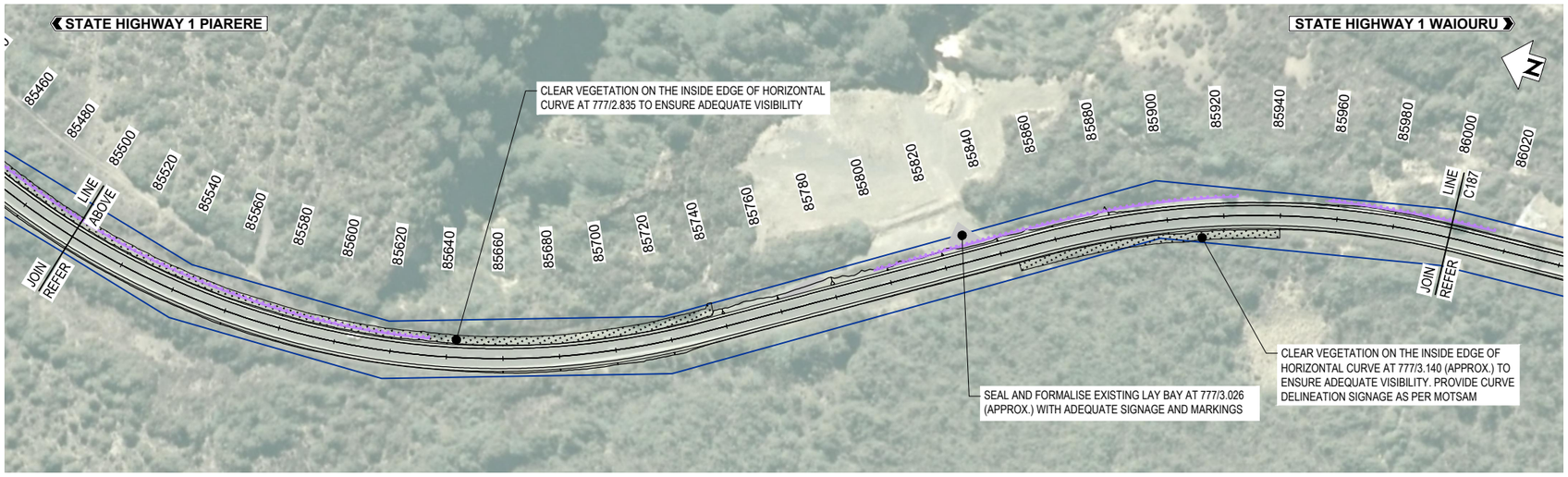
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



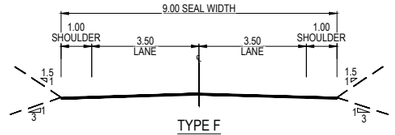
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE F
TYPICAL CROSS SECTION
CH 84700 TO CH 86100
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 85000m TO 86000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C186
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
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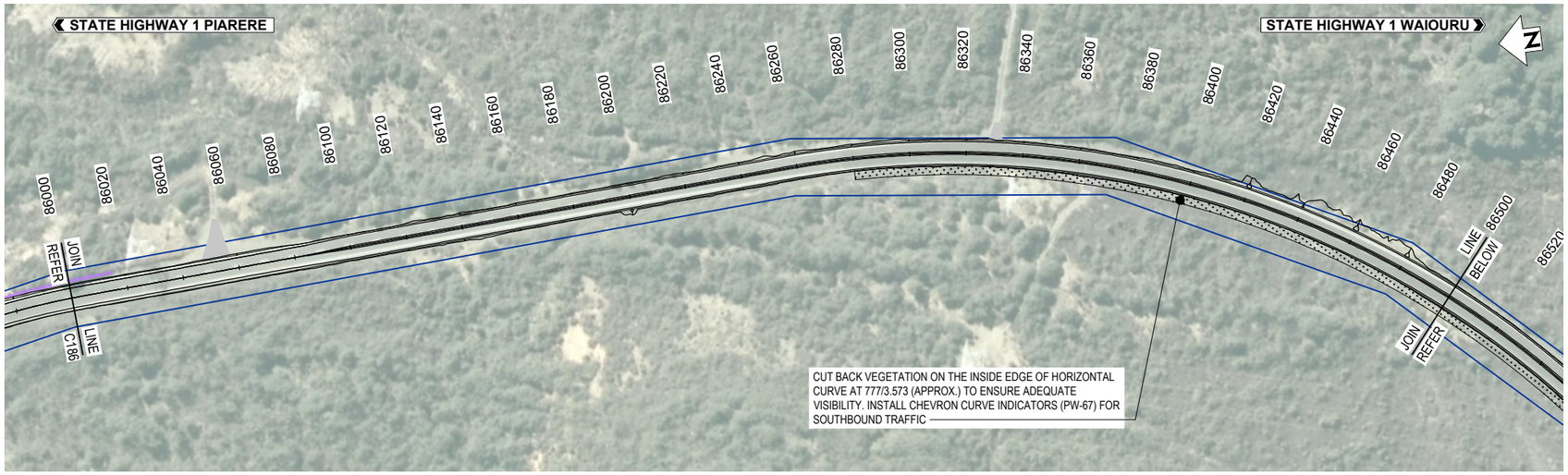
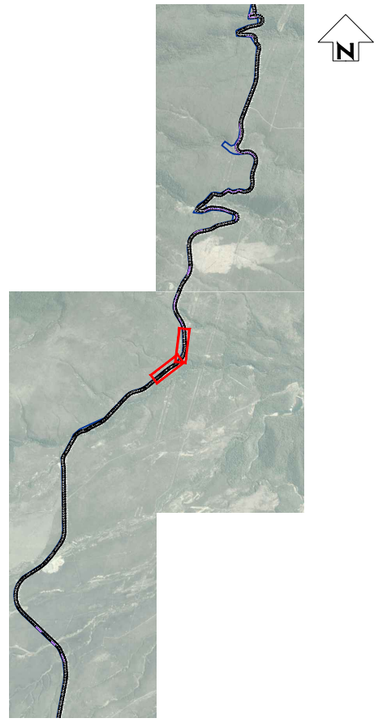
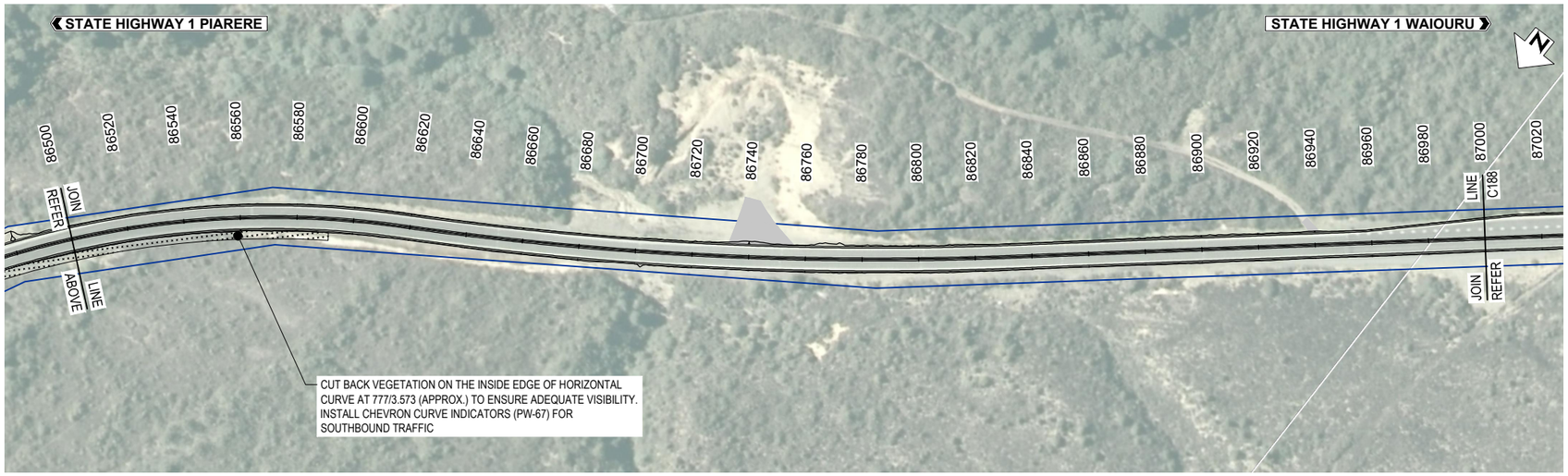


PLAN
SCALE 1 : 1000



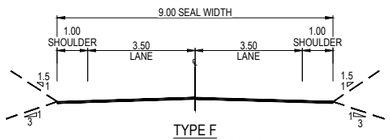
LOCATION PLAN
SCALE : NTS



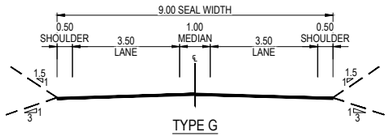
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE F
TYPICAL CROSS SECTION
CH 84700 TO CH 86100
(SCALE NTS)



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 86000m TO 87000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C187
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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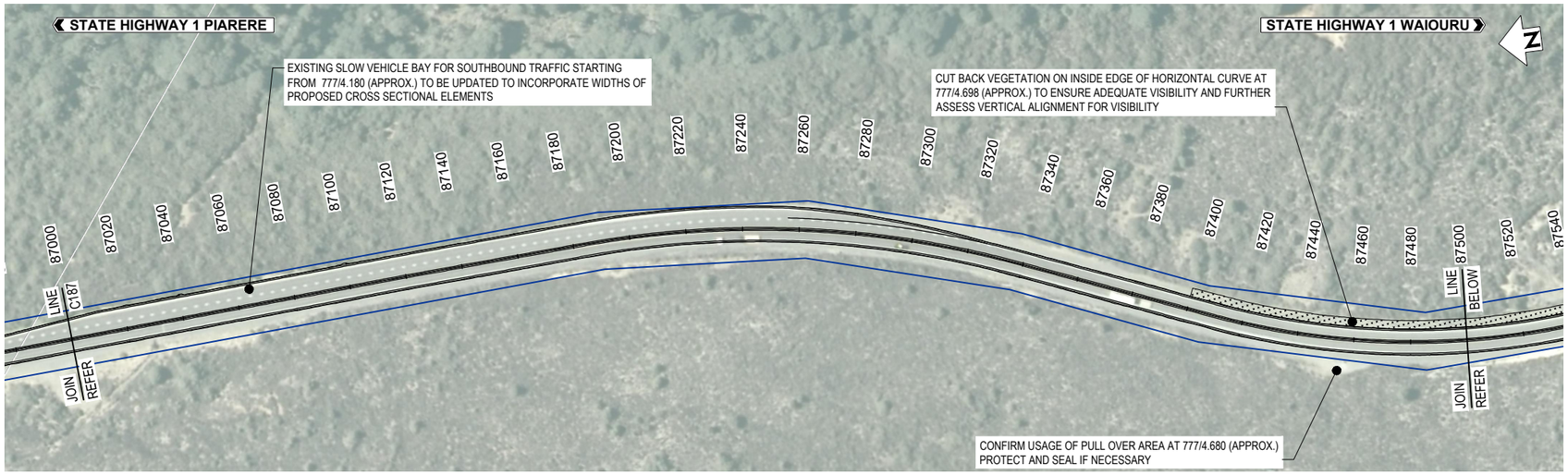
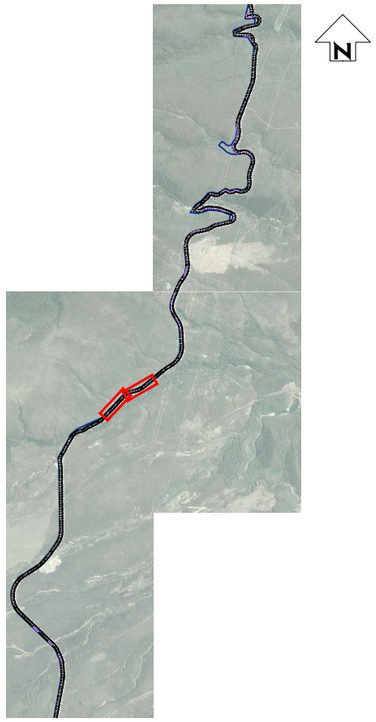
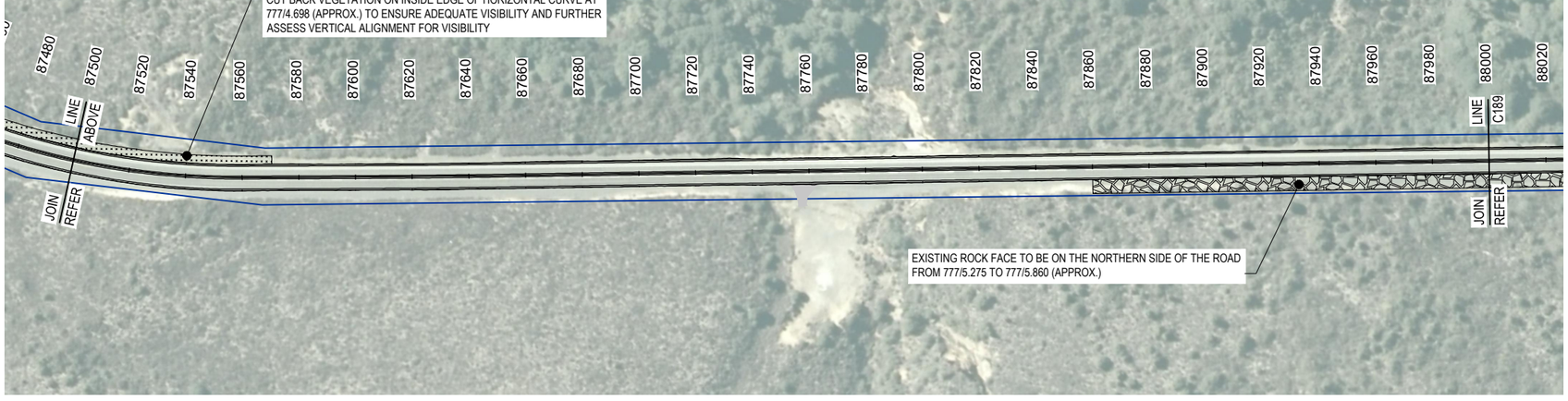


PLAN
SCALE 1 : 1000

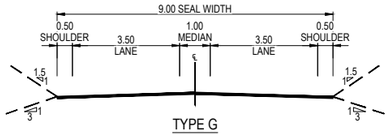


LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



PLAN
SCALE 1 : 1000



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 87000m TO 88000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C188
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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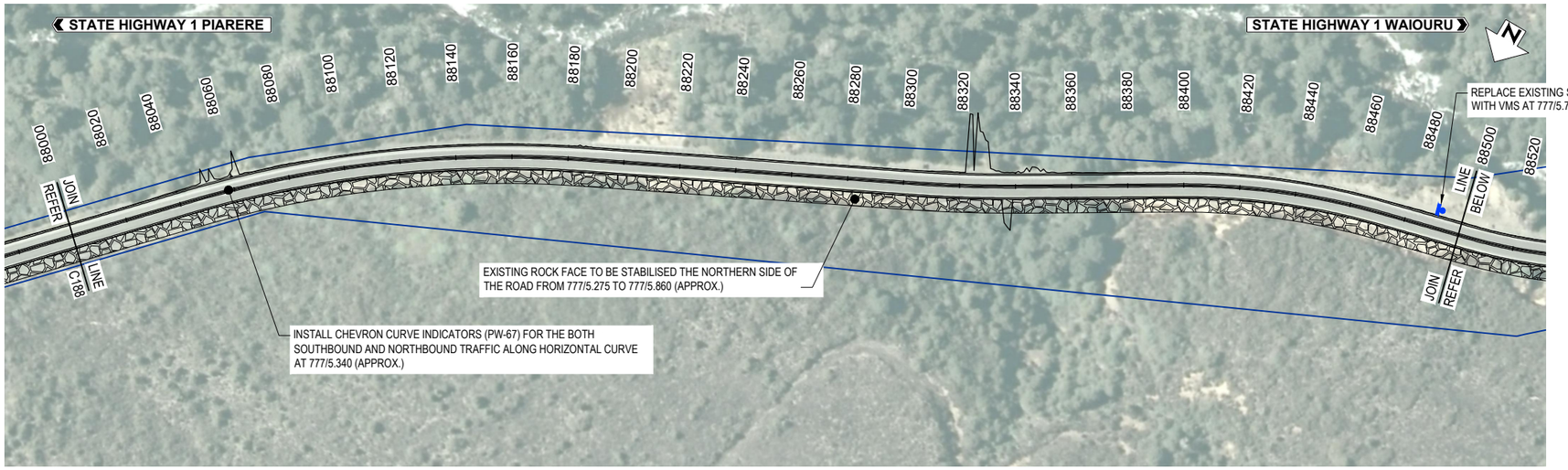
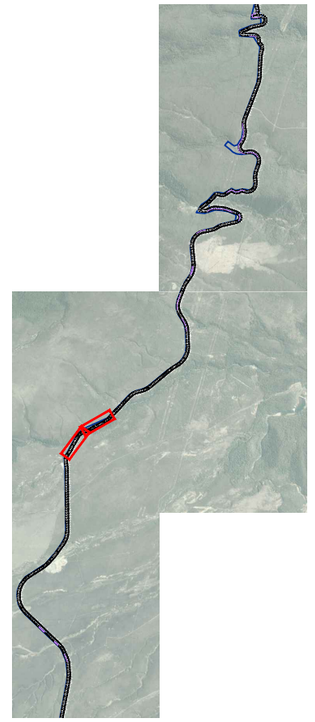
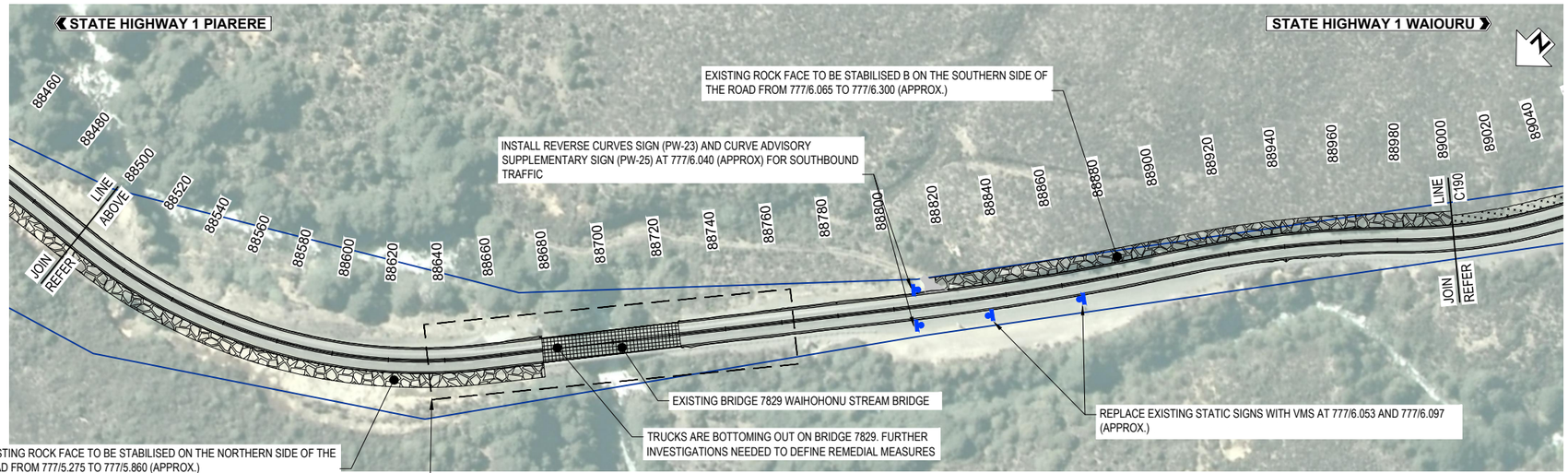


PLAN
SCALE 1 : 1000



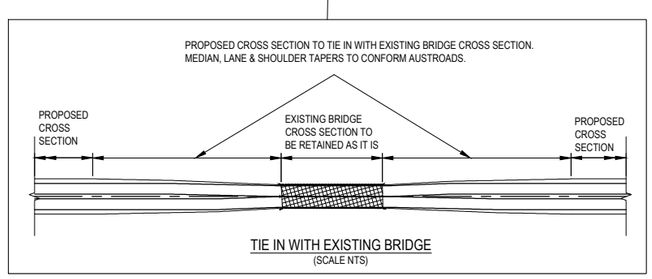
LOCATION PLAN
SCALE : NTS



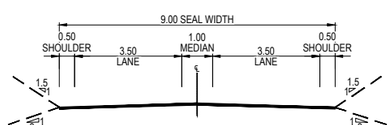
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TIE IN WITH EXISTING BRIDGE
(SCALE NTS)



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 88000m TO 89000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C189
Rev.: A

Last modified: Feb 18 2020 By Dattatray Ghundre
ORIGINAL SIZE A1
DO NOT SCALE - IF IN DOUBT, ASK

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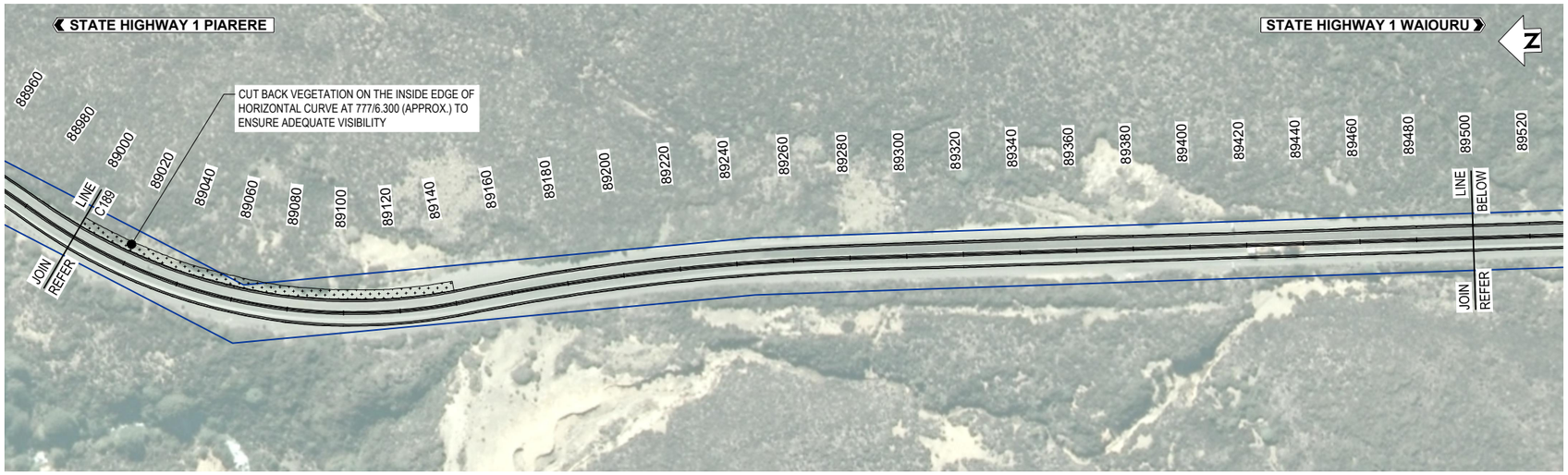
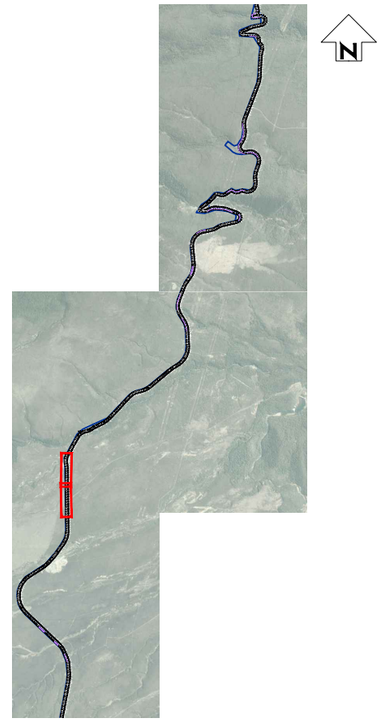
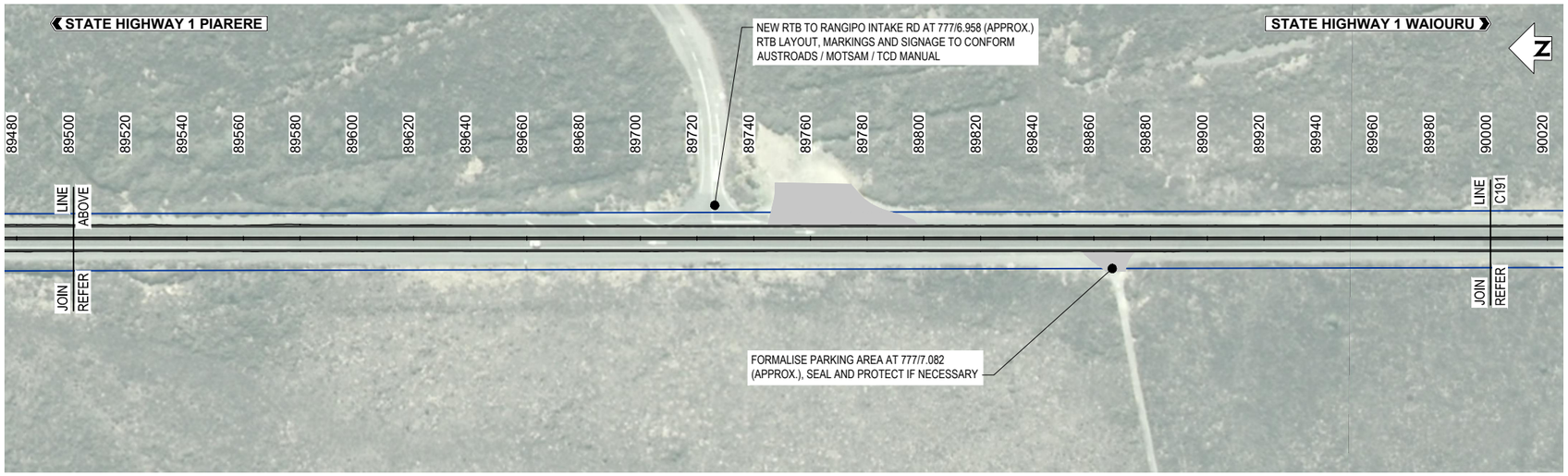


PLAN
SCALE 1 : 1000



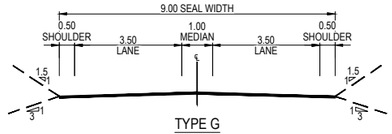
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 89000m TO 90000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C190
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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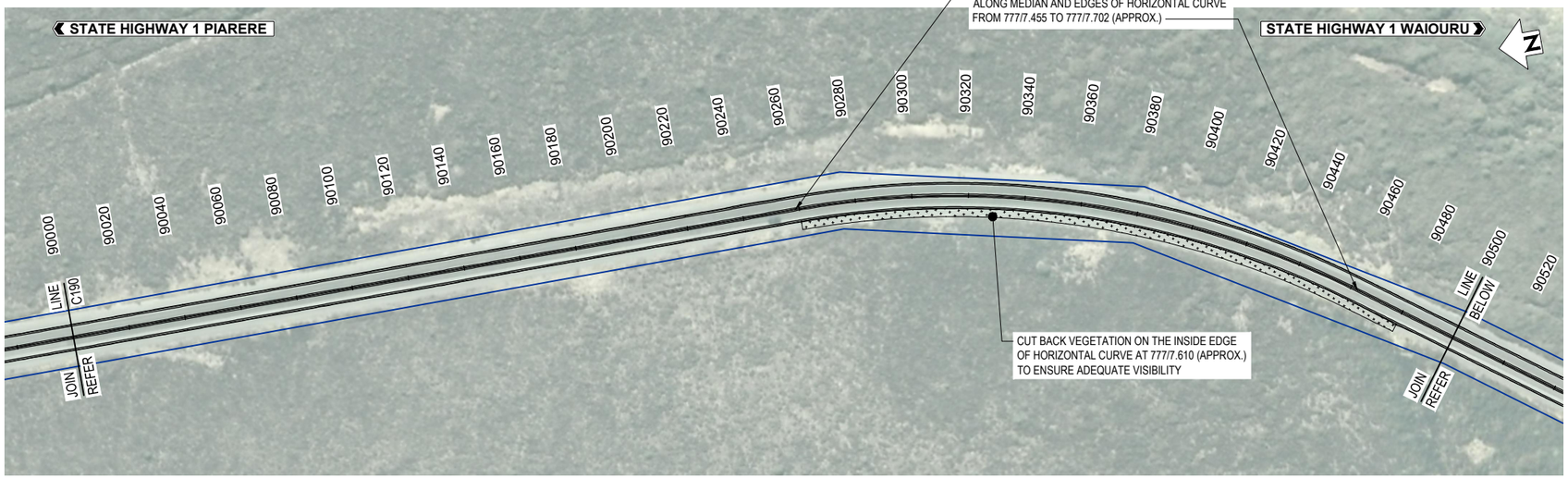
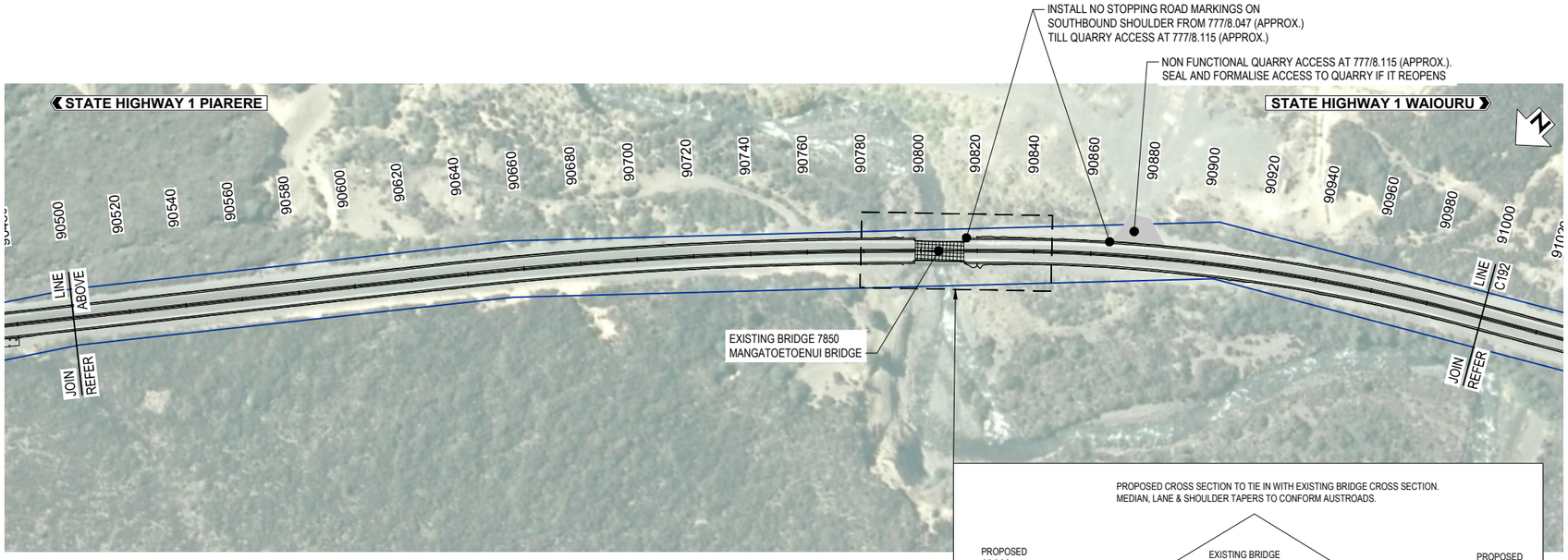
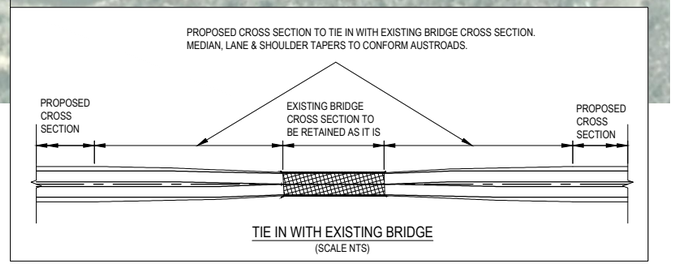


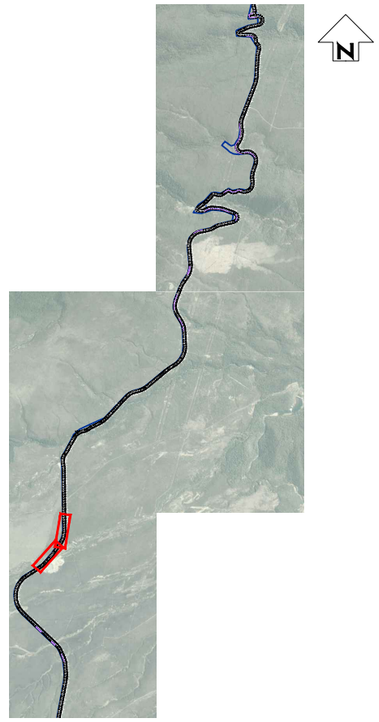
PLAN
SCALE 1 : 1000



PLAN
SCALE 1 : 1000



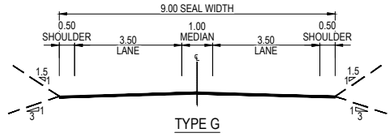
TIE IN WITH EXISTING BRIDGE
(SCALE NTS)



LOCATION PLAN
SCALE : NTS

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 90000m TO 91000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C191
Rev.: A

ORIGINAL SIZE A1
DO NOT SCALE - IF IN DOUBT, ASK
Last modified: Feb 18 2020 By Dattatray Ghundre

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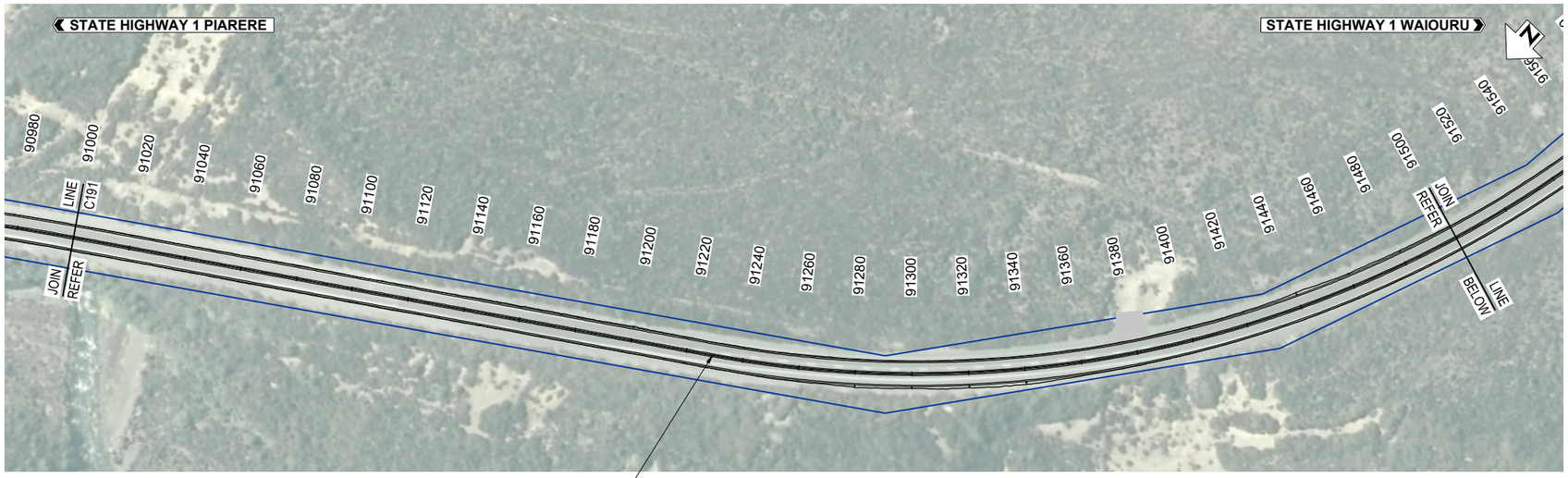
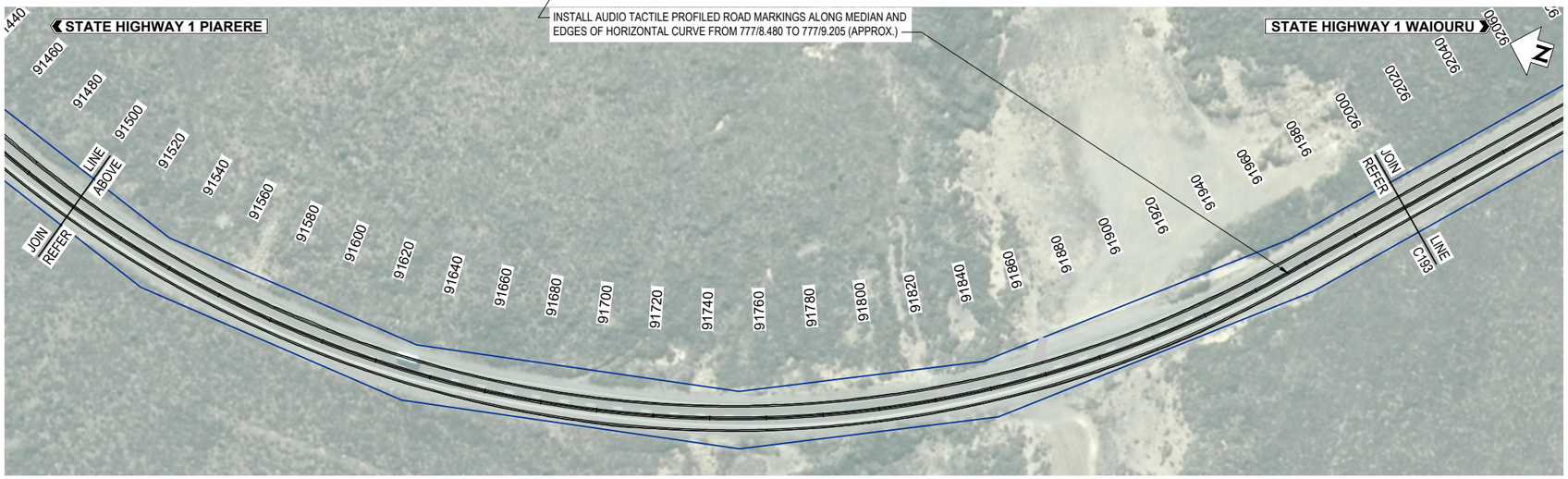


PLAN
SCALE 1 : 1000

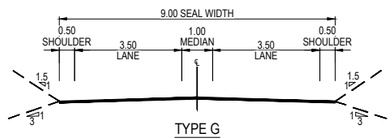
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 91000m TO 92000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C192
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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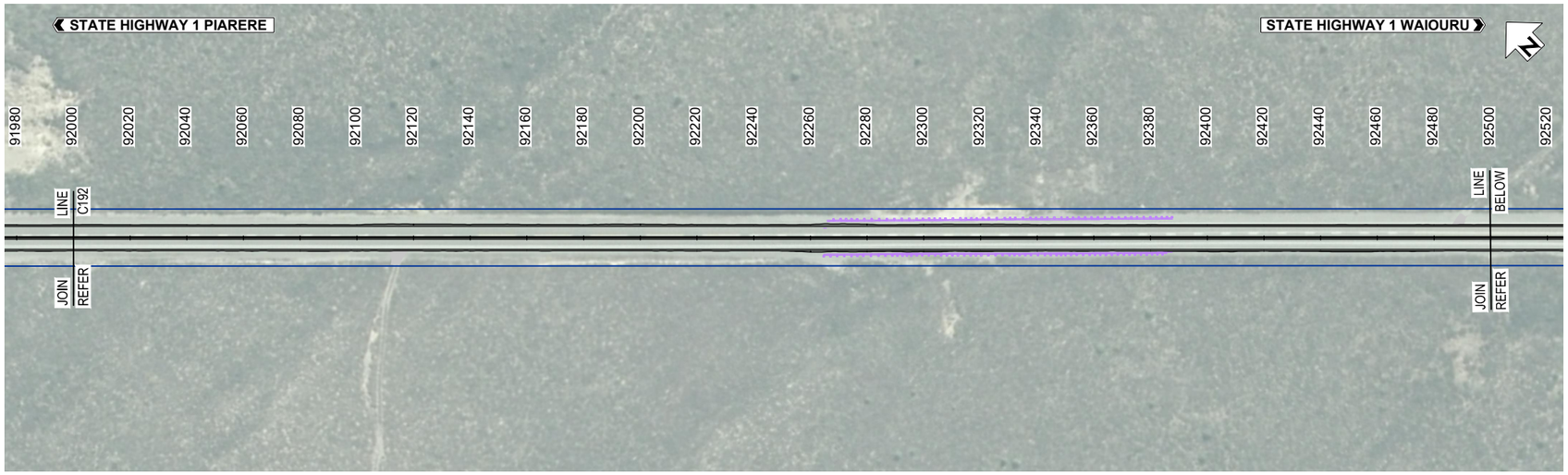


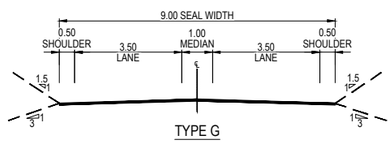
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 92000m TO 93000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C193
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre
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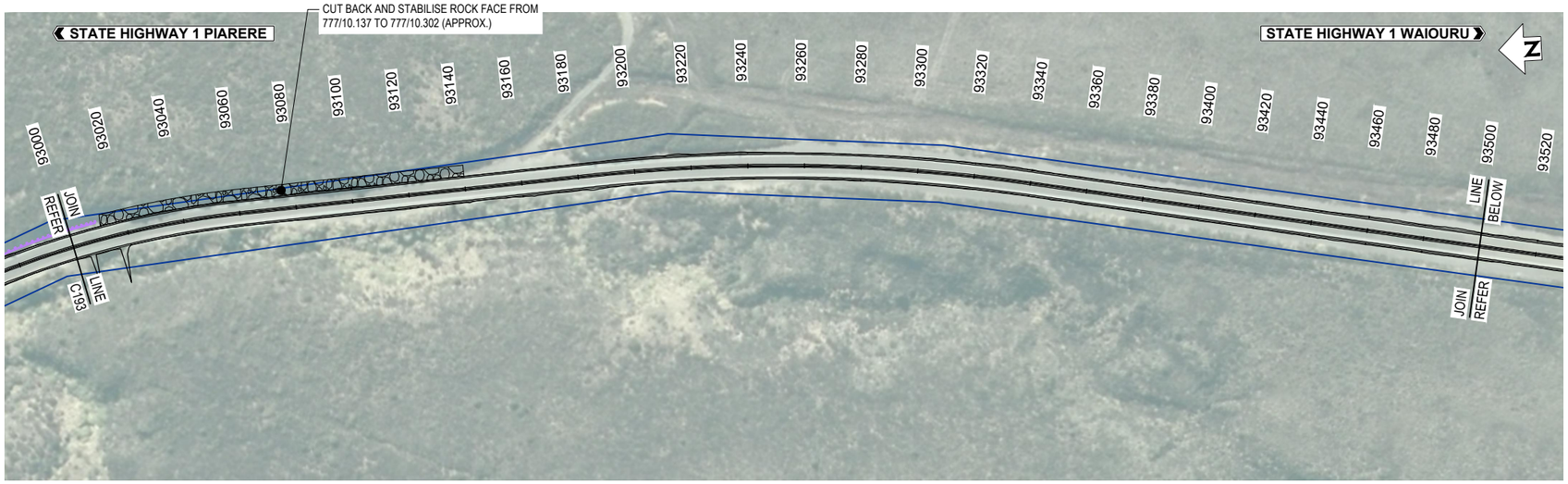
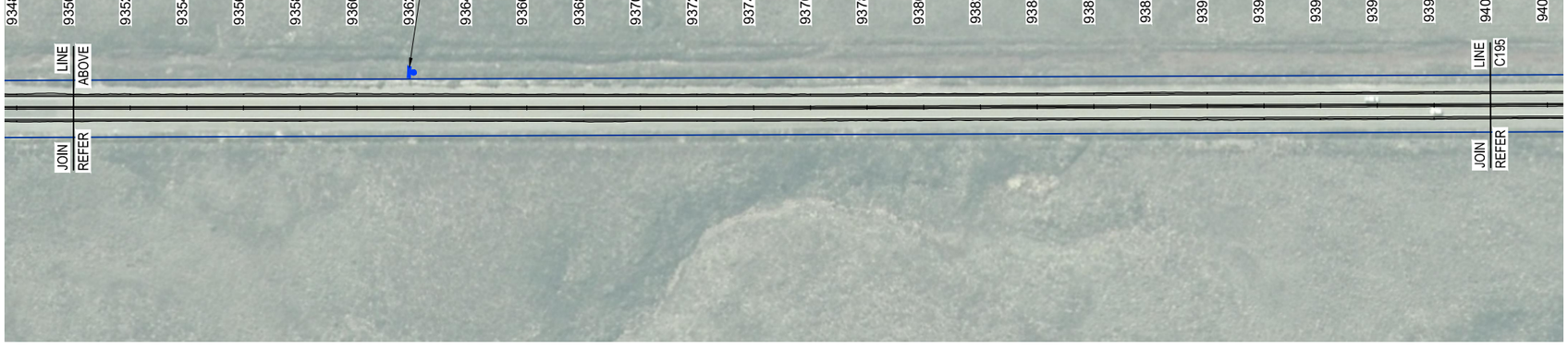


PLAN
SCALE 1 : 1000

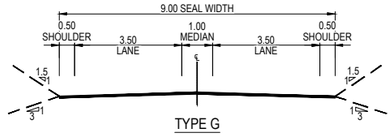
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 93000m TO 94000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C194
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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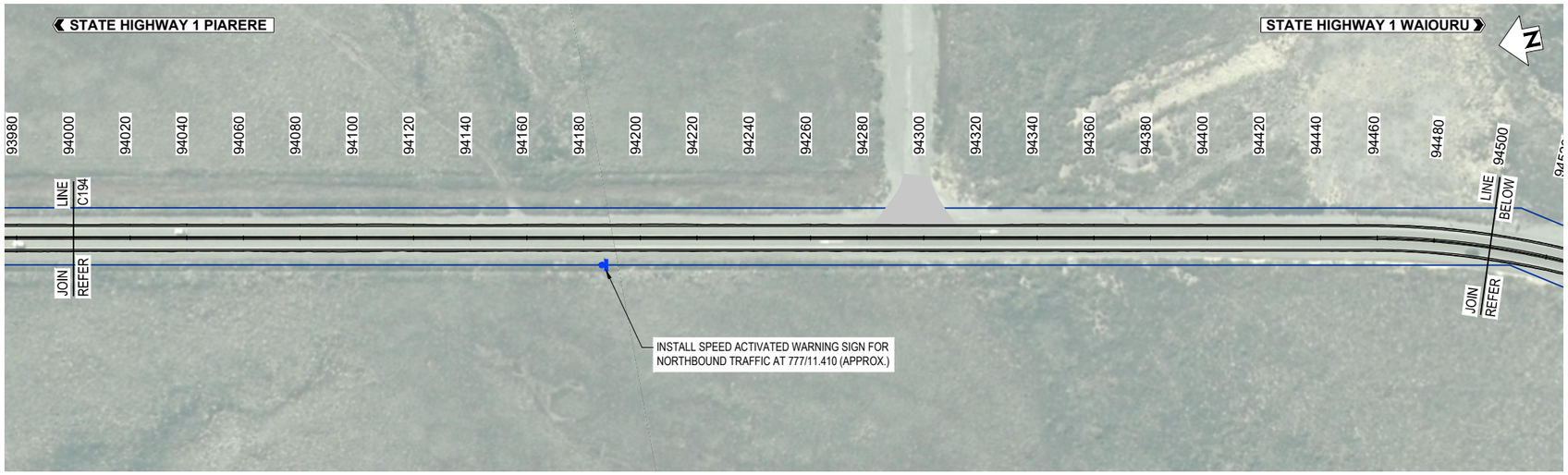
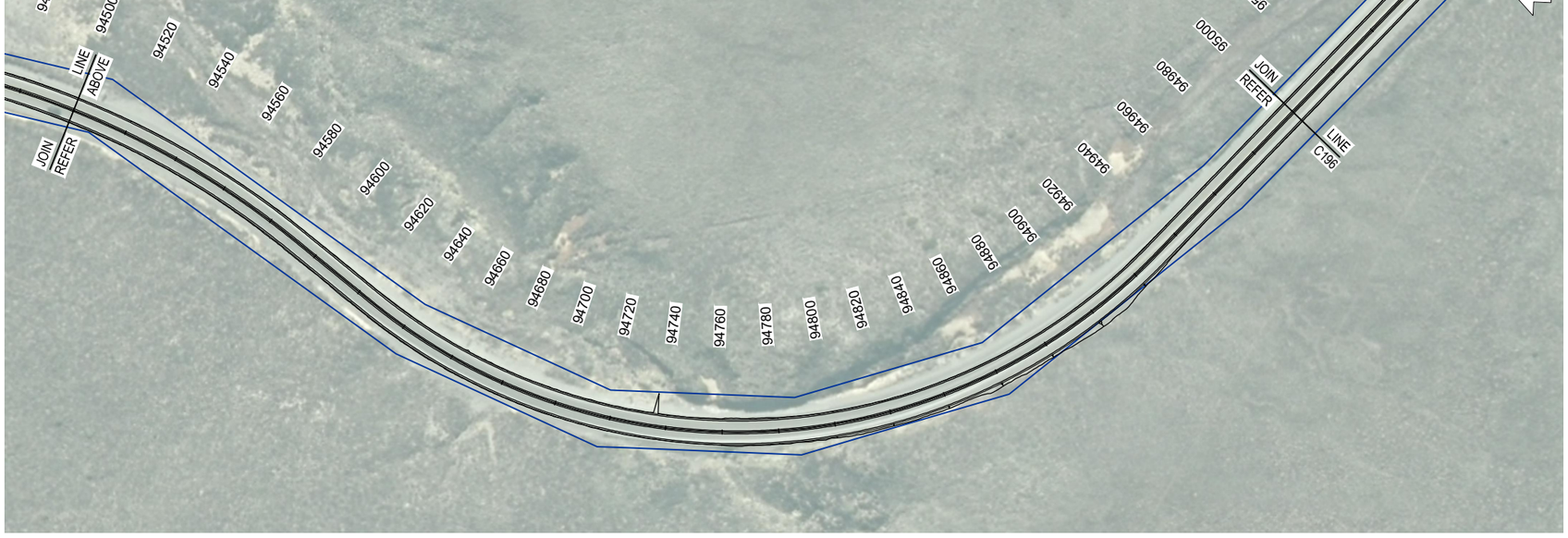


PLAN
SCALE 1 : 1000

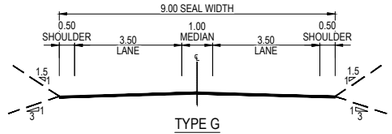
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 94000m TO 95000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C195
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 18 2020 By Dattatray Ghundre

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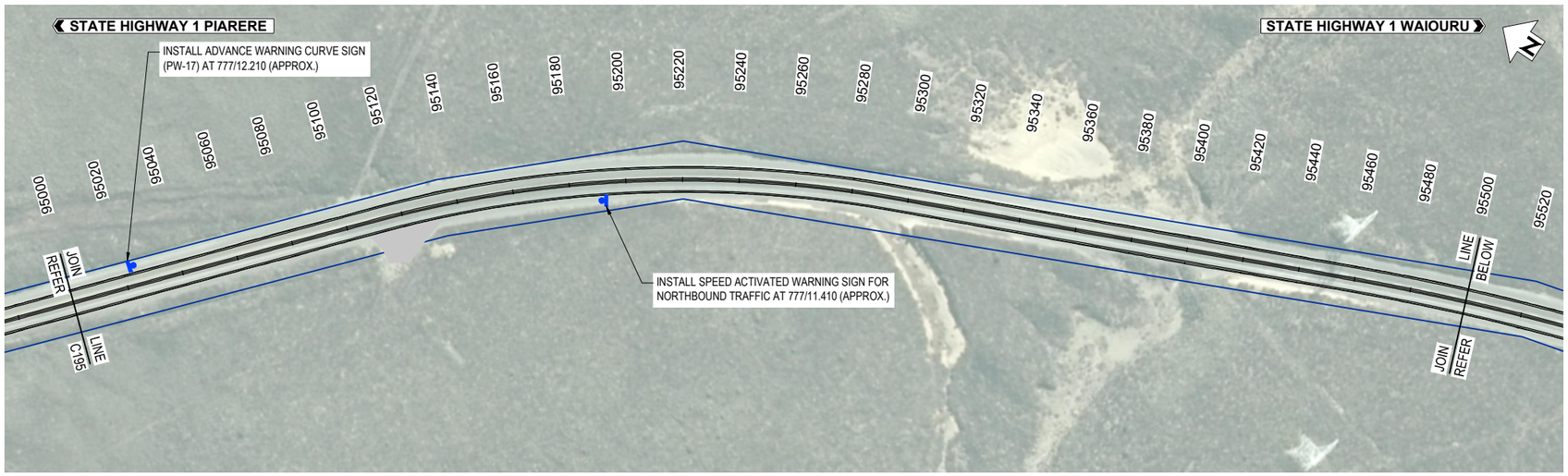
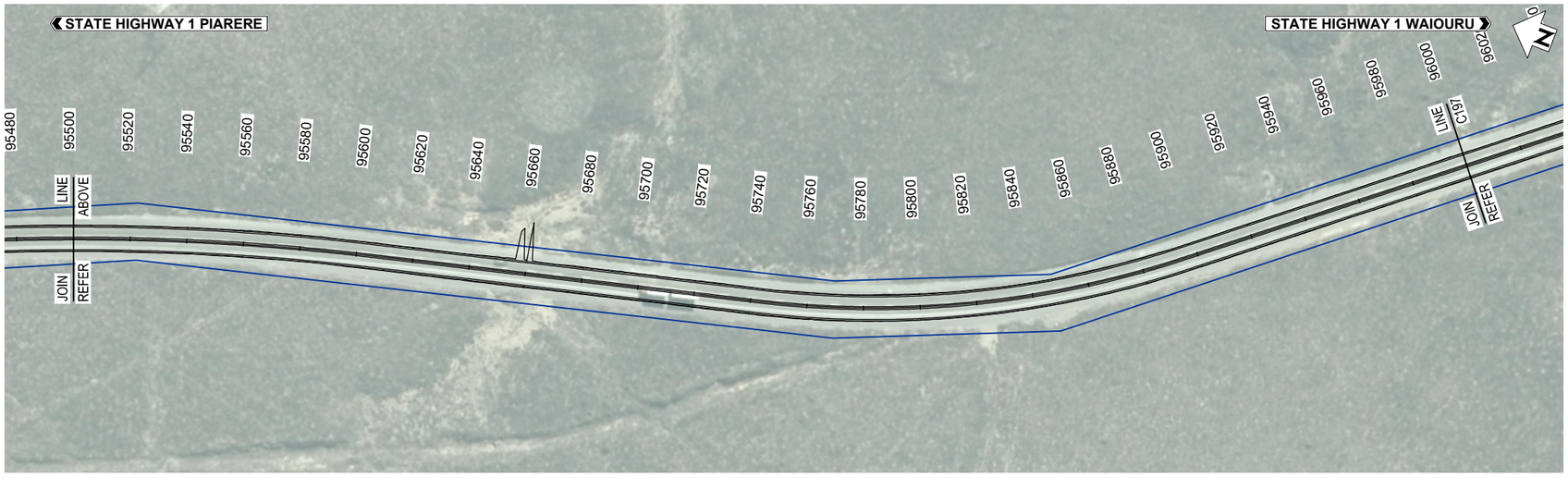


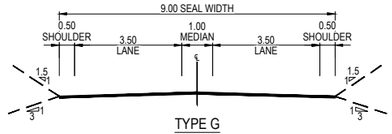
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 95000m TO 96000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C196
Rev.: A

ORIGINAL SIZE A1
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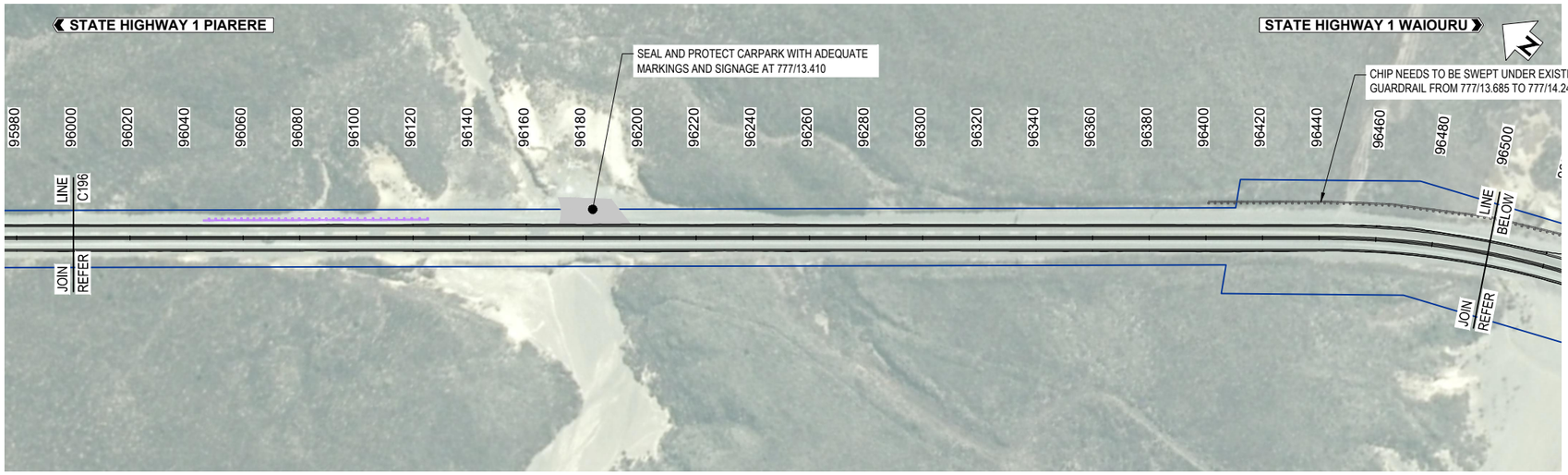
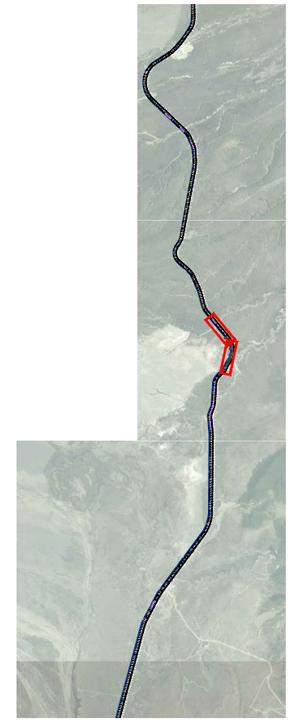
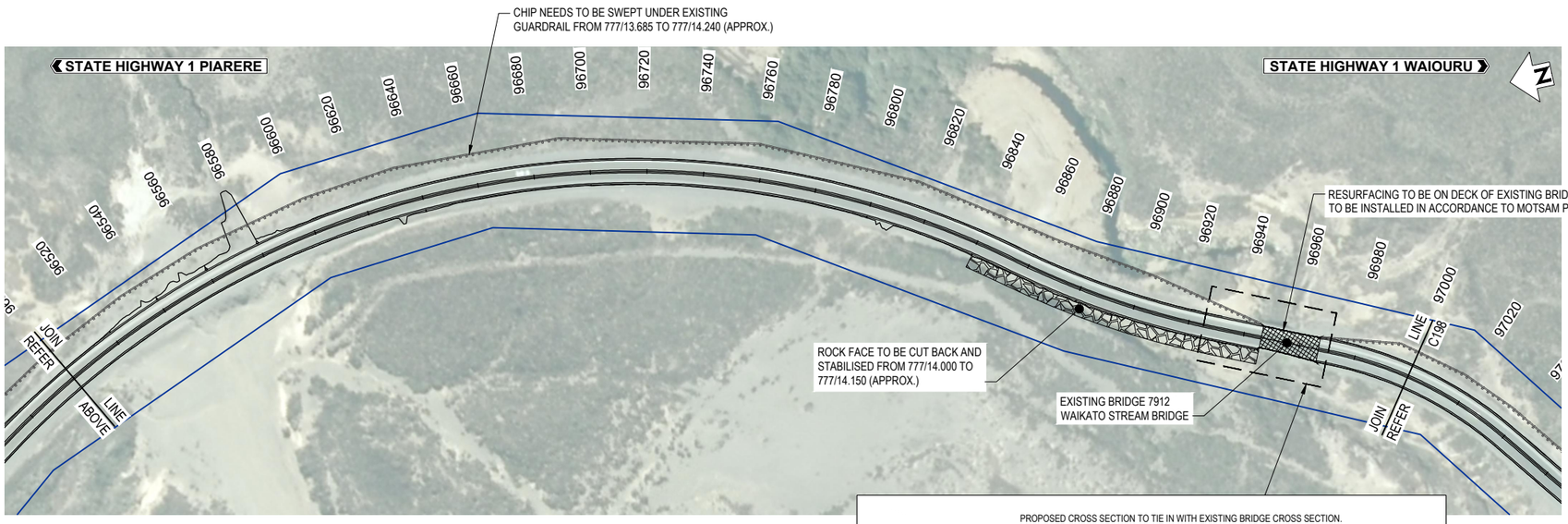


PLAN
SCALE 1 : 1000



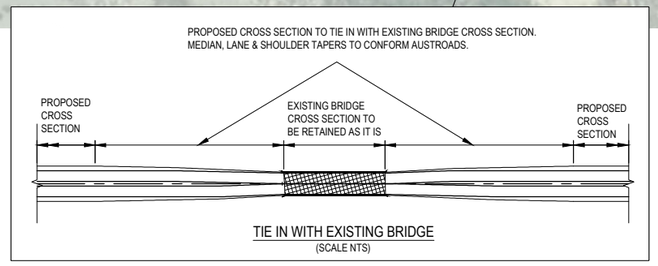
LOCATION PLAN
SCALE : NTS



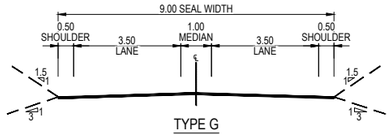
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TIE IN WITH EXISTING BRIDGE
(SCALE NTS)



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 96000m TO 97000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C197
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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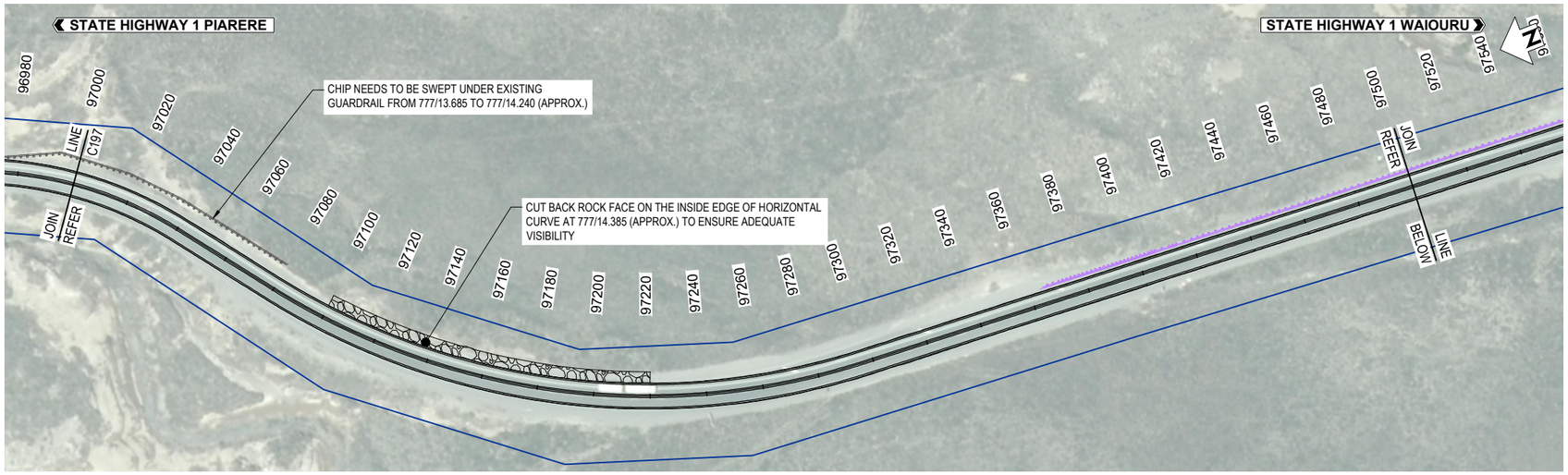
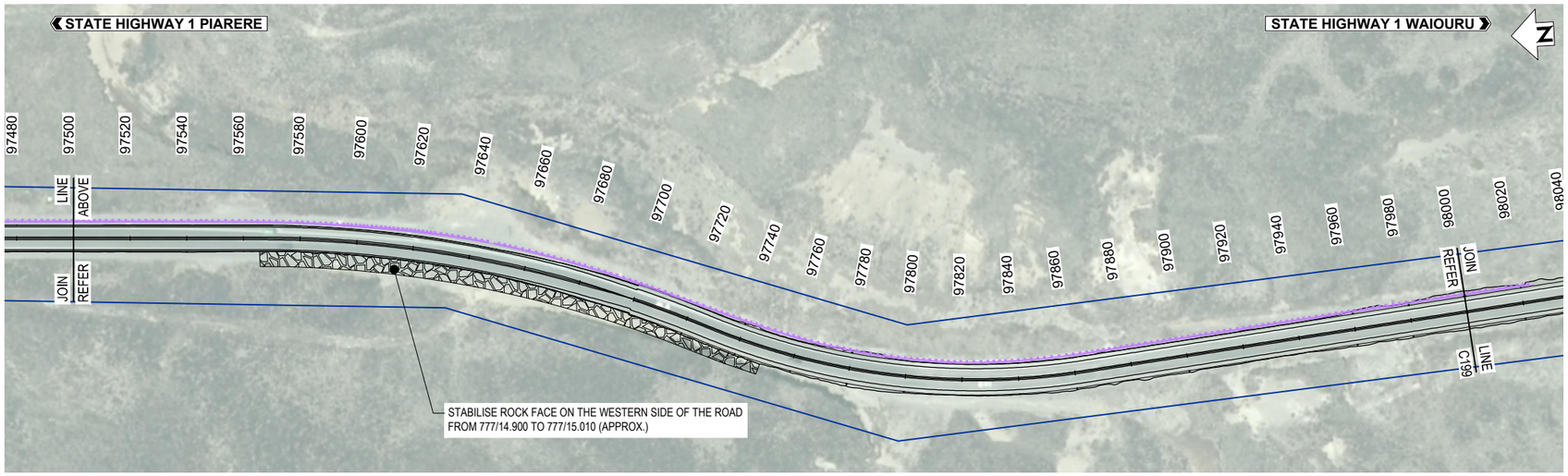


PLAN
SCALE 1 : 1000

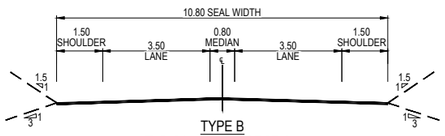


PLAN
SCALE 1 : 1000

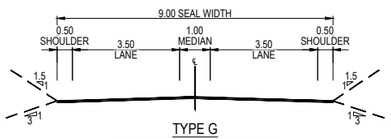
LOCATION PLAN
SCALE : NTS

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)



TYPE G
TYPICAL CROSS SECTION
CH 86100 TO CH 97700
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 97000m TO 98000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C198
Rev.: A

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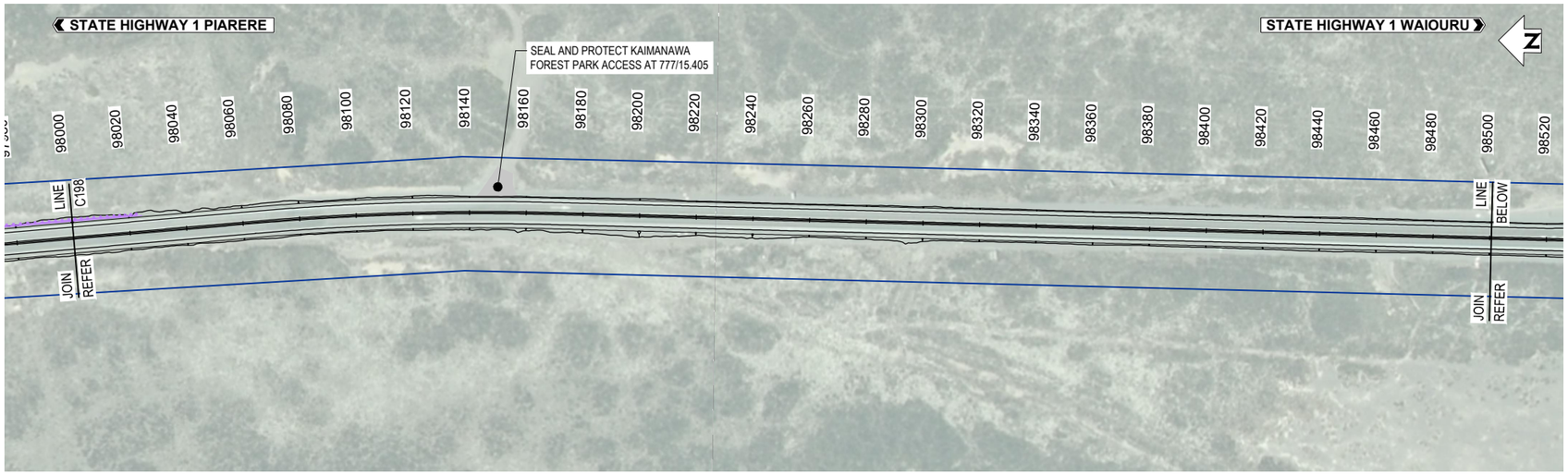
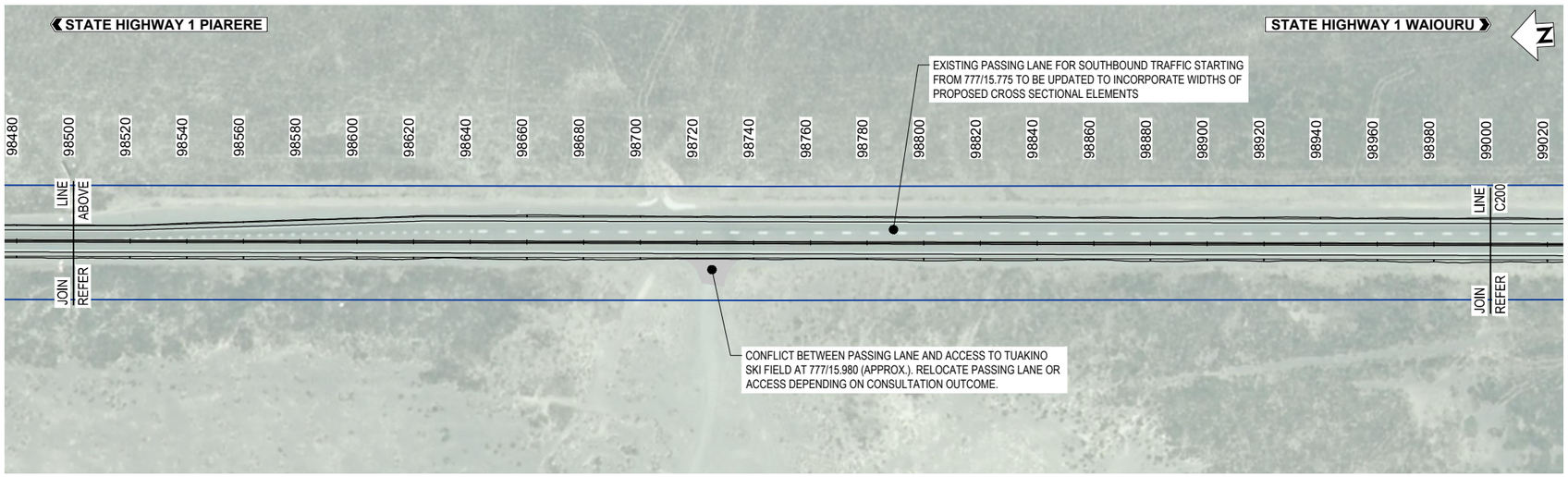


PLAN
SCALE 1 : 1000

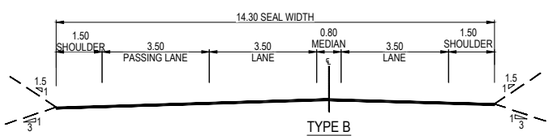
LOCATION PLAN
SCALE : NTS



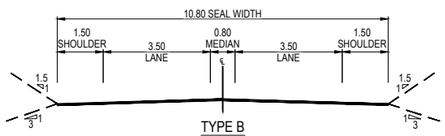
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 98000m TO 99000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C199
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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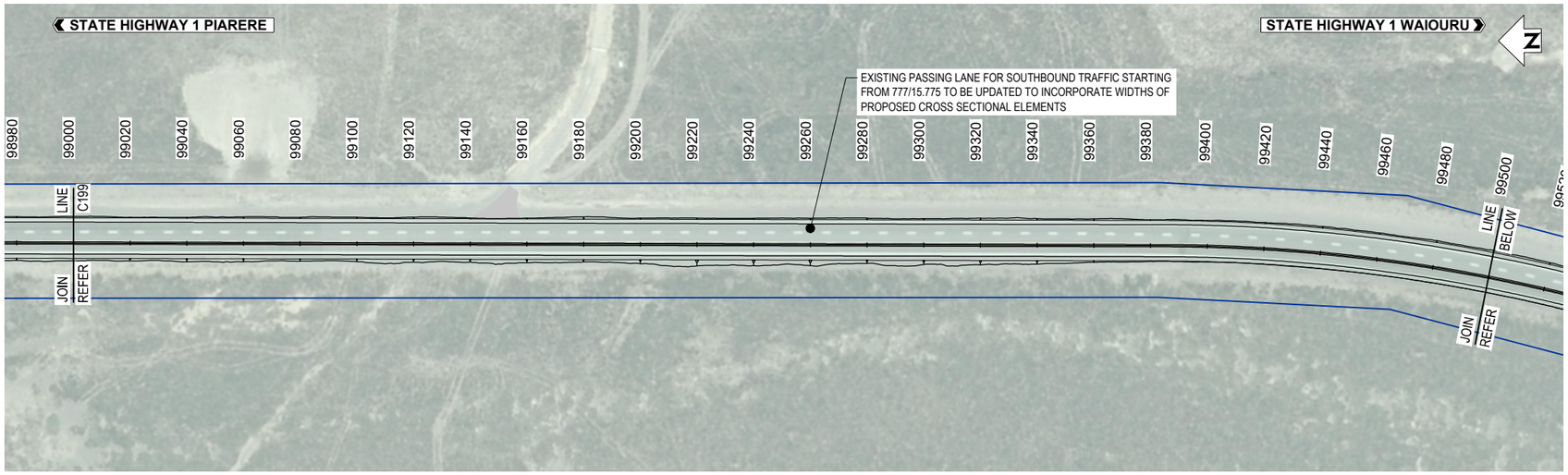
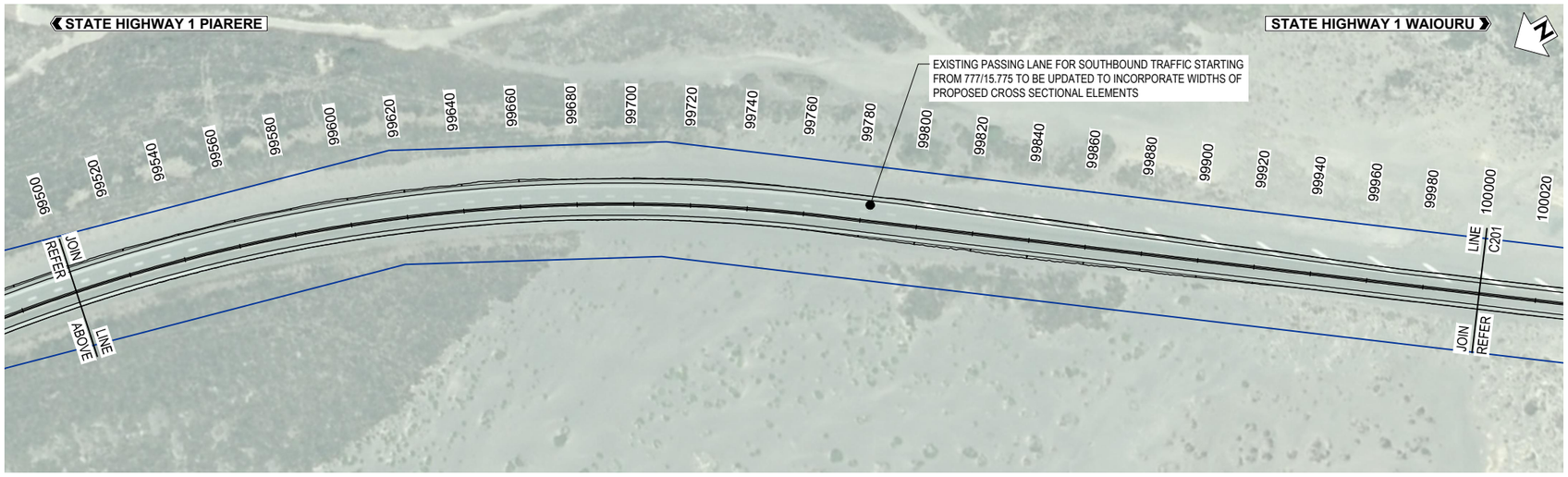


PLAN
SCALE 1 : 1000

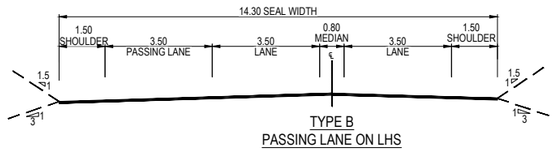
LOCATION PLAN
SCALE : NTS



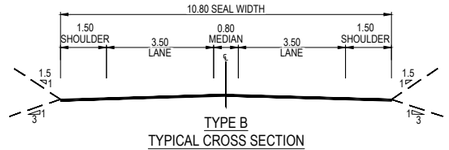
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 99000m TO 100000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C200
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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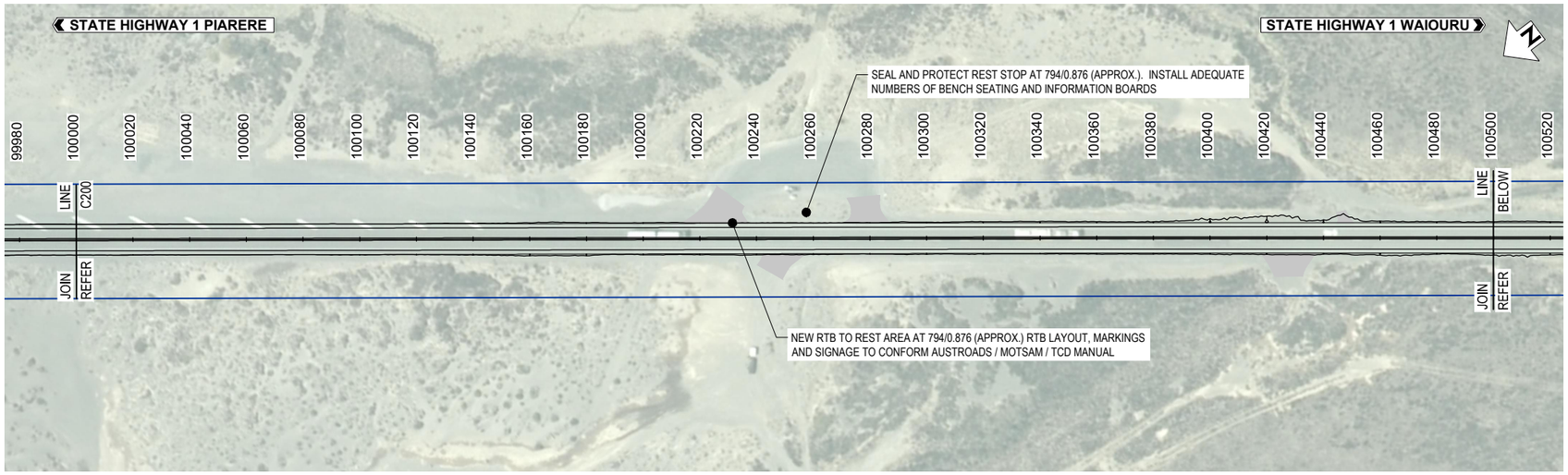


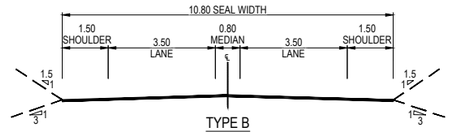
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 100000m TO 101000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C201
Rev.: A

ORIGINAL SIZE A1

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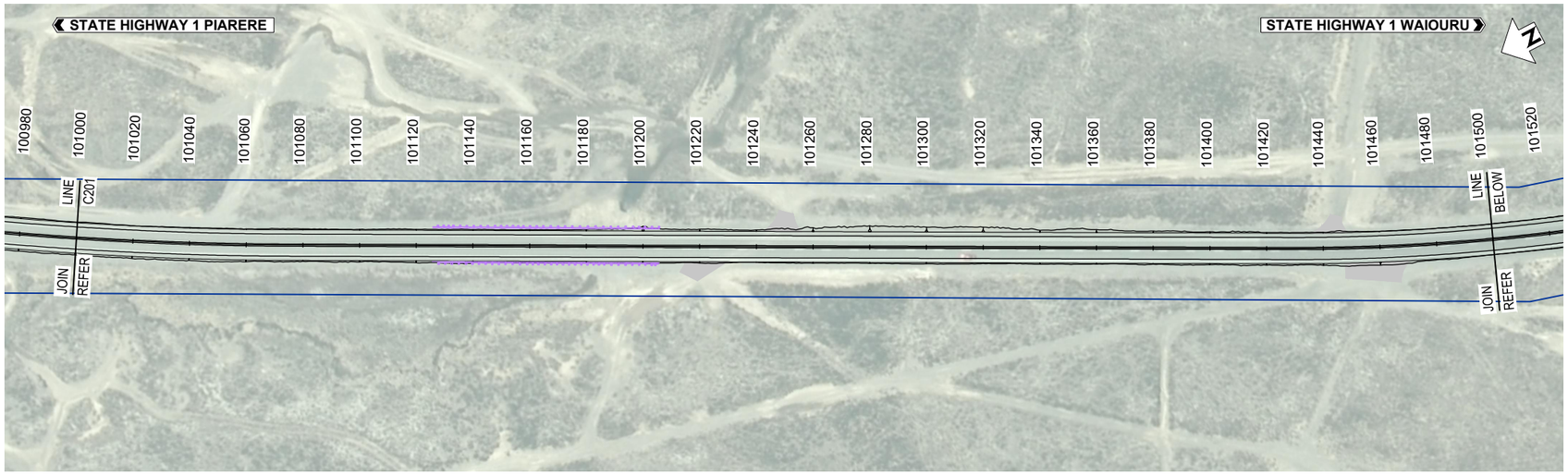
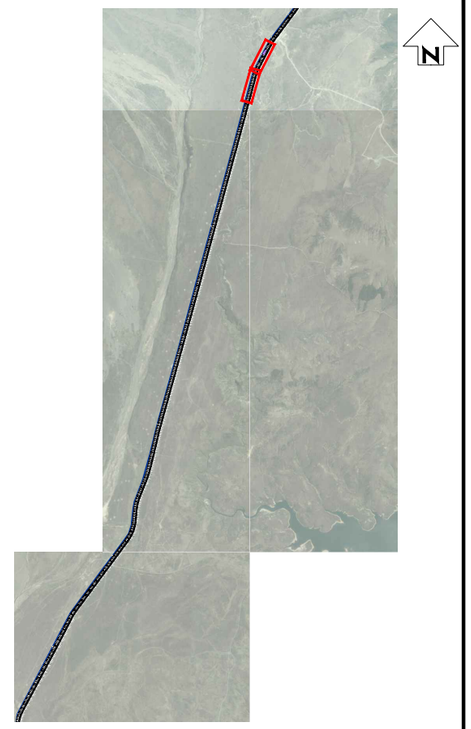
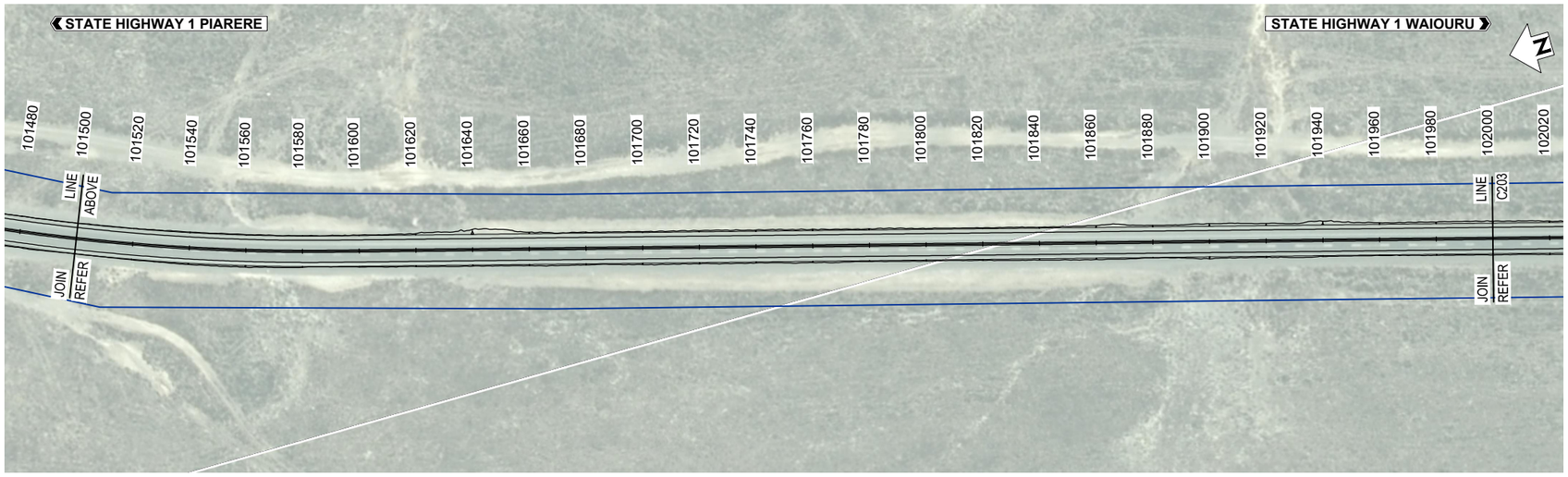


PLAN
SCALE 1 : 1000



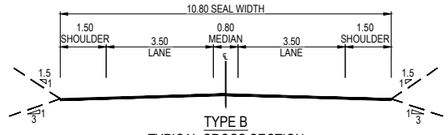
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 101000m TO 102000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C202
Rev.: A

ORIGINAL SIZE A1

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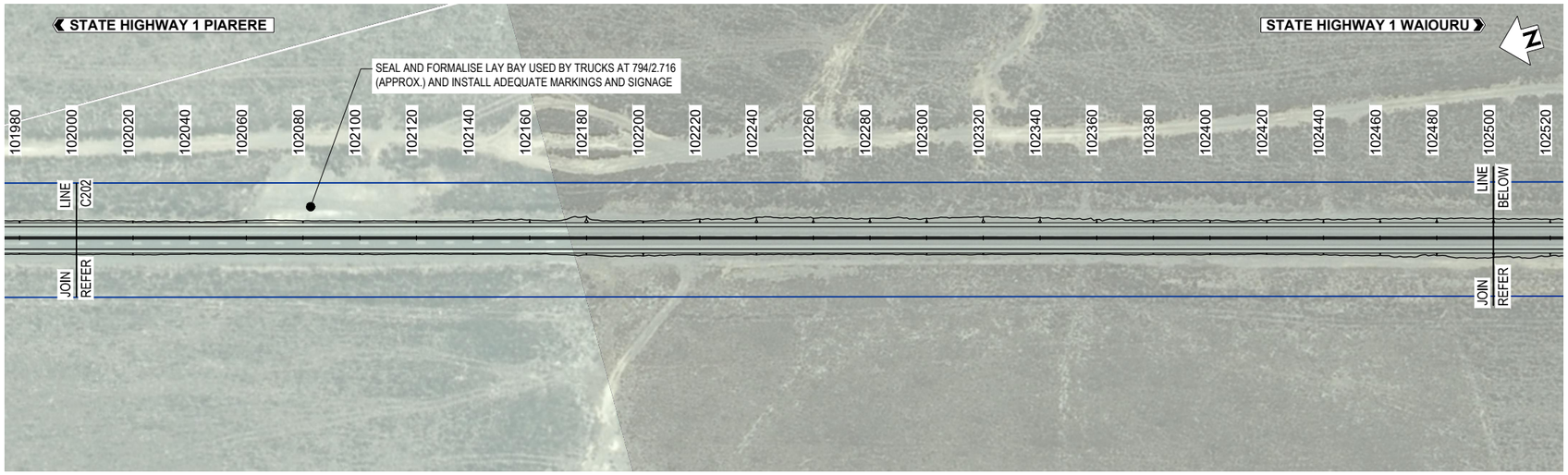
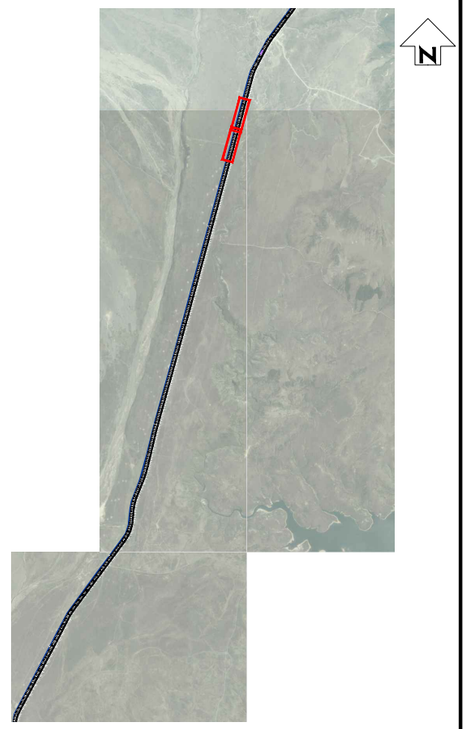
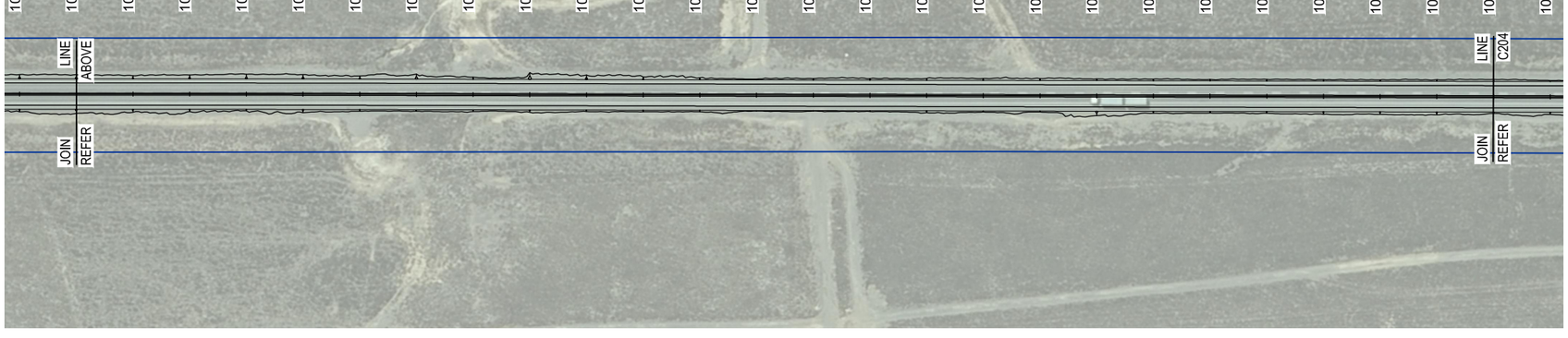


PLAN
SCALE 1 : 1000



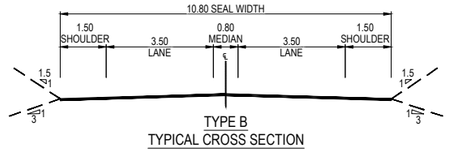
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 102000m TO 103000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C203
Rev.: A

Last modified: Feb 18 2020 By Dattatray Ghundre
ORIGINAL SIZE A1
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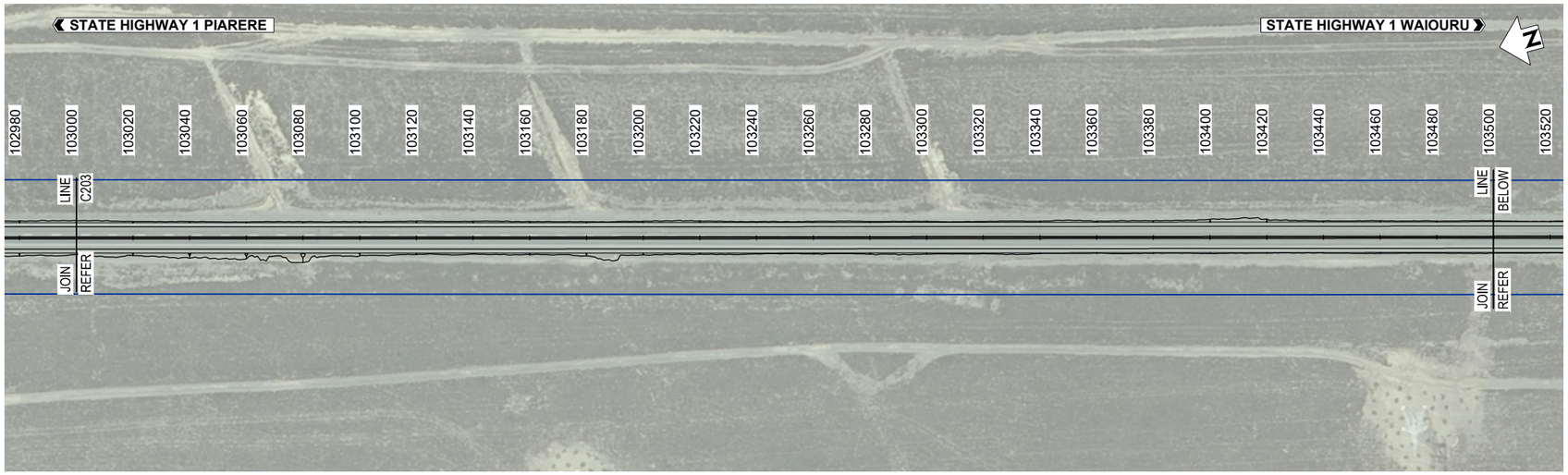
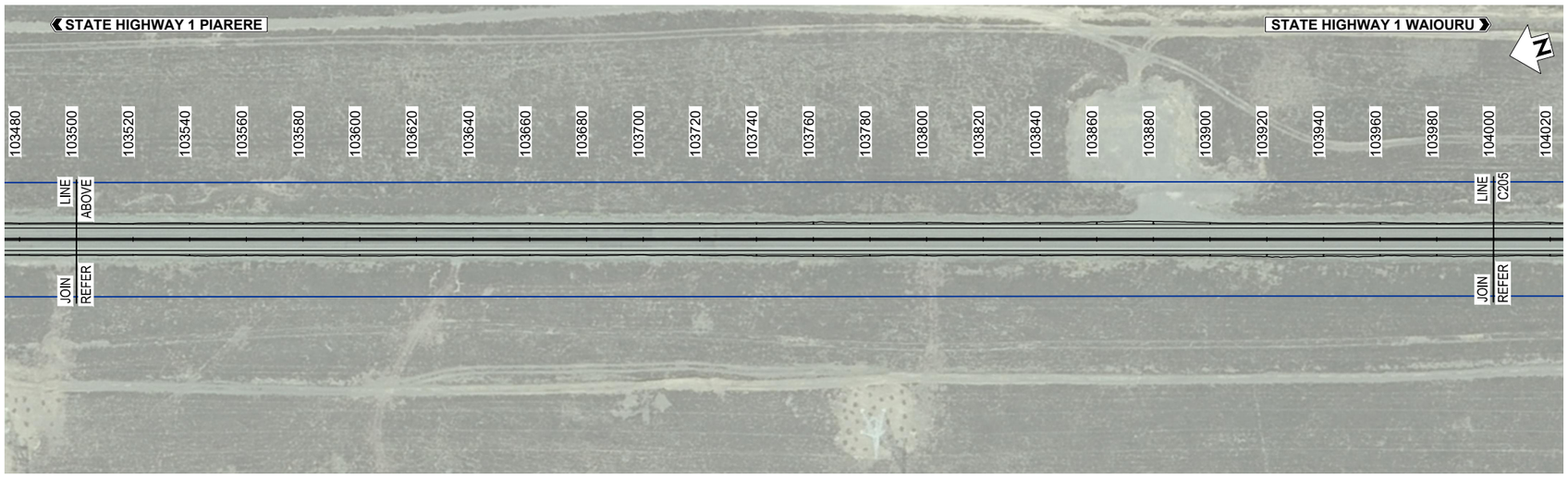
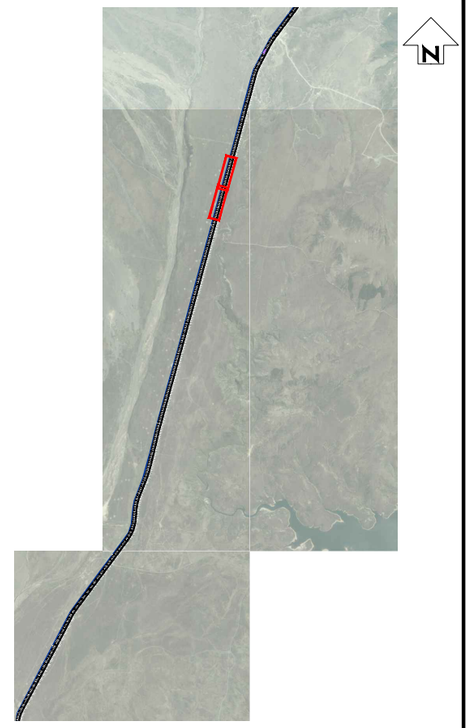


PLAN
SCALE 1 : 1000

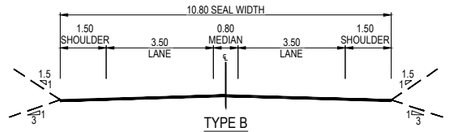


PLAN
SCALE 1 : 1000



LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 103000m TO 104000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C204
Rev.: A

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ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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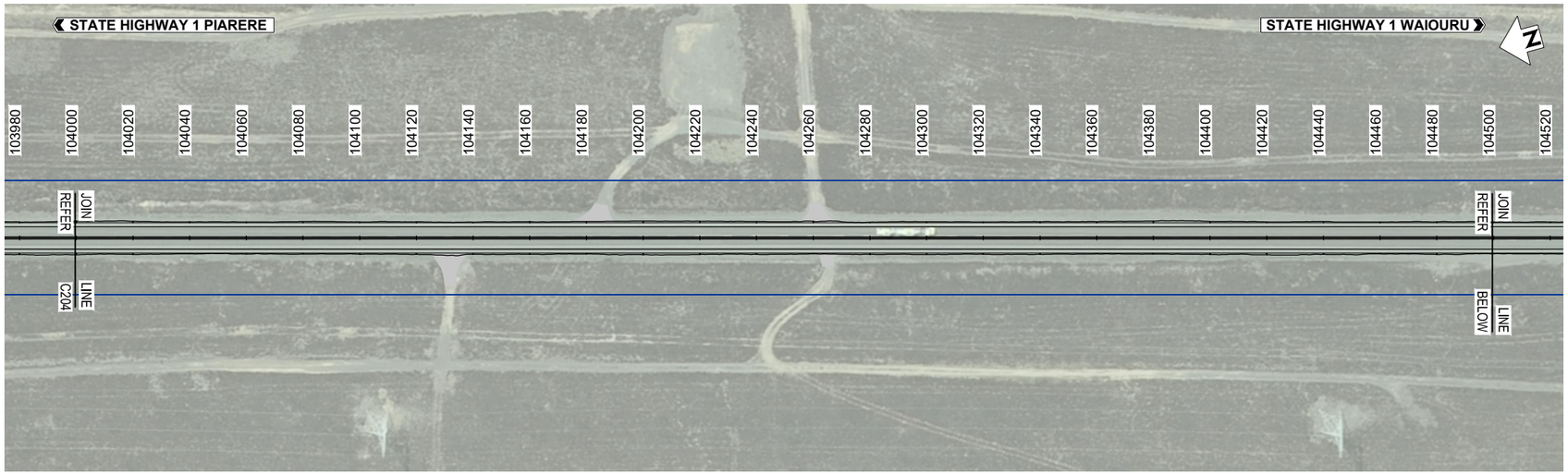
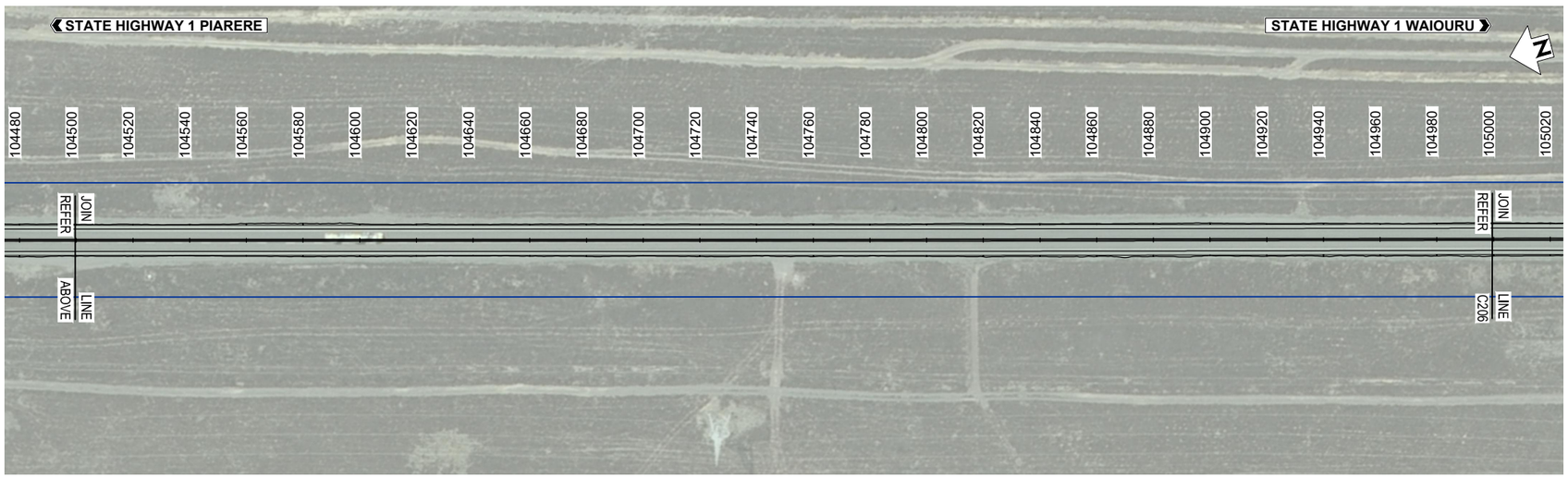


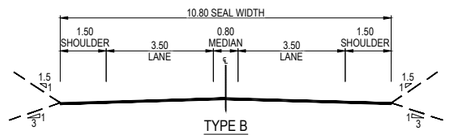
PLAN
SCALE 1 : 1000



PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	NOT APPROVED
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 104000m TO 105000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C205
Rev.: A

ORIGINAL SIZE A1
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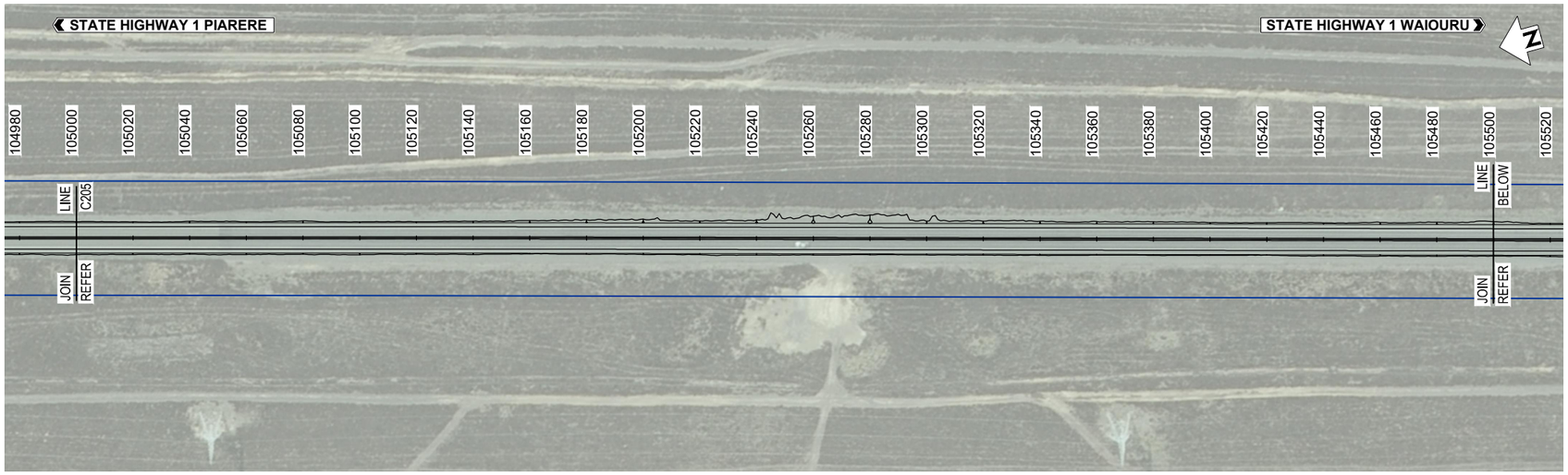
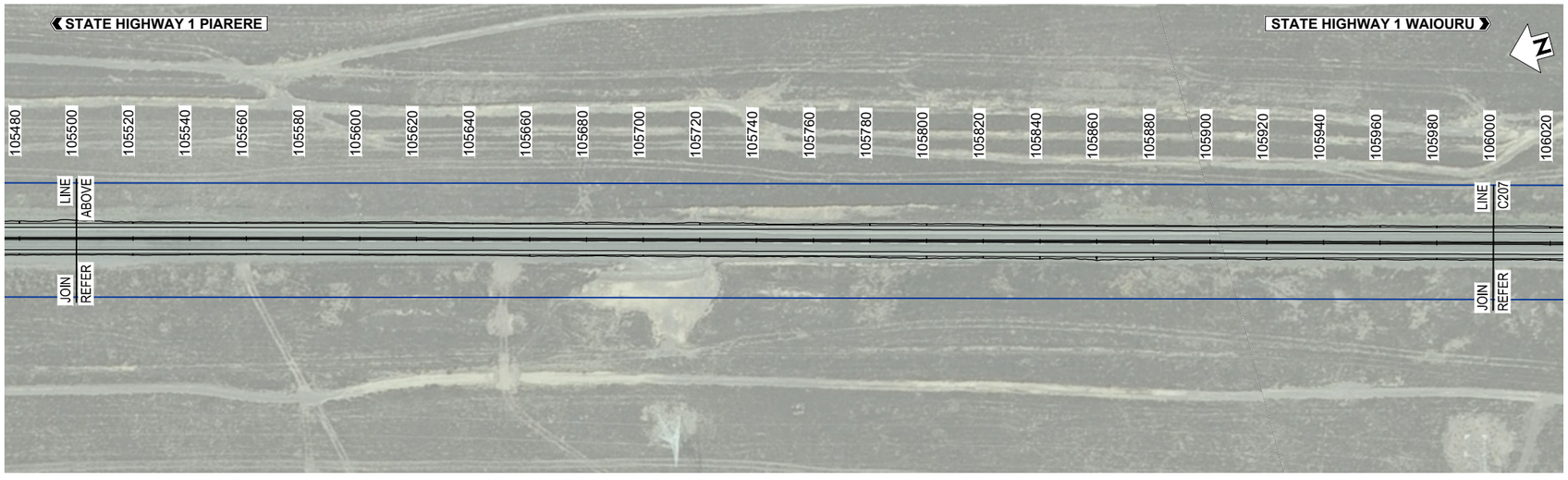


PLAN
SCALE 1 : 1000

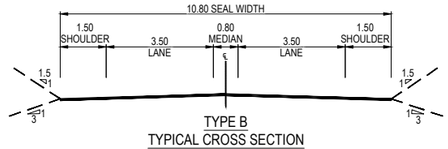
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 105000m TO 106000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C206
Rev.: A

ORIGINAL SIZE A1

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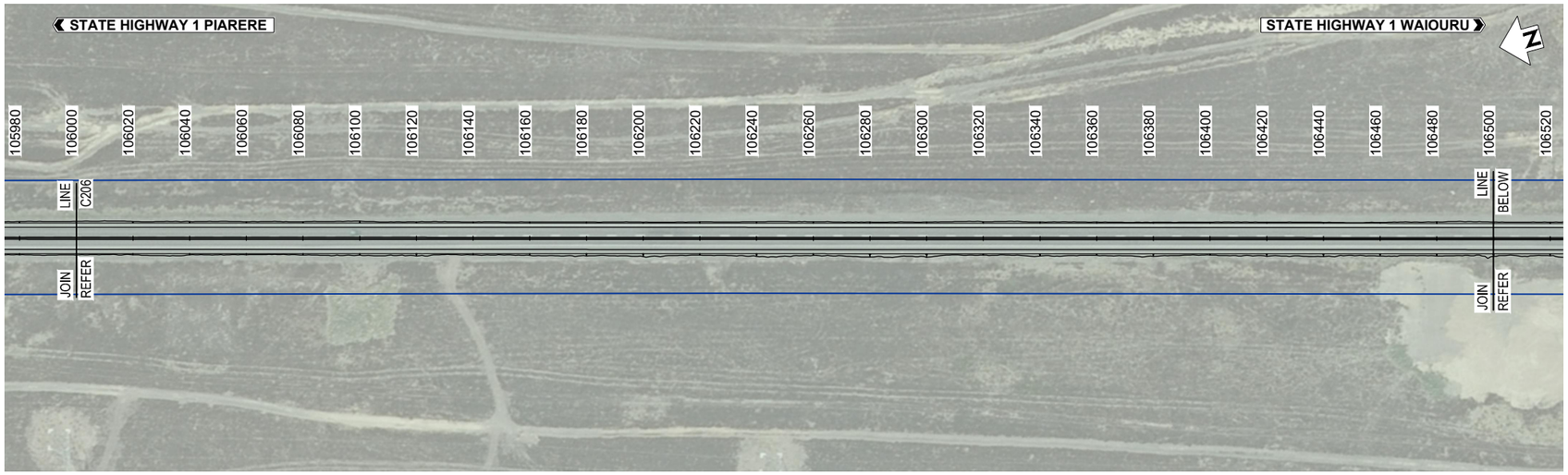
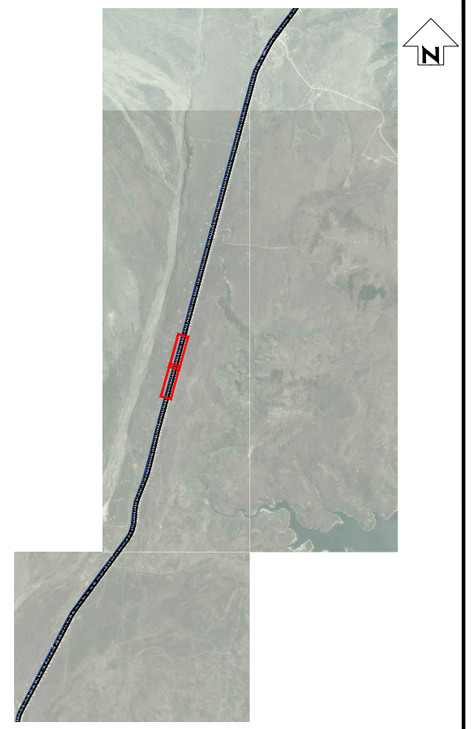
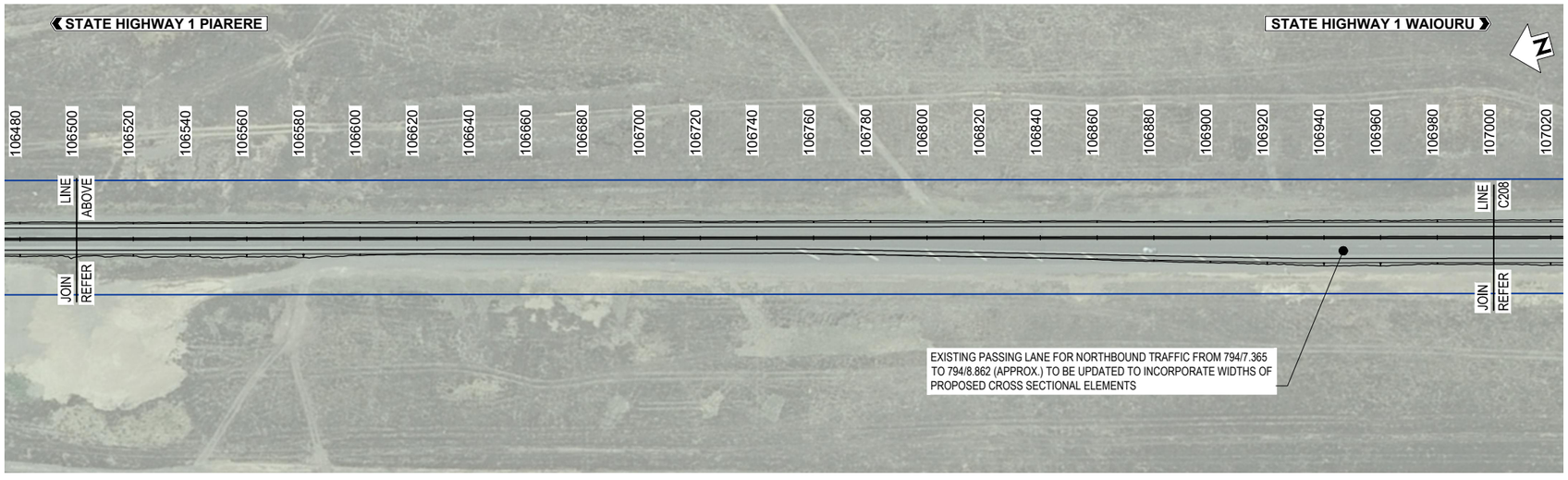


PLAN
SCALE 1 : 1000



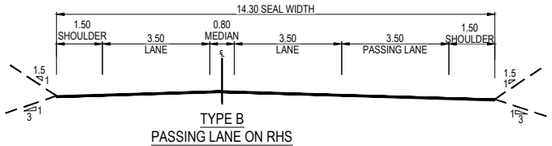
LOCATION PLAN
SCALE : NTS



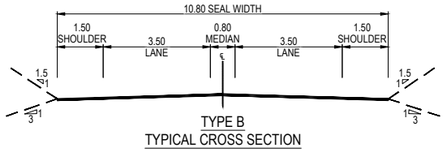
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 106000m TO 107000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C207
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 18 2020 By Dattatray Ghundre

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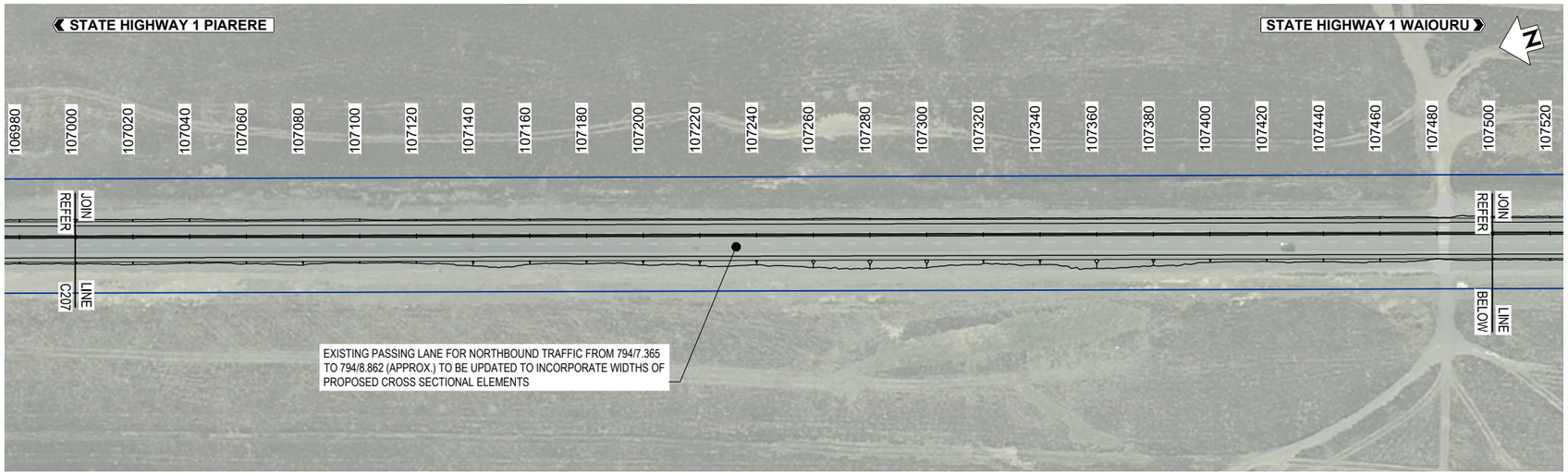
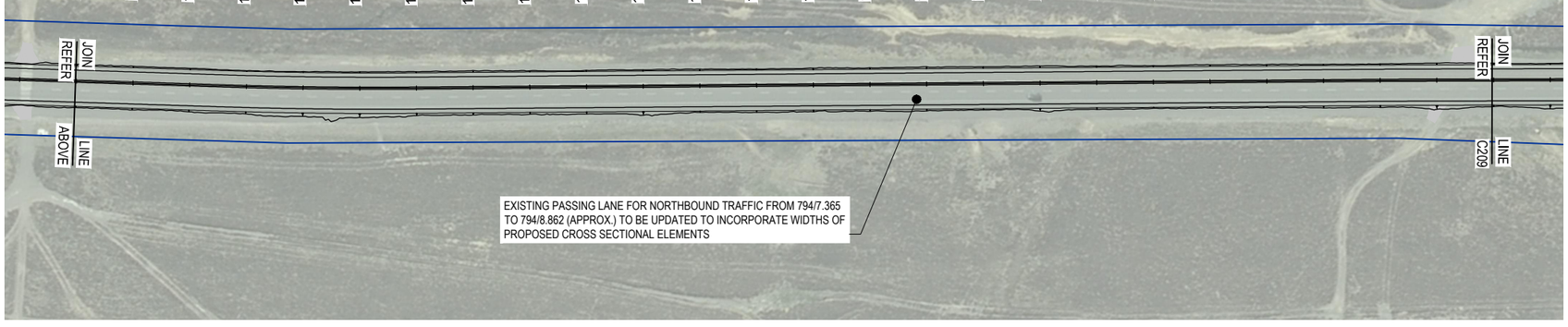


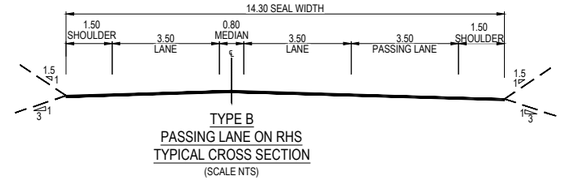
PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



PLAN
SCALE 1 : 1000



TYPE B
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 107000m TO 108000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C208
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre

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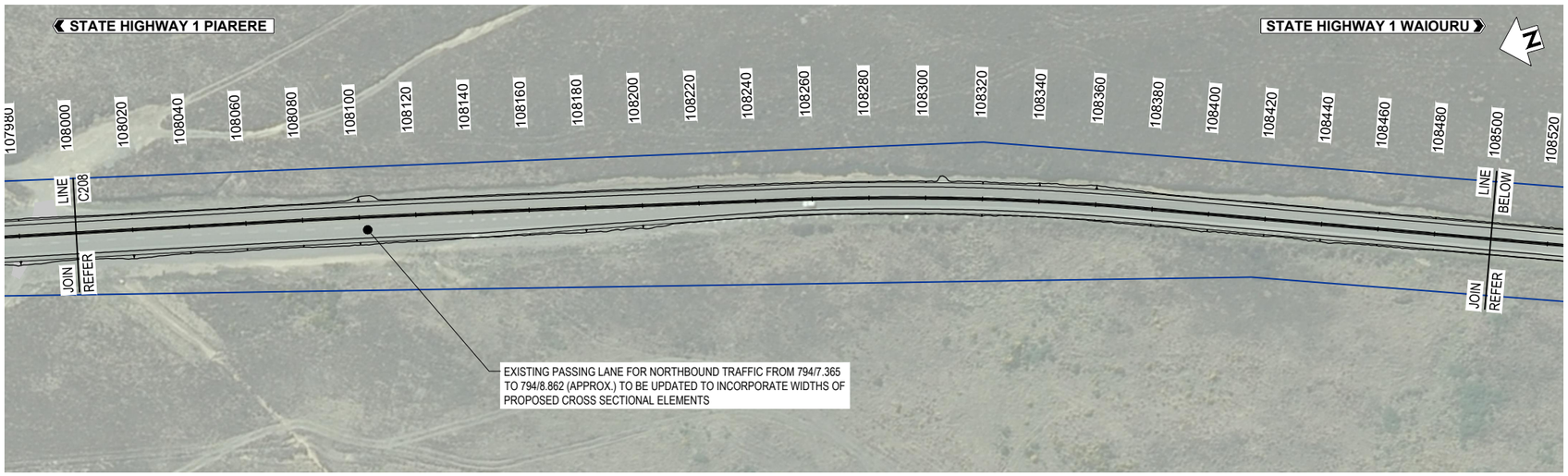
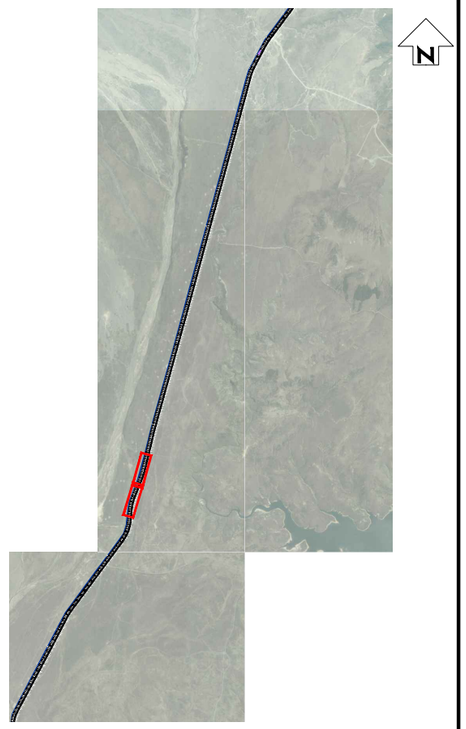


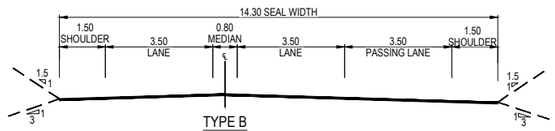
PLAN
SCALE 1 : 1000



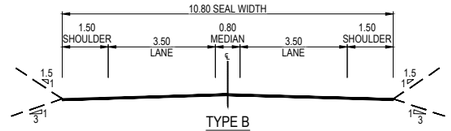
LOCATION PLAN
SCALE : NTS

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE

PLAN
SCALE 1 : 1000



TYPE B
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 108000m TO 109000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C209
Rev.: A

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ORIGINAL SIZE A1
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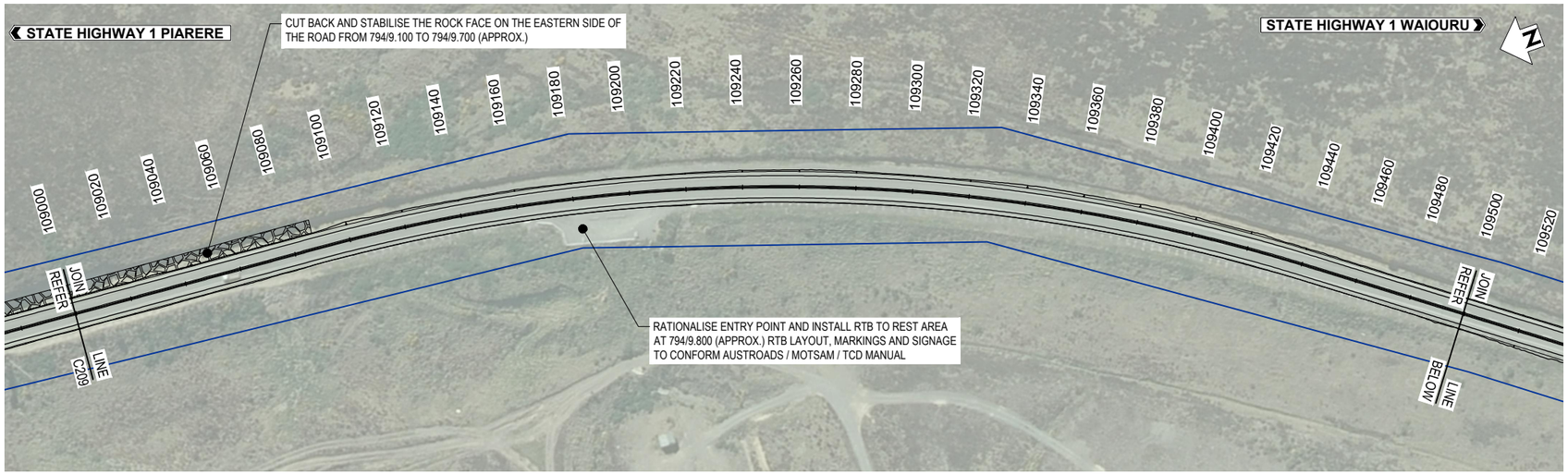
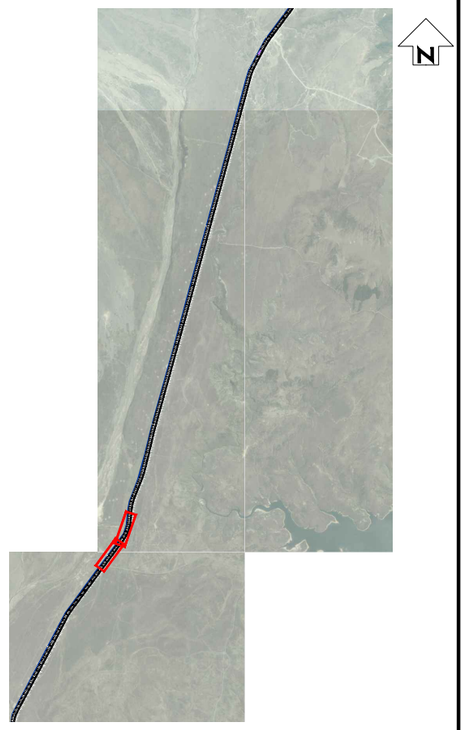
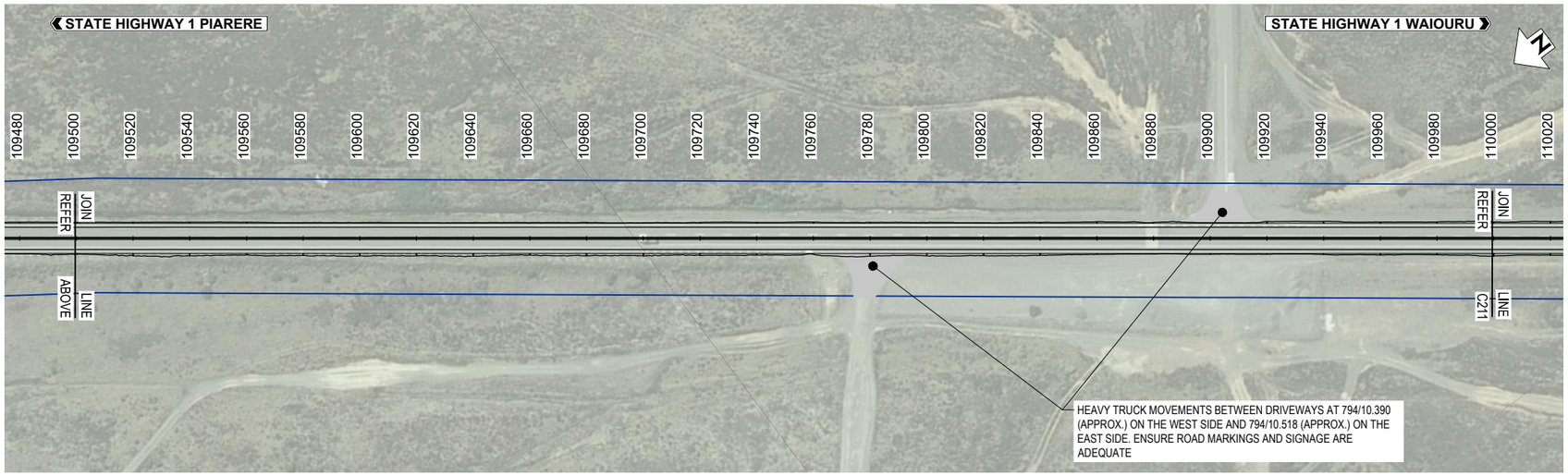


PLAN
SCALE 1 : 1000



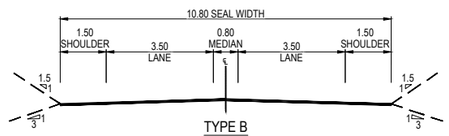
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN-
STATION 109000m TO 110000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C210
Rev.: A

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ORIGINAL SIZE A1
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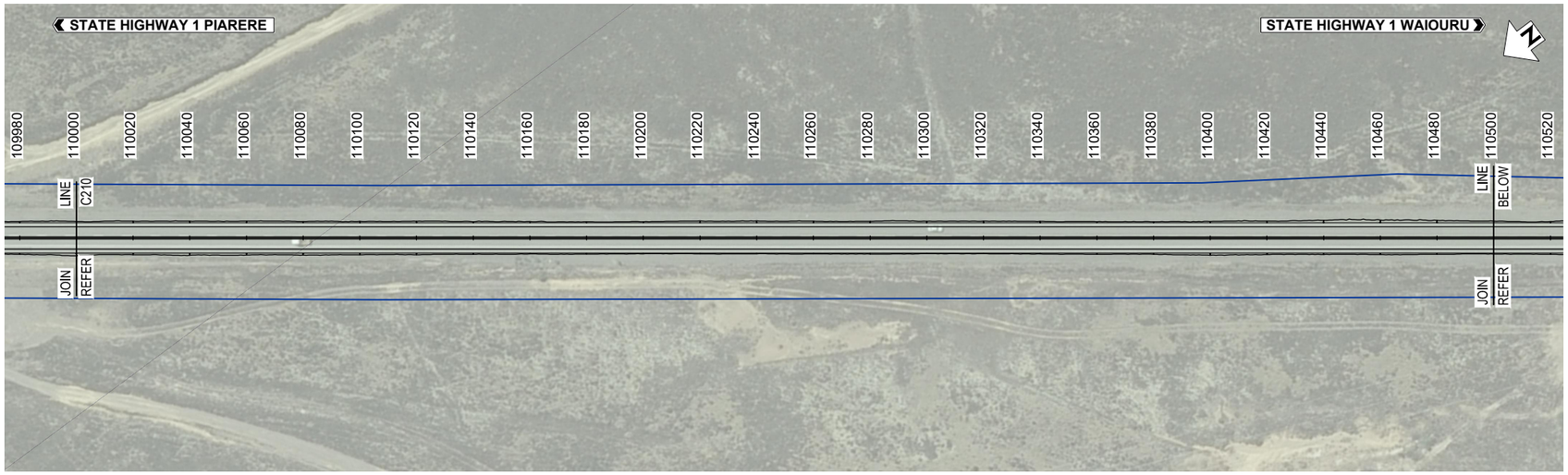
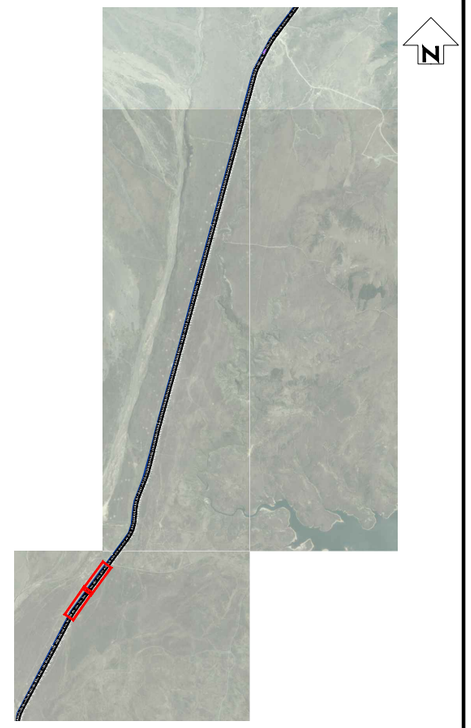


PLAN
SCALE 1 : 1000

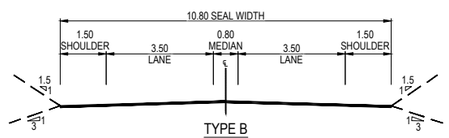


LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 110000m TO 111000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C211
Rev.: A

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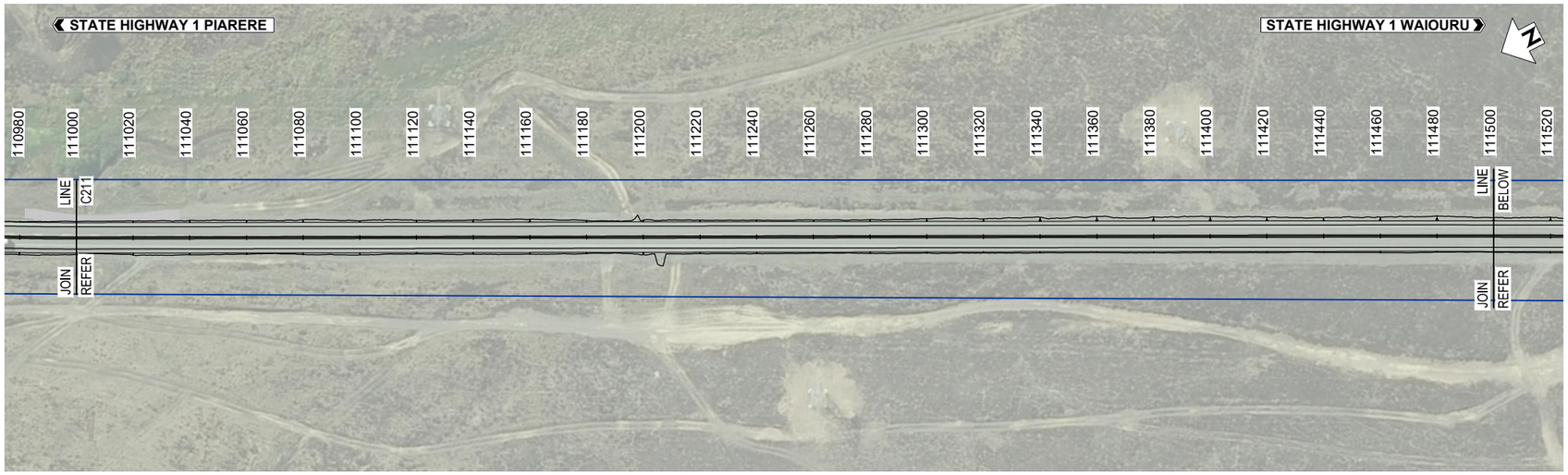
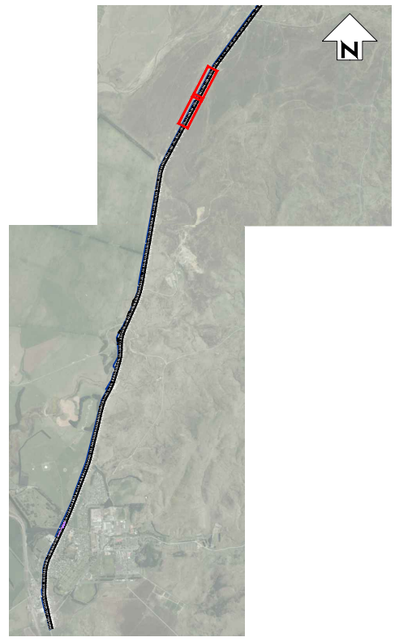
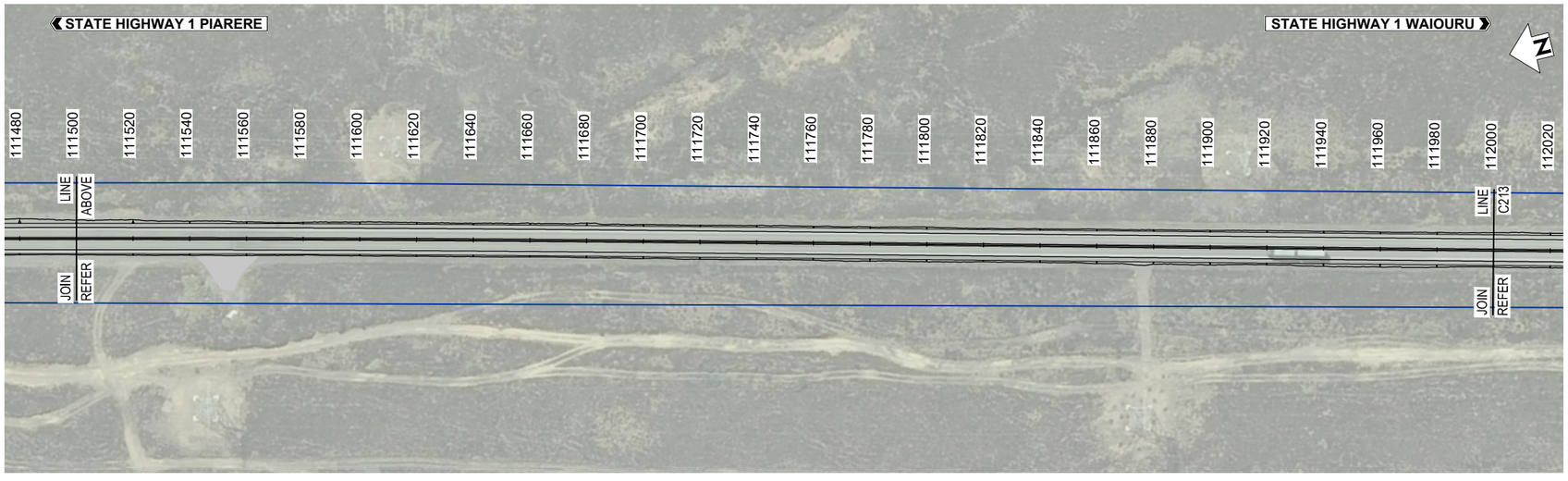
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



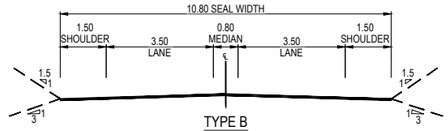
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 111000m TO 112000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C212
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 18 2020 By Dattatray Ghundre

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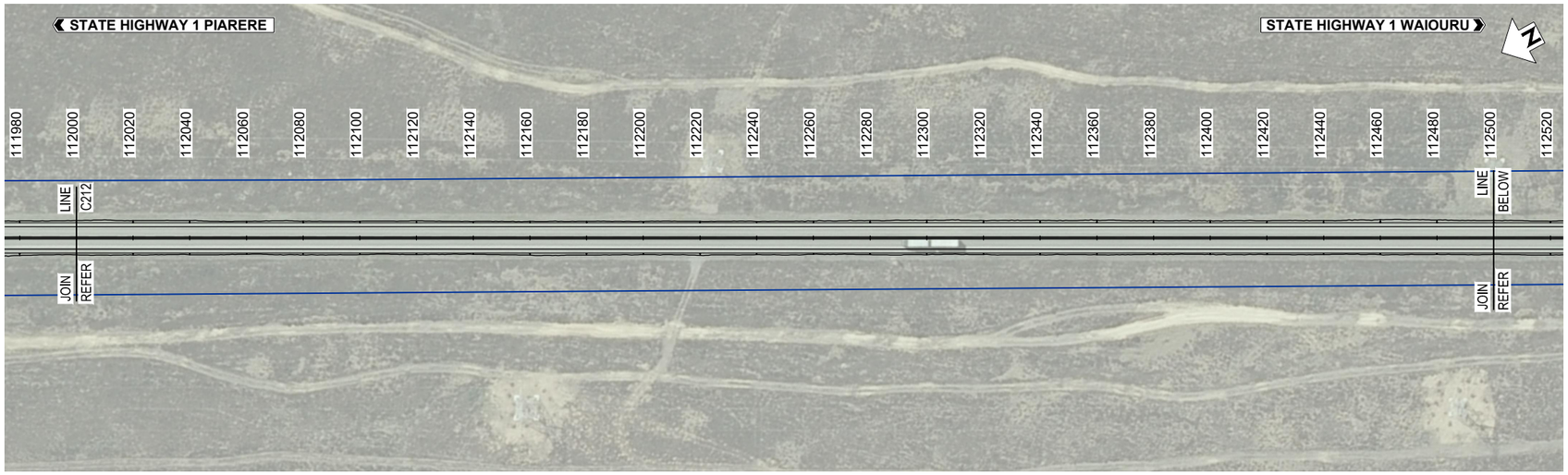
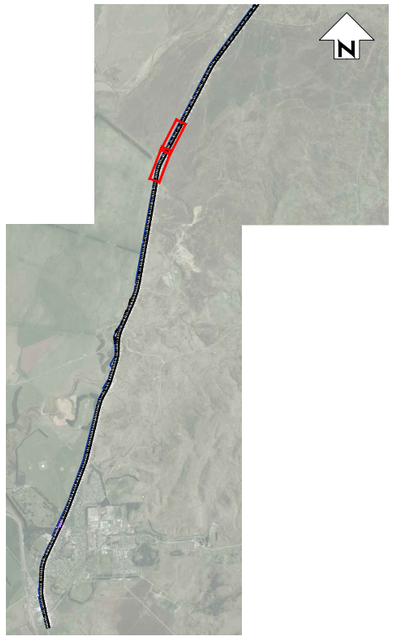
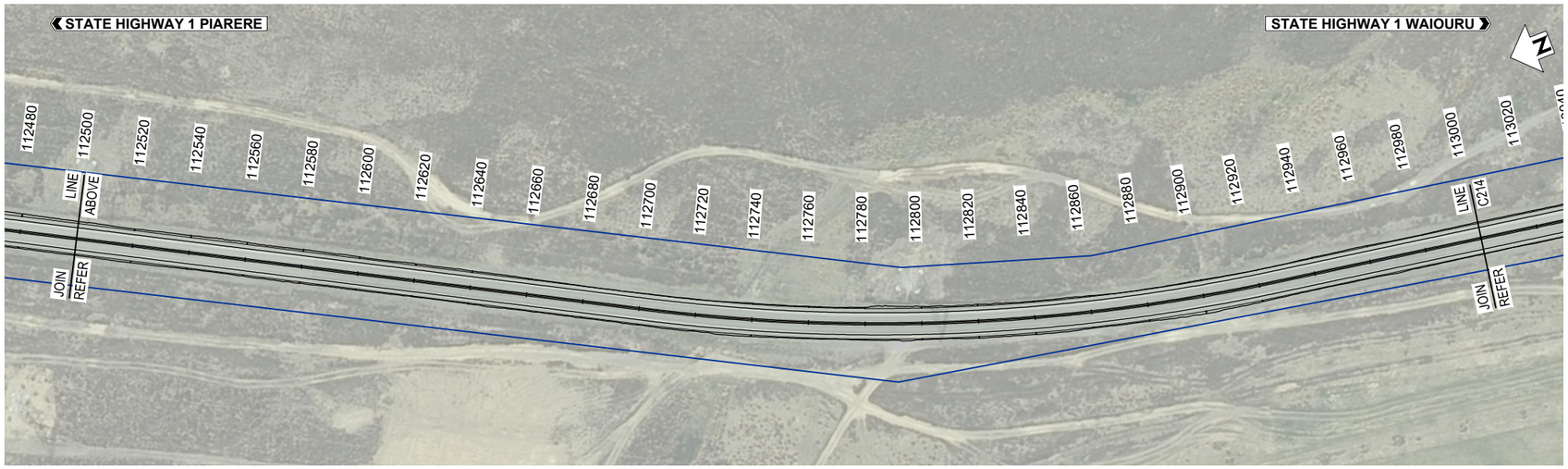


PLAN
SCALE 1 : 1000



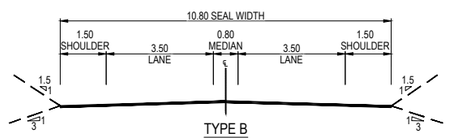
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	NOT APPROVED
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 112000m TO 113000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C213
Rev.: A

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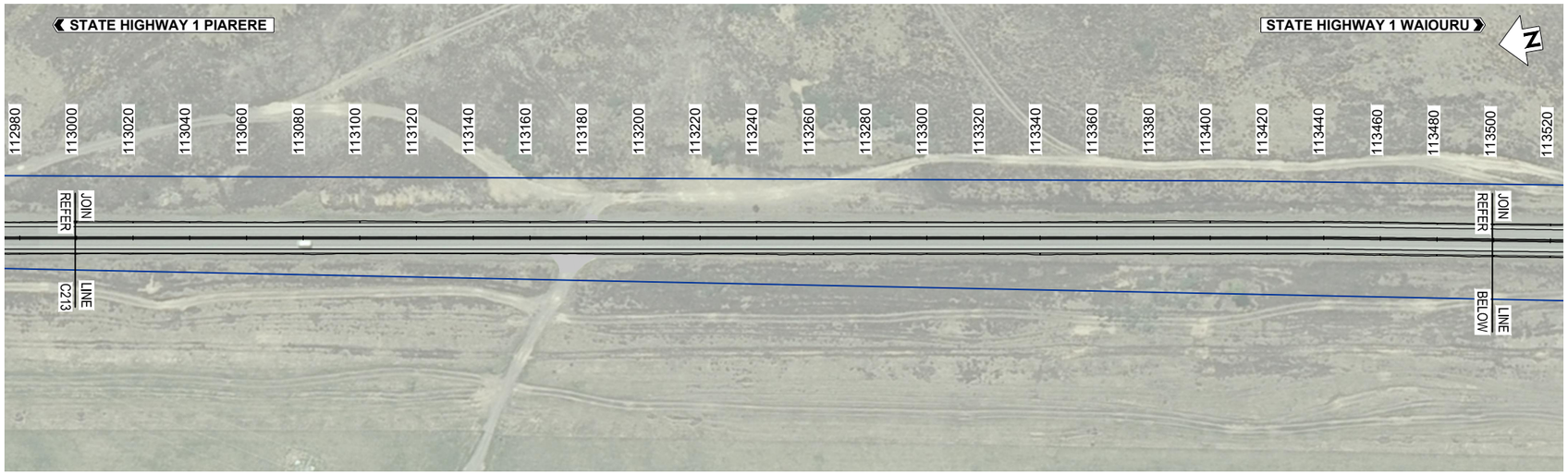
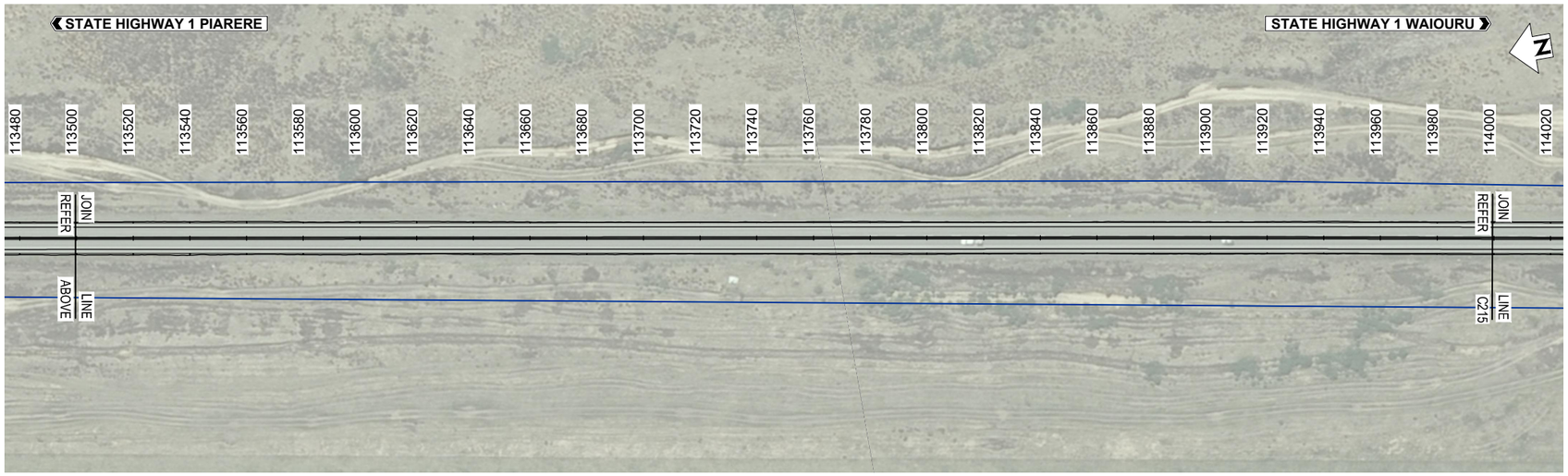
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000

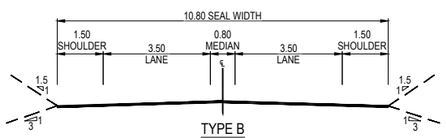
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 113000m TO 114000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C214
Rev.: A

DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
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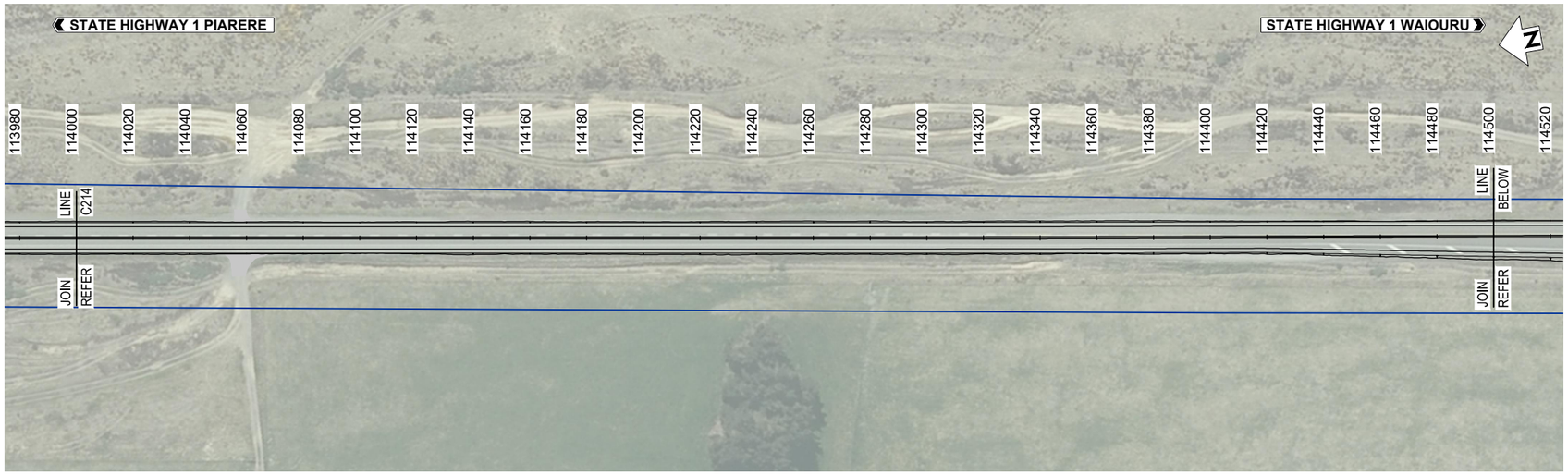
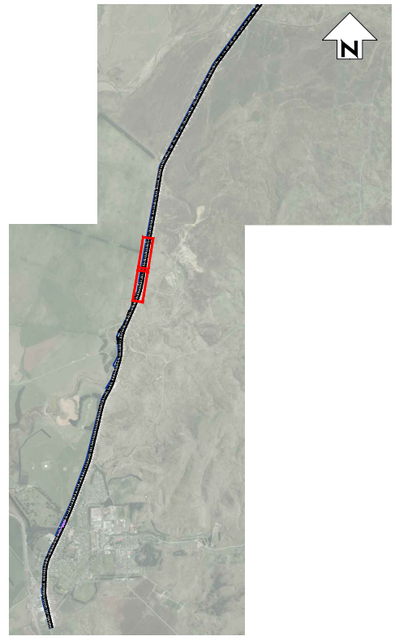
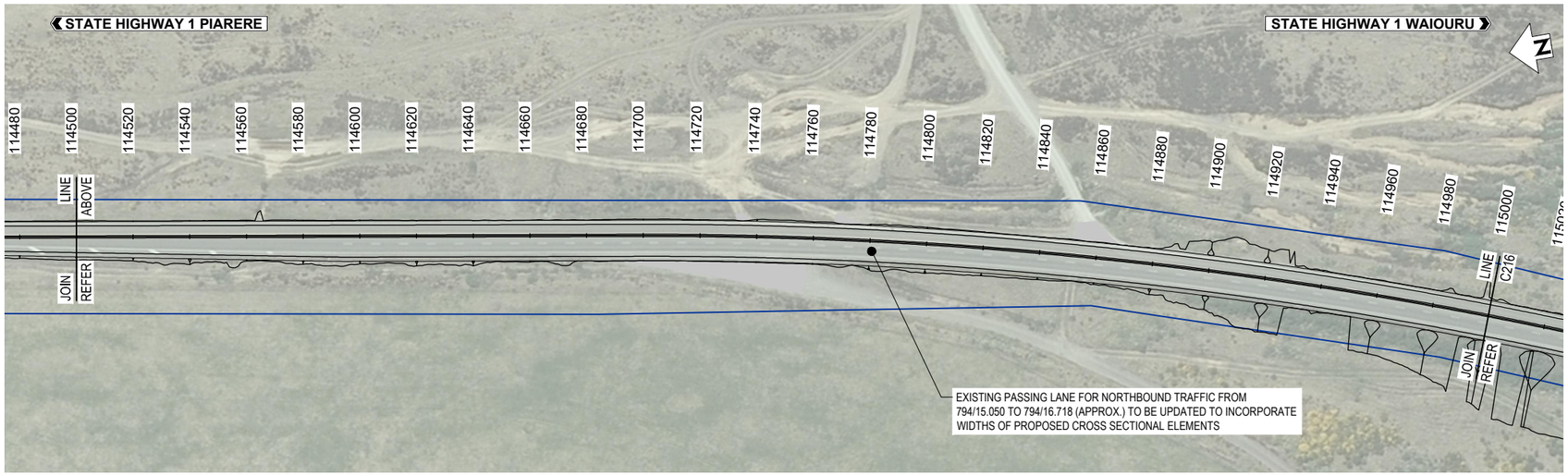


PLAN
SCALE 1 : 1000



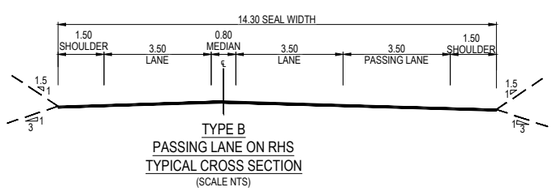
LOCATION PLAN
SCALE : NTS



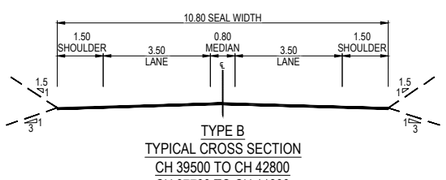
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	
APPROVED	NOT APPROVED
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 114000m TO 115000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C215
Rev.: A

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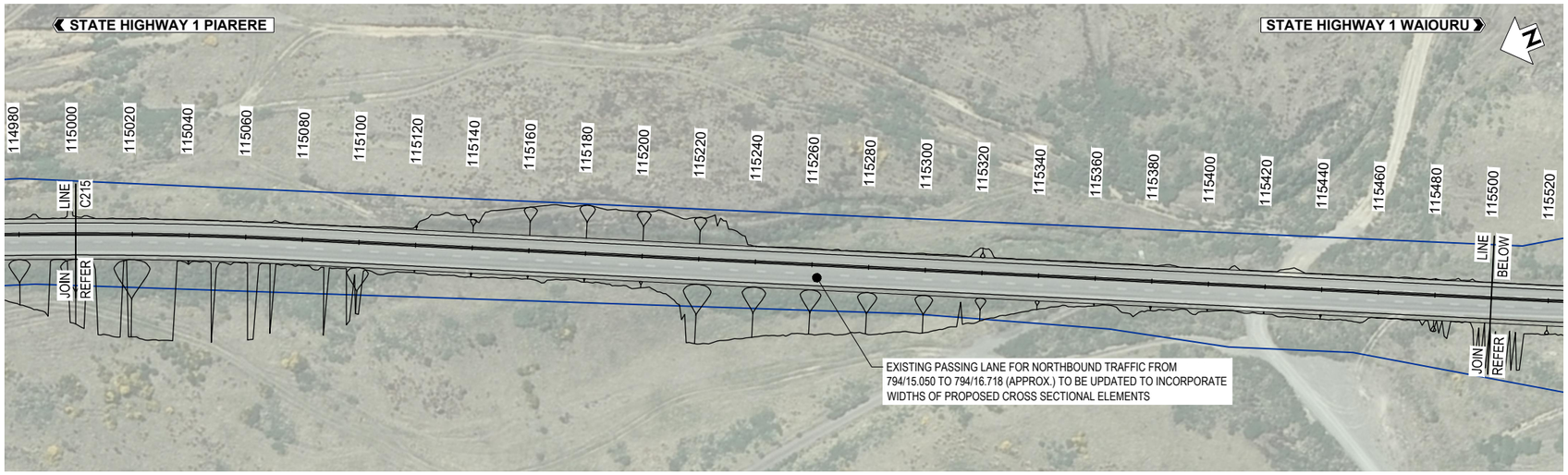
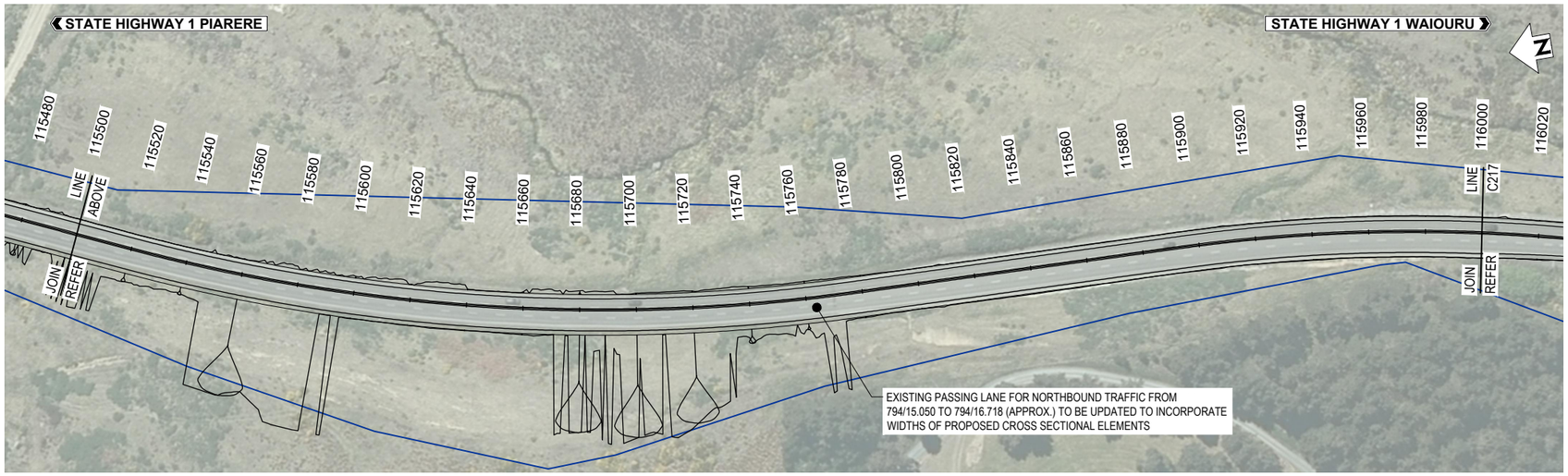
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000

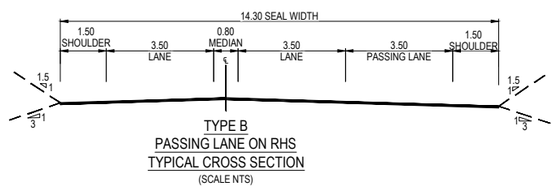
LOCATION PLAN
SCALE : NTS



PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON RHS
TYPICAL CROSS SECTION
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED	
DESIGNED	
DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 115000m TO 116000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C216
Rev.: A

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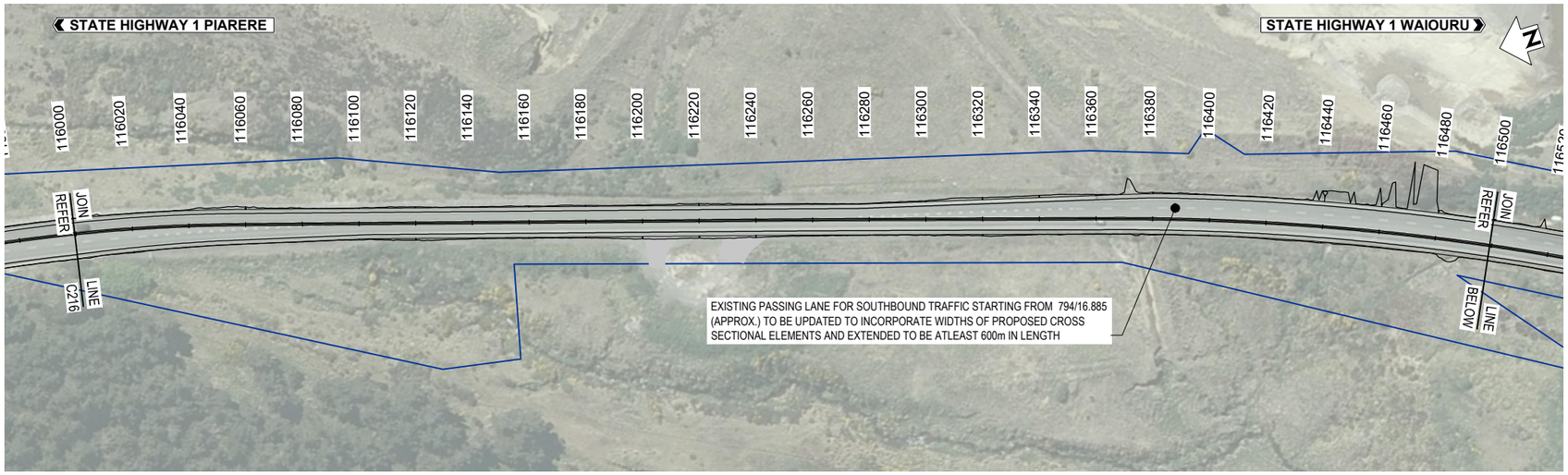
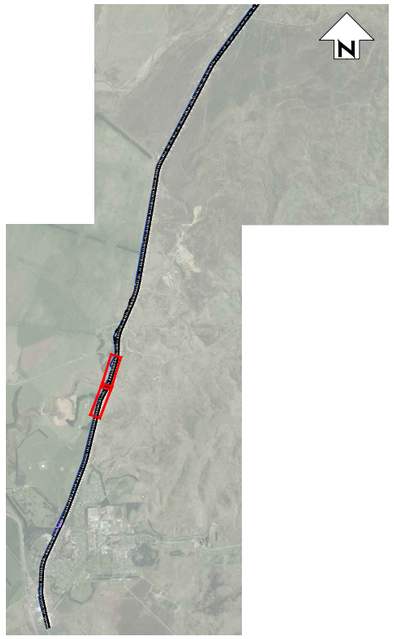
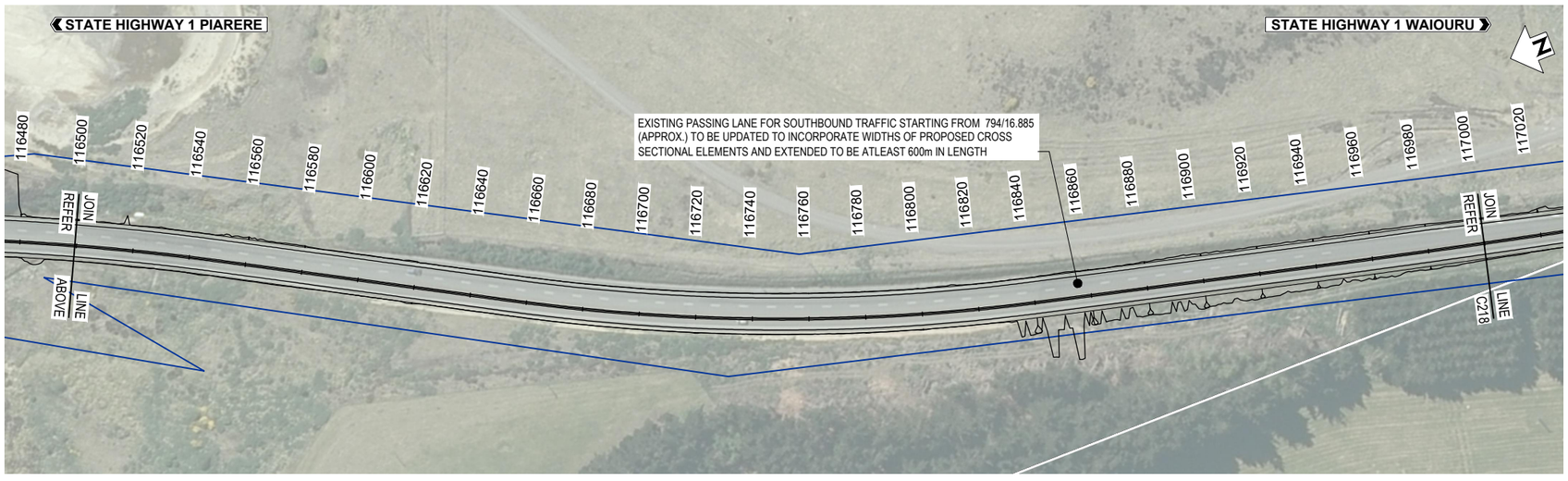
DO NOT SCALE - IF IN DOUBT, ASK
ORIGINAL SIZE A1
Last modified: Feb 18 2020 By Dattatray Ghundre



PLAN
SCALE 1 : 1000



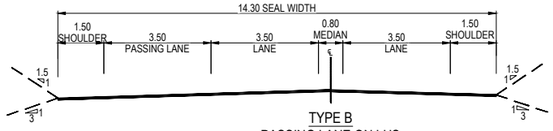
LOCATION PLAN
SCALE : NTS



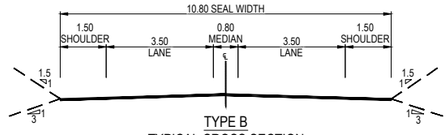
PLAN
SCALE 1 : 1000

LEGEND

- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
PASSING LANE ON LHS
TYPICAL CROSS SECTION
(SCALE NTS)



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 116000m TO 117000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C217
Rev.: A

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ORIGINAL SIZE A1
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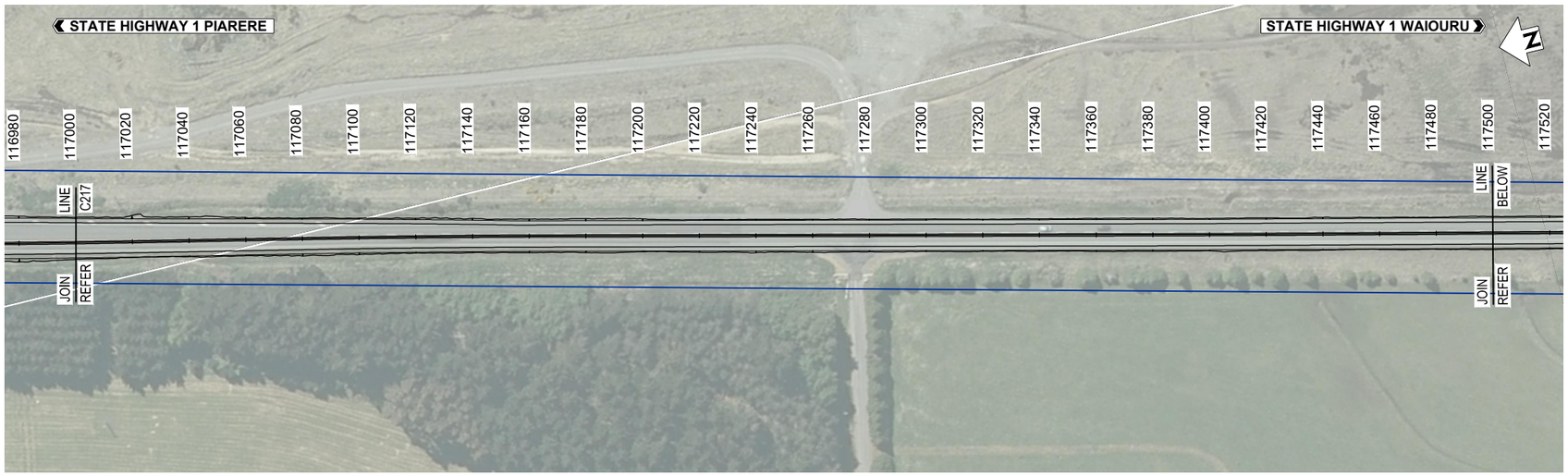
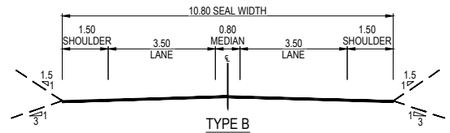


PLAN
SCALE 1 : 1000

LOCATION PLAN
SCALE : NTS

PLAN
SCALE 1 : 1000

LEGEND
- ROAD RESERVE BOUNDARY
- PROPOSED GUARDRAIL (TL-3 MINIMUM)
- EXISTING ACCESS TO BE UPDATED TO MATCH WITH PROPOSED CROSS SECTION EXTENTS
- EXISTING BRIDGE



TYPE B
TYPICAL CROSS SECTION
CH 39500 TO CH 42800
CH 97700 TO CH 11800
(SCALE NTS)

10 0 10 20 30 40 50m
SCALE 1:1000

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE

SURVEYED		
DESIGNED		
DRAWN		
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
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Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
STATION 117000m TO 118000m

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C218
Rev.: A

ORIGINAL SIZE A1

Last modified: Feb 18 2020 By Dattatray Ghundre

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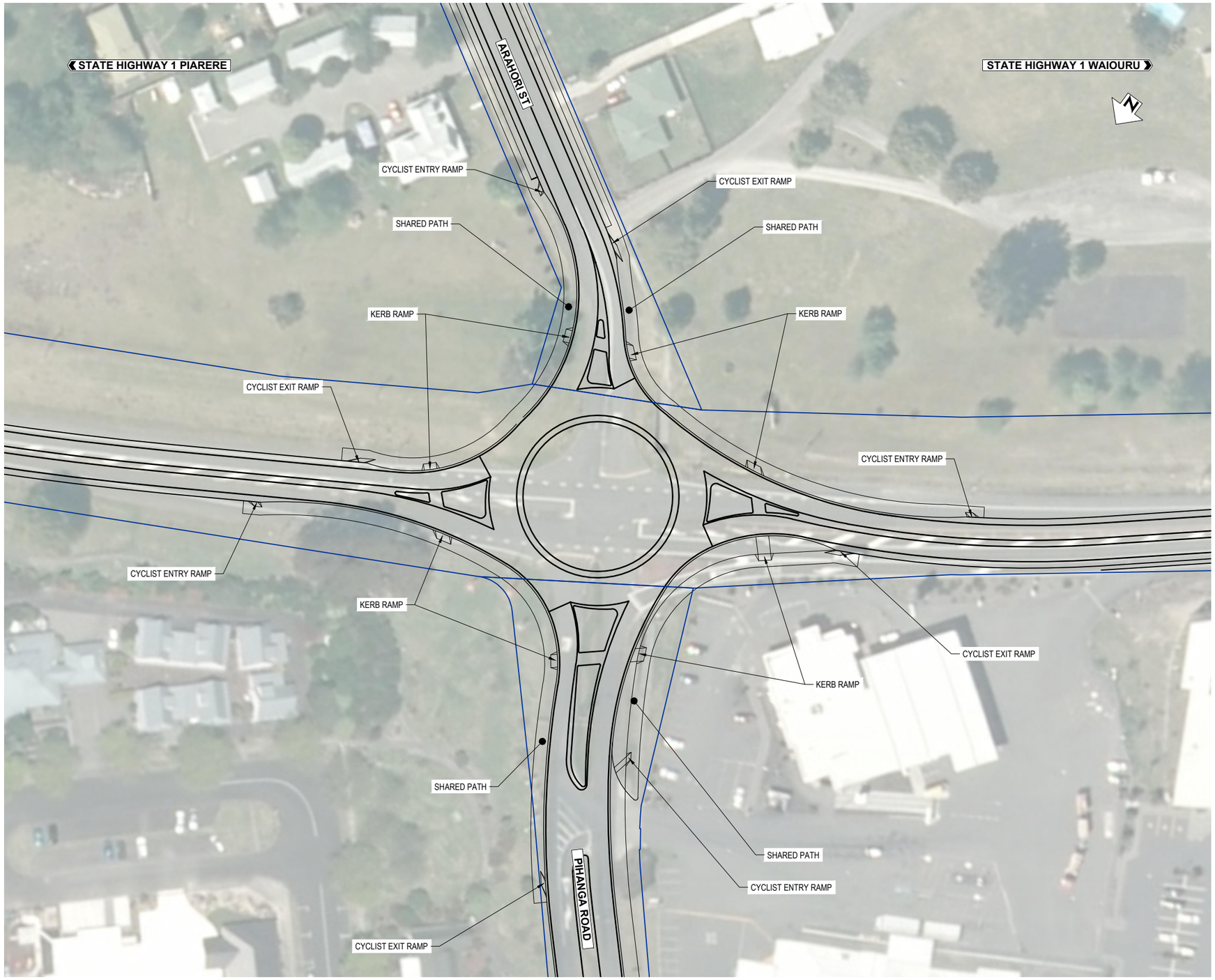
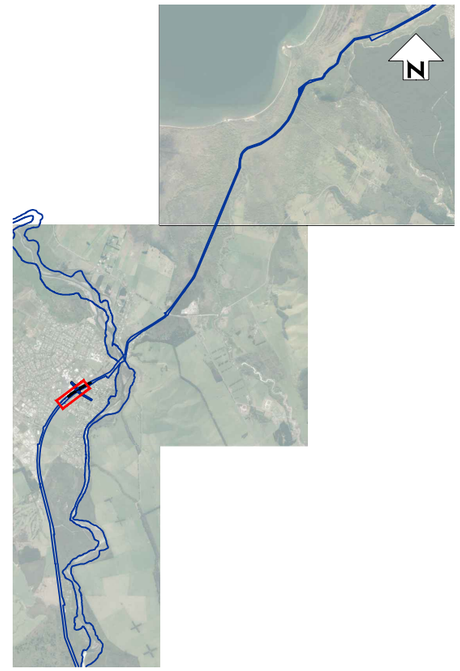


PLAN
SCALE 1 : 500 @ A1

10 0 10 20m
SCALE 1:500



LOCATION PLAN
SCALE : NTS

LEGEND
ROAD RESERVE BOUNDARY

FOR ILLUSTRATION ONLY

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

Last modified: Jun 4 2020 By Rutujpama Sali

REV	REVISIONS	DRN	CHK	APP	DATE

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DRAWN	
CAD REVIEW	
DESIGN CHECK	
DESIGN REVIEW	NOT APPROVED
APPROVED	
PROF REGISTRATION:	

Stantec

Client: WAKA KOTAHI NZ TRANSPORT AGENCY

STATE HIGHWAY 1 - TAUPO TO WAIOURU

PLAN
ROUNDABOUT AT TURANGI

Status Stamp: **WORKING PLOT**
Date Stamp:
Scales: AS SHOWN
Drawing No.: 310201099-00-100-C222
Rev.: A

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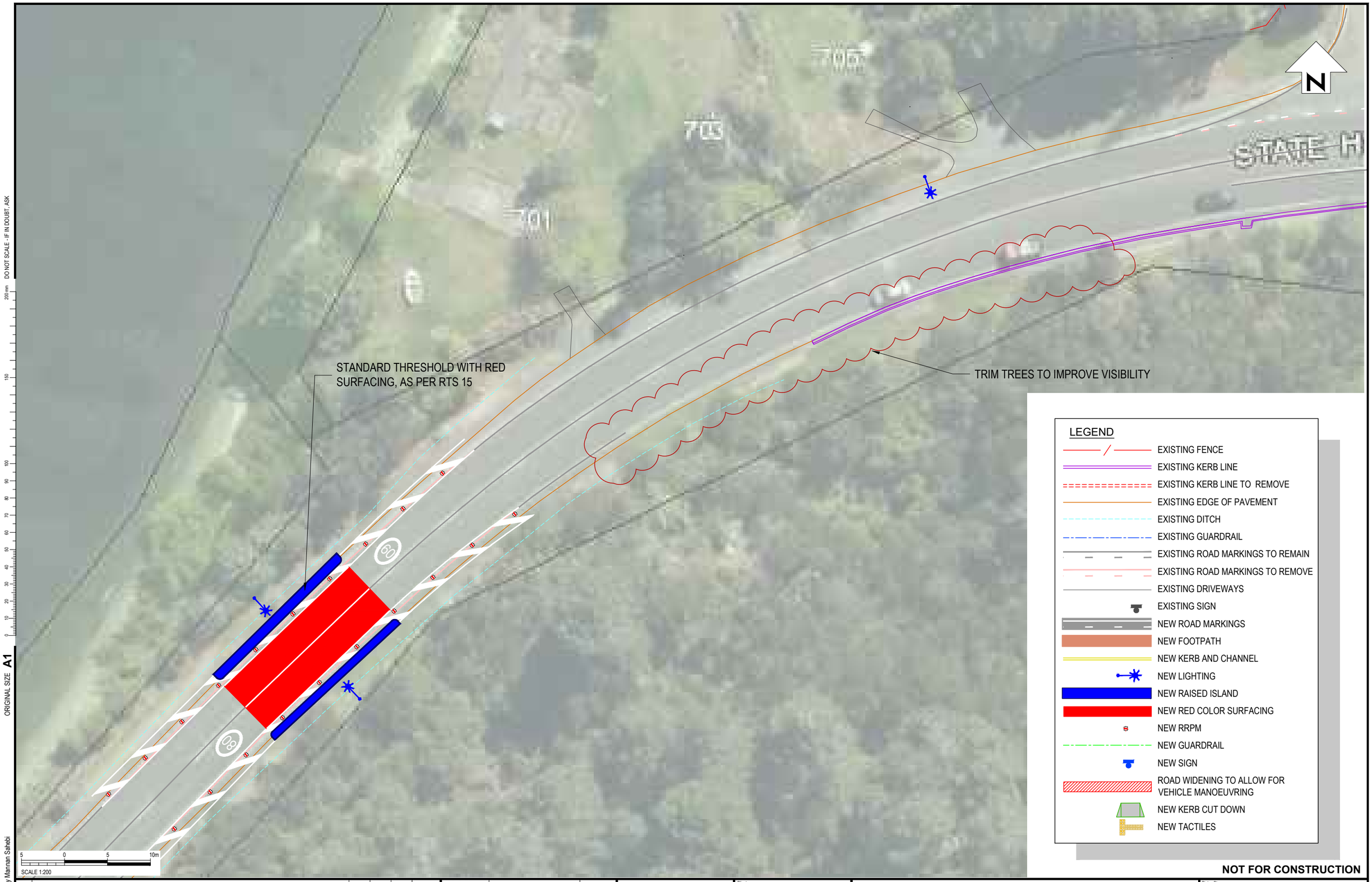

LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE **A1**

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 1 OF 6

Status Stamp: **WORKING PLOT**

Date Stamp: **20.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-01-100-C101

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N

LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

DO NOT SCALE - IF IN DOUBT, ASK

200 mm

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 2 OF 6

Status Stamp: **WORKING PLOT**

Date Stamp: **20.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-01-100-C102

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK
200 mm
ORIGINAL SIZE A1
Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 3 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-01-100-C103
Rev.: A

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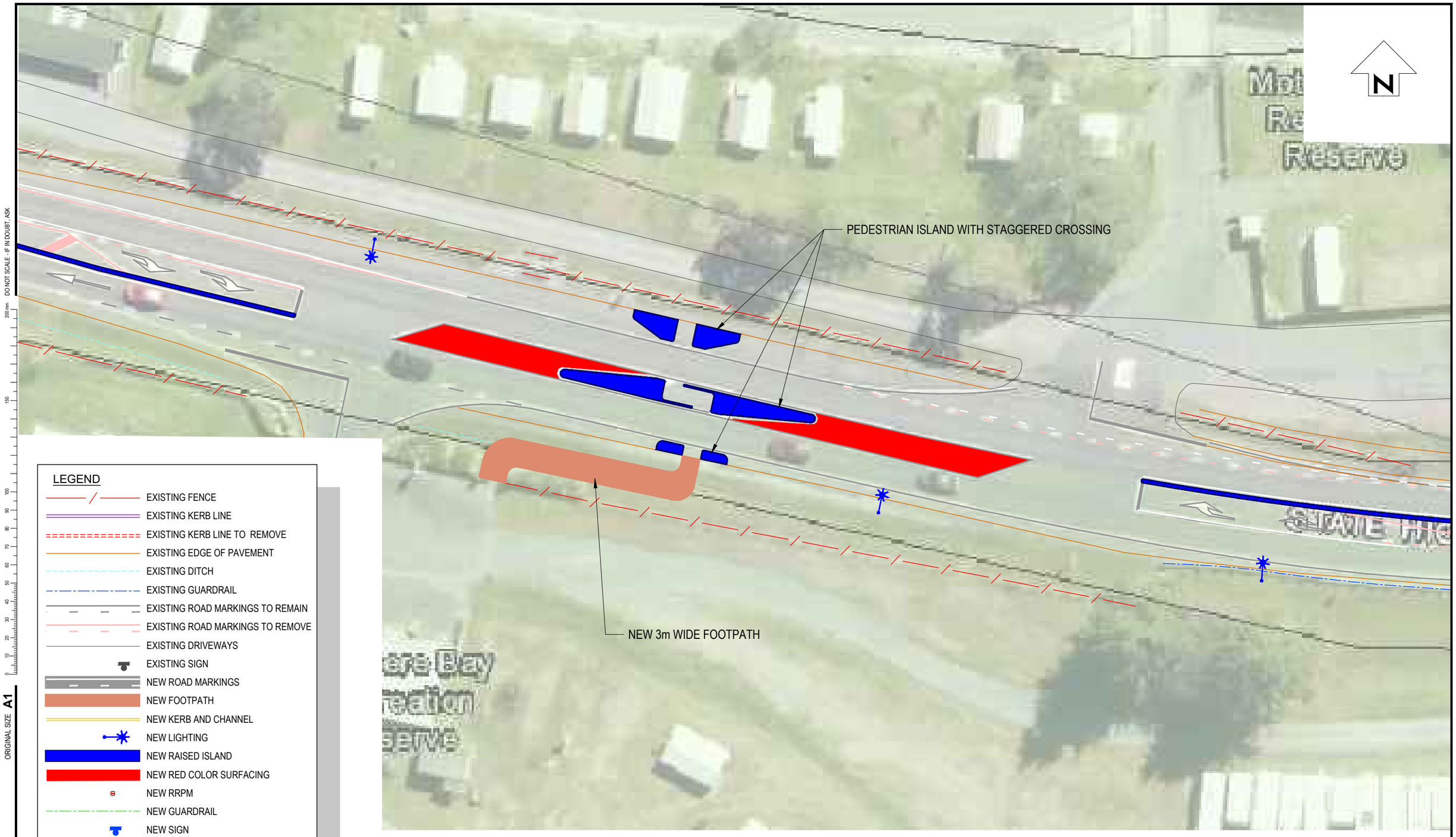

DO NOT SCALE - IF IN DOUBT, ASK

200 mm
150
100
90
80
70
60
50
40
30
20
10
0

ORIGINAL SIZE **A1**

LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 4 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-01-100-C104
Rev.: A

Last modified: Mar 8 2020 By Mannan Sahebi

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DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

N

CHANNELISED RIGHT TURN BAY

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
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DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 5 OF 6

Status Stamp: WORKING PLOT

Date Stamp: 20.02.20

Scales: 1 : 200@A1

Drawing No.: 310201099-01-100-C105

Rev.: A

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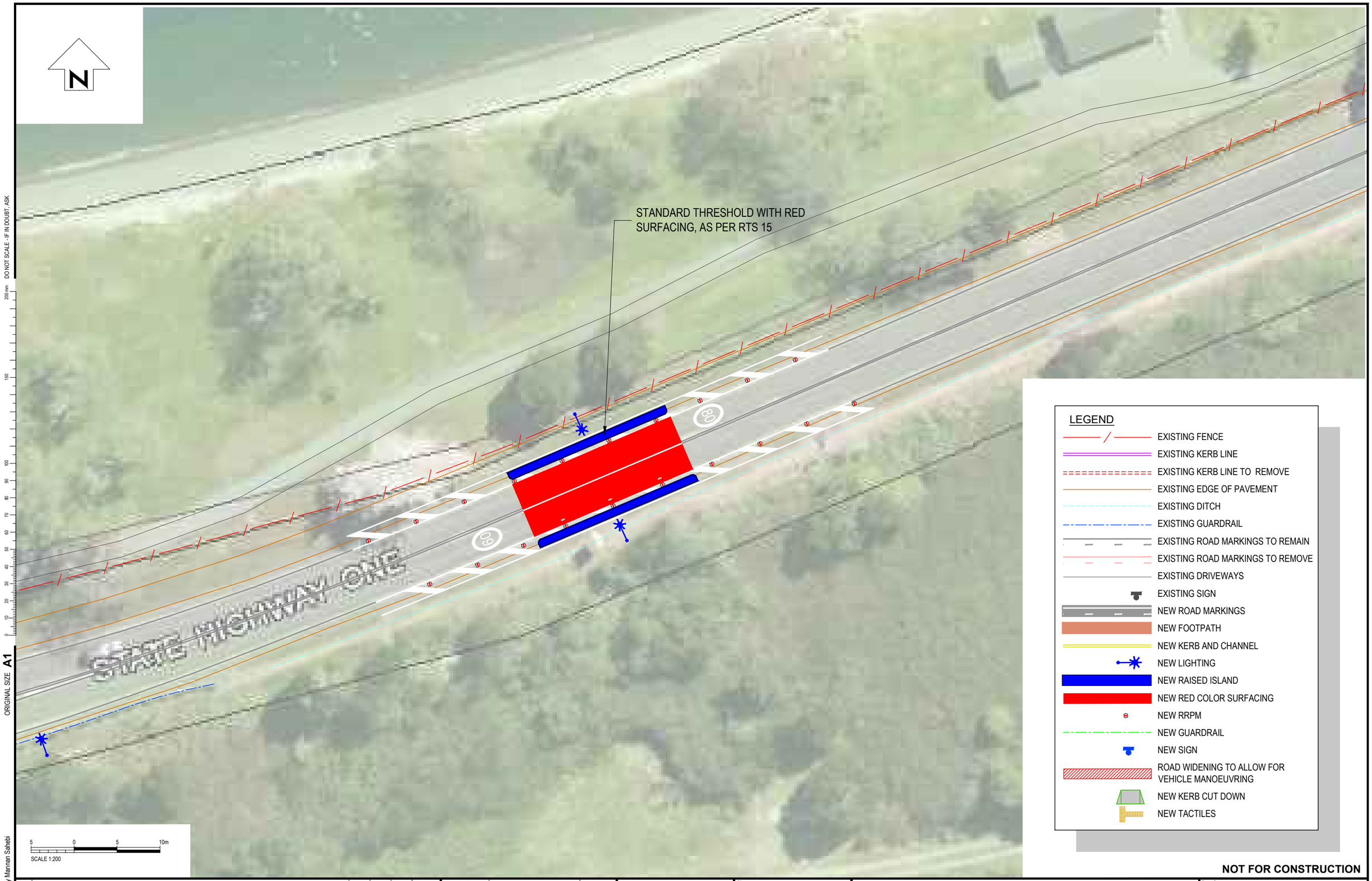

LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
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- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
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- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE **A1**

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
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DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUTERE SAFETY IMROVEMENT
SHEET 6 OF 6

Status Stamp: **WORKING PLOT**

Date Stamp: **20.02.20**

Scales: 1 : 200

Drawing No.: 310201099-01-100-C106

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
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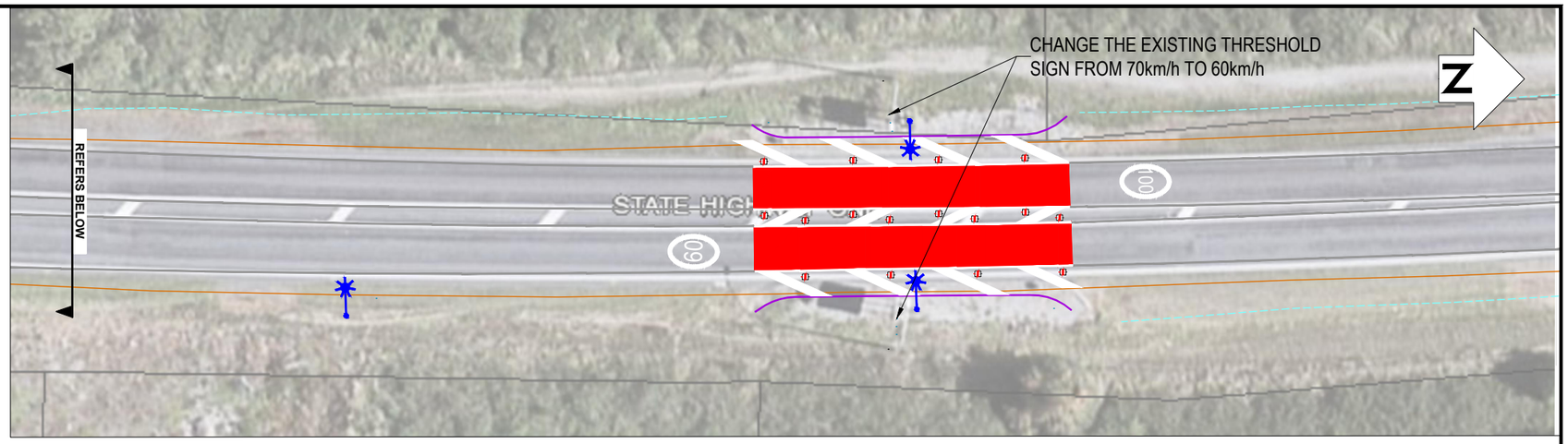
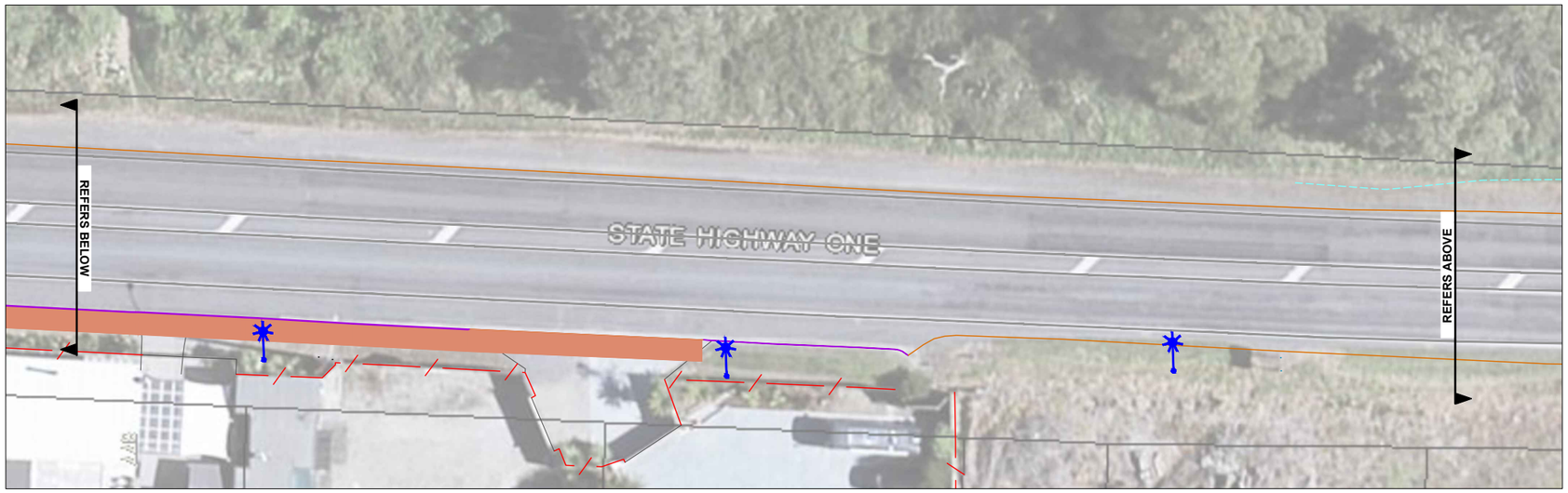
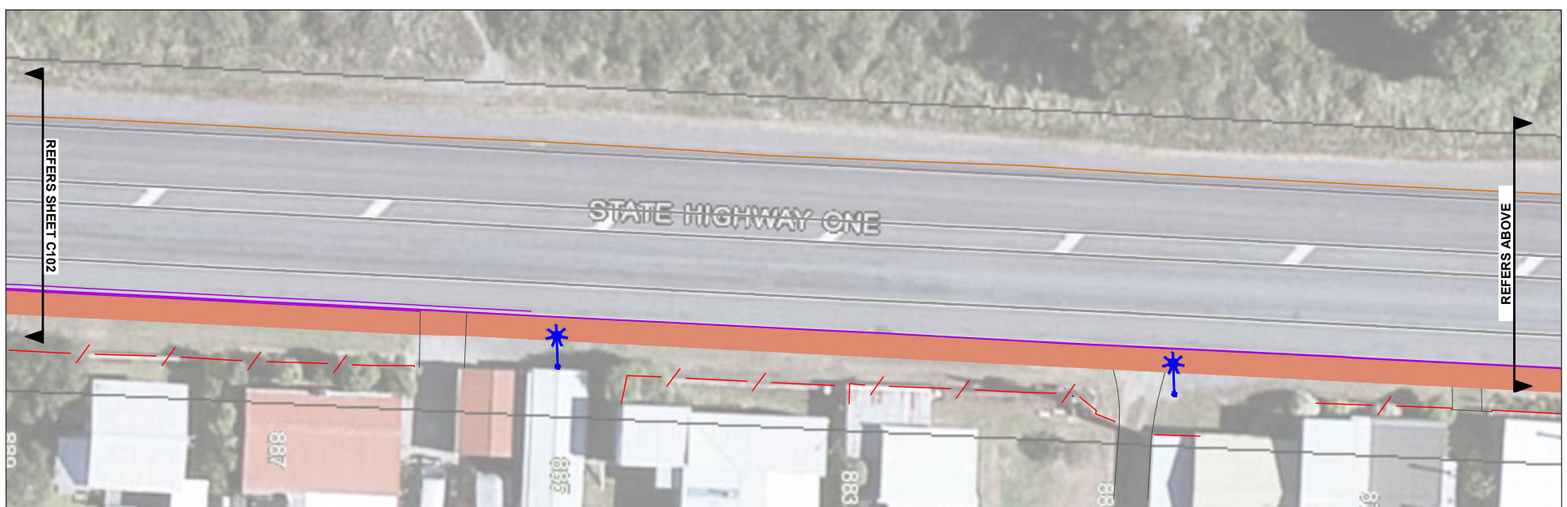
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES







5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 1 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-02-100-C101
Rev.: A

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ORIGINAL SIZE A1
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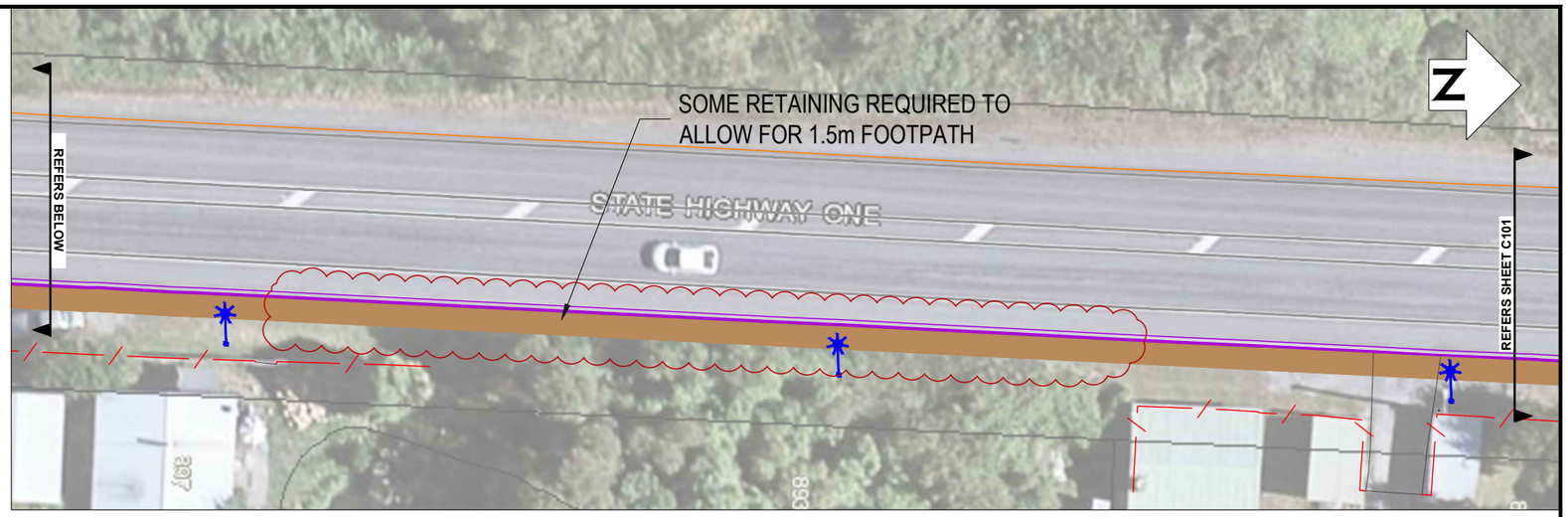
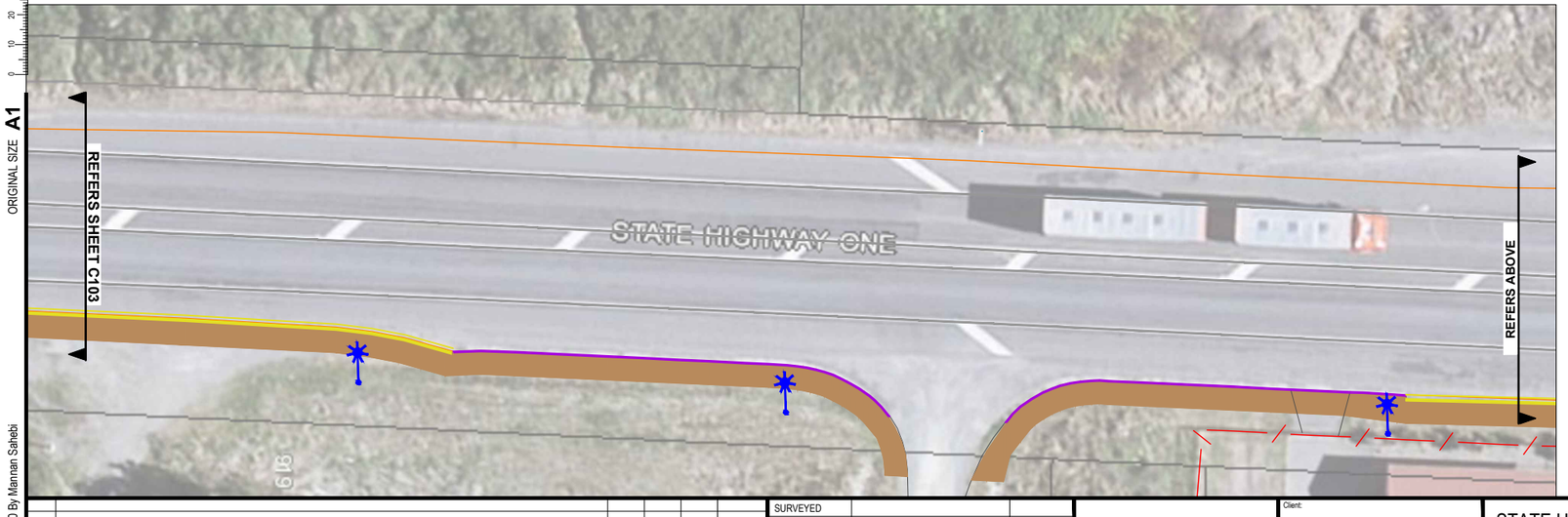
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

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SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 2 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-02-100-C102
Rev.: A

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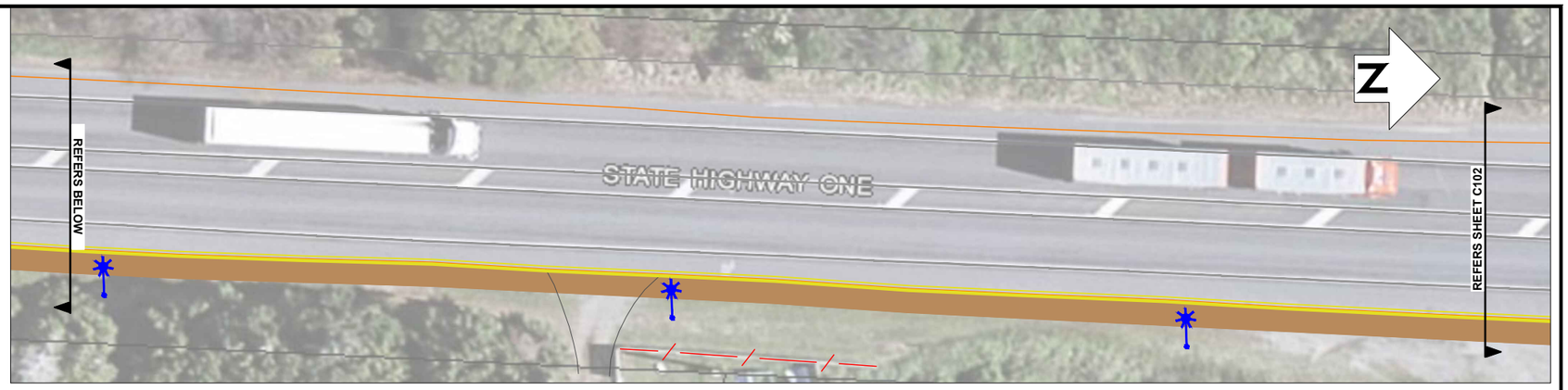
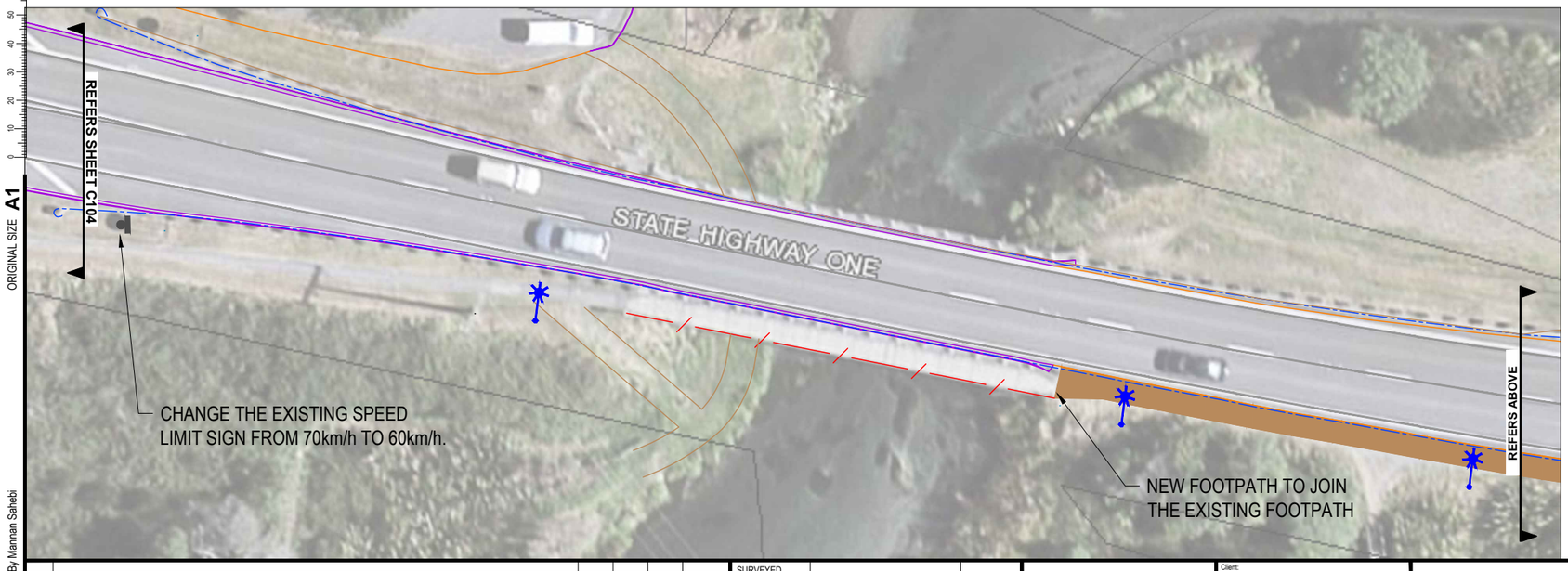
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	NOT APPROVED	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 3 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-02-100-C103
Rev.: A

ORIGINAL SIZE A1
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
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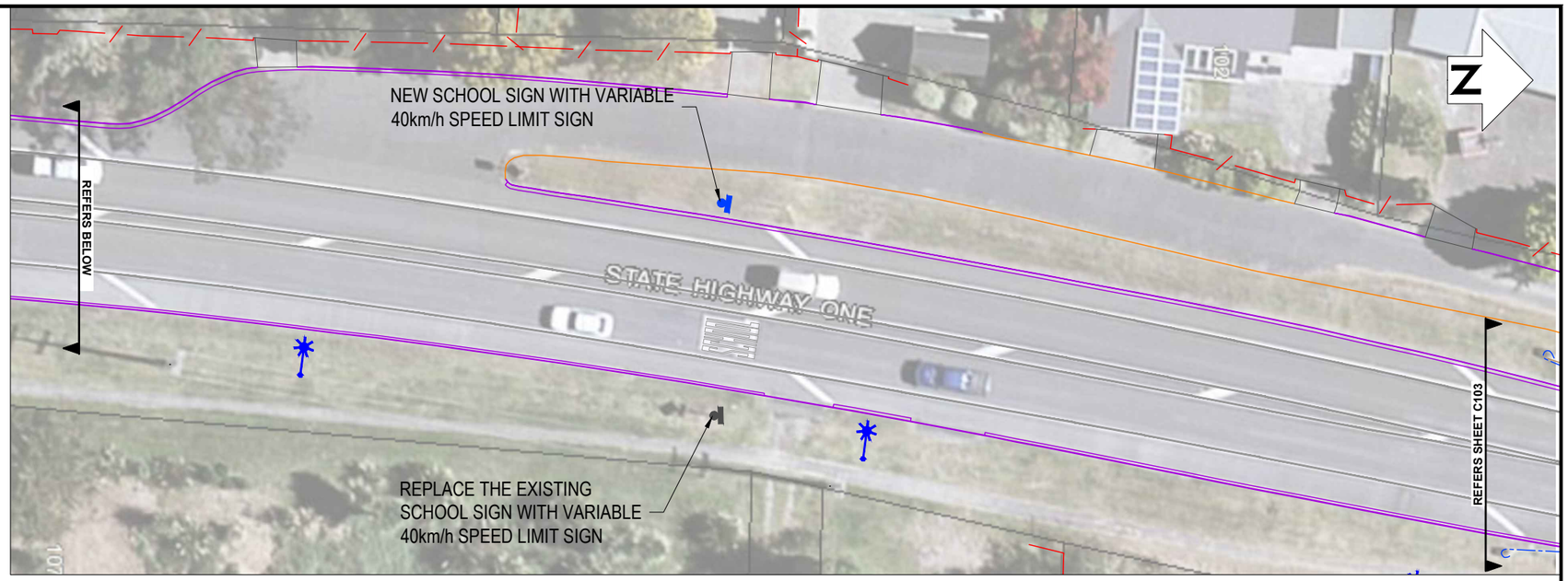
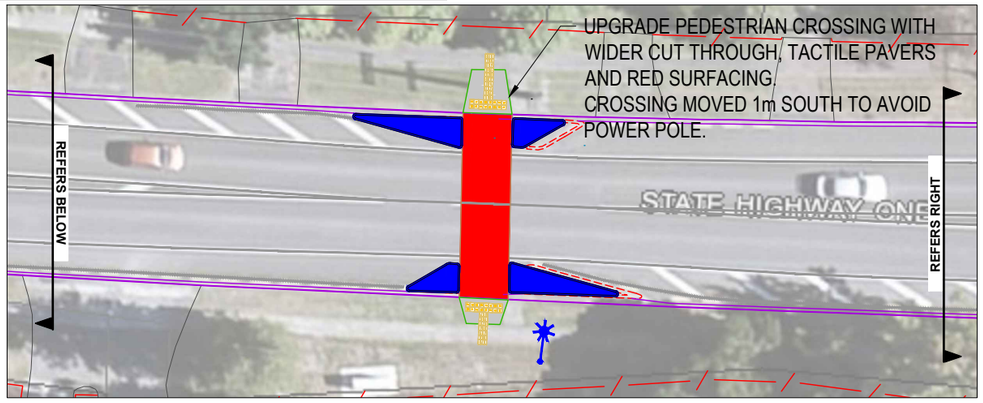
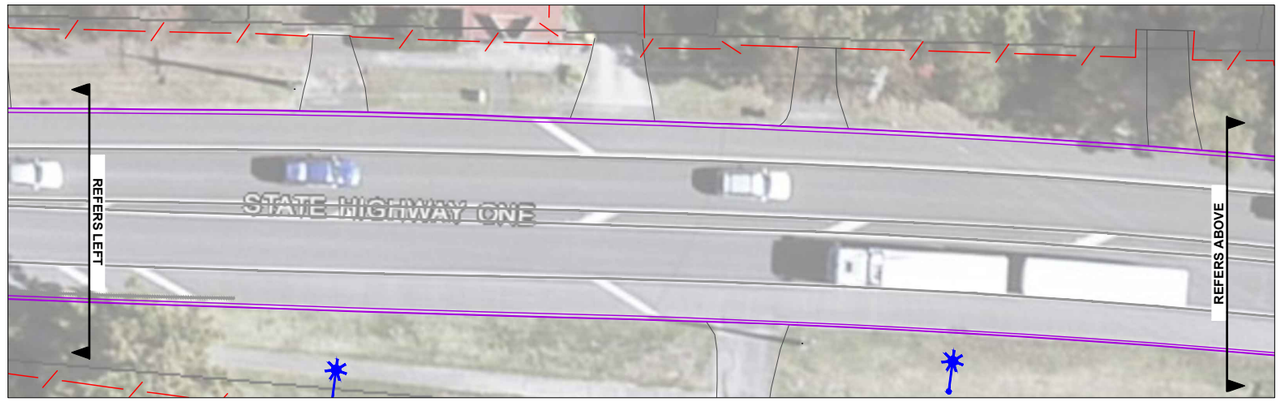
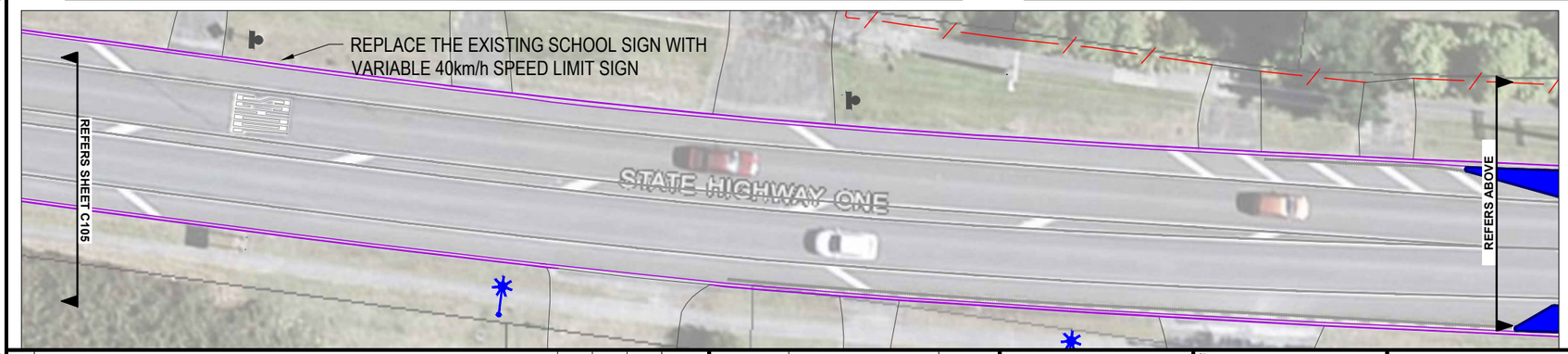
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES









SCALE 1:200

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Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 4 OF 6

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-02-100-C104
Rev.: A

ORIGINAL SIZE A1
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
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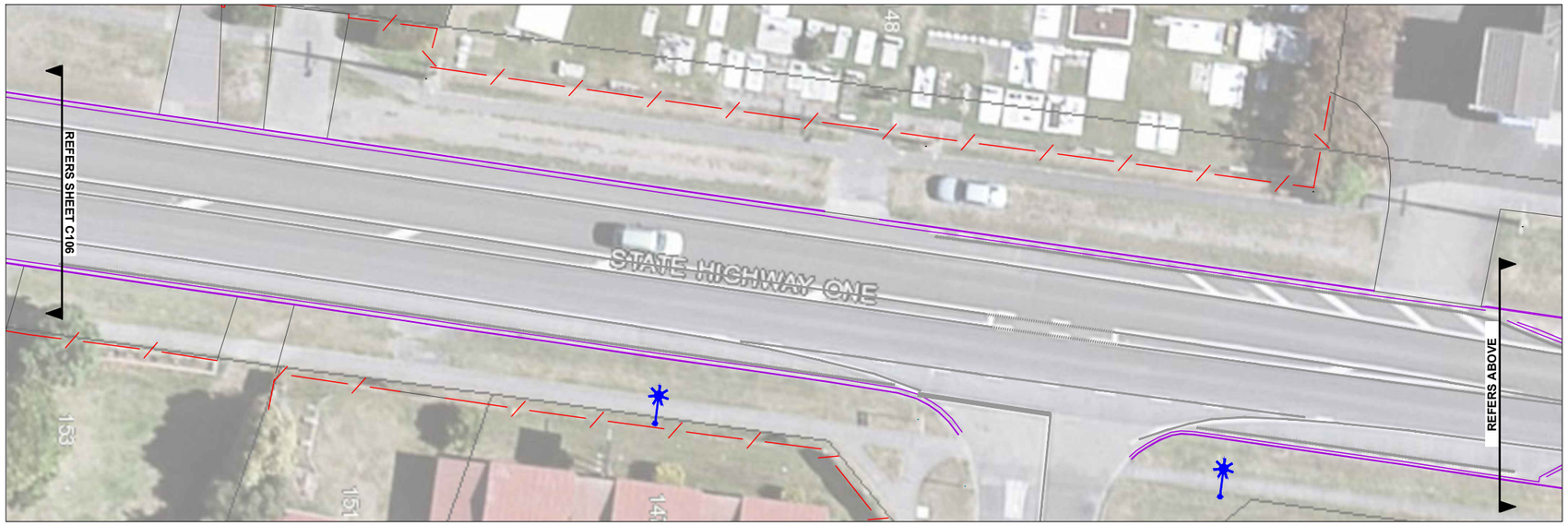

5 0 5 10m
SCALE 1:200

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APPROVED		
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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 5 OF 6

Status Stamp: **WORKING PLOT**
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
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5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

ORIGINAL SIZE A1

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Last modified: Mar 8 2020 By Mannan Sahebi

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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

WAITAHANUI SAFETY IMROVEMENT
SHEET 6 OF 6

Status Stamp: **WORKING PLOT**
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
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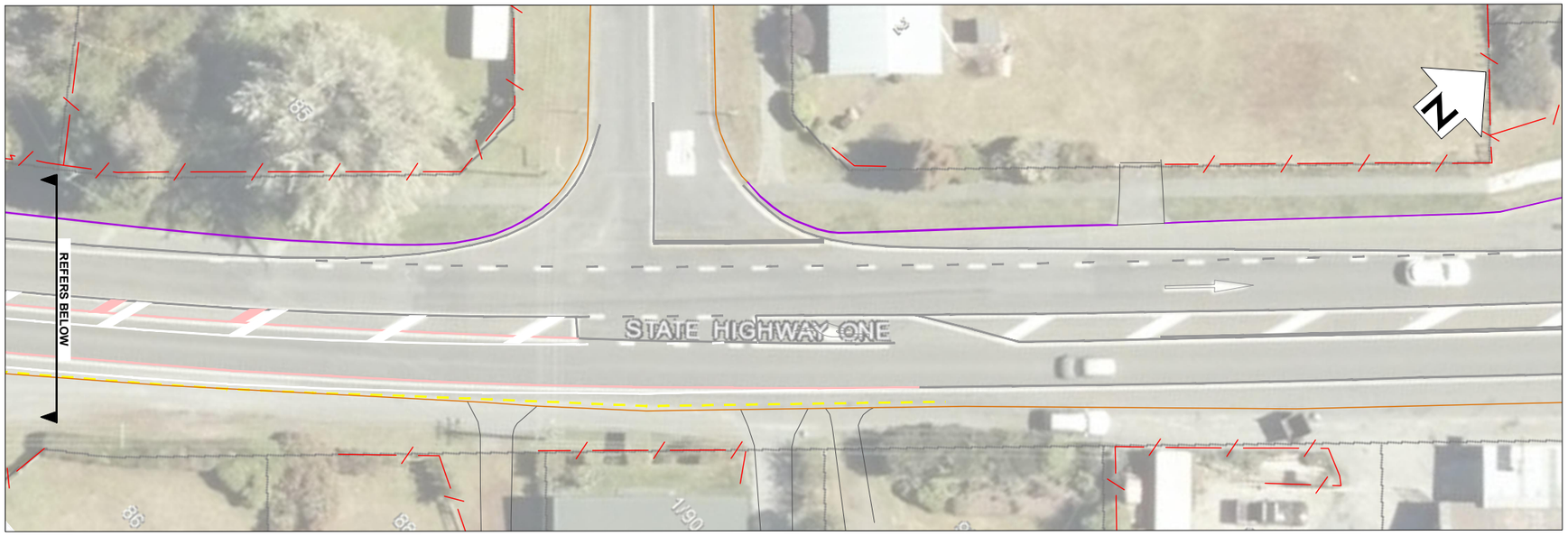

SCALE 1:200

NOT FOR CONSTRUCTION

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ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	20.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	20.02.20
DRAWN	Mannan Sahebi	20.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUOAPA SAFETY IMROVEMENT
SHEET 1 OF 3

Status Stamp: **WORKING PLOT**
Date Stamp: **20.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-03-100-C101
Rev.: A

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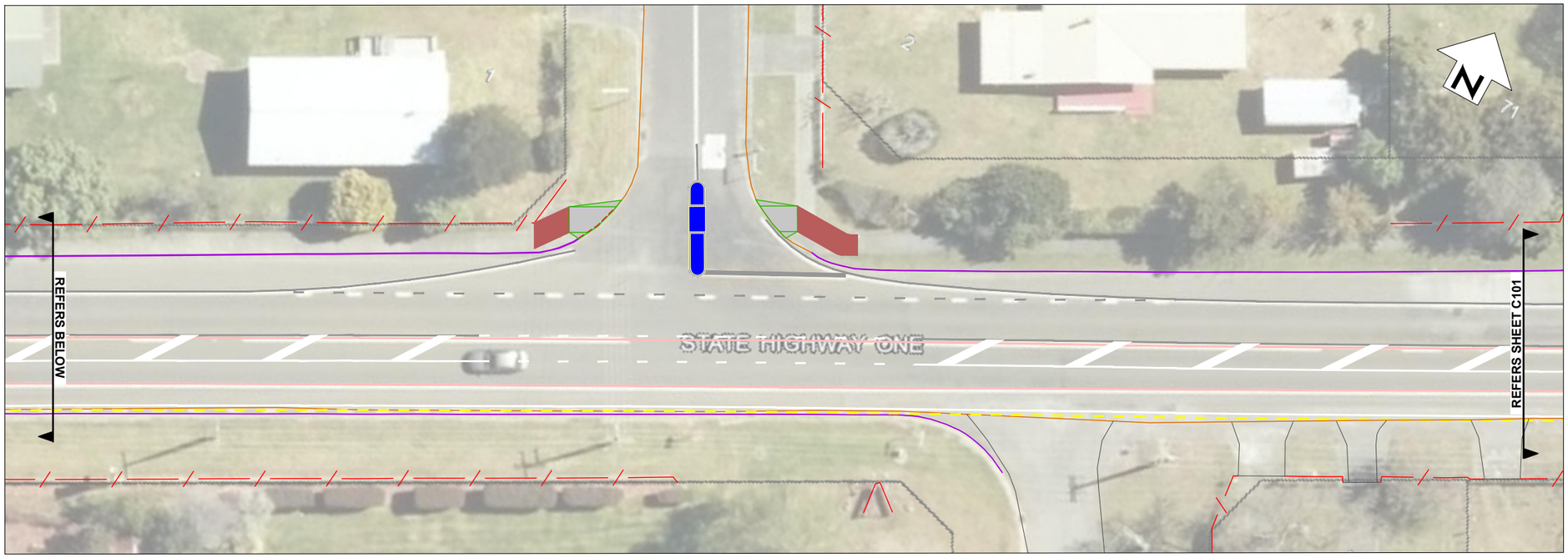
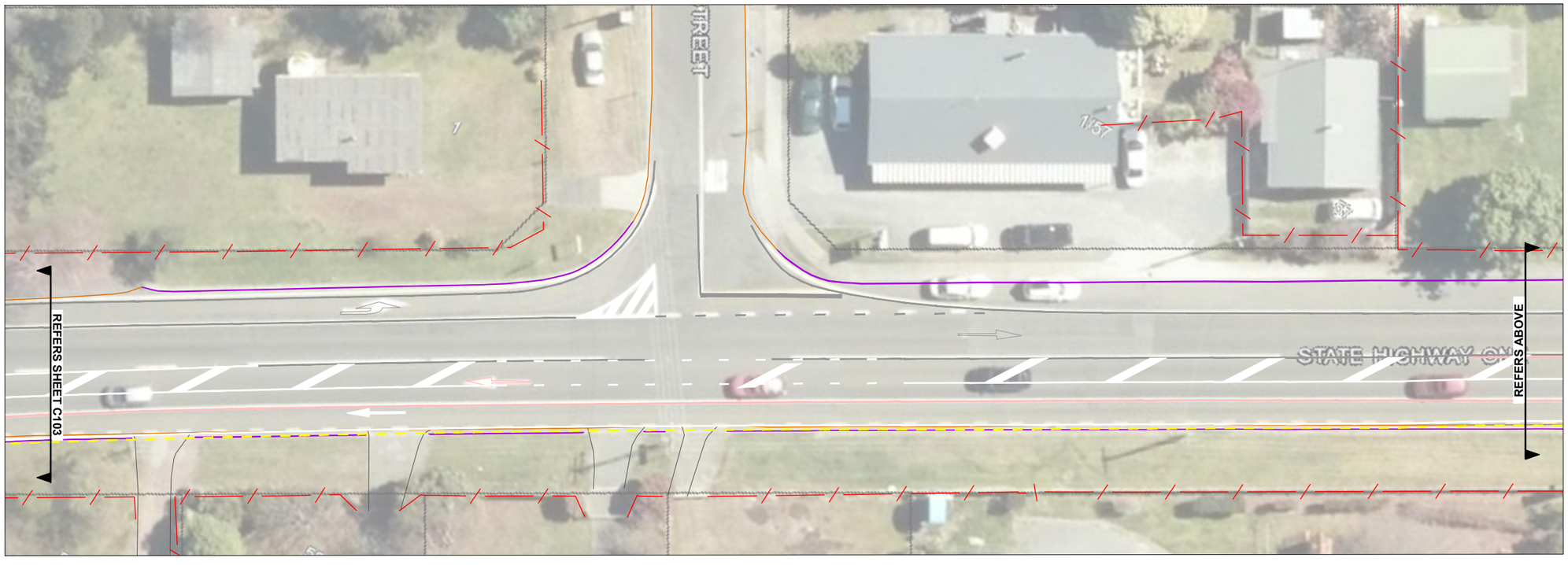
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





SCALE 1:200

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
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PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUOAPA SAFETY IMROVEMENT
SHEET 2 OF 3

Status Stamp: **WORKING PLOT**

Date Stamp: **20.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-03-100-C102

Rev.: A

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
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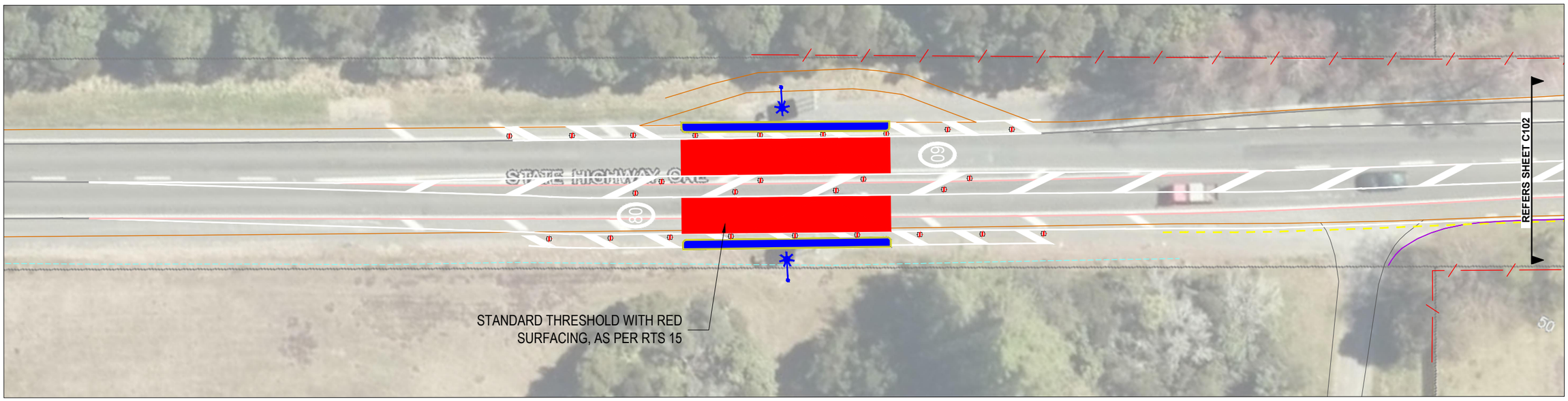
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES



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SCALE 1:200

NOT FOR CONSTRUCTION

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ORIGINAL SIZE **A1**

Last modified: Mar 8 2020 By Mannan Sahebi

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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

MOTUOAPA SAFETY IMROVEMENT
SHEET 3 OF 3

Status Stamp: **WORKING PLOT**
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
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- EXISTING DITCH
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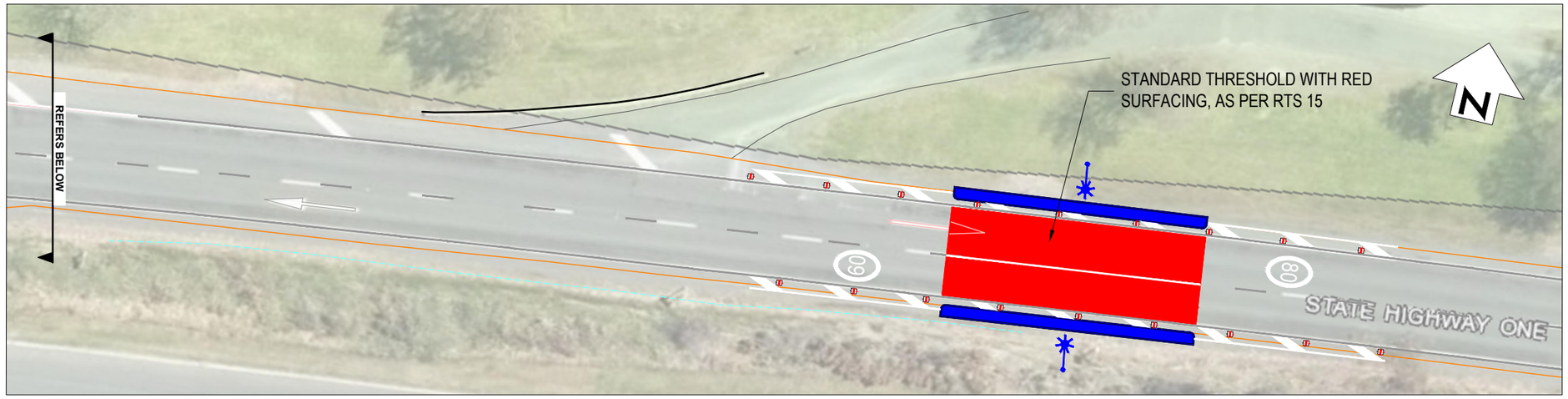
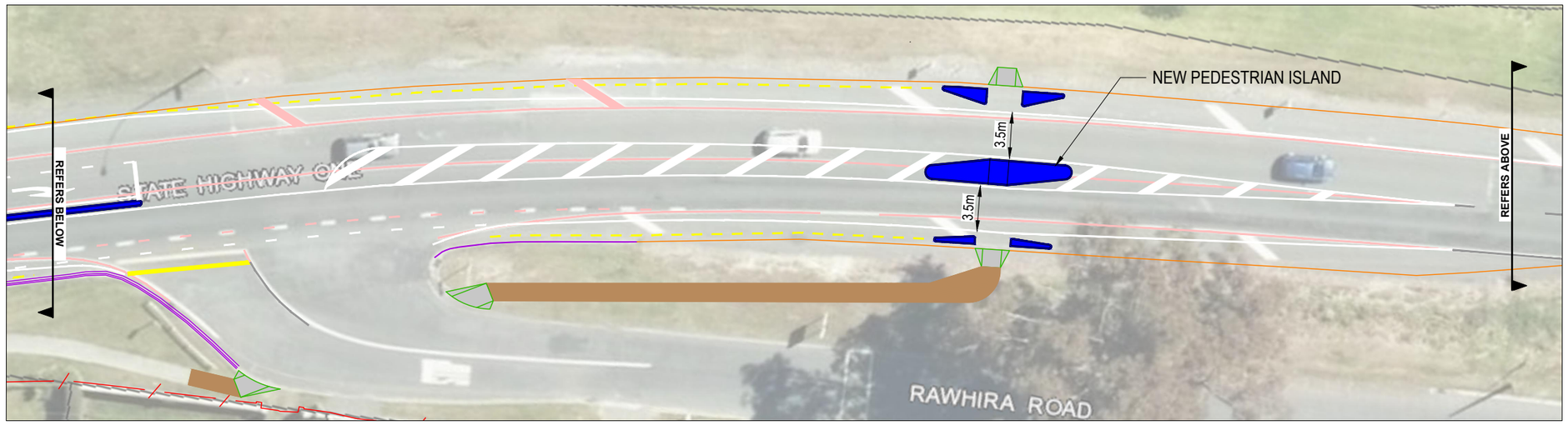
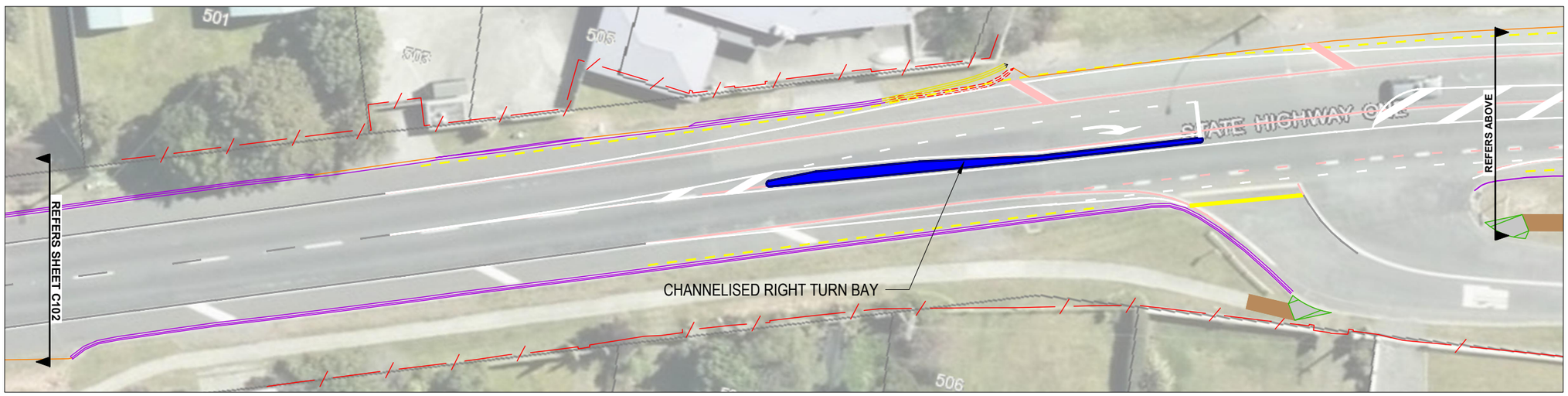
- NEW KERB CUT DOWN
- NEW TACTILES







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SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 1 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C101
Rev.: A

ORIGINAL SIZE A1
Last modified: Mar 8 2020 By Mannan Sahebi
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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
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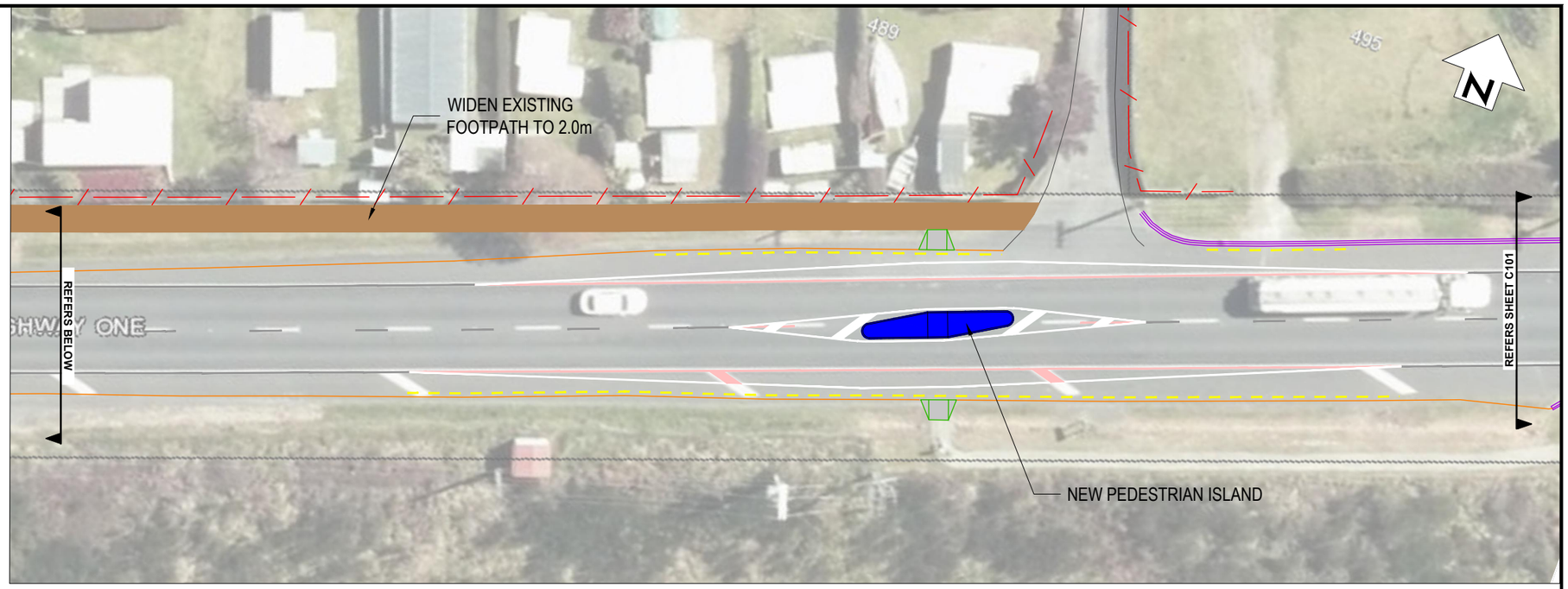
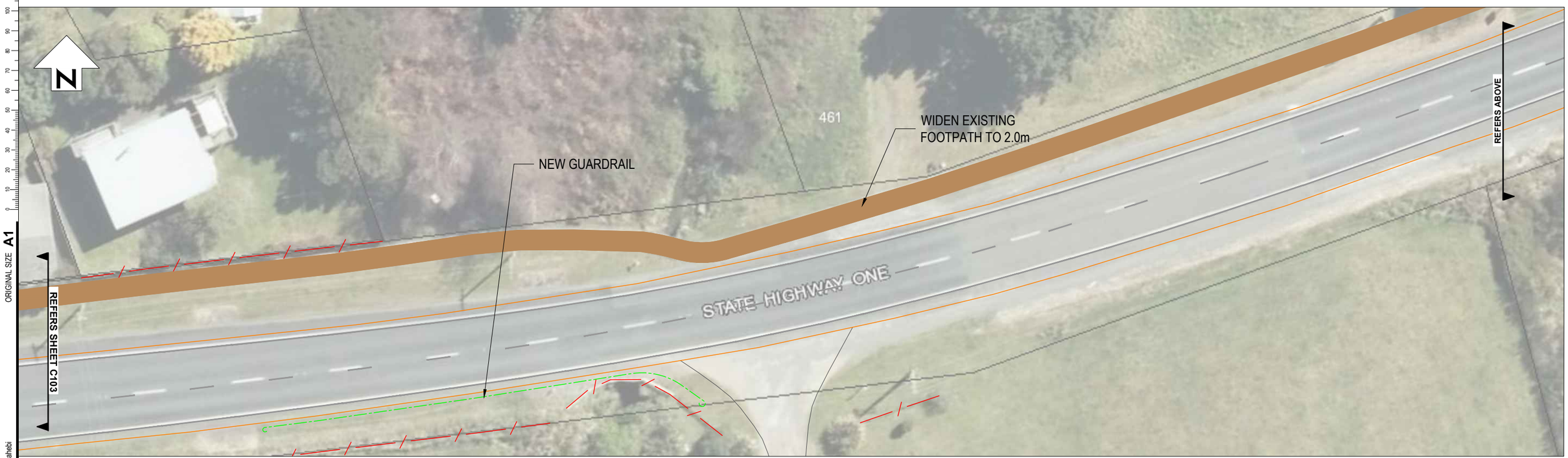
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

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A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
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DESIGN CHECK		
DESIGN REVIEW		
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PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 2 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C102

Rev.: A

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
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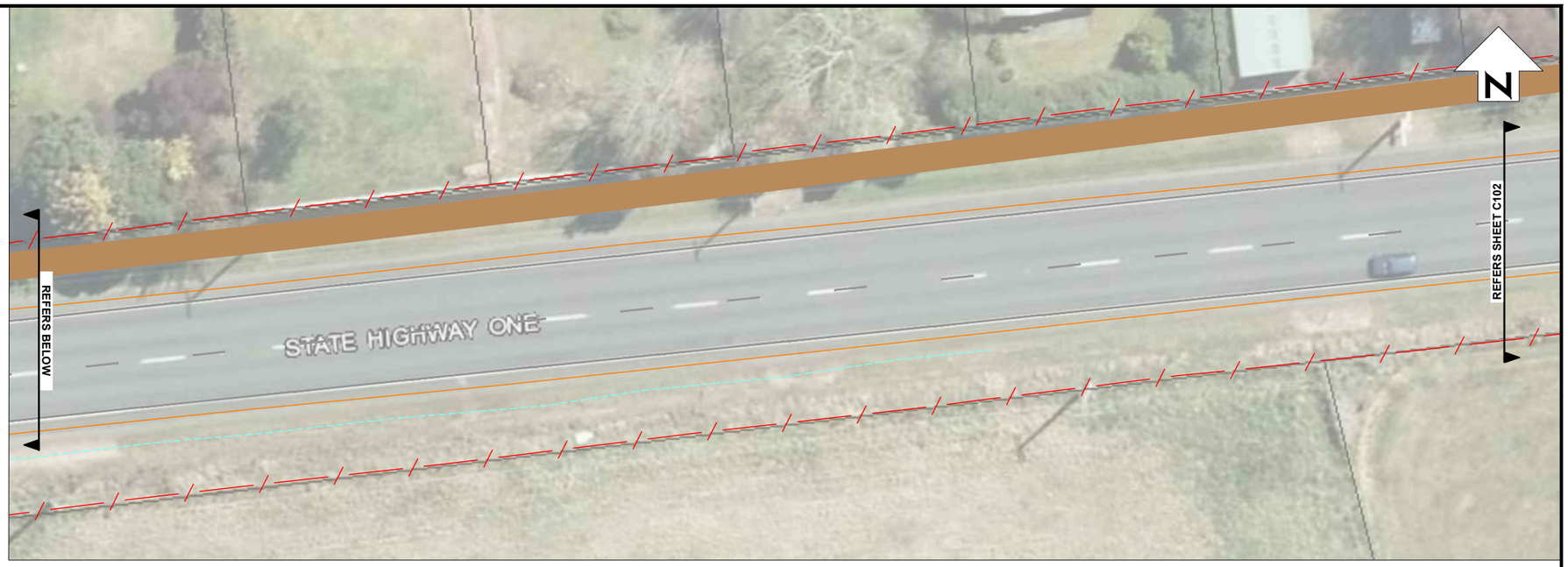

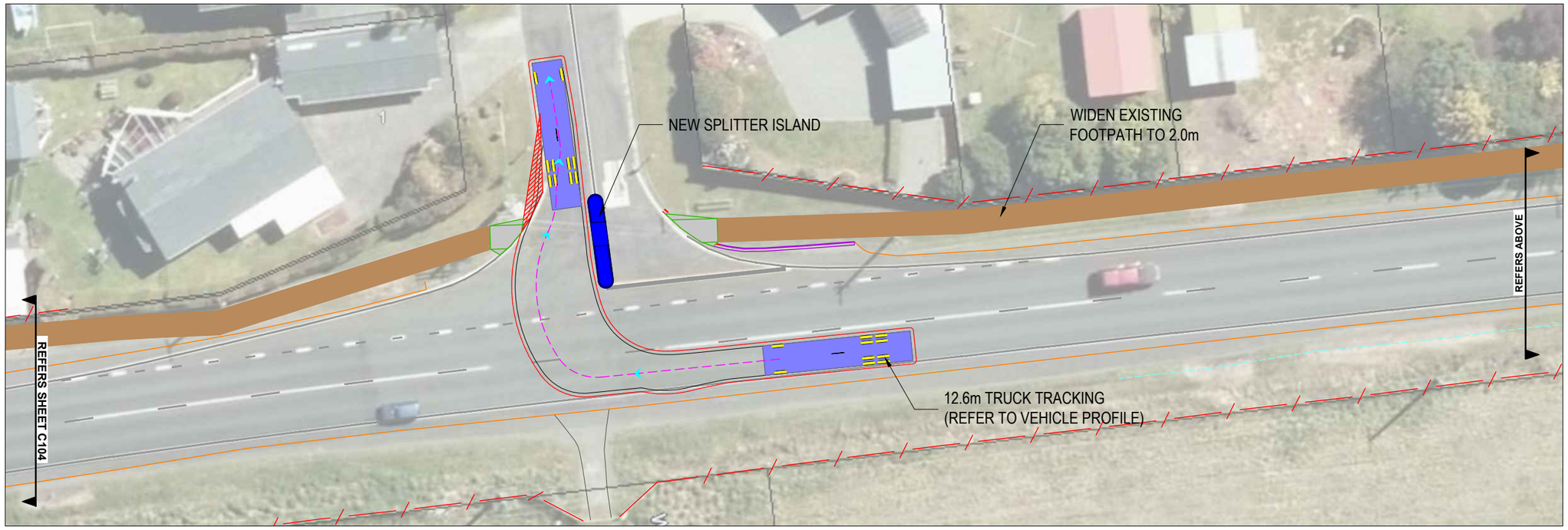

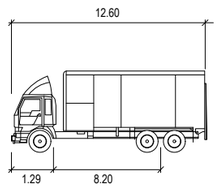

AT 126 Truck — meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0

5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
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PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 3 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.2.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C103

Rev.: A

ORIGINAL SIZE A1

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
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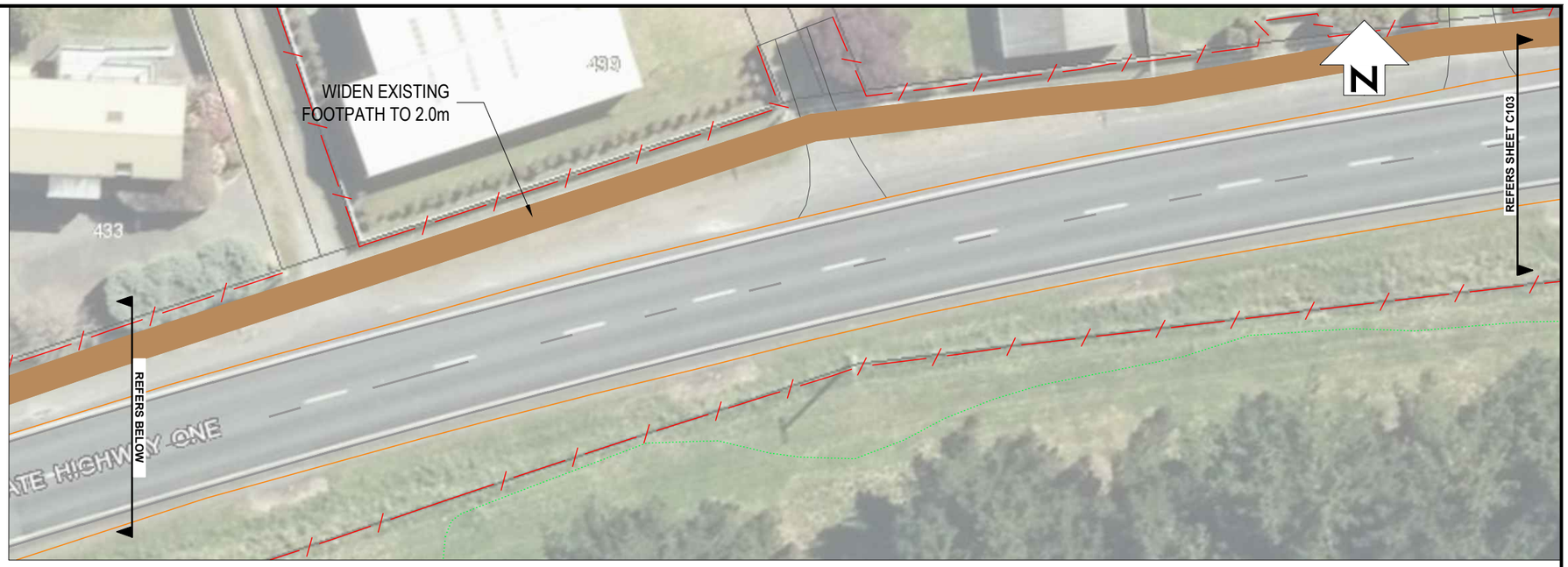

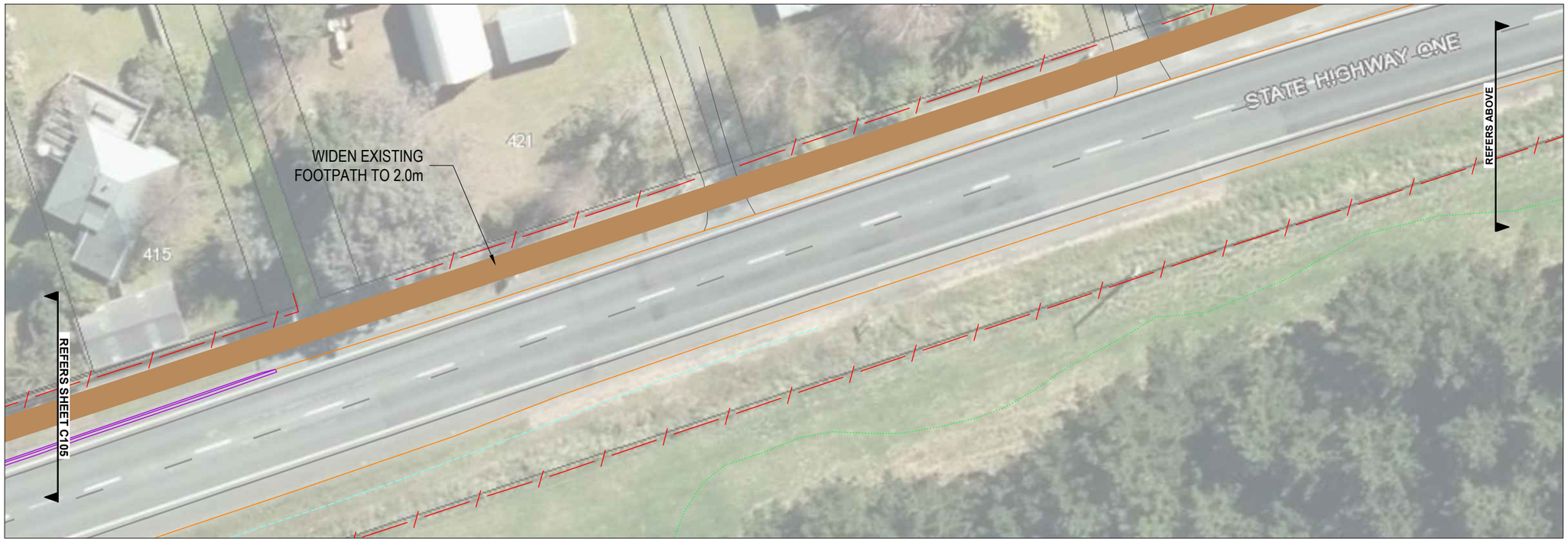

5 0 5 10m

SCALE 1:200

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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 4 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C104

Rev.: A

ORIGINAL SIZE A1

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
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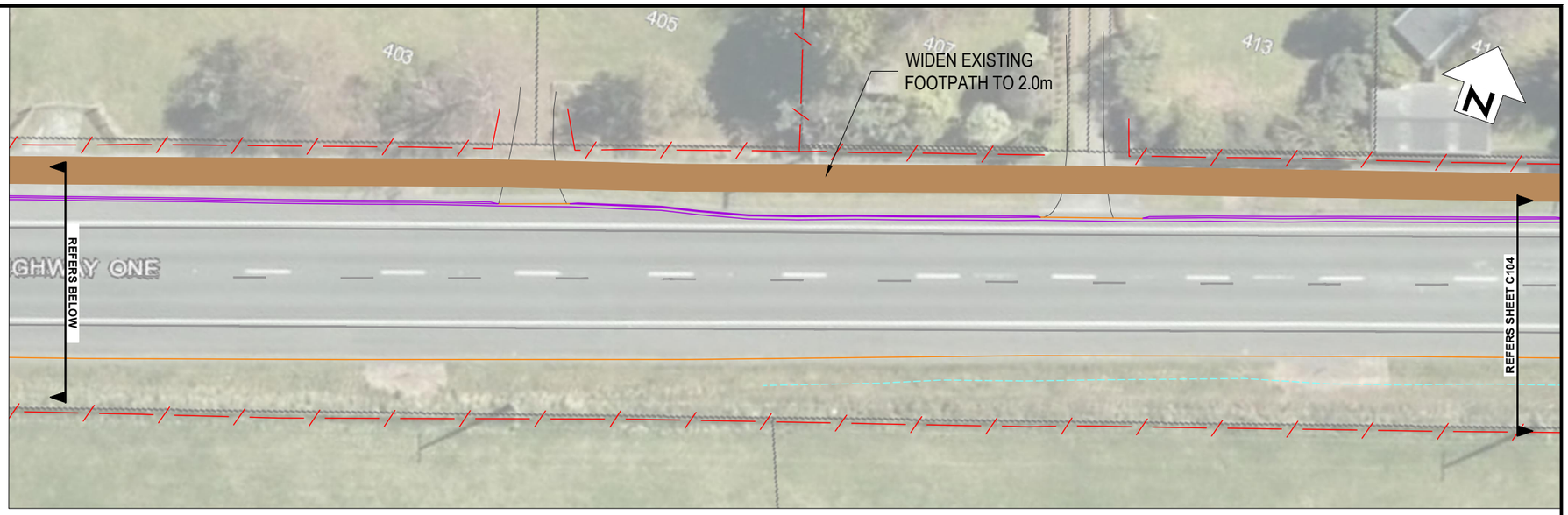

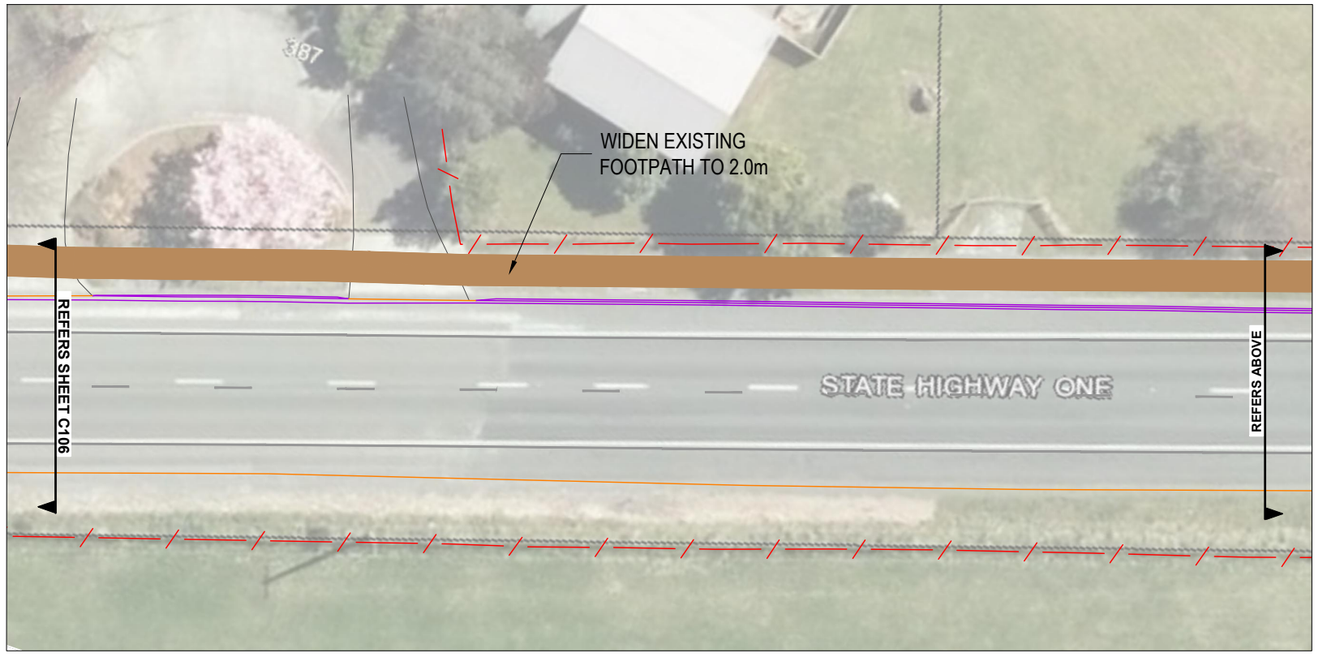

5 0 5 10m

SCALE 1:200

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200 mm

ORIGINAL SIZE A1

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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 5 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

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Drawing No.: 310201099-04-100-C105

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
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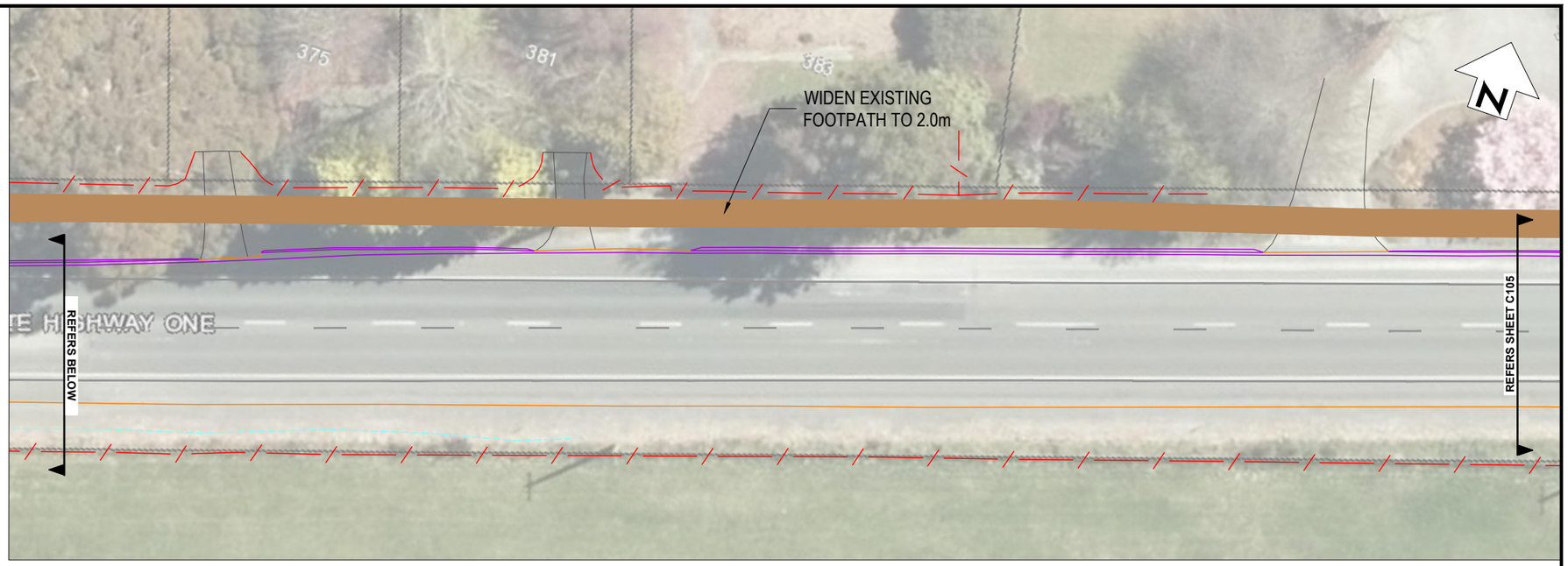

5 0 5 10m

SCALE 1:200

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ORIGINAL SIZE A1

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Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

NOT FOR CONSTRUCTION

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 6 OF 15

Status Stamp: WORKING PLOT

Date Stamp: 26.02.20

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C106

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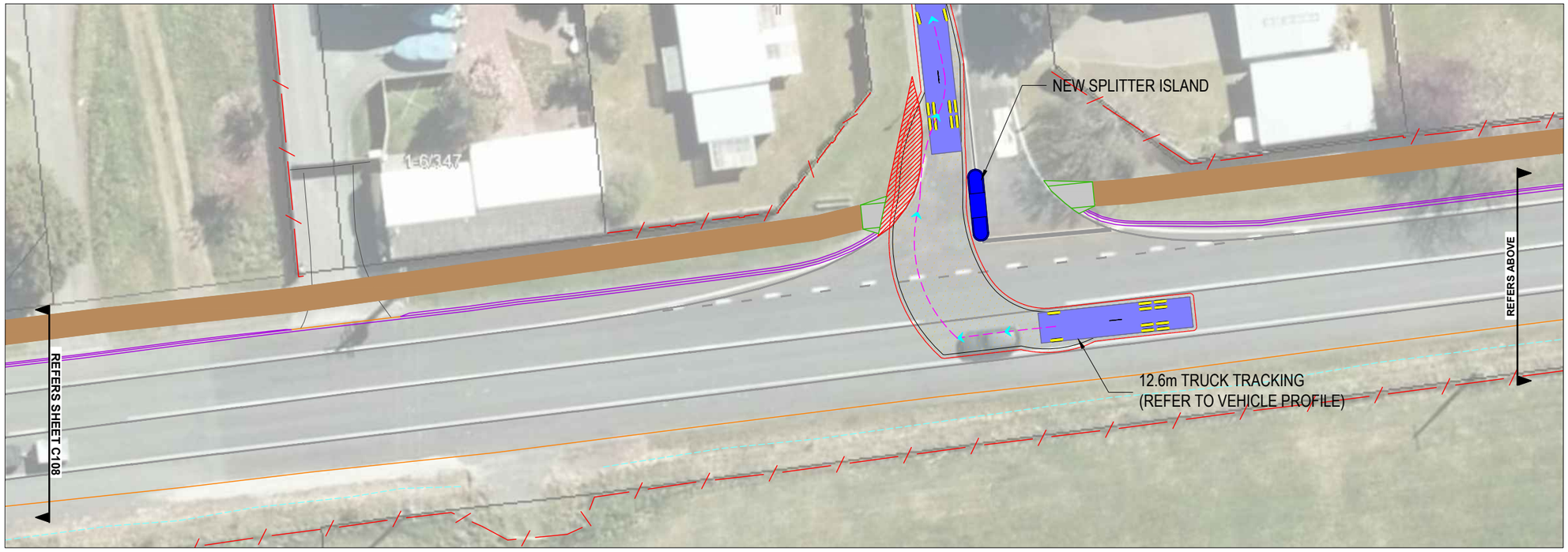
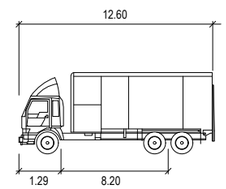
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





AT 126 Truck	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0

5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 7 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C107

Rev.: A

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

DO NOT SCALE - IF IN DOUBT, ASK

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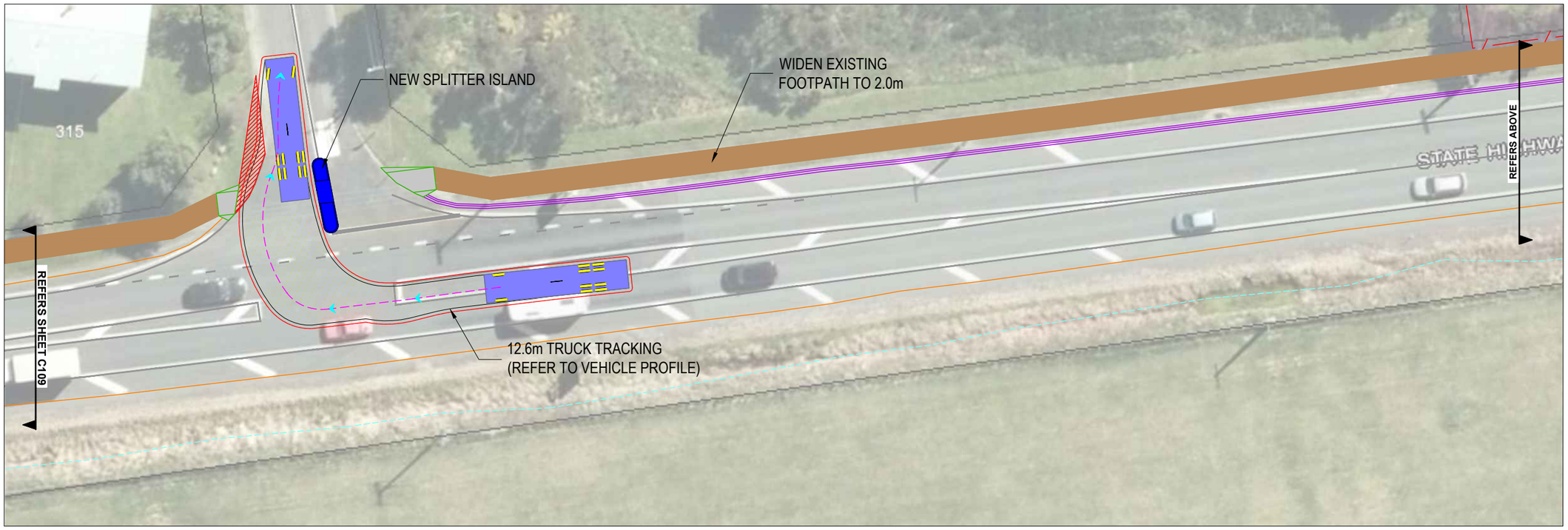
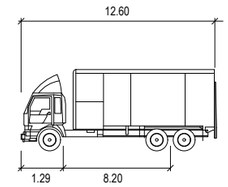
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES





AT 126 Truck meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0

5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 8 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C108

Rev.: A

ORIGINAL SIZE A1

DO NOT SCALE - IF IN DOUBT, ASK

Last modified: Mar 8 2020 By Mannan Sahebi

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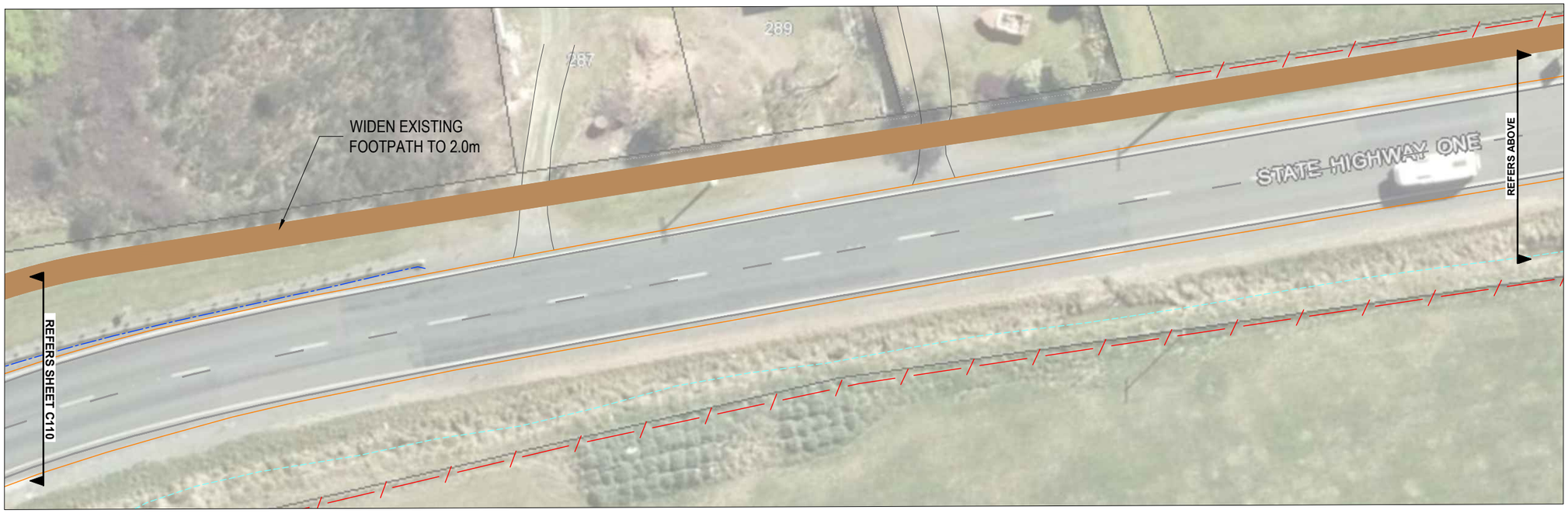
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES



5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
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CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 9 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C109
Rev.: A

ORIGINAL SIZE A1
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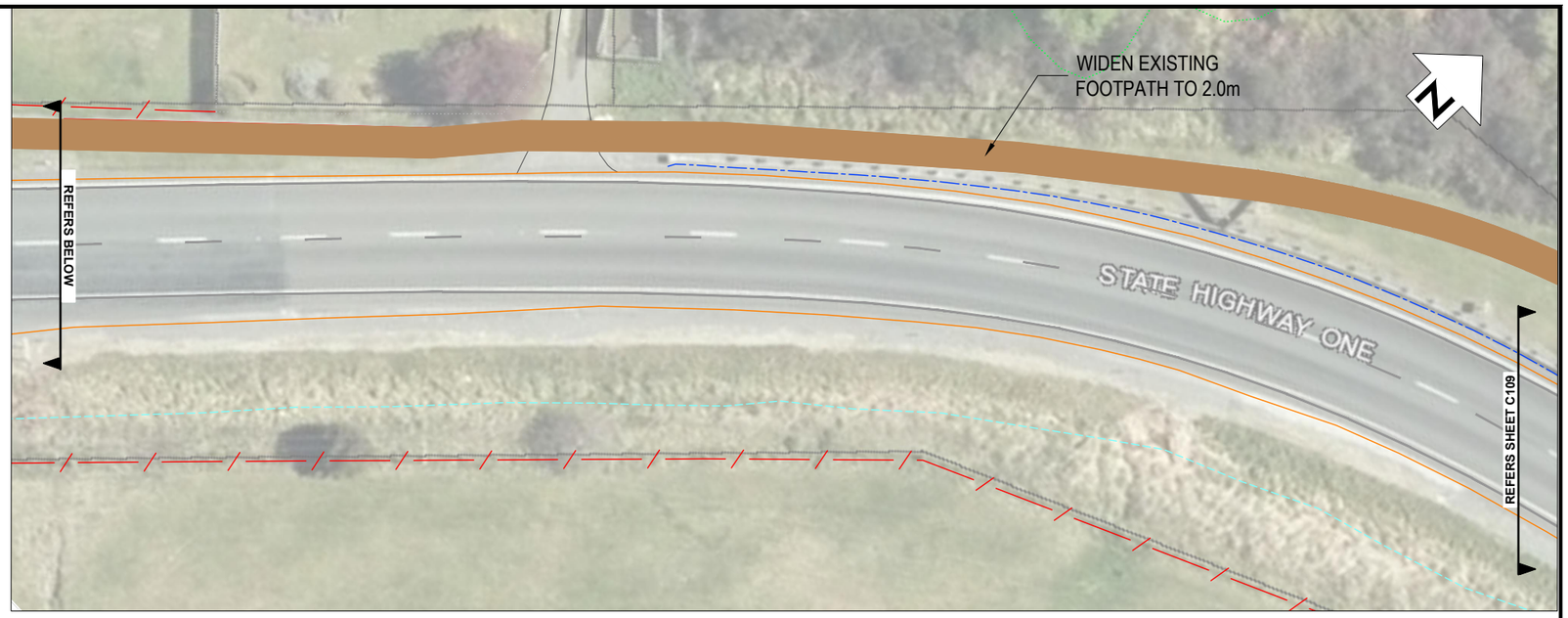
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES



5 0 5 10m

SCALE 1:200

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE A1

Last modified: Mar 8 2020 By Mannan Sahebi

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 10 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C110

Rev.: A

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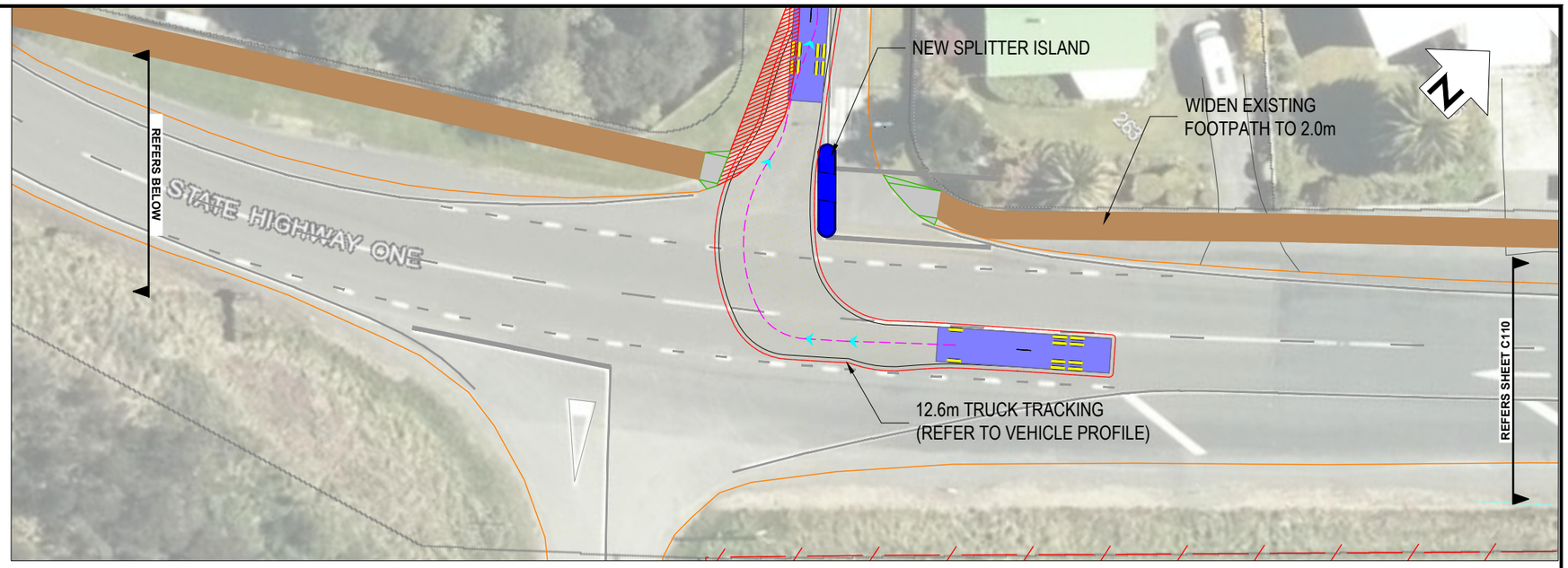
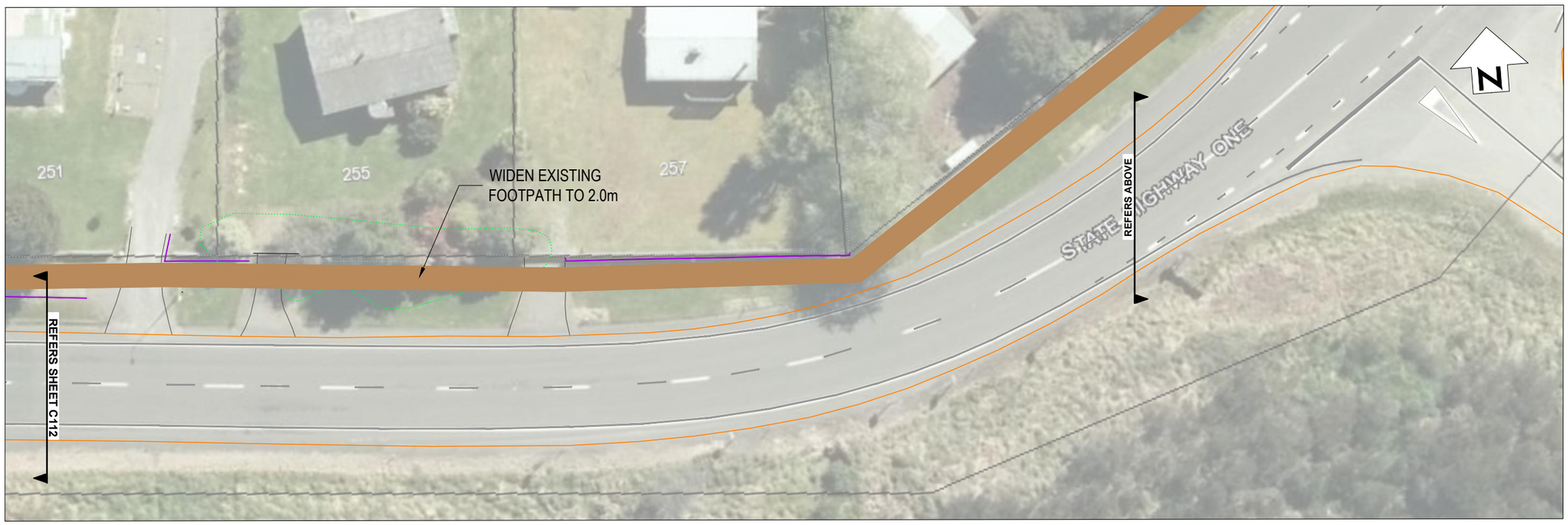
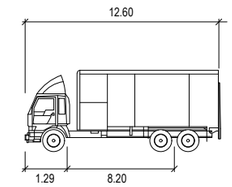
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES







AT 126 Truck — meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0

5 0 5 10m

SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	**NOT APPROVED**	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 11 OF 15

Status Stamp: **WORKING PLOT**

Date Stamp: **26.02.20**

Scales: 1 : 200@A1

Drawing No.: 310201099-04-100-C111

Rev.: A

ORIGINAL SIZE A1

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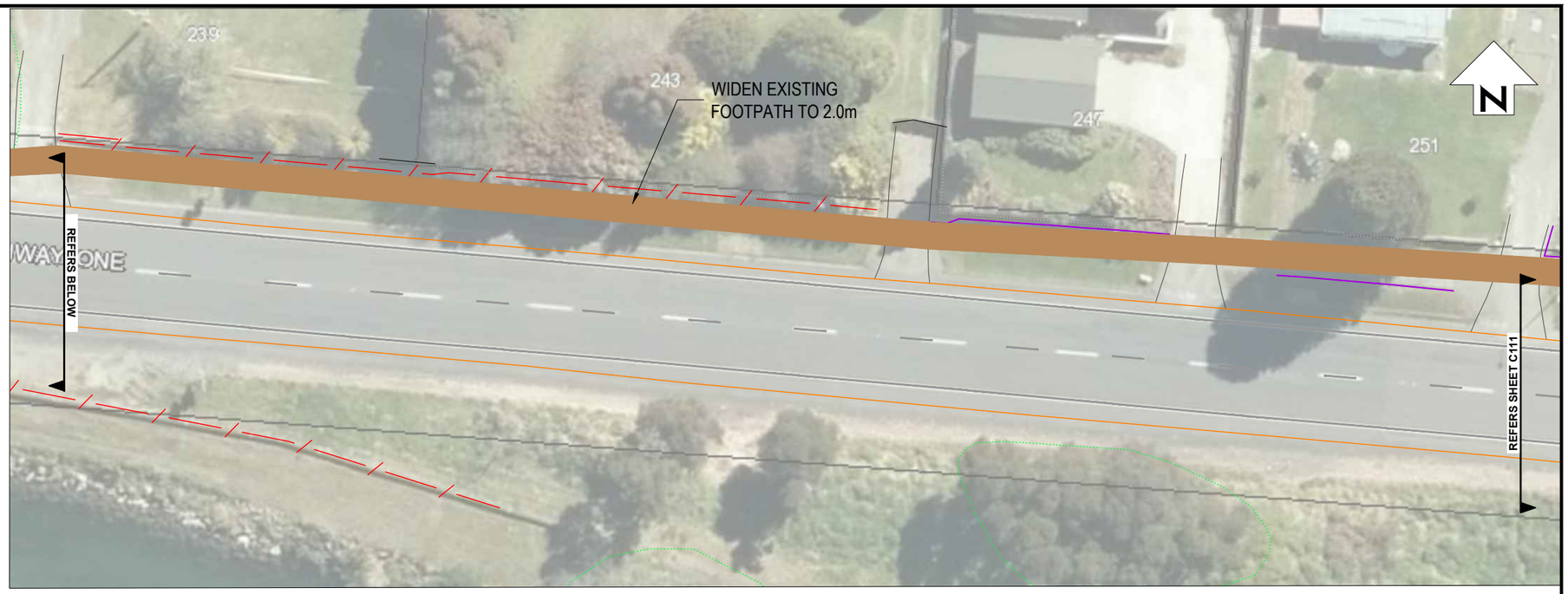
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES



5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

200 mm 150 100 90 80 70 60 50 40 30 20 10 0

ORIGINAL SIZE **A1**

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 12 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C112
Rev.: A

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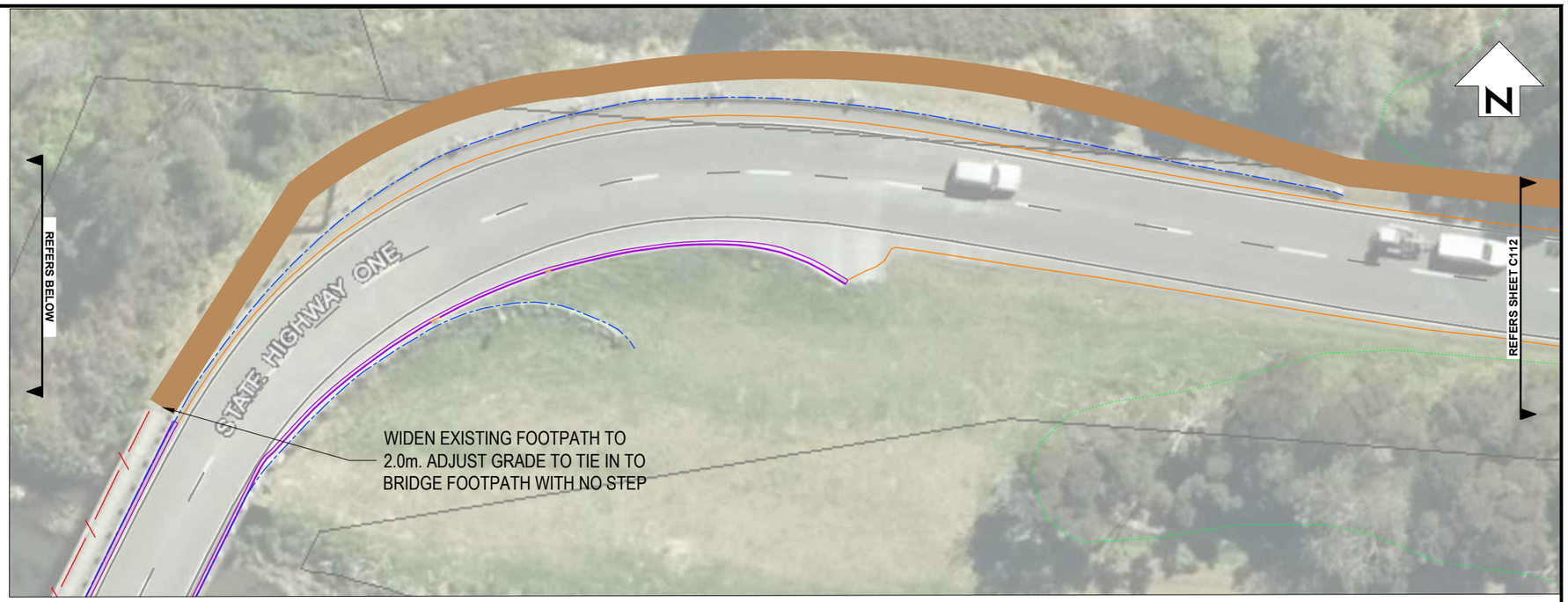
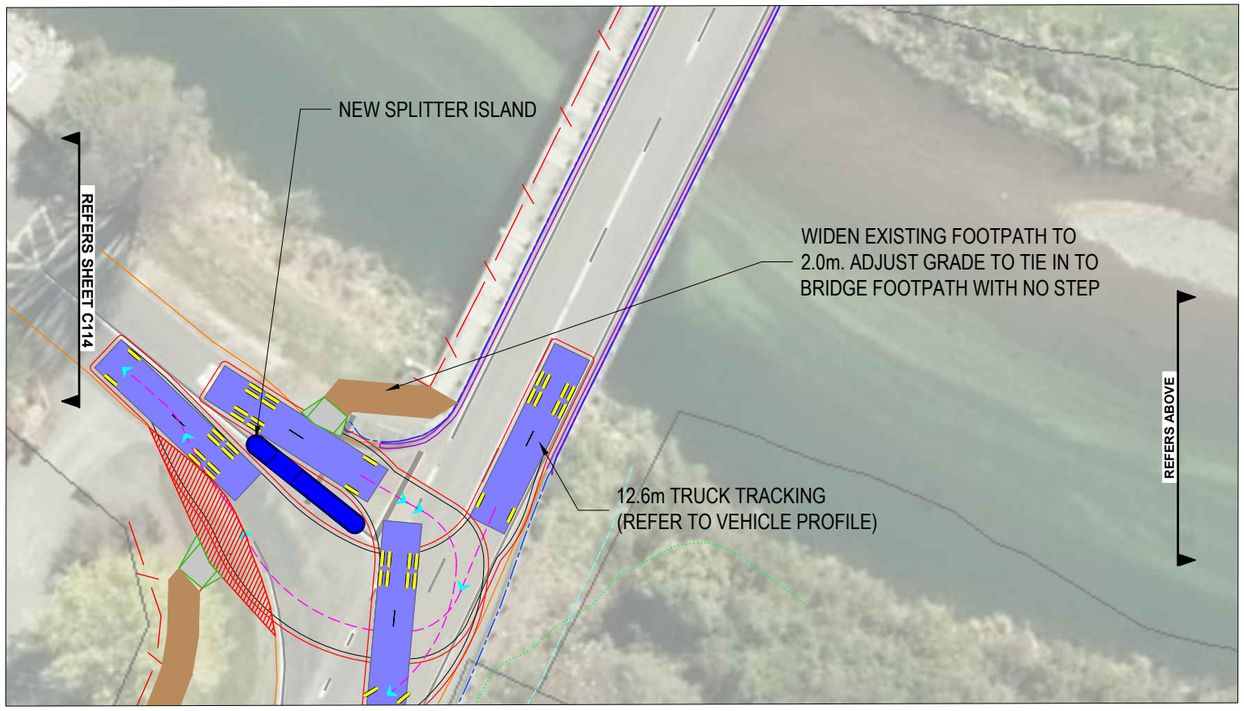
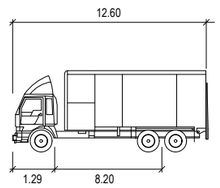
LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
- NEW LIGHTING
- NEW RAISED ISLAND
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES







AT 126 Truck

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0

5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 13 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C113
Rev.: A

ORIGINAL SIZE A1
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Last modified: Mar 8 2020 By Mannan Sahebi

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
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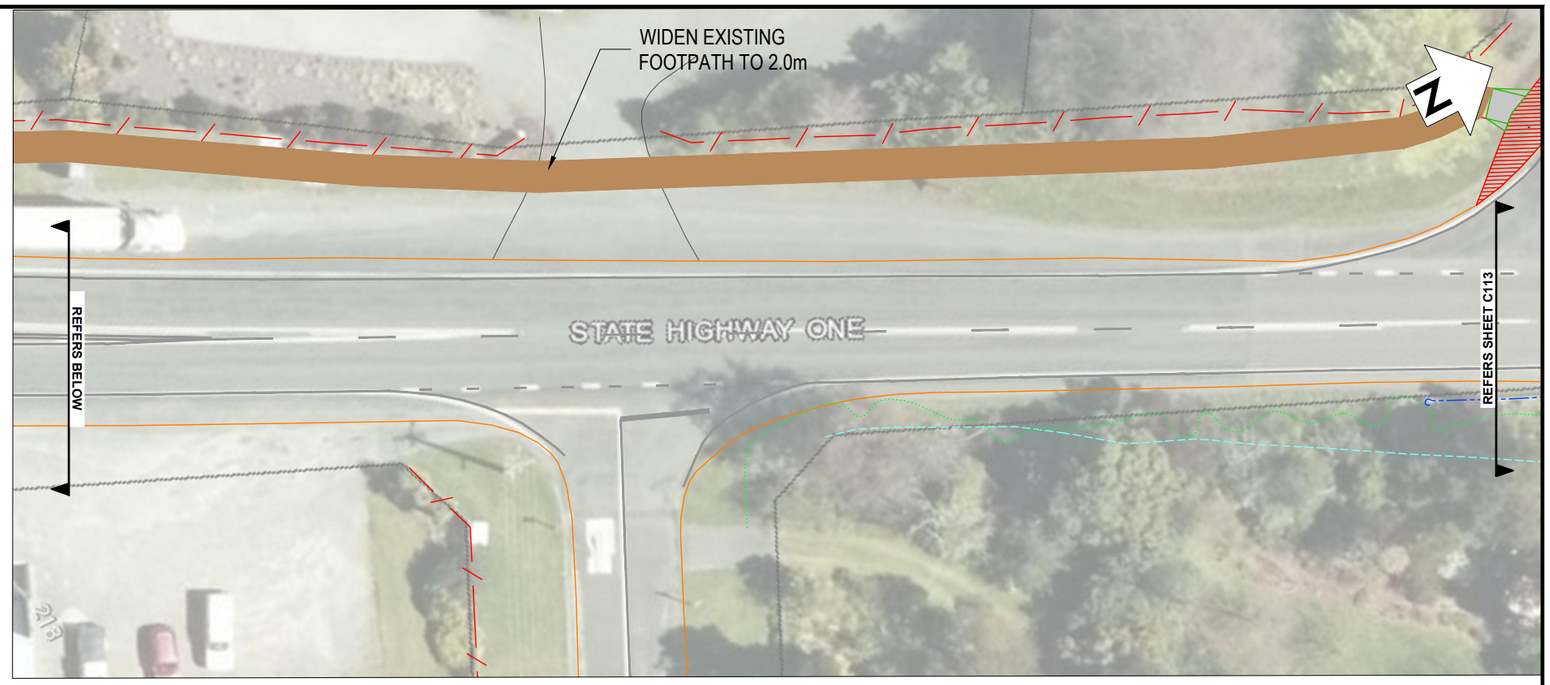
- NEW RED COLOR SURFACING
- NEW RRPM
- NEW GUARDRAIL
- NEW SIGN
- ROAD WIDENING TO ALLOW FOR VEHICLE MANOEUVRING
- NEW KERB CUT DOWN
- NEW TACTILES



5 0 5 10m
SCALE 1:200

NOT FOR CONSTRUCTION

DO NOT SCALE - IF IN DOUBT, ASK

ORIGINAL SIZE **A1**

Last modified: Mar 8 2020 By Mannan Sahebi

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW	**NOT APPROVED**	
APPROVED		
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 14 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C114
Rev.: A

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LEGEND

- EXISTING FENCE
- EXISTING KERB LINE
- EXISTING KERB LINE TO REMOVE
- EXISTING EDGE OF PAVEMENT
- EXISTING DITCH
- EXISTING GUARDRAIL
- EXISTING ROAD MARKINGS TO REMAIN
- EXISTING ROAD MARKINGS TO REMOVE
- EXISTING DRIVEWAYS
- EXISTING SIGN
- NEW ROAD MARKINGS
- NEW FOOTPATH
- NEW KERB AND CHANNEL
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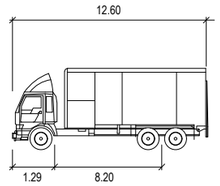
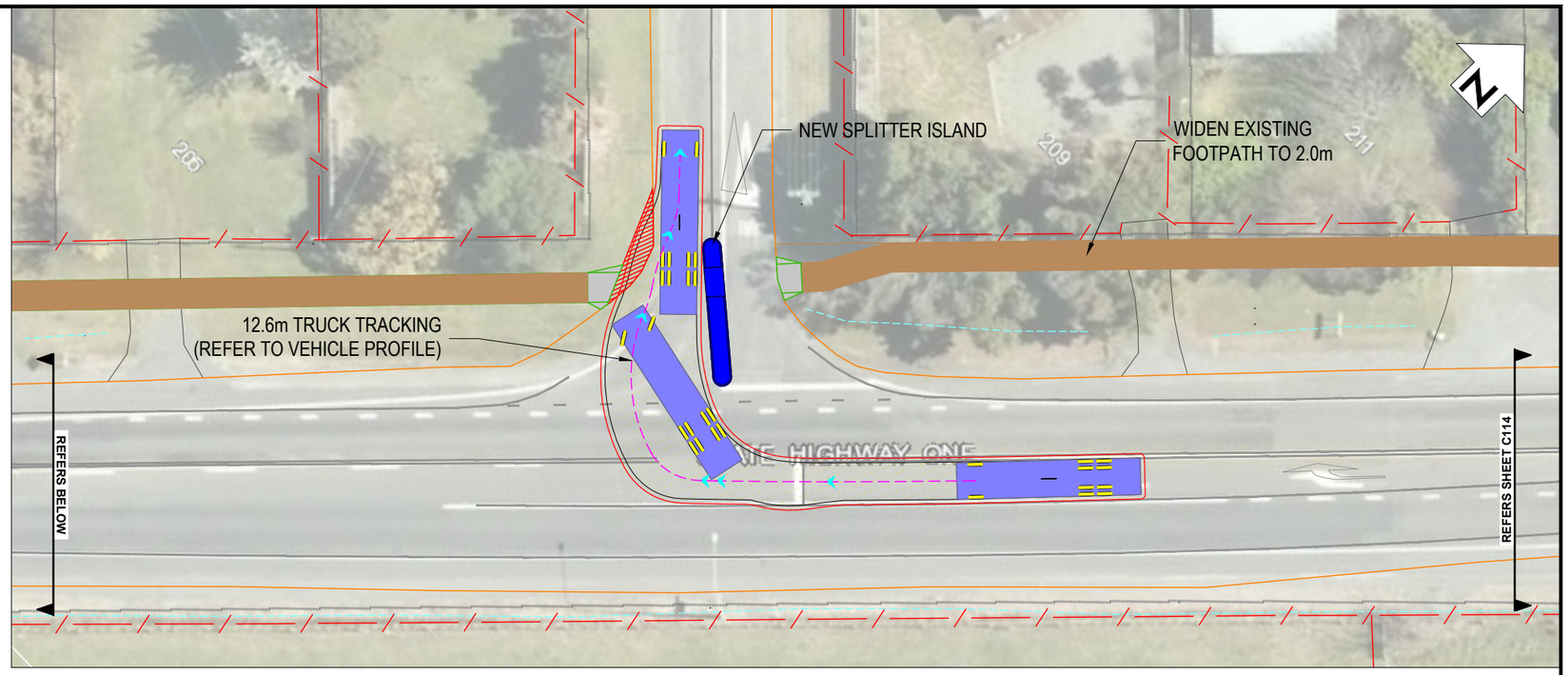
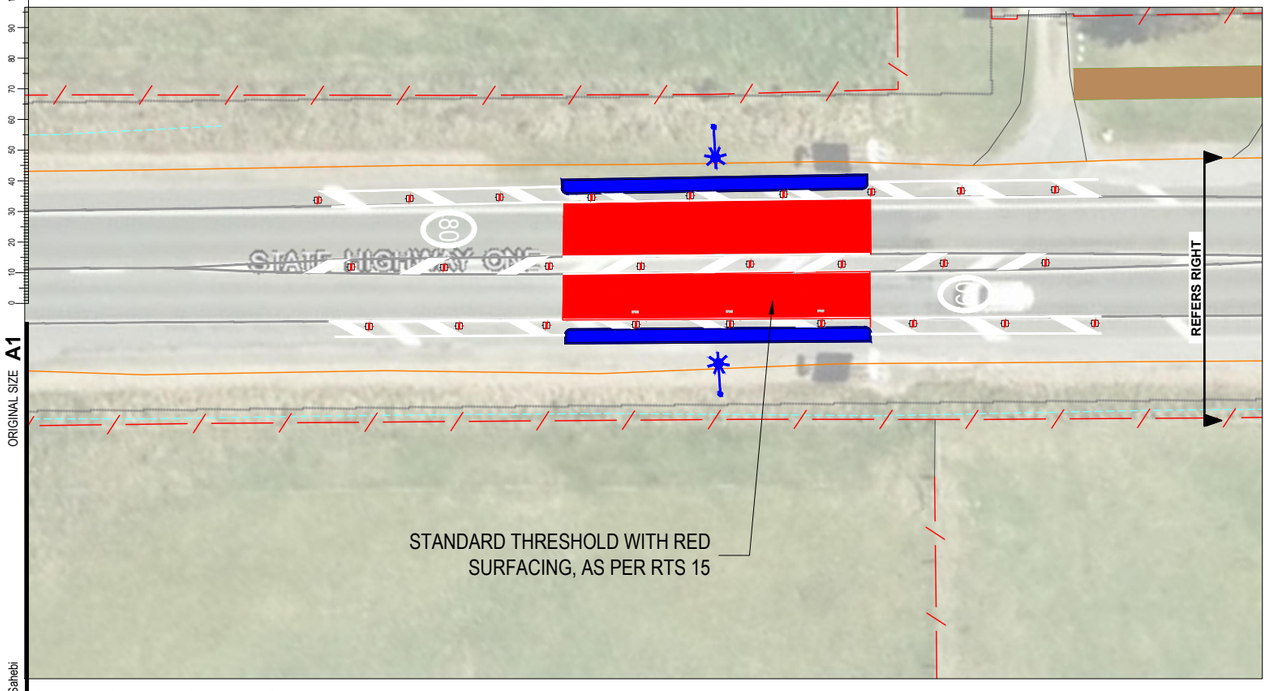
- NEW KERB CUT DOWN
- NEW TACTILES

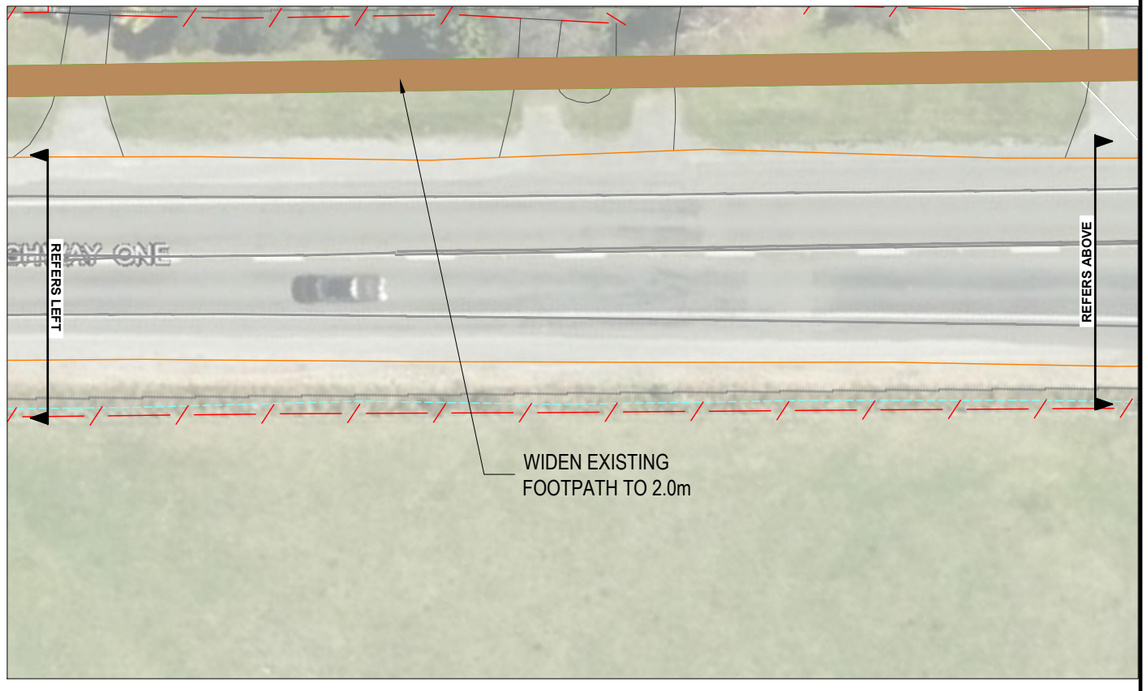


AT 126 Truck — meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 49.0







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SCALE 1:200

NOT FOR CONSTRUCTION

REV	REVISIONS	DRN	CHK	APP	DATE
A	FOR PRELIMINARY DESIGN	MS	KH	JC	26.02.20

SURVEYED		
DESIGNED	Mannan Sahebi	25.02.20
DRAWN	Mannan Sahebi	25.02.20
CAD REVIEW		
DESIGN CHECK		
DESIGN REVIEW		
APPROVED	NOT APPROVED	
PROF REGISTRATION:		

Stantec

Client: NZ TRANSPORT AGENCY WAKA KOTAHI

STATE HIGHWAY 1 - TAUPO TO WAIOURU

TE RANGIITA / ORUATUA SAFETY IMROVEMENT
SHEET 15 OF 15

Status Stamp: **WORKING PLOT**
Date Stamp: **26.02.20**
Scales: 1 : 200@A1
Drawing No.: 310201099-04-100-C115
Rev.: A

ORIGINAL SIZE A1
Last modified: Mar 8 2020 By Mannan Sahebi
DO NOT SCALE - IF IN DOUBT, ASK

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Appendix I2: Safety in Design Register

Safety In Design Register

Client Name	Waka Tokahi-NZTA	**Location**	Hamilton	**Drawings #'s**	Project construction drawings
Project Name	SH1 Taupo - Waiouru DBC	**Date**	29-Jan-2020		
Project Number	80509861	**Project Component**	All	169	
SID Facilitator	James Caufield	**Design Stage**	Detailed Design Business Case	64	
				15.26433752	

SID Review Team

Name	Position	Company
James Watt	Civil Design lead	Stantec
Nik Devlin	Structural Designer	Stantec
Chris Grainger	Project Manager	Stantec

PRELIMINARY HAZARD IDENTIFICATION						RISK ASSESSMENT			PROPOSED MITIGATION		RESIDUAL RISK ASSESSMENT				HANDOVER			
Ref	**Area / Activity**	**Hazard Category**	**Hazard Sub Category**	**Nature of hazard**	**Possible effect of hazard**	**Consequence**	**Likelihood**	**Assessed Risk**	**Proposed Treatment / Remedial Action**	**Hierarchy of Control**	**Consequence**	**Likelihood**	**Assessed Risk**	**Nature of Residual Risk**	**Phase Affected**	**Status**	**Remarks**	**Owner**
1	Route reliability Works	Ground_Stability	Unstable Outcrops (above ground)	Rock falls/edge collapse	Fall/struck by rock	Catastrophic	Possible	H	Temporary rock debris fences. Trained specialists in unstable slope work.	Control (Engineering)	Major	Very Unlikely	M		Construction	Ongoing		Contractor
2	Construction and maintenance	Ground_Stability	Swamp / Peat	working platform collapse	fall	Moderate	Possible	M	All underground services should be relocated and marked prior to works, particularly where wrsb posts to be installed. Consider installing as	Control (Engineering)	Major	Very Unlikely	M		Construction	Identified		Contractor

									enabling works.									
5	Bridge Works	Hazardous_Construction	Heavy lifting	Lefting heavy bridge components	Crush	Catastrophic	Unlikely	M	Contractors construction methodology	Control (Engineering)	Moderate	Very Unlikely	L		Construction	Closed	Controls should eliminate risk	Contractor
9	Bridge Work	Working_Near_Water	Bank/Slope Instability	Fall into water	drowning	Catastrophic	Unlikely	M	Appropriate safety platforms, edge protection and harnessing	Isolate	Moderate	Very Unlikely	L		Construction	Identified		Contractor
10	Bridge Work	Working_at_Height	Falling from height	Fall into water	drowning	Catastrophic	Unlikely	M	Appropriate safety platforms, edge protection and harnessing	Isolate	Moderate	Very Unlikely	L		Construction	Identified		Contractor
10	Construction and maintenance	Working_Conditions_or_Location	Climate / Weather (e.g. Temp, Wind, Snow, Ice, Rain)	Snow/Cold at isolated location	Exposure, vehicle crash	Major	Likely	H	Appropriate PPE for conditions. Driver training for adverse conditions. Satelite emergency beacons	Control (Administration)	Minor	Unlikely	L		Construction	Identified		Contractor
3	Construction and maintenance	Working_Conditions_or_Location	Topography	Working in remote location	delay in event of emergency	Major	Likely	H	Appropriate emergency communications equipment and procedures	Eliminate	Moderate	Very Unlikely	L		Construction	Closed	Controls should eliminate risk	Contractor
4	Construction and maintenance	Existing_Services	Underground - Electricity	Strike unlocated services	Electrocution	Catastrophic	Possible	H	Ensure all services located and marked prior to construction, or relocated prior.	Control (Engineering)	Major	Very Unlikely	M		Construction	Closed	Controls should eliminate risk	Contractor
6	Construction and maintenance	Access_and_Traffic	Traffic Management Requirements	Vehicle interaction	DSI from vehicle crash	Major	Possible	H	Ensure approved TMPs prior to commencing works.	Control (Engineering)	Minor	Unlikely	L		Construction	Ongoing		Contractor

8	Construction and maintenance	Working_Conditions_or_Location	Topography	Construction works in limited available working platform, close proximity of works vehicles, and debris falls	work place accideent	Major	Possible	H	Ensure safe working practises are followed	Control (Engineering)	Major	Possible	H		Construction	Identified		Contractor

Appendix J: Quick Win – Low Cost Low Risk

Quick Wins – Low Cost Low Risk

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
713	646	139	west	Rest area	Shunting crashes (low injury). Feedback from speed management drop in sessions highlighted often near misses	Right turn bay	No	not in toolkit	Yes			
713	646	139	west	Rest area	Rest stop area - some area sealed. Understand how this area is used for trucks and campers etc	Signage, seal areas, for better stopping facilities?	No	not in toolkit			yes	
713	1249	149	west	Intersection	Number of low injury crashes	Improve road marking	No	not in toolkit	yes			
713	1398	25	east	Signage	Road open/closed sign with some VMS	Full VMS sign with greater options for information	No	not in toolkit				
713	1688	94	west	Weigh station	Weigh station - needs additional separation from live lanes, barrier of buffer.	Install guardrail or separation	Unlikely as modification to layout likely		yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
713	2376	109	both	Guardrail	Culvert (westside) and Power pole (east side)	Install guardrail	Yes		yes			
713	3515	87	both	Guardrail	Culvert both sides, Possibly driveway on western side	Install guardrail	Yes		yes			
713	4146	130	west	Access	Forestry access behind residential properties	Ensure RTB for parking area doesn't conflict with access to forestry area	No	not in toolkit	yes			
713	7080	994	west	Guardrail	Bank of eastern side. High severity, moderate risk on KAT.	Install guardrail	yes		yes			
713	12048	176	both	Weigh station	Damage to seal. Turning movements into weigh station and forestry area. Close to mature trees	RTB to weigh station. Seal left turn in. Install guardrail around trees?. Upgrade signage, add in a second street light	Yes	signage and guardrail yes. RTB and streetlights	yes			
713	12795	208	west	Visibility	Poor forward visibility	Reshape earthworks to improve visibility	No	could get approval for chevron signage for the curve	yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
713	13864	1292	south	Guardrail	Large drop off east side	Install guardrail - determine actual risk on site	Yes		yes			
713	14756	84	west	Visibility	Forward visibility for south bound traffic	Trim back trees	No		yes			
713	16316	58	east	Visibility	Forward visibility for south bound traffic	Trim back trees - tree	No		Yes			
713	16250	154	both	Infrastructure	Narrow bridge - poor guardrail. Driveways on all approaches to the bridge	Clip on for cyclists- option 1 &2 . Improve guard railing	Yes	yes for improved guardrail. No for clip on - could get a yes for SAWS for cyclist warning	Yes for improved guardrail	yes - for entire package		
713	4351	1944	both	Township	Entry to Waitahanui township	80km/h to 60km/h. widen buildouts and plant with a mixture. Keep the fish. RTS 15 for 80 to 60km/h	No?		yes			
713	4475	588	east	Pedestrian facility	No footpath	Install footpath	No?		yes			
713	4475	588	east	Lighting	Footpath	Footpath should be lit?	No		yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
713	5058	195	east	Guardrail	Guardrail has a 'bulge' not installed correctly. Interferes with the shy-line	Tidy up guardrail - assess for pedestrian crossing facility etc through this area	No	if speed limit is dropped to 60km/h	yes			
713	5123	2	east	SID	Can SID be moved around	Speak to LR	No		Yes			
713	5093	160	west	Guardrail	Short w-section guardrail	Extend guardrail to cover length of sight rail - tidy up other guardrail	No	if speed limit is dropped to 60km/h	Yes			
713	5078	44	west	Rest stop	No signage on approach. No RTB	Install signage and RTB	No		Yes			
713	5113	80	west	Pedestrian facility	No footpath across bridge	Clip on western side	No			Yes		
713	5198	25	both	Pedestrian facility	Underpass? Could be dangerous	Could this be formalised?	No		Yes			
713	5248	55	both	Pedestrian facility	No pedestrian facility near school	Install a pedestrian island. Will help reduce speed etc	yes	Yes for pedestrian island as no present crossing	Yes			
713	5293	10	both	School zone	Static school sign	School VMS sign	yes	I think it should….	Yes			
713	5422	594	west	Pedestrian facility	Narrow footpath, near school. High(ish)	Widen footpath	No	Not in SIT	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
					pedestrian numbers							
713	5442	2	west	Signage	Passing lane ahead sign	Remove passing lane ahead sign at 1km	Yes		Yes			
713				Pedestrian facility	Existing school crossing point - poor facility	Better drainage and wider crossing and central in centre. Planting on the sides of the road	Yes	But no present pedestrian crossing	Yes			
713	4351	1944	both	Lighting			No		Yes			
713	5452	-5452		Footpath		Upgrade lighting to LED	No	Lighting not in SIT	Yes			
713		0		Footpath	Narrow footpath	Upgrade to shared path	No		Yes			
713		0		Driveway	Narrow driveways with channels	Upgrade driveways	No		Yes			
713		0		Signage	Better urban signage		Yes		Yes			
713		0			Wide roads	Bring kerbs out	yes		Yes			
713		0			Intersections	Side roads. Threshold treatments etc. check for 50km/h	No		Yes			
713	6145	-6145		Pedestrian		Plant island - widen island	yes		Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
713	6245			Speed	Confusion over speed limit and right turns into side road.	Rationalised the speed limit. Flag intersection for further discussion. Shortening passing lane and RTB	no		Yes			
726			west	Gravel pit	Gravel pit on one side with	Speak to NOC, potential to use as parking	No				Yes	
726	100	63			Freedom camping site - Hinemaiana reserve	Improve access - achieve minimum visibility.	No		Yes			
726	203	330	both	Guardrail	Hazard trees - on approach to hazard curves	Consult and remove or guardrail	Yes		Yes			
726	100	2400		Speed	Currently 100km/h	Drop speed to 80km/h on approach to Bulli point	No		Yes			
726	2702	2329	North	Guardrail	Small amount of guardrail	Guardrail lake side	Yes		yes			
726	5404	56	North	Guardrail	Sight rail covers culvert	Replace with guardrail	yes		yes			
726	7191	604		Urban area	Pedestrian crossing problem. High speed.	Reduce speed (during peak season) 80km/h to 60km/h. Support engineering. Opus	yes		yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
						report say 60/80. ped/cycle crossing facilities. Parking area? Footpaths/shared path						
726	7705	289		Out of context curve	Limited visibility at intersection	80km/h posted limit. Widen on inside of the curve. Threshold on approach	No	due to set 60km/h speed limit	yes			
726	7795	84		Intersection	Side road - high speed	Change to 50km/h	no	due to two non-injury crashes occurred	Yes			
726	8757	296	north	Guardrail rest area	Widening through the rest stop. Popular rest stop	Install RTB. Possibly install guardrail. Check on level of service? Parking issues - maybe	yes		Yes			
726	9575	148		Private access	Intersection - gated	Seal back intersection. Move back gate - 20m (check)	no		Yes			
726	10082	249		Rest area	DOC access	Check what this is for, rationalise?	no				Yes	

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
726	11438	88		intersection	Intersection of Rawhia Street	Minor improvements programme NZTA	no	Due to not enough crashes occurred and medium risk section	Yes			
726	12000	64		footpath	Narrow footpath	If space available - widen to a shared path standard. Does this have to be lit?	No		Yes			
726	13045	275		speed limit change	Speed limit change	Change to 60km/h at some point. Improve threshold. Solid chanalisation	yes		Yes			
726	13485	44		bus stop		Look into bus stop facility	no				Yes	
726	13529	105		intersection	Poor visibility at intersection and petrol station	For petrol station side road (towards lake) look at improving visibility	No	?	Yes			
726	14511			Speed threshold		Build out	No		Yes			
726	14641	189	south	Guardrail	Culvert	Install guardrail	no	due to low collective risk	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
726	16575	989		Speed		Change speed in town from 70km/h to 60km/h. Install build outs	No		Yes			
726	17396	14		Pedestrian	No pedestrian island	Install pedestrian island	yes	Not sure	Yes			
726	17203	309		No RTB	Widen centre line	Install RTB and flushed median	yes		Yes			
726				Side road		Splitter islands on all side roads	No		Yes			
744	968	210	both	Guardrail/curve	75km/h corner - sharp corner	Ease corner and cut back vegetation. Guardrail for option 1	No	due to low collective risk	Yes			
744	1292	220	both	Guardrail/curve	75km/h corner - sharp corner	Ease corner and cut back vegetation. Guardrail for option 1	No	due to low collective risk	Yes			
744	1397	334	north	Guardrail	Sharp corner	Signage, guardrail	No	due to low collective risk	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
744		0		Sign	Distance to Turangi sign	Install sign	yes		Yes			
744	1950	150		Bridge - cycle sign	Cycling provision on the bridge	Install sign	yes		Yes			
744		0		Curve	Curve south of bridge	Vegetation cut back,	No		Yes			
744	2494	230	both	Guardrail	Existing guardrail - needs replacing. Remove bridge marker posts	Improve to TL-4. Extend guardrail around corner to protect deep ditches. Remove bridge marker posts	No	due to low collective risk	Yes			
		0		Bridge - cycle sign	Cyclist using the bridge	Active warning sign of cyclist on loop	Yes		Yes			
744	1935	1055		Speed change	Speed change point?	Threshold to 80km/h from 100 km/h - is this too short?	No		Yes			
744	3202			Access closure	Waiotaka scenic reserve - discuss use with DOC?	Possible closure of one of two accesses	No				Yes	
744	3741	268	both	Guardrail	Existing guardrail - Poor guardrail on bridge	Improve to TL4	No	due to low collective risk	Yes			
744	4743	1272	south	Guardrail	Steep road side drains	Install guardrail along whole section?/ reprofile drains	No	due to low collective risk	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
744	6603	185		Intersection	Dangerous intersection – KiwiRAP analysis Intersection protection score >16	Potentially lower speed limit. Include with design of passing lane. Threshold design and streetlights. Channelising the intersection?	Yes		Yes			
744				Signage	Static information sign	Upgrade to smart sign.	yes				Yes	
744				Side access	People driving over berm.	Headlight screen/ noise screen. Does this need protection?	No		Yes			
744	7347			Side access	No RTB	Install RTB	yes		Yes			
744			both sides	Bridge	Bridge abutment	Hazard - install proper guardrail	Yes		Yes			
744	7706	458	both	Guardrail	Guardrail on approach to bridge non compliant, no guardrail on bridge and rusting on the Turangi side	Replace guardrail	Yes	No if speed limit below 80km/h	Yes			
744	7890			Pedestrian crossing	Pedestrian crossing facilities	Improve crossing point - potentially more cyclists (threshold treatment)	Yes		Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
744				Rest area	Parking area with no facilities - nice area	Improve with toilets, picnic tables etc					Yes	
744				Intersection	Pedestrian underpass ramps too steep, low CPTED features. Pedestrians choose to cross at-grade.	Improve pedestrian underpass or close with roundabout incorporating splitter islands etc	Yes	urban roundabout will be included. Underpass probably not....		Yes		
744				Speed	Speed changes to 100km/h	Extend 80 kph SH41 intersection.	No		Yes			
753	2807	152	both sides	Guardrail	Remove sight rail	Install barrier	No	due to low collective risk	Yes			
753				Curves	No delineation	Install chevrons etc	Yes	delineation	Yes			
753	4048			Intersection	Poor intersection	Improve intersection (signage, rtb, diagram E)	No	due to low collective risk	Yes			
753	5018			Guardrail		Remove culvert, traversable or guardrail	Yes	Could this be covered under guardrail?	Yes			
753	5717	748	both	Guardrail	Older barriers on bridge. Sight rail south of bridge	Upgrade end terminals	No	due to low collective risk	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
753	5916	10		Guardrail	Remove sight rail	Install barrier	No	due to low collective risk	Yes			
753	9363	197	western	Guardrail	Lots of power poles - severe roadside hazard	Install guardrail or slip base	no	due to low collective risk	Yes			
753	9438			Speed	Speed management	Install RIAWS. Investigate options	no	due to low collective risk	Yes			
763	2284	328	both	Guardrail	Poorly maintained guardrail	Maintain/replace guardrail	yes	not sure about existing	Yes			
763	7246	94	eastern	Guardrail	Guardrail doesn't cover pylon	Increase guardrail and provide proper protection. High containment	No	due to low collective risk, but already existing so could be yes to extend	Yes			
763	7310	176		Ice sign	Limit sign	Install speed smart sign or VMS and link to temperature	yes		Yes			
763	7486			Narrow road	Narrow road with lots of vegetation	Clear on vegetation (inside of curve). Extra signage	yes	signage	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
	7943			Sign	Active warning sign - Ice area - needs a clean	Clean up or replace etc	yes	signage	Yes			
763	8477			White patch	White patch on the ground	Fix - reseal	No		Yes			
	9578			Signage	Not correct signage	Install correct signage. And at the correct height	yes	delineation	Yes			
763	9907	3	east	Guardrail	Gap in barrier	Check why gap?	No	medium collective risk/personal risk	Yes			
763	9954	74	west	Guardrail	Damaged barrier	Replace barrier	No	medium collective risk/personal risk	Yes			
		0		Signage review		Removal of gravel pit & install guardrail	No	medium collective risk/personal risk	Yes			
				SVB	Out of context curve - south bound. Could this	Install barrier and clear out foliage - install chevron signage - higher signs	No		Yes			
				Roadmaking	Roadmaking severely faded after 2 years.	Longer life paint - issues with seal	Yes	delineation			Yes	

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
	14419			Metal angle		Remove	No	Not in toolkit	Yes			
777	752	94	east	Guardrail	Old sight rail	Replace with barrier	no	medium collective risk/personal risk	Yes			
777	1902	88	both	Straight road	Straight section of road after SVB	Widen only	yes		Yes			
777	1995	49	east	RUF/access/rest stop	Before curve. Unformed rest area - labelled 'Mount Doom'	Widen shoulder. In line parking (road marked?). Seal driveway 20m. Signage	Yes	widening and roadmaking			Yes	
777	2129	278	both	Guardrail	Barrier on western side short. Possibility of run off road crash through gap - both ends. Pinch point along route	Barrier need to be lengthened across stream (Western side). widen culvert (If possible). (RAMM data - wooden)	Yes		Yes			
777	3057	130	east	Guardrail and Curve	Fatal crash on curve, no signage on curve and poor visibility	vegetation on inside of curve needs clearing. Delineation signage on curve. Consider barrier outside curve	Yes	signage and barrier	Yes			
777	3217	60	east	Guardrail	Large power pole.	Guardrail	yes		Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
777	3452	150		Barrier and Curve	No chevrons. Moderately out of context. Cut vegetation back and easy the curve. Barrier on the outside of curve	Cut vegetation back and easy the curve. Barrier on the outside of curve	yes	chevrons only. Medium collect risk - cannot justify barrier	Yes			
777	5274	-5274		Curve	Curve - lots of signs on approach. No Chevrons (?) issue. Drop off before barrier	- Length barrier. Widen not likely to happen. Check the crashes.	No		yes			
777	5705	-5705	east	Signs	Relocatable sign - VMS	Change to VMS	yes	delineation			Yes	
777		5883		Surfacing	on bridge - trucks are bottoming out? Damage to surface	Repair	No		yes			
777		6075		Signage	Static sign	Change signs to VMS	Yes	delineation			Yes	
777		6692		Signage	Gated signs at 65km/h could this be done on the other side	Install extra signage	yes	delineation	Yes			
777		0		Road marking	Wide centreline through the straight	Road marking	Yes		Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
777	7488	162		Curve	Highly out of context curve. Visibility clearing on the inside.	ATP on curve - ATP on all the wide centrelines.	yes		Yes			
777		7940		Roadmaking	Narrowing the wide centre lines, on approach to crossing the bridge. Mangatoetoenui steam - ongoing monitoring for Lahar	Roadmaking	Yes	Delineation	Yes			
777		0		Access	Gravel migration from carpark to quarry (sweep back, seal back further?)		No		Yes			
777		0		Access	Access to Quarry. Formalise. Move access if it's a long term quarry. Mitigate the effects.	Access improvements or relocation	no				Yes	
777		8387		Curve	Middle out of context - large sweeping curve. ATP.	Road marking	Yes		Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
777	9527	246	both	Guardrail	Replace sight rail with guardrail at appropriate length - look at opposite side	Replace sight rail with guardrail at appropriate length - look at opposite side	Yes	road side hazard	Yes			
777	9872	170	both	Guardrail	Culvert 7869 - guard rail both sides -extend culvert if needed	Guardrail	Yes	road side hazard	Yes			
777	11149			Signage	Long straight - speed activated sign	VMS	Yes	Assessed as delineation	Yes			
777	12463	300		Curve	Poor advance warning of curve. Undercutting? Remove half a metre. No chevrons - to be installed.	Warning signage	Yes	Chevrons only - delineation	Yes			
777	12918	- 12918		Curve	Moderately out of context. 85km/h CAW. Poor surfacing in southern lane. Chevrons relatively difficult to see.	Warning signage	Yes	Improved delineation	Yes			
		13538		Road marking	Centre line markings are based on the horizontal	Road markings	Yes	delineation	Yes			

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
					alignment? Sight distance. Check on this							
	13947	- 13947		Signage	Lots of signage on the approach eastern side. AWS already in place.	Warning signage	Yes	Signage and delineation	Yes			
777		0	east	Roadside hazard	Rock face. Undercut - needs to be stabilised.	Cut back top part. Both options - no land take needed	No				Yes	
	14163	- 14163		Bridge	Pinch point. Poor surfacing. Only white line no yellow line.	Road markings	Yes	delineation	Yes			
777	13663	734	east	Barrier	Chip needs to be swept under guardrail and guardrail to be extended south past rock wall	Install Guardrail	Yes	Significant road side hazard	Yes			
	14552	23		Pullover area	After curve not ideal. Dumping material or machinery? Good shoulders.		No				Yes	
		0		Rock wall	Slope shows signs of minor rock fall	Investigate risk of rock fall and cut back or catch fence	No					

Site Location				Treatment Notes			Assessment Against SSI Toolkit		Implementation Pathway			
Start RP	Start RS	Length (m)	Side	Type	Justification/ hazard	Mitigation/ Treatment	Standard Safety Intervention Criteria met	Reason for not meeting SSI criteria	SNP – LCLR (Safety)	SNP - SSI	LCLR Road User Facility	Low Cost Low Risk Resilience
0794	797	115	east	Rest stop	Eastern side of the road. Looks relatively well used.	Increase the amenity. Info boards. Install right turn bay. Shade over picnic table. Vantage point - photo opportunity. Formalising the parking	No	not in toolkit			Yes	
0794	2684	35	east		Truck accesses	Seal back accesses. Provide safe crossing?	No	not in toolkit			Yes	
0794	10434	155	east		Intersection	Seal back access.	No	not in toolkit	Yes			

Appendix K: Communications and Engagement Plan

Communications and Engagement Plan: SH1 Piarere to Waiouru

Project manager/leader: Anuradha Fitzwalter and Alexios Kavallaris

***Communications and Engagement team members**: Simon Brandon, NZTA; Jo Wilkins, Stantec; Craig McKibbin, Safe Roads*

Overview

The SH1 Piarere to Taupo and SH1 Taupo to Waiouru projects were initially developed as Programme Business Cases as part of the priority PBC programme. Based on the board decision in 2016, Detailed Business Cases were proposed to look at short-term options to address the safety, resilience and journey experience improvements problems identified along these corridors.

The DBCs started together in mid-2017 and an overarching Problems, Opportunities and Constraint report was drafted for the combined route. At the time of the general election, the projects were put on hold while a new strategic direction was set out in the Government Policy Statement (GPS) on land transport.

The NLTP 2018-21 confirmed the inclusion of the DBC phase but not further phases. With no timeline for implementation, the approach to engagement has been altered since contract award, in a bid to manage public expectations. Parts of the corridor are included in Safe Network Programme but implementation looks to be outside of the 2018-21.

The Safe System approach being promoted by the NZ Transport Agency aims for a more forgiving road system that takes human fallibility and vulnerability into account. Under a Safe System approach, the whole transport system is designed to protect people from death and serious injury. There are four key components to the Safe System approach, including: Safe Speeds, Safe Vehicles, Safe Road Use and Safe Roads. It is the Safe Roads component of the Safe System approach that the SH1 Piarere to Taupo, and SH1 Taupo to Waiouru projects are seeking to address.

This plan describes how we will work with mana whenua and key stakeholders to seek input on the problems and possible options for the short-term improvement solutions for these corridors.

This plan is a live document and will be reviewed and added to regularly. If at some point in the future, it makes sense to split out the two projects we will do separate C&E plans with this as an overarching plan. The teams will work closely together and split if necessary.

Project background

STATE HIGHWAY 1 (PIARERE TO TAUPŌ)

This 100km stretch of SH1 from the turn off to Tauranga (SH29) at Piarere through to Taupō is part of the North Island's main north to south route. It connects Auckland, Hamilton and Wellington, and provides an important freight link for the dairy and logging industries. SH1 also provides connections to the key tourist destinations of Rotorua and Taupō. It also serves local communities, bringing business to the towns of Tirau, Putaruru and Tokoroa.

The key problems identified on this corridor include:

- a high number of crashes, deaths and serious injuries due to the inconsistent and unforgiving road environment. Crashes also result in road closures, which cause significant problems for freight
- unpredictable journey times, due to crashes and maintenance activities affect all customers, particularly business traffic
- The corridor serves both through and local traffic which disrupts traffic flow.

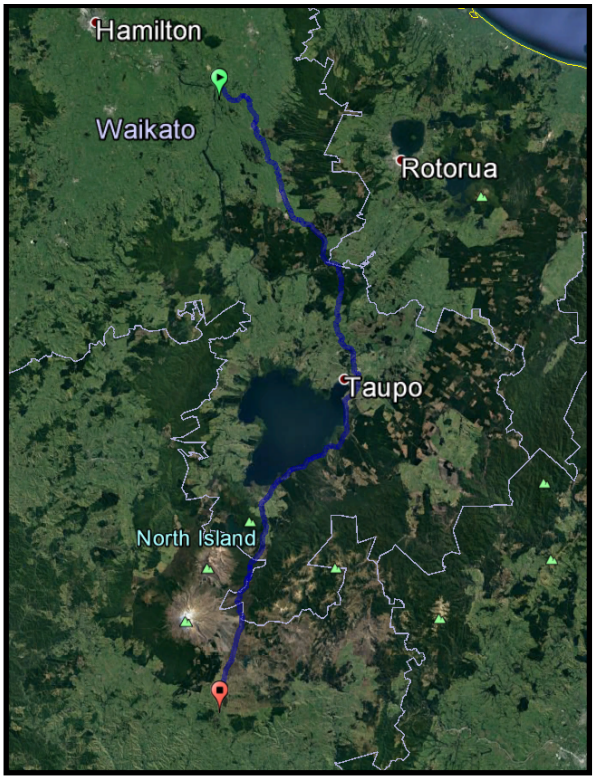
STATE HIGHWAY 1 (TAUPŌ TO WAIOURU)

This 105km stretch of SH1 is also part of the North Island's main north to south route. It provides connections to the key tourist destinations of Taupō, Mount Ruapehu and Tongariro National Park. It also serves a wide rural community along with townships along the edge of Lake Taupō and the larger urban area of Turangi.

Key problems identified on this corridor include:

- unreliable and inefficient journeys due to pinch points at certain sections (including along Lake Taupō and Three Sisters)
- a high number of crashes, fatalities and serious injuries due to the inconsistent and unforgiving road environment. Crashes also result in road closures, which cause significant problems for freight
- unpredictable journey times, due to crashes and weather events which affect all customers, particularly business traffic
- The corridor alongside Lake Taupō serves both through, local and tourist traffic which disrupts traffic flow.

The following map sets out the route from Piarere in the north to Waiouru in the south, along SH1.



Previous Comms & Engagement

During the PBC stages and at the start of the DBCs, stakeholder workshops have been held. Giving an opportunity to those with an interest to input into the business cases. No public consultation has been conducted yet.

Purpose/goal of communication and engagement

This latest update of the project's Communications & Engagement Plan focuses on engagement with mana whenua, local government partners and key stakeholders to help shape the Detailed Business Case (DBC)'s preferred option. A deliberate decision has been made to defer potentially affected property owner engagement and wider public engagement until funding is confirmed to proceed to the next stages of project development. At that time more certainty can be provided to potentially affected parties and the community, including what it means for their properties and what the timeline for when implementation may be.

However, proactive, affected property owner/neighbour engagement and wider community consultation may need to be undertaken as the details of the short-term improvements becomes clearer. A separate action plan will be developed for these initiatives including reference to this overarching plan's key messages.

This plan incorporates the following two Detailed Business Case (DBC) projects. For this phase, we will present the project to stakeholders as one full corridor. The project teams are working closely together on communications and engagement for the DBCs:

- SH1 – Piarere to Taupō Improvements, led by Safe Roads
- SH1 – Taupō to Waiouru Improvements, led by Stantec

Measurable objectives

The communication and engagement objectives for this project are to:

- identify key issues and concerns that mana whenua and stakeholders have regarding this part of the SH1 corridor
- partner with mana whenua and involve or consult stakeholders as part of the development of the project's options, helping to shape the project's preferred option selection by ensuring their feedback is considered at all key workshops and decision-making points of the project.
- ensure high quality collateral and clear reporting back processes are in place for all stakeholders, including describing how their feedback has been considered and/or addressed
- ensure all stakeholders feel the NZ Transport Agency has been open and transparent in their approach to producing the DBCs
- internally, ensure clarity of engagement management responsibilities, consistency of messaging and a joined-up approach is implemented with neighbouring projects and the future Communications and Engagement strategy for the programme's short-term Safer Network initiatives.

Audiences

Key internal stakeholders to be kept informed of the project are set out below. This list does not include members of the project team who are actively involved in the project. The project team will work with the Central and Northern Community Engagement Practice Manager when issues or risks need to be elevated to senior NZTA teams.

NZTA BUSINESS GROUP	LEAD CONTACT	ROLE / INTEREST
Customer Design and Delivery: Journey Management	Liam Ryan	Waikato Journey Manager
Customer Experience & Behaviour	Mark McMann	Advisor on approach
Investment and Finance: Investment Assurance	Mark Jack	Practice Manager, Investment Assurance
Strategy, Policy and Planning: System Planning	Al Talbot	Alignment with strategic case
System Design and Delivery (SDD): Operational Policy and Performance	David Greig	Principal Environmental Specialist
SDD: Project Delivery	Darryl Coalter	Portfolio Manager, Delivery
SDD: System Design: Consents and Approvals	Jenni Fitzgerald	Manager, Consents & Approvals Principal Planning Advisor (for iwi advice)
SDD: Design Practice and Solutions	Sebastian Reed	Principal Advisor
SDD: Inter-regional corridors	Chris Gasson	DBC Sponsor
SDD: System Optimisation	John Garvitch	Safety advisor
SDD: System Management	Karen Boyt Stephen Parker Bevan Percival Nick Cook	Manager, System Management, Waikato Asset Integrator

Corporate Services (Legal, Risk Assurance and Property)	Mark Spring	Property Acquisition Advisor
Connected Journey Solutions	Martin McMullan	Director Connected Journey Solutions
GSC	Sarah Azam Janette Williams Nicholas Manukau	Practice Manager (Central and Northern Community Engagement) Practice Manager, Safety & Environment Group (Safer Networks) Manager, Maori and Central iwi advisor
TBC	TBC	Cell phone coverage – input the work already been done

The following external audiences will be engaged with during the project:

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
Regional Councils					
Waikato Regional Council	Wants Waikato Expressway (WEX) and associated improvements complete to move people and freight, and improve safety, so would support options, and require full engagement.	Low	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
Horizons Regional Council	The southern end of the project (SH1 – Taupō to Waiouru Improvements)	Low	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
District Councils					
South Waikato District Council	Interested in impacts on town centres i.e. Tirau, Putururu and	Medium	Involve	- NZTA project team	- Workshop s - Regular email Face-to-face

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
	Tokoroa. Project links closely with Council's Town Centre projects.				meetings, as needed
Taupō District Council	Interested in southern section (Taupō to Waiouru) especially around Te Poporo/Bulli Point and in impacts on community centres.	Medium	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
Ruapehu District Council	Interested in how network will connect to their communities.	Medium	Involve	- NZTA project team	- Workshop - Face-to-face meetings, as needed
Other Infrastructure / Service Providers					
KiwiRail	Would want to know about any project work that delays trains or impacts their rail network.	Low	Consult	- NZTA project team	- Workshop - Face-to-face meetings, as needed
New Zealand Post	Want an understating of what improvements are being considered and how this may impact on their routes.	Low	Consult	- NZTA project team	- Stakeholder email and update
First Gas	Need to understand how any options may impact on existing or future planned infrastructure.	Low	Consult	- NZTA project team	- Face-to-face meetings, as needed
Chorus	Need to understand how any options may impact on existing or future planned infrastructure.	Low	Consult	- NZTA project team	- Face-to-face meetings, as needed
PowerCo Electricity	Need to understand how any options may impact on existing or future	Low	Consult	- NZTA project team	- Face-to-face meetings, as needed

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
	planned infrastructure.				
Transpower	Need to understand how any options may impact on existing or future planned infrastructure.	Low	Consult	- NZTA project team	- Face-to-face meetings, as needed
Kinleith Mill	Need to understand how any options may impact on existing or future planned infrastructure.	Low	Consult	- NZTA project team / Safe Roads	- Face-to-face meetings, as needed
Fonterra Lichfield	Need to understand how any options may impact on existing or future planned infrastructure.	Low	Consult	- NZTA project team / Safe Roads	- Face-to-face meetings, as needed
Advocacy / Representative Groups					
NZ Automobile Association	Represents road users so will provide good insights as well as being able to gauge impact on members.	Low	Involve	- NZTA project team	- Workshop - Regular email
Road Transport Association and Road Transport Forum	Represents commercial road users so will provide good insights as well as being able to gauge impact on members.	Low	Involve	- NZTA project team	- Workshop - Regular email
National Road Carriers (NRC)	Represents commercial road users so will provide good insights as well as being able to gauge impact on members.	Low	Involve	- NZTA project team	- Workshop - Regular email
Freight Logistics Action Group (FLAG)	Could provide valuable cross-sector view.	Low	Consult	- NZTA project team	- Regular email

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
					- Face-to-face meetings, as needed
Heavy Haulage Association	Would want to have closer look at all options which enhance or disrupt route. Keep engaged.	Low	Consult	- NZTA project team	- Regular email - Face-to-face meetings, as needed
Cycle Action Waikato	Would want to have closer look at all options, with safety being biggest consideration but also connections to River trails.	Low	Consult	- NZTA project team	- Update on project - Seek feedback
Bike Taupō	Would want to have closer look at all options, with safety being biggest consideration. Link to their cycleway project connecting Taupō to Turangi.	Medium	Involve	- NZTA project team	- Update on project - Seek feedback
Fonterra	Interest in how improvements being considered may impact on their farmers and transport networks.	Low	Inform	- NZTA project team	- Stakeholder email and update
Federated Farmers	Interest in how improvements being considered may impact on their members.	Low	Inform	- NZTA project team	- Stakeholder email and update
Fish and Game	If changing access to lakes or rivers	Medium	Consult	- NZTA project team	- Stakeholder email and update - Face-to-face meetings, as needed
Motorcycle Safety Advisory Council	National advisory group	Low	Inform	- NZTA project team	- Stakeholder email and update
Emergency Services					
NZ Police	Would want to have closer look at all	Low	Involve	- NZTA project team	- Workshops - Regular email

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
	options. Keep engaged.				- Face-to-face meetings, as needed
Fire and Emergency	Would want to have closer look at all options. Keep engaged.	Low	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
St John Ambulance	Would want to have closer look at all options. Keep engaged.	Low	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
Central Government					
ACC	Want an understating of what improvements are being considered. Interested in reducing harm.	Low	Inform	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
Heritage NZ	Want an understating of what improvements are being considered and any impacts on cultural or historic sites.	Low	Consult	- NZTA project team	- Face-to-face meetings, as needed
Department of Conservation	Full engagement required, due to environmental sensitivity of area through the National Park.	High	Involve	- NZTA project team / Stantec	- Workshop - Face-to-face meetings, as needed
Tourism New Zealand	Interest in impact on tourist experience.	Low	Inform	- NZTA project team	- Stakeholder email and update
Hamilton and Waikato Tourism	Interest in how improvements being considered may impact on tourists and how to best connect with tourist attractions.	Low	Inform	- NZTA project team	- Stakeholder email and update

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
Destination Great Lake Taupō	Interest in how improvements being considered may impact on tourists and how to best connect with tourist attractions.	Low	Involve	- NZTA project team	- Workshops - Regular email - Face-to-face meetings, as needed
Community groups					
Potentially affected landowners [1]	Impact this will have on their land.	High	Consult	- NZTA project team	- Letters - Face to face meetings

The NZTA project team will be responsible for managing the majority of the relationships – the engagement teams will assist with managing these relationships by: organising and facilitating meetings or workshops; tracking and recording interactions; providing supporting collateral.

Mana Whenua

Hui have occurred to discuss how iwi groups want to be involved. There is agreement that groups will take part in the workshops, with briefing meetings taking place a week beforehand.

[More information about the process to date and sessions planned]
Anuradha will insert some text

For internal purposes, we want to mention that there are separate discussions under way with Tūwharetoa about lakeside re-alignment.

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
Tūwharetoa	Mana whenua have a Guardianship role in their regions. Kaitiakitanga (guardianship) provides the foundation for	High	Collaborate	- NZTA project team / Stantec	- Hui - Pre-workshops to work through workshop content just with iwi.

[1] For the Taupo to Waiouru there are several large landowners, who will be consulted with throughout the project; for the Piarere to Taupo there is unlikely to be the requirement for land.

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
	environmental controls and customary practices for whanau, hapu and iwi. It is an inherent obligation to be custodians, protectors and guardians of traditional interests, taonga (possessions) and resources. Mana whenua desire to manage resources in ways that respect, conserve, and sustain the health and wellbeing of taonga, while ensuring a sustainable balance between the use of resources by present generations and their availability for future generations.				
Ngati Tahu-Ngati Whaoa	As above, however each iwi will have specific interests which will need to be identified during initial conversations.	High	Collaborate	- NZTA project team	- Hui
Raukawa	As above, however each iwi will have specific interests which will need to be identified during initial conversations.	High	Collaborate	- NZTA project team	- Hui

EXTERNAL AUDIENCE	THEIR INTEREST	RISK FACTOR	LEVEL OF ENGAGEMENT	WHO WILL MANAGE THIS ENGAGEMENT	HOW WE WILL ENGAGE WITH THESE GROUPS
Ngāti Hauā	As above, however each iwi will have specific interests which will need to be identified during initial conversations.	High	Collaborate	- NZTA project team	- Hui
Ngāti Rangi	As above, however each iwi will have specific interests which will need to be identified during initial conversations.	High	Collaborate	- NZTA project team	- Hui

Key messages

The work to look at improvements on SH1 between Piarere and Waiouru has restarted following a pause in 2018 while the Transport Agency awaited direction from the Government – which was clarified in the Government Policy Statement on Transport and the National Land Transport Programme (NLTP) 2018-21.

While the Government's focus is on safety, funding is now being spread to other areas and work on this section of SH1 between Piarere and Waiouru did not get included in 2018-21 (NLTP) other than the completion of the current phase (DBC).

However, the Transport Agency and partners can continue to develop the business cases which allow future priorities to be developed, and also means planned improvements can be done more quickly if and when funding becomes available.

These messages are for key stakeholders.

SH1 PIARERE TO WAIOURU (WHOLE CORRIDOR)

- State Highway 1 (SH1) is New Zealand's main highway. It carries a large volume of freight, tourists and commuters making local, regional and inter-regional journeys.
- The SH1 Piarere to Taupō and Taupō to Waiouru Programme Business Cases, which were completed and supported by the Transport Agency Board in late 2016, identified both short-term and long-term programmes of investment to achieve significant resilience, reliability, community amenity and safety outcomes. While there is no funding set aside for future phases in the current NLTP, completing these Detailed Business Cases means the project team is well-placed to start works if and when funding becomes available.
- SH1 is part of New Zealand's economic backbone and a journey experienced by more than 6 million tourists each year.

SH1 PIARERE TO TAUPŌ

- A high number of fatal and serious injuries occur on this corridor, mainly as a result of head-on and run-off road crashes. Sections of the route do not meet the standards of a nationally important highway.
- Between January 2013 and December 2017, 35 people died and 58 were seriously injured on this stretch of road. Road user mistakes, which contribute to crashes, include loss of control, failure to keep left and fatigue.
- The recommended programme for the Piarere to Taupō corridor combines operational and capital improvement works to create a safer, more resilient and reliable highway. The programme aims to:
    - Improve emergency response and incident management
    - Improve maintenance regimes
    - Improve traveller information and communications
    - Improve safety, resilience and reliability through staged roading upgrades along the whole corridor over the next 10-30 years.
- The current focus is on acting quickly to reduce harm/save lives on the road by delivering short-term safety, journey and resilience improvements.
- When complete, the short-term stage of works will:
    - Reduce deaths and serious injuries
    - Improve the route's safety rating
    - Reduce the number and duration of road closures.
    - Making journey times more reliable

SH1: TAUPŌ TO WAIOURU

- There are also a high number of fatal and serious injuries on this corridor, mainly as a result of head-on and run-off road crashes. There are sections of this route which do not meet the standards of a nationally important highway.
- In the past 5 years, 7 people have died and 39 have been seriously injured on this stretch of road. Road user mistakes contributing to crashes include loss of control, driving too fast, and inexperienced drivers.
- The recommended programme for the Taupō to Waiouru corridor is a long-term programme of investment to create a safer alignment of SH1, initiatives to encourage safer driver behaviour, and innovative technology to improve the traveller experience. Improvements will:
    - Improve safety, resilience and reliability
    - Increase the route's road safety rating which will help reduce deaths and serious injuries
    - Reduce the conflict between traffic and local communities
    - Improve maintenance regimes
    - Improve traveller information and communications
    - Improve emergency response and incident management
    - Achieve safer more consistent travel speeds.
- In the longer term, the conversation will continue around realigning the road between Hatepe Hill and Motuoapa and between Three Sisters and the Desert Road.
- The current focus is on reducing harm/save lives on the road by delivering short-term safety, journey and resilience improvements.
- Funding permitting, we expect the short-term safety improvements will be developed following the DBC.
- When complete, the short-term stage of works will:
    - Reduce deaths and serious injuries

- Improve the route's safety rating
- Remove some of the pinch points for heavy vehicles
- Reduce the number and duration of road closures.
- Improve community amenity/reduce conflict between local communities and traffic.

OTHER SAFE ROADS MESSAGES

Road crashes are a major cause of preventable death and injury in New Zealand.

The Safe Network Programme is making state highways safer through measures such as rumble strips, shoulder widening, safety barriers and better signage.

We are working with stakeholders to find safety solutions that will make a difference. Mistakes will still happen, but if our roads and roadsides can be made safer, more of us might survive those crashes.

Risks/issues and mitigation

The following provides a high-level overview of the risks for the project and how they can be mitigated. Specific mitigation activities for each part of the project will vary and will be noted in the specific action plan. The wider comms and engagement risks will be incorporated into a project risk register.

RISK	MITIGATION AND RESPONSES
Not engaging the wider public. Input and local knowledge is not captured from the wider community; however, expectations are not raised when project funding is uncertain. Reputational risk in regard to a lack of transparency in reaching a decision without public input.	Working with key stakeholders who represent the wider community to gather views and input. When appropriate, involved the community to understand their views on short-term improvements.
Internal Transport Agency processes (timing)	Factor in lead-in times to project actions; ensure material is presented timely to enable smooth sign-off.
Consultation fatigue	Contacting stakeholders to ask how they want to be involved. Aim to brief various councils through joint meetings/committees. Timely involvement with iwi and key stakeholders.
Iwi notification	Attend all internal workshops, materials sent week in advance. Iwi sent information about the project prior to anything going stakeholders.
Requirement and expectations of stakeholders	Be clear about expectations, including what is required of stakeholders and double checking they are the correct person. Will they be able to report back to their organisation?
Further info requests/OIAs from media/stakeholders are requested for the project	Acknowledge the previous phase and prepare key messaging about how this project has developed since then.
Miss involving key people	Check-in with stakeholders to ensure we're dealing with the correct person and organisations.
Adjacent projects, SH1 Cambridge to Piarere and SH29 to be re-evaluated – risk of stakeholder dissatisfaction with Agency approach. People question why this	Work closely with the project teams on re-evaluation projects to ensure consistent messages and using opportunities to join-up when appropriate. Refer to approved Agency messaging.

project is going ahead while the future of the SH1 Bypass is yet to be confirmed	
Other works on the corridors	Keep internal communications strong, work with the relevant Transport Agency operational staff.
Consistency and collaboration between the Stantec/Safe Roads team to avoid stakeholder confusion or inconsistency of contact. Aligned story and collaboration with current neighbouring Cambridge Piarere works, and the forthcoming short-term programme	Work through the NZTA project manager to ensure we avoid stakeholder confusion. The project team will meet regularly to keep on top of each corridor elements and will work together to present a joined-up project. This plan will be split, if it makes sense to do so at some point in the future.
Getting buy-in from stakeholders	Set expectations up front – about the nature of the project, timing and deliverables. Celebrate and communicate more immediate improvements.
Unrealistic expectations about what we can do	Be clear about what we can do and our objectives from the beginning. Manage expectations and be careful not to overpromise.
Opposition from those who are directly affected (landowners) by short-term programme	Work closely with parties who might be directly affected. Tailor messages and appoint staff within the Transport Agency to manage relationships.

Key milestones

KEY MILESTONES	TIMING
Hui	Nov 2018
Workshop 2 – Long list to short list	Dec 2018
Refreshed Comms and Engagement Plan	Dec 2018
Meetings with all other key stakeholders to gain understanding of key considerations of short-list options – if necessary	Early 2019
Preparation of short list option materials for engagement with stakeholders	Jan 2019
Internal NZTA check-in of short list	Jan 2019
Hui – short-list to preferred	Feb 2019
Workshop 3 – Short list to – preferred	Feb 2019
Final DBC	April 2019
Seek support of NZTA Board on preferred option	June 2019

Tools and Tactics

TOOL/TACTIC	PURPOSE	DETAILS
Workshops	To work through the Business Cases with key stakeholders	There will be three or four workshops across the duration of the project
One-on-one meetings	These meetings are either follow ups to the workshops with attendees or meetings with key stakeholders to gather key insights that may impact on potential options identified (for example environmental impacts)	These meetings will occur following each workshop
Hui	To work with mana whenua on developing solutions for the problems identified that provide the best possible outcomes	It has been agreed that separate hui take place before the wider stakeholder workshops to work through a similar agenda
Emails	To update stakeholders	Emails will have content specific to the project at the time
Letters and meetings	Updating potentially affected parties of the options being investigated and how they may be affected (short-term programme)	The format for landowner engagement will need to be assessed once there is an understanding of the property impacts
Joint comms group across NZTA, Stantec and Safe Roads	Meet regularly to ensure engagement is coordinated and on track, appropriate feedback is being considered at workshops/key milestones	Format TBC but include regular reporting to GSC and project team.
Subsequent short-term programme C & E plan	Once short-term programme becomes clearer and fund/vehicle for delivery decided	Build support for short-term initiatives, consult on detail, gain permission from neighbours/landowners for works etc.

Analysis of feedback

Feedback will be captured by the project team at the MCA workshops, hui and meetings, and worked through and incorporated into options. Feedback and minutes from each stakeholder meeting will all be recorded in Consultation Manager (or another appropriate system). A stakeholder consultation report will be drafted and reviewed by GSC and the project team as part of the final DBC documentation. Comments and views received will be incorporated into the DBC in relevant chapters to explain how mana whenua and stakeholder feedback was accounted for as part of the option selection process.

Roles and Responsibilities

ROLE	RESPONSIBILITY
Sponsor/Owner	Chris Glasson
NZTA Project Manager	Alexios Kavallaris
Technical Project Lead SH1	Anuradha Fitzwalter
Consultant Team Leader – Stantec	Phil Peet

Consultant Team Leader - SafeRoads	Campbell McKegg
Comms and Engagement – Transport Agency	Simon Brandon
Comms and Engagement – Stantec	Jo Wilkins
Comms and Engagement – Safe Roads	Craig McKibbin

The teams, project and engagement, will have regular contact throughout the project. Actions for certain activities will be planned and assigned a lead to ensure joined up thinking and no surprises.

Evaluation

NZ Transport Agency will have collected data and evidence during this phase to inform the development of the Business Case. The team can point to evidence of stakeholder feedback being considered in key workshops and decision-making milestones.

Stakeholder feedback following completion of the Business Case notes satisfaction with the process and relationship status, and understanding of how decisions were made, even if a stakeholder's feedback has been unable to be wholly included.
Iwi and key stakeholders will have had ample opportunities to contribute to the DBC and will feel heard. Relationships will have been strengthened.

We will know we are successful when we have:

- reached all stakeholders
- the quality of input reflects an understanding of the issue
- we heard from a wider variety of groups
- iwi feel they have been appropriately consulted and their input has been considered
- feedback is positive and supportive.

Action planning

INTERNAL ACTIONS

STAKEHOLDER	ACTION PLANNED	LEAD RESPONSIBILITY	TIMING
Steering Group	Email update	Project Manager	Weekly
Internal stakeholders	Email update	Project Manager	Monthly
NZTA Staff	GSC Comms update	NZTA C & E representative	Weekly
Minister's Office	Ministers Weekly Report – as necessary	Project Manager	Weekly
System Design and Delivery Delegations group	Presentation	Project Manager	As required
NZTA Board	Board Paper	Project Manager	As required

Project Manager = NZTA

EXTERNAL ACTIONS

The following provides a high-level overview of actions to be undertaken.

STAKEHOLDER GROUP	ACTION PLANNED	LEAD RESPONSIBILITY	TIMING
Iwi	Hui	Project manager	Ongoing
Regional Councils	Email update on the project Invitation to workshops Workshops Follow up meetings Close out emails (preferred and DBC)	Project manager Project manager Consultant Consultant Project manager	October October Various Various 2019
District Councils	Email update on the project Invitation to workshops (if relevant) Workshops (if relevant) Follow up meetings Close out emails (preferred and DBC)	Project manager Project manager Consultant Consultant Project manager	October October Various Various 2019
Other infrastructure / Service Providers	Email update on the project Invitation to workshops (if relevant)	Project manager Project manager	October October

STAKEHOLDER GROUP	ACTION PLANNED	LEAD RESPONSIBILITY	TIMING
	Workshops	Consultant	Various
	Follow up meetings	Consultant	Various
	Close out emails (preferred and DBC)	Project manager	2019
Advocacy / representative groups	Email update on the project	Project manager	October
	Invitation to workshops (if relevant)	Project manager	October
	Workshops	Consultant	Various
	Follow up meetings	Consultant	Various
	Close out emails (preferred and DBC)	Project manager	2019
Emergency Services	Email update on the project	Project manager	October
	Invitation to workshops	Project manager	October
	Workshops	Consultant	Various
	Follow up meetings	Consultant	Various
	Close out emails (preferred and DBC)	Project manager	2019
Central Government	Email update on project	Project manager	October
	Email updates	Consultant	Ongoing
	Meetings (if required)	Consultant	Ongoing
Potentially affected landowners (for short term works?)	Letter informing of potential impact	Project Manager (property)	TBC
	Meetings	Project Manager (property)	TBC
	Confirm if affected	Project Manager (property)	TBC
	Property acquisition process	Property acquisition agent	TBC

Project Manager = NZTA

Appendix - Workshops

Email to key stakeholders / workshop attendees:

Name	Organisation	Email
Phillip Hindrup*	Horizons RC	Phillip.Hindrup@horizons.govt.nz
Gordon Naidoo*	South Waikato District Council	Gordon.Naidoo@southwaikato.govt.nz
Denis Lewis*	Taupo District Council	dlewis@taupo.govt.nz
Tom Cloke*	RTA	tcloke@rtanz.co.nz
Keith McGuire*	RTA	kmcguire@rtanz.co.nz
Bill McMaster*	Waikato Region	Bill.McMaster@waikatoregion.govt.nz
Brent Crowe*	Police	Brent.Crowe@police.govt.nz
Fane Troy*	Police	Fane.Troy@police.govt.nz
Hamish Smith*	Fire Services	Hamish.Smith@fireandemergency.nz
Damian Coutts*	Great Lake Taupo	damian@greatlaketaupo.com
Roger Coles*	AA	rogerc@xtra.co.nz
Belinda Darragh	AA	BDarragh@aa.co.nz
Cathy McDonald	AA	cmcdonald@aa.co.nz
John Galbraith	FLAG	john.galbraith@xtra.co.nz
Dave Cox	RTA	DCox@rtanz.co.nz
Carolyn McAlley	Heritage	CMcAlley@heritage.org.nz
Stuart Cockburn	St Johns	stuart.cockburn@stjohn.org.nz
Dave Lumley*	DOC	dlumley@doc.govt.nz
Gareth Saunders*	Waiouru Military Camp	gareth.saunders@nzdf.mil.nz
Kirstin Hall*	ACC	Kirstin.Hall@acc.co.nz
Warren Furner*	Ruapehu District Council	warrenf@ruapehudc.govt.nz
Grant Turner	National Road Carriers	grant.turner@natroad.co.nz
John Garvitch*	NZTA	John.Garvitch@nzta.govt.nz
Bevan Percival*	NZTA	Bevan.Percival@nzta.govt.nz
Stephen Parker*	NZTA	Stephen.Parker@nzta.govt.nz
Sebastian Reed	NZTA	Sebastian.Reed@nzta.govt.nz
Mark Jack	NZTA	Mark.Jack@nzta.govt.nz
		gandcmasters@gmail.com
Poto		poto@puawai.com
Lisa	Ngāti Hauā	Lisa@ngatihauaiwitrust.co.nz
Maria*	Tūwharetoa	maria@tuwharetoa.co.nz
Evelyn	Ngati Tahu-Ngati Whaoa	evelyn@tahu-whaoa.com; office@tahu-whaoa.com
David	Ngāti Rangi	david@ngatirangi.com
April Haika	Raukawa	april.haika@raukawa.org.nz
Jo-anne Cook	Raukawa	jo-anne.cook-munro@raukawa.org.nz

* Invited or attended workshop 1

Email sent: 28 September 2018:
As per my last email to you back in March, our work to look at improvements on SH1 between Piarere and Waiouru was put on hold whilst we awaited the Government's new direction for transport. It's now been some months since the new GPS (Government Policy Statement on Land Transport) was published and since then the Transport Agency has been working to confirm our new work programme for the next three years to give effect to the GPS, through the National Land Transport Programme 2018-21 (NLTP).

The good news is that things have now settled down and we are now in a position to re-start our work on SH1 Piarere to Waiouru. As a result I will be sending out a placeholder for our next workshop planned for mid-November.

Whilst we are continuing with the development of the business cases, future phases such as implementation of the projects did not make it into the NLTP. As you are probably aware, the Government's focus is very much on safety, however, funding is now being spread to other areas such as local roads and therefore this project has not met the priority threshold at this time. However, we are keen to continue the business cases as this could allow us the opportunity to consider implementation of more affordable quick wins which could be funded through other sources. From a project team perspective, we are keen to continue to build the case for improvements and be in a position to implement if and when circumstances change.

Workshop 2 will take place in November; with a hui prior (early November)
Workshop 3 will take place in Feb 2019
1:1 meetings will occur in between the two workshops

Workshop 2 – Purpose:
Work through long-list options; criteria to be used and evaluation process
MCA style process

Invite those who were a part of workshop 1
Suggested dates for iwi meeting:

- Thursday 1 November
- Friday 2 November
- Monday 5 November
- Tuesday 6 November

Workshop 2: **Tuesday 13 November**

Workshop 1

SH1 Piarere to Waiouru Detailed Business Case

Date/Time:	August 23, 2017 / 10:00 AM	
Place:	Suncourt Hotel, Taupo Suncourt Hotel, Taupo	
Attendees:	Gordon Naidoo	South Waikato DC
	Denis Lewis	Taupo DC
	Tom Cloke	RTA/NRC
	Keith McGuire	RTA
	Bill McMaster	WRC
	Brent Crowe	NZ Police
	Fane Troy	NZ Police
	Hamish Smith	NZ Fire & Emergency
	Roger Coles	AA (Wanganui)
	Damian Coutts	Destination Great Lake Taupo
	John Garvitch	NZTA
	Bevan Percival	NZTA
	James Darge	Downer (Network Contractor)
	Ami Willmoth	Downer (Network Contractor)
	Adrian Khan	NZTA
	Daniel Gilmour	NZTA
	Anuradha Fitzwalter	NZTA
	Keryn Zimmerman	NZTA
	Todd Webb	NZTA
	Stephen Parker	NZTA
	Phil Peet	Stantec
	Paula Hunter	Stantec
	Jeremy France	Stantec
	Andrew Maughan	Stantec
	Sarah Connolly	Stantec
	Caroline Wratt	Stantec (Facilitator)
	Lisa Matthews	Safe Roads
	Craig Inskeep	Safe Roads
	Jamie Minchington	Safe Roads
	John Garvitch	NZTA
	Bevan Percival	NZTA
	James Darge	Downer (Network Contractor)
	Ami Willmoth	Downer (Network Contractor)
	Adrian Khan	NZTA
	Daniel Gilmour	NZTA
	Anuradha Fitzwalter	NZTA
	Keryn Zimmerman	NZTA
	Todd Webb	NZTA
	Stephen Parker	NZTA
	Phil Peet	Stantec
	Paula Hunter	Stantec

Jeremy France	Stantec
Andrew Maughan	Stantec
Sarah Connolly	Stantec
Caroline Wratt	Stantec (Facilitator)
Lisa Matthews	Safe Roads
Craig Inskeep	Safe Roads
Jamie Minchington	Safe Roads
Gordon Naidoo	South Waikato DC
Denis Lewis	Taupo DC
Tom Cloke	RTA/NRC
Keith McGuire	RTA
Bill McMaster	WRC
Brent Crowe	NZ Police
Fane Troy	NZ Police
Hamish Smith	NZ Fire & Emergency
Roger Coles	AA (Wanganui)
Damian Coutts	Destination Great Lake Taupo

Absentees: Ruapehu DC, Horizons RC, Waiouru Military Camp, ACC, DOC, Tuwharetoa

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Item:

Welcome and Introductions

Caroline Wratt welcomed everyone.

Business Case Process

Anuradha Fitzwalter provided an update on where the NZ Transport Agency are at in the Business Case process. She gave a presentation of the preferred programme and outlined the scope of the DBCs (see presentation in Attachment 1).

There was concern raised that the larger aspects of the PBCs, i.e. the realignments, weren't being progressed at this time. Anuradha stated that there is still a need to undertake the online safety improvements regardless. NZ Transport Agency are still continuing to gather evidence through this DBC phase and they will still need to test any potential solutions against the long-term realignments to ensure value for money.

Recap of the Problem and Benefit Statements and Investment Objectives

Phil Peet gave an update of these from the PBC and how they will be slightly modified for the DBC (see presentation in Attachment 1).

These were accepted by the attendees.

Identification of Constraints

Paula Hunter presented the constraints as currently identified.

Item:

All attendees were invited up to long plot aerials of the corridor to add additional constraints to the maps using pens and sticky notes. These have been captured and will be added to the constraint maps.

Option Identification

The attendees were split into 5 groups and each had 15 minutes at each of the following stations to identify potential improvement options.

- Road User Facilities
- Resilience \ Emergency Response
- Safety – Piarere to Taupo
- Safety – Taupo to Waiouru
- Tauranga Taupo Bridge

Each of the stations had background information for the attendees which is provided in Attachment 2.

A raw list of the options identified are presented in Attachment 3.

Key Principles

Caroline posed the following question for the attendees to complete.

"I don't mind what is proposed along here as long as……."

The following responses were received. NZ Transport Agency will consider these and filter, consolidate and refine them to compile a set of Key Principles.

- It's straight with no hill and no corners
- Solves the identified issues
- Reduces travel time variability
- Looks at the entire journey rather than sections in isolation
- It is done working with partners
- Its National Strategic function is delivered so consequences (crashes, delays and closures) are minimised.
- It is of substance to address the issues
- Short term works are started immediately
- Safety standards are improved
- Reduces significant resilience risk
- Protects environmental aspects around the lake
- It is done in line with joint outcomes for the towns (as per PBC)
- It improves the visitor experience
- High risk sites get attention first (e.g. Bulli Point)

Item:

- We stop "band-aiding" the route

Next Steps

Anuradha and Phil briefly outlined the next steps and noted that Workshop 2 is proposed for early November.

The meeting adjourned at 2:00 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec NZ Ltd
Phil Peet
3 September
phil.peet@stantec.com

Attachments: Attachment 1: Presentation
Attachment 2: Background Information
Attachment 3: Option Identification

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Please visit **www.stantec.com** to learn more about how Stantec design with community in mind.

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