
SH29 Piarere to Tauriko

Iain China

June 2016

V1

Programme Business Case



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NZ Transport Agency
Private Bag 6995
Wellington 6141

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APPROVAL

PREPARED BY:	REVIEWED BY:	ENDORSED BY:	APPROVED BY:
Tony Innes	Derek McCoy		
[JOB TITLE]	[JOB TITLE]	STAKEHOLDER PROJECT SPONSORS	DELEGATED AUTHORITY - STAKEHOLDERS
DATE:	DATE:	DATE:	DATE:

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GLOSSARY OF TERMS

Benefit Cost Ratio	BCR
Detailed Business Case	DBC
Indicative Business Case	IBC
Multi-Criteria Assessment	MCA
Net Present Value	NPV
One Network Road Classification	ONRC
Programme Business Case	PBC
Road Controlling Authority	RCA
Road of National Significance	RoNS
Scheme Assessment Report	SAR
State Highway 1	SH1
State Highway 29	SH29
State Highway 28	SH28
State Highway 27	SH27
State Highway 24	SH24

EXECUTIVE SUMMARY

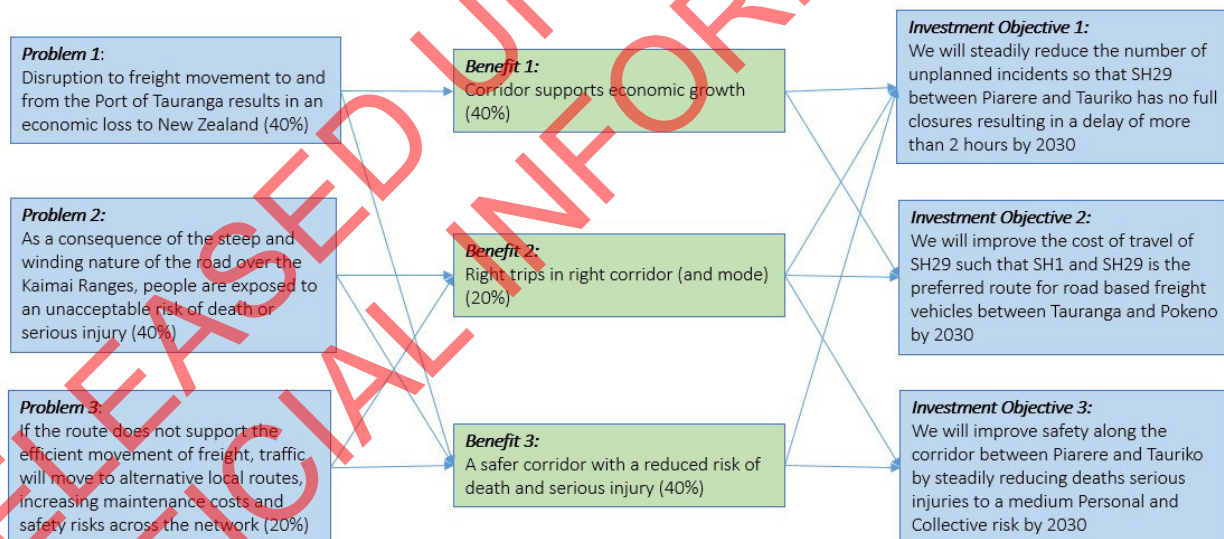
State Highway 29 (SH29) is identified as a National (High Volume) route using the One Network Road Classification (ONRC) system, the highest possible rating. It provides the strategically important link between the soon to be completed Waikato Expressway on SH1 and Tauranga, and in particular the Port of Tauranga. When the Waikato Expressway is complete, it will be the preferred route, identified by the NZ Transport Agency, for road-based freight between Auckland and Tauranga.

SH29 plays a critical transport accessibility role, connecting the Bay of Plenty with the Waikato region and beyond. At present the corridor between Piarere and Tauriko is often closed, its alignment is comparatively unsafe by national standards and the cost of travel is an impediment to economic growth, particularly with respect to freight due to the topography and the current alignment. This is not consistent with the aspirations of a National (High Volume) route.

Providing a safer, more resilient, and cheaper route between Piarere and Tauriko not only provides better accessibility between the Bay of Plenty and Waikato, but also the rest of New Zealand given the importance of the Port of Tauranga to New Zealand's GDP.

A comprehensive and collaborative approach has been adopted with stakeholders to develop this Programme Business Case (PBC). This has resulted in alignment on the problems, benefits and investment objectives for the corridor as outlined below.

Project Problems, Benefits, and Investment Objectives



The collaborative PBC approach has involved the development of options to best address the problems identified and then the compilation of a suite of programmes from these options to best deliver the outcomes sought by the agreed investment objectives.

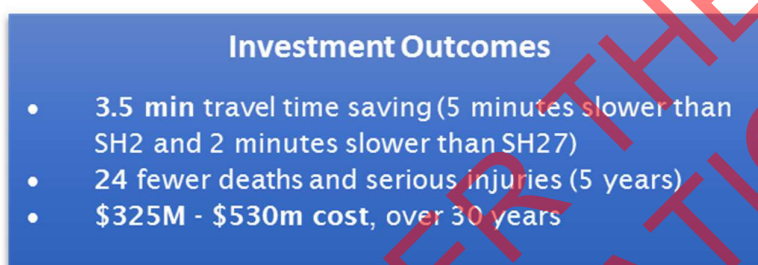
Eleven programmes were developed and assessed in detail, ranging from lower-cost interventions to programmes that aimed to fully meet the ONRC aspirations for the corridor.

The recommended programme best balances achieving the desired investment outcomes in an economically efficient manner. This has been achieved through a combination of operational and capital interventions. The major capital interventions include:

- ∩ Kaimai Loop on western side of Kaimai's
- ∩ Alignment improvements along rest of Kaimai's;
- ∩ 2+1 online alignment for majority of SH1 / SH28 section;
- ∩ Intersection upgrades at SH27, SH24 and SH28
- ∩ Safety improvements between SH1 and SH24

A truck stop at the SH1/SH29 intersection will be provided. The recommended programme is shown in the figure below.

The outcomes achieved by the recommended programme include:



The recommended programme will still result in the SH1/29 route being slower than the alternative SH2 or SH27 routes. However this difference has reduced and is driven largely by the 30km further distance that can not be changed.

The BCR for the recommended programme is between 0.9-1.4 and best matches the level of investment required to deliver the investment outcomes sought. As well as these transport outcomes, opportunities exist to deliver further benefits for the local, regional and national economy, including social, economic and land use benefits.

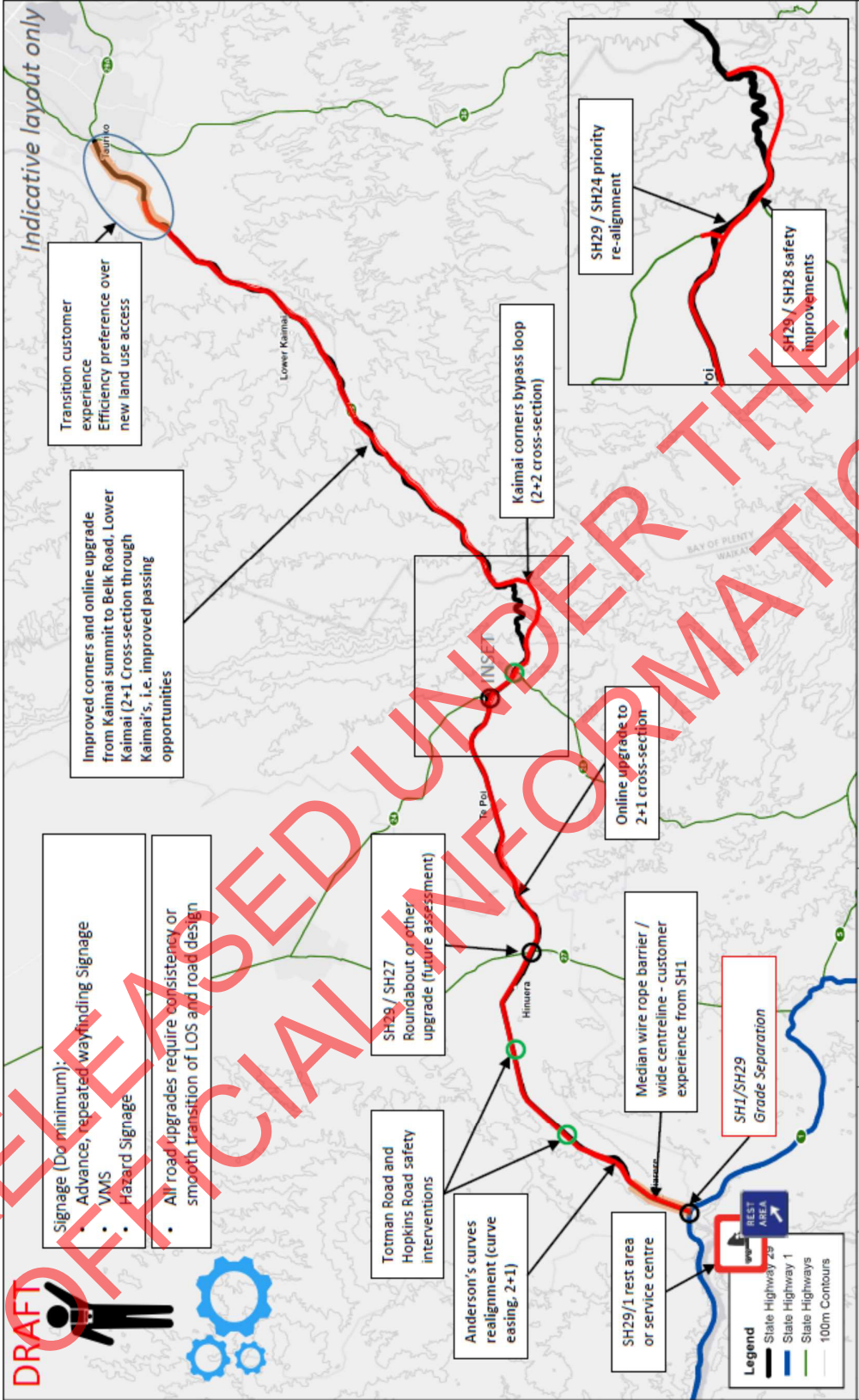
Although the recommended programme does not deliver as many transport benefits as the programme with a tunnel through the Kaimai's, it is not considered justifiable to spend over ten times the cost of the preferred programme to deliver only four times the benefit and importantly only reduces the travel time by an additional three minutes.

The recommended programme has an investment profile of H/H/L.

The recommended programme has been assessed to carry manageable implementation risks. Implementation of the programme is initially focussed on the most immediate safety areas in the Kaimai Ranges and then the remaining components of the programme.

The recommended programme best meets the investment outcomes sought for the corridor, connecting Tauranga with a safer, more resilient and less costly journey that will enable economic growth. This is achieved through a wide range of projects along the corridor length.

Recommended Programme



PART A ' THE STRATEGIC CASE

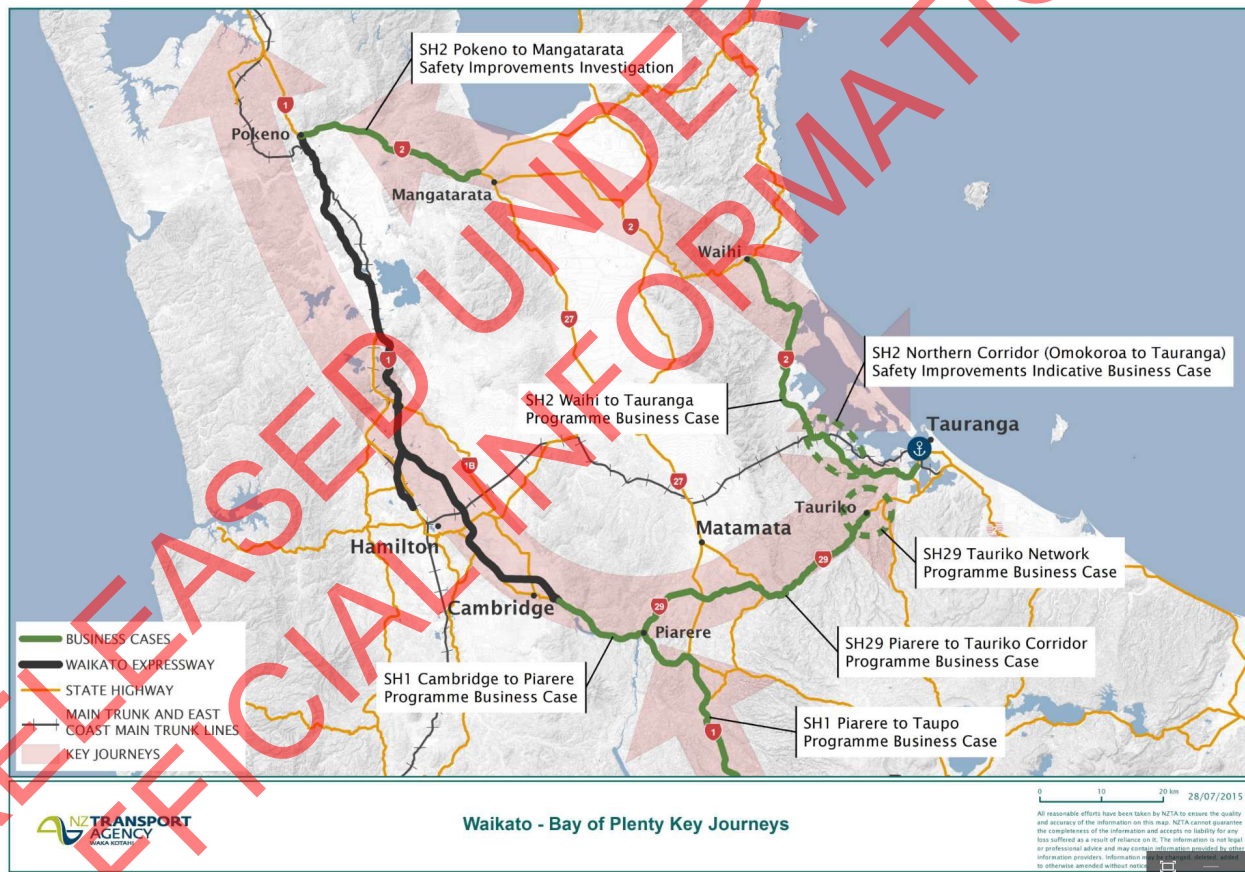
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1 INTRODUCTION

Tauranga is New Zealand's fifth largest city and home to New Zealand's busiest port (by tonnage moved). Given these factors, and Tauranga's close proximity to Hamilton and Auckland, transport connectivity is a key aspect of the region's economic success. SH29 plays a key role in this regard, being the link between Tauranga and SH1 at Piarere. This Auckland-Tauranga route is referred to as SH1-29.

This Programme Business Case (PBC) considers the case for improvement on SH29 between Piarere and Tauriko. Whilst the PBC is focussed on SH29, it has also considered the wider surrounding transport network, including the East Coast Main Trunk (ECMT) line. The PBC builds upon the Hamilton to Tauranga strategic case that was approved by stakeholders and the Transport Agency's Value Assurance Committee (VAC) in December 2015. The strategic case was focussed on the Hamilton to Tauranga corridor, however as outlined in Figure 1 below, this PBC is part of a wider suite of business cases examining key journeys and routes in the Waikato and Bay of Plenty regions, hence the specific focus on SH29.

Figure 1 : PBC Context



SH1-29 and the ECMT both have nationally important functions. SH1-29 has been identified in the One Network Road Classification (ONRC) as a National (High Volume) road. It currently has a dual role of providing for local and inter-regional light and heavy vehicle (freight) traffic between major centres of population and economic activity, including the Port of Tauranga (PoT). It is also the route

for full High Productivity Motor Vehicles (HPMVs) between the Bay of Plenty and areas to the north and west including Auckland and Waikato.

The ECMT is an important inter-regional freight route servicing the PoT and is one of KiwiRail's nationally strategic trunk lines. It is classified as a Class 1 Line within the KiwiRail network, which provides for running speeds between 80km/h and 90km/h. The Hamilton to Tauranga rail link currently operates with no more than 3 to 4 minutes of speed restrictions. Recent improvements to the route have increased capacity to 42 trains per day (2 way) with no weight restrictions.

This PBC has been developed with stakeholders and investors to ensure that all parties direct change and improvement in the right areas. In particular it:

- ¿ Reconfirms (with minor refinement) the strategic case problems and benefits;
- ¿ Develops investment objectives;
- ¿ Investigates options and alternatives to address the problems in the corridor; and
- ¿ Identifies a preferred programme of works to address the problems in the corridor.

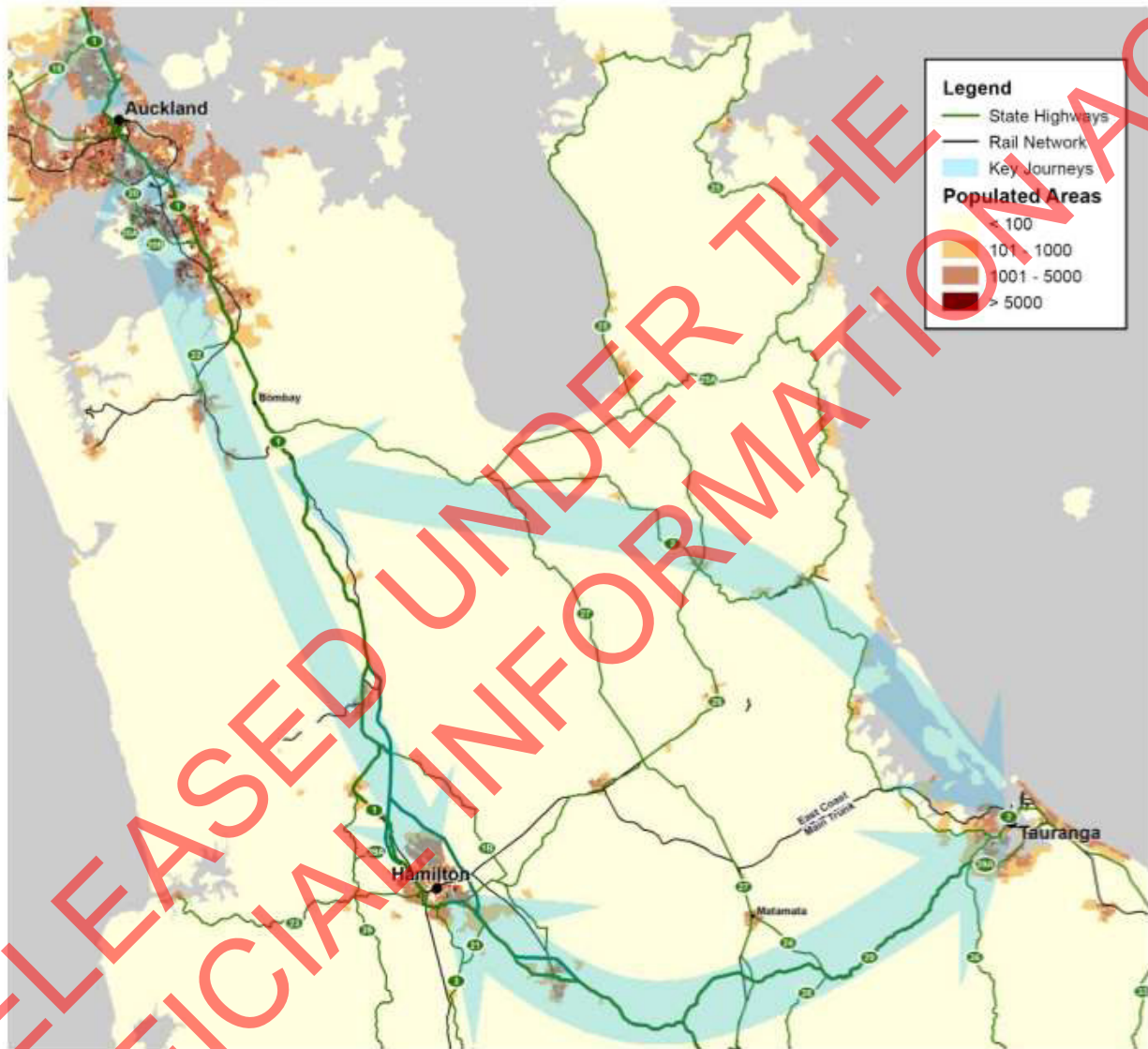
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2 PROGRAMME CONTEXT

2.1 GEOGRAPHIC, ENVIRONMENTAL AND SOCIAL CONTEXT

Figure 2 shows the SH29 corridor in the context of the wider Upper North Island area. It indicates its key connection role between Tauranga, Hamilton and, together with SH1, Auckland.

Figure 2: Geographic Context



SH29 traverses two distinct areas from a topographical perspective. From SH1 to the base of the Kaimai Ranges the geography is generally flat pastoral farming land. East of this point, the corridor changes considerably as the corridor makes its way over the Kaimai Ranges. The Kaimai Ranges are approximately 950m in height and 10km in width and consist mainly of native bush vegetation. A significant portion of the Kaimai Ranges is Department of Conservation (DoC) reserve. The Ranges are used for recreation, including walking and cycling, with an access to these tracks near the summit directly from SH29.

There is little built environment in the corridor, with some small communities on the flat pastoral land and industrial development at the Tauriko end of the corridor. The Tauriko industrial area is proposed to grow substantially over the coming years. Given the scale of this development, a separate programme business case is being developed to determine the necessary transport response to this development. The SH29 PBC will interface with the outcome of the Tauriko PBC.

The SH29 corridor provides the key link between the cities of Tauranga and Hamilton and the wider Waikato and Bay of Plenty regions. There is increasing industrial development at the Tauriko end of the corridor and a number of small local communities along the route, including Te Poi, and Hinuera. SH29 therefore provides accessibility between Tauranga and the Waikato areas, whilst also providing critical accessibility to the wider transport network for the smaller local communities along it.

Population and employment growth is predicted in and around Tauranga at the eastern end of the corridor, with the Bay of Plenty SMART Growth study predicting a 35% increase in population and employment over the next 20 years. There is little growth predicted in other areas along SH29.

2.2 ECONOMIC CONTEXT

Tauranga is New Zealand's fifth largest city, home to New Zealand's busiest port (by tonnage moved). With Hamilton (New Zealand's 4th largest city) and Auckland (New Zealand's largest city) nearby, the Upper North Island Freight Strategy has identified that the 90km radius that covers these three cities accounts for 56% of New Zealand's freight movements, contains 53% of the country's population and 52% of GDP. This is the economic engine room of the country.

A Waikato University study of the PoT's impact on the New Zealand economy study identified that PoT contributed approximately 9% of New Zealand's total revenue and that 5% of all jobs in the country were related to the PoT. The performance of the PoT therefore has a significant effect on the country's economic performance.

The Waikato region is a key location for the growing, manufacturing and production of goods and these goods use the PoT to reach international markets. The rail and road links between these two areas are therefore critically important to the regional and national economic performance.

SH29 is the key transport link between Tauranga and the Waikato region.

Few economic centres are located along SH29, with the main economic activity coming from farm operations between SH1 and the base of the Kaimai Ranges.

2.3 TRANSPORT CONTEXT

2.3.1 Rail

The ECMT runs from Tauranga to Hamilton, approximately 15-20km north of SH29 and is a single track with passing loops. It is one of KiwiRail's nine routes of national significance and is the busiest route of the network outside of the Auckland and Wellington commuter areas. This is due to its direct connectivity with PoT and the increasing development of rail hubs within the Waikato.

The ECMT serves trains from Auckland via Hamilton to Tauranga, together with commodities from Kinleith and Lichfield. The line is dedicated to freight with a capacity of 42 trains per day. Currently only half of these train slots are utilised, indicating that the ECMT is running at market capacity, with significant availability if demand increases.

The PoT has an agreement with KiwiRail to utilise up to nine dedicated train movements per day to move containerised freight from PoT to Auckland. Currently six movements per day are used. Three

extra trains per day are available to PoT, if required.

KiwiRail has substantially increased the capacity and reliability of the ECMT in the past 5 years including longer passing loops and replacing bridges that had restricted the axle loading on the line. KiwiRail has confirmed that the loops are sufficiently sized and spaced to ensure efficient operation. KiwiRail has purchased a fleet of 80 tonne gross weight capacity wagons for use across its network, which are now being used for the Auckland to Tauranga route.

There is a 9km tunnel through the Kaimai Ranges that is considered to be structurally sound and expected to function for another 60 - 80 years. Sections of the tunnel floor are currently being upgraded to repair water damage. The tunnel is not considered a real capacity constraint in the foreseeable future; any potential risk relates to the tunnel floor, which is in the process of being strengthened.

KiwiRail has confirmed that the ECMT is currently operating successfully with no significant issues affecting scheduling and their customers. KiwiRail has robust plans in place to address any incidents that may occur that could result in the closure of their lines. There is no evidence to suggest incidents occur regularly, and no evidence to suggest there is an adverse impact on the road network as a result. Hence resilience on the line is considered to be strong and the rail system is considered fit for purpose.

Importantly, KiwiRail has indicated its preferred investment in the Upper North Island rail system is to provide an extra line out of Auckland. This is because passenger transport demand on the Auckland rail network means that freight train slots are constrained. Increasing Auckland rail network capacity would significantly benefit the North Island Main Trunk (NIMT) and the ECMT as it reduces the need to manage freight and public transport schedules.

2.3.2 Road (SH29)

SH29 is identified as a National High Volume route using the One Network Road Classification (ONRC) system, the highest possible rating. It provides the strategically important link between the soon to be completed Waikato Expressway on SH1 and Tauranga, and in particular the PoT. When the Waikato Expressway is complete, it will be the preferred route, identified by the NZ Transport Agency, for road-based freight between Auckland and Tauranga.

SH29 is a single lane (in each direction) undivided carriageway between SH1 and the base of the Kaimai Ranges. Over the Kaimai Ranges, passing lanes are provided for the majority of the uphill sections. A single lane is generally provided in the downward direction, giving a 2 + 1 general configuration for the Kaimai section. The gradients on the western side reach 11% and 7% on the eastern side. The western side gradients in particular, are steep for the heavy vehicles using them.

There is evidence that due to these grades, some heavy vehicles with route choice options travel laden to Tauranga via SH2 and return on SH29 unladen, such is the effect of the gradients on the western side of the Kaimai Ranges.

SH29 currently carries between 6,000 (near SH1) and 10,000 (Kaimai Ranges) vehicles per day, with 15% of heavy vehicles. The High Volume classification for this nationally significant route is achieved because of the number of heavy vehicles (1,500 per day, against the criteria of 1,200 vehicles a day) rather than the total traffic volume, highlighting the importance of the freight movement for this corridor and its national classification.

Figure 3 and Figure 4 show daily traffic volumes on key corridors close to SH29.

Figure 3: 2014 AADT

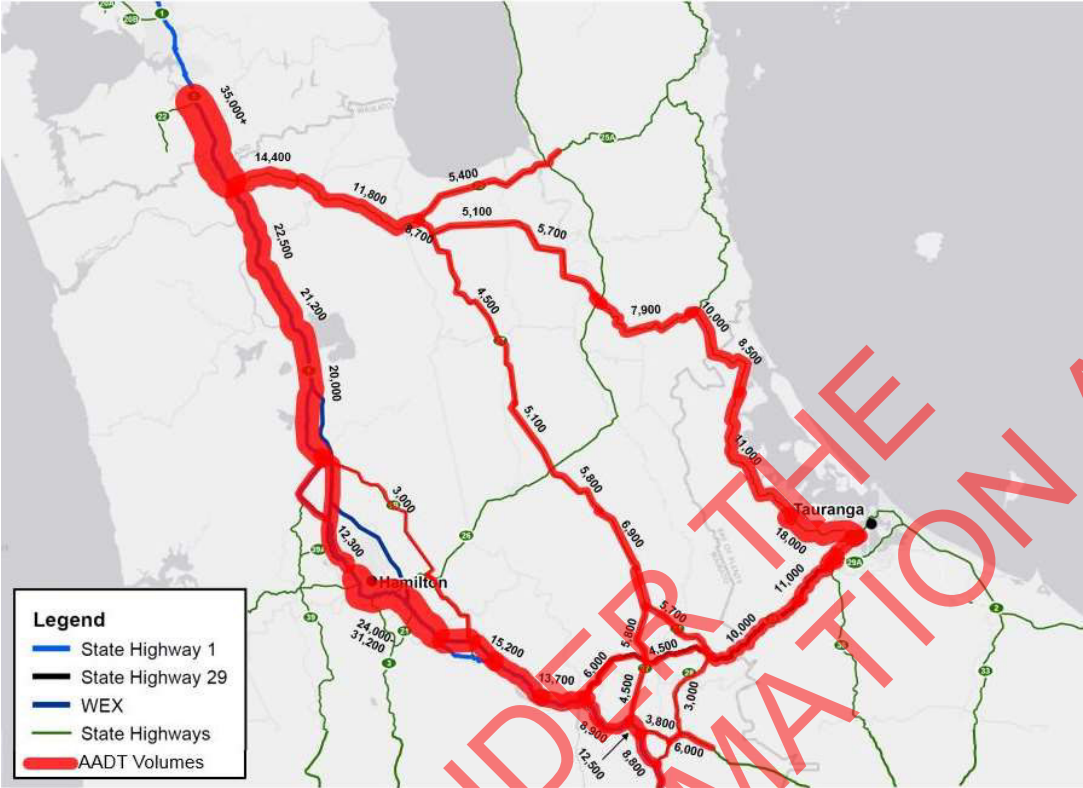


Figure 4: 2014 Heavy Vehicle Daily Volumes

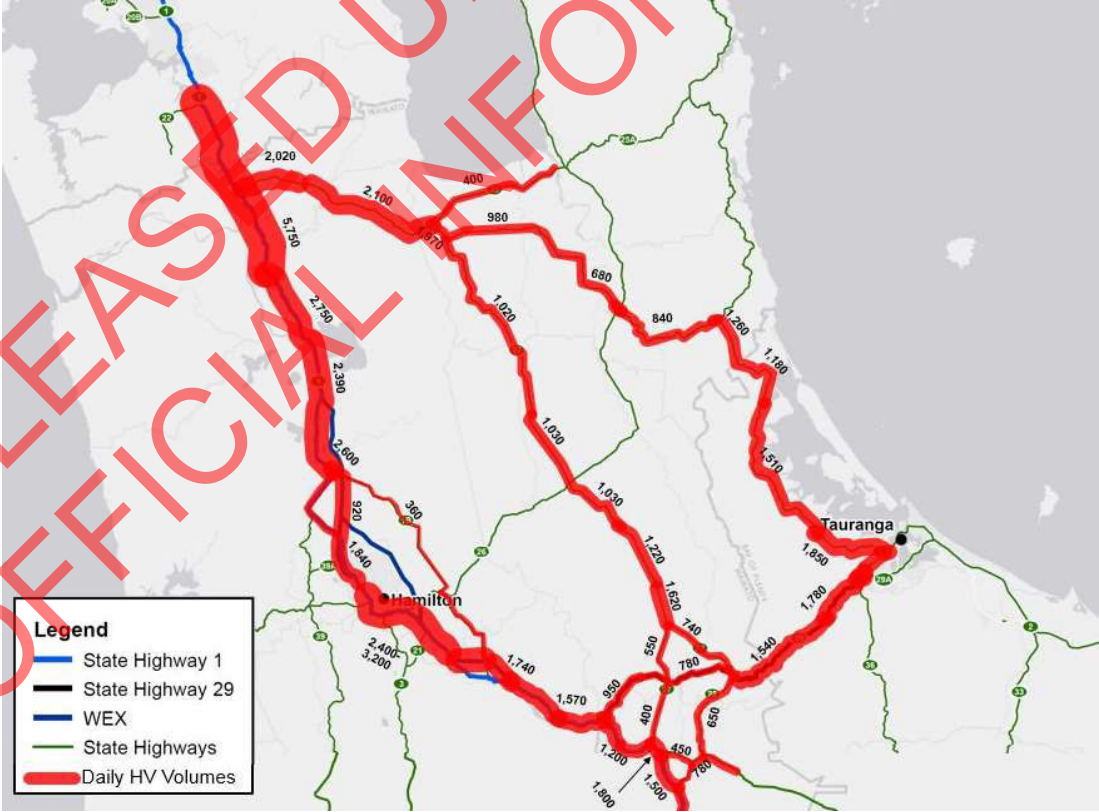


Table 1 summarises the average traffic growth on the corridor. It indicates that traffic volumes are increasing significantly on the Kaimai Ranges section of the corridor, but that growth is relatively slow on the flat section between SH1 and SH24. It also indicates that heavy vehicle volumes are growing much more rapidly than general traffic.

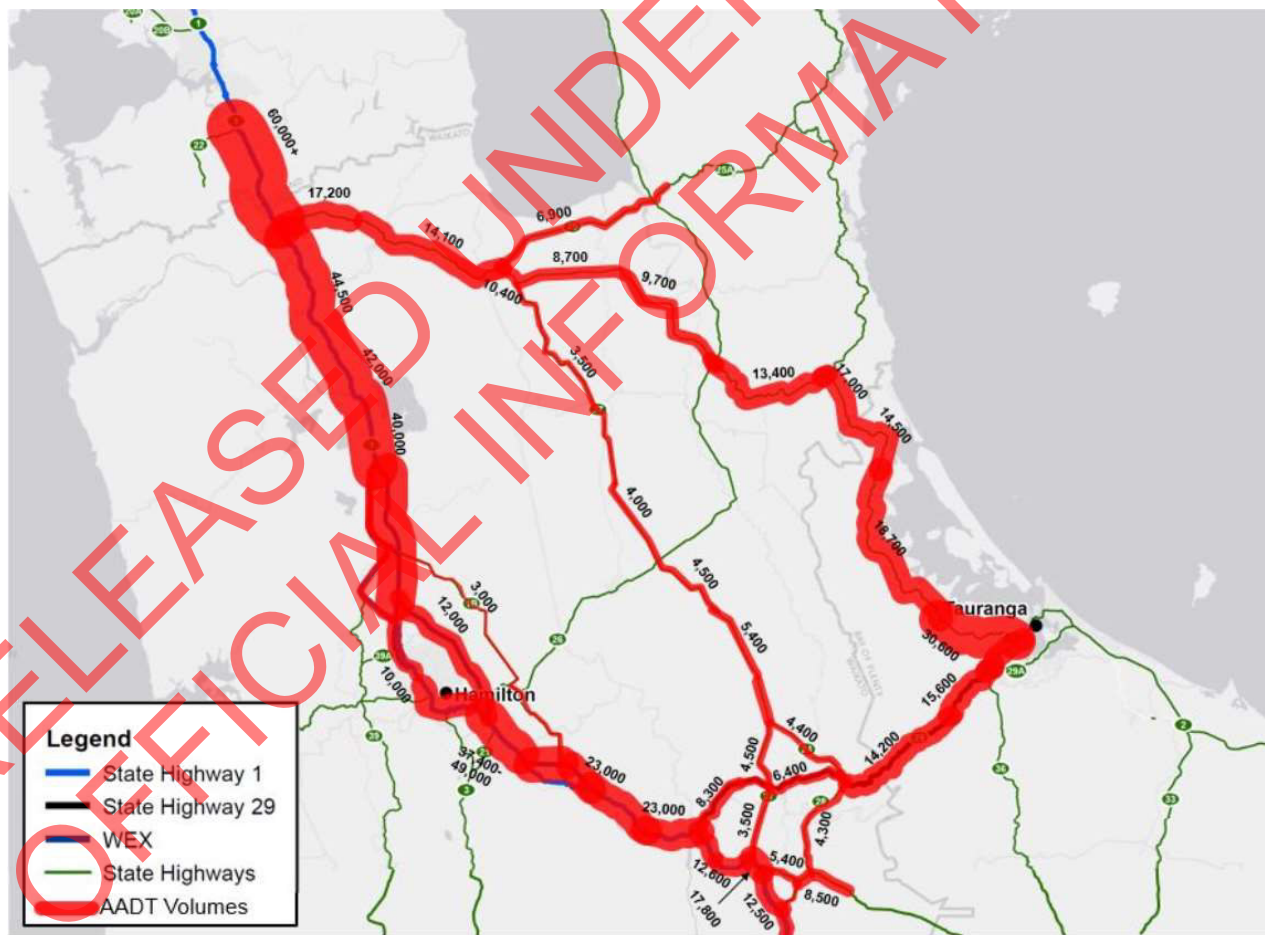
Table 1: Average Daily Traffic SH29 (2011 - 2014)

Section	SH1 to Totman	Totman to SH24	SH24 to SH28	SH28 to Tauriko
AADT Growth	1.7%	1.9%	4.5%	3.8%
HV Growth	1.9%	6.0-8.7%	3.5%	6.7%

From the information presented in Figure 3, Figure 4 and Table 1 it could be inferred that more traffic chooses to use SH2/SH28/SH24/SH29 than SH1/SH29 as a route from the north to Tauranga.

Figure 5 shows forecast AADT on key corridors in 2041, assuming the growth rates described above. It indicates that SH29 could carry between 8,000 (near SH1) and 15,000 (Kaimai Ranges) vehicles per day in 2041.

Figure 5: 2041 Forecast AADT



2.3.3 Road (Wider Route Choice)

The introduction of the Land Transport Management Act (LTMA) in 2003 required a 30-year vision for Regional Land Transport Strategies (RLTS). The longer-term horizon led to better strategic planning and consideration of networks, whereas previously a shorter-term focus led to project-based, incremental improvements only.

Between 2000 and 2006, strategic planning conversations with the Regional Land Transport Committees for Waikato and Bay of Plenty recognised that applying a similar scale of improvements (improved travel time) on both SH1 (between Auckland and Hamilton) and SH2 (between Auckland and Tauranga) would potentially undermine the benefits of investment in the Waikato Expressway. This led to the regionally collaborative Inter-Regional Transport Study, which recommended that SH29 become the main inter-regional route to the Bay of Plenty.

The focus of the 2006 strategy was the journey on SH1 from Pokeno to Tirau. The strategy's main purpose was to provide improved connections between Auckland and further south, through the development of the Waikato Expressway. Recognising the risk of potentially undermining the early implementation of the Expressway, the strategy was to not invest in large capacity improvements on the alternative routes. Rather, the aim was to ensure that for journeys between Auckland and Tirau (and further south), the improved SH1 would be the preferred route and with improvements to SH29, SH1 and SH29 would become the preferred route between Auckland, Hamilton and Tauranga. This approach of prioritising investment in one corridor in the short to medium term was embedded into subsequent Regional Land Transport Strategies and Plans.

The 2006 strategy recognised that alternative routes, such as SH2 and SH27, would continue to play a role for freight in the short to medium term, until the improved form of SH1 reduced travel time on SH1 and SH29. The strategy acknowledged that some investment would still be required on these alternative routes where capacity is constrained, but the nature and timing of the investment would need to be managed consistent with the strategy.

In formalising this strategy, the Transit NZ Board resolved In June 2006 that it agrees with the strategy that the main route between Auckland, Hamilton and Tauranga is State Highway 1 and State Highway 29; agrees that State Highway 2 between the Thames turn-off (State Highway 25) and Tauranga no longer be the main route to Tauranga from Auckland. The Transit NZ Board made this decision for three main reasons:

to focus and target, medium and long term investment strategy to best effect; to take account of the constraints of upgrading and providing additional capacity on the alternative route into the Bay of Plenty on SH2 via the Karangahake Gorge; and to take account of the deteriorating level of capacity [form] of the section of SH2 between Katikati and Tauranga as a result of significant land use development fronting onto SH2 or requiring access from [multiple] side roads.

SH1 and SH29 are generally at a higher standard than SH2, but the journey between Pokeno and Tauranga is currently some 27 minutes longer. Once the Expressway is completed, the journey is expected to take around 3 minutes longer than via SH2, but will still be approximately 16 km longer. Vehicle operating costs (fuel consumption and Road User Charges) are additional factors that influence operators' route choice, and the Kaimai Ranges via SH29 requires a climb of 400 metres with multiple gear changes and increased fuel cost, which represents a significant dis-incentive for freight traffic.

Since 2009, significant progress has been made in delivering the Waikato Expressway, which will be substantially complete by 2020. The Transport Agency and both Regional Transport Committees are working together to explore priorities post completion of the Waikato Expressway, when the benefits of current investment will be realised.

3 PARTNERS AND KEY STAKEHOLDERS

The activities and problems relating to SH29 affect a number of different organisations and customers. The engagement through the PBC built upon engagement undertaken during the development of the Strategic Case and has been undertaken through a mix of group workshops and one on one discussions. Earlier strategic case engagement was also undertaken for the Hamilton-Tauranga corridor.

This PBC builds on that earlier engagement, using the same stakeholder group, with the additional of the NZ Police and the Automobile Association, to ensure broader engagement given the issues identified in the corridor in the strategic case.

The following stakeholders were invited to participate in workshops, as they are considered best placed to contribute to the development of a preferred programme for the corridor:

- ∩ NZ Transport Agency (Waikato / BoP Region)
- ∩ KiwiRail
- ∩ Waikato Regional Council
- ∩ Bay of Plenty Regional Council
- ∩ Tauranga City Council
- ∩ Western Bay of Plenty District Council
- ∩ Matamata-Piako District Council, also representing Waikato and Waipa District Councils
- ∩ Port of Tauranga
- ∩ Freight Logistics Action Group (FLAG)
- ∩ NZ Police
- ∩ Automobile Association
- ∩ Road Transport Association

As well as these stakeholders, engagement was also undertaken with Hamilton City Council and Iwi. All stakeholder perspectives have been considered in the development of the PBC and the diversity of stakeholder perspective has resulted in a robust assessment of key decisions at each stage of the PBC development.

3.1 INVESTMENT PARTNERS

3.1.1 NZ Transport Agency

The Transport Agency is responsible for managing, operating, planning for and improving state highways. As a partner to this PBC, the Transport Agency is fundamentally concerned with ensuring the safety of users on SH29 and the efficient access to one of the New Zealand's busiest ports. Investment in the state highway network may be needed to address the problems identified in the strategic case, and fully realise the benefits of investing.

3.1.2 KiwiRail

KiwiRail is responsible for the ECMT rail infrastructure that services the area. Investment by KiwiRail may be required to fully realise the benefits as identified in the strategic case.

3.1.3 Port of Tauranga

The Port of Tauranga Company is responsible for the operation of the Tauranga Port. It relies primarily on the land transport network for transporting containers and commodities within New Zealand. It is also increasingly using coastal shipping to accommodate some demand.

Investment by the Port of Tauranga or operational/scheduling changes may potentially be required within the boundaries of its site to fully realise the benefits identified in the PBC. This may also be true of other transport operators.

3.2 KEY STAKEHOLDERS

Based on engagement with stakeholders, the following key focus areas have been identified. Generally, there is strong alignment between stakeholders regarding the focus areas for the corridor.

Stakeholders	Focus areas
NZ Transport Agency – Highway Networks Operations	Development of a programme of works that provides for the safe and efficient operation of SH29
NZ Transport Agency – Planning and Investment	Development of a programme that has a sound evidence base and represents a good investment
Matamata Piako District Council (Waikato and Waipa District Councils)	Focussed on a programme that delivers safety improvements, whilst also supporting growth aspirations
Tauranga City Council / Western Bay of Plenty District Council / Bay of Plenty Regional Council	Focused on the interaction with the communities along the current corridor and understanding any implications and opportunities from the programme
KiwiRail	Preference is to focus investment in additional capacity for Auckland rail network. Consider that ECMT is fit for purpose and does not currently require further investment.
Port of Tauranga	Focussed on a programme that supports efficient movement of freight between the Port and Auckland.
Freight Logistics Action Group (FLAG)	Focussed on a programme that supports efficient and safe movement of freight between the Port and Auckland.
NZ Police	Focussed on improving safety on the network by reducing road crashes and improving enforcement.
Automobile Association	Focussed on interests of the everyday road user, including a programme that promotes journey efficiency, reliability, and safety.
Road Transport Association	Focussed on interests of everyday road users and freight operators, including a programme that promotes journey efficiency, reliability and safety.
Iwi	Focussed on a programme that acknowledges the cultural and historical contexts of the surrounding land and promotes access to existing sites of Maori significance.

4 STRATEGIC ASSESSMENT ' OUTLINING THE NEED FOR INVESTMENT

4.1 DEFINING THE PROBLEM

The Hamilton to Tauranga Strategic Case identified a number of key problems within the SH29 corridor. During the first stages of this PBC, further evidence was gathered and a workshop held on 15th February 2016 with key stakeholders to reconfirm these problems.

Key discussion points at this workshop, based on the new safety, resilience and travel time evidence gathered, is summarised in Table 2.

Table 2: Problem Statement Summary

Previous Problem	Evidence	Updated Problem
Disruption to freight movement to and from the Port of Tauranga results in an economic loss to New Zealand (60%)	Feedback was that the percentage weighting on this problem was high, given the additional evidence shows a lot of the disruption relates to safety (and therefore is addressed in part by Problem 2)	Disruption to freight movement to and from the Port of Tauranga results in an economic loss to New Zealand (40%)
Because of conflict in land use, a large number of access points to the State Highway results in a high number of accidents with severe outcomes (20%)	Additional safety evidence gathered confirmed: <ul style="list-style-type: none"> ∩ that there is a road safety problem along the whole of the road corridor, ∩ Loss of control rather than side access conflict is the predominant cause of death and serious injury crashes. ∩ Crashes involving turning vehicles are only prevalent at the SH1/29 intersection and between Tauriko and Route K. ∩ It was therefore agreed that this problem should be increased in importance (as it also addresses a significant proportion of the disruption issues in the corridor) and reworded to better reflect the actual safety problem 	Because of steep and winding nature of the road over the Kaimai Ranges, people are exposed to an unacceptable risk of death or serious injury (40%)
If the route does not support the efficient movement of freight, traffic will move to alternative local routes, increasing maintenance costs and risk to safety across the network (20%)	Evidence shows the likely travel times for a number of freight corridors (SH2, SH27 and SH29) when the Waikato Expressway is completed. Recent roadside heavy vehicle surveys also confirm this problem; vehicles are using other routes in preference to SH29 due to gradients and efficiency	If the route does not support the efficient movement of freight, traffic will move to alternative local routes, increasing maintenance costs and risk to safety across the network (20%)

The following problem statements and weights have therefore been refined to reflect the outputs of the 15th February 2016 workshop. The weighting of Problem 1 has been reduced, and Problem 2 increased. The Problem 2 wording has been changed to better reflect the actual safety issue on the corridor. Problem 3 has not been changed.

- ∩ Problem 1: Disruption to freight movement to and from the Port of Tauranga results in an

economic loss to New Zealand (40%).

- ∩ Problem 2: As a consequence of steep and winding nature of the road over the Kaimai Ranges, people are exposed to an unacceptable risk of death or serious injury (40%).
- ∩ Problem 3: If the route does not support the efficient movement of freight, traffic will move to alternative local routes, increasing maintenance costs and risk to safety across the network (20%).

The revised Investment Logic Map is attached as Appendix A.

4.2 THE BENEFITS OF ASSESSMENT

The benefits of addressing the identified problems were also reconfirmed at the 15th February 2016 workshop. The benefits from the approved strategic case were:

- ∩ Benefit 1: Corridor enables economic growth (40%)
- ∩ Benefit 2: Corridor supports wider transport network (10%)
- ∩ Benefit 3: Enable mode shift (10%).
- ∩ Benefit 4: A safer corridor with a reduced risk of death and serious injury (40%)

Based on the first PBC workshop in February 2016, changes to the proposed Benefit Map were sought.

These changes included:

- ∩ Benefit 1: The original wording implies that if the problems along the corridor were resolved, the movement of freight would be more efficient, reducing transport costs which in turn would reduce the cost of importing and exporting goods, i.e. 'doing business' and enable economic growth enables economic growth. Stakeholders considered this benefit to be very important for the corridor.
- ∩ Benefit 2 & 3: It was considered that a key benefit of addressing the problems identified would be that the right traffic would use the right route across all modes. This was considered a clearer and more succinct way of addressing both the original benefits 2 and 3 and also removes a specific mode shift target that was difficult to quantify.
- ∩ Benefit 4: This was considered a key benefit of addressing the problems identified, particularly as it also addresses resilience concerns.

Based on this engagement and feedback, the benefits have been refined from four to three as outlined below.

- ∩ Benefit 1: Corridor supports economic growth (40%)
- ∩ Benefit 2: Right trips in right corridor (and mode) (20%)
- ∩ Benefit 3: A safer corridor with a reduced risk of death and serious injury (40%)

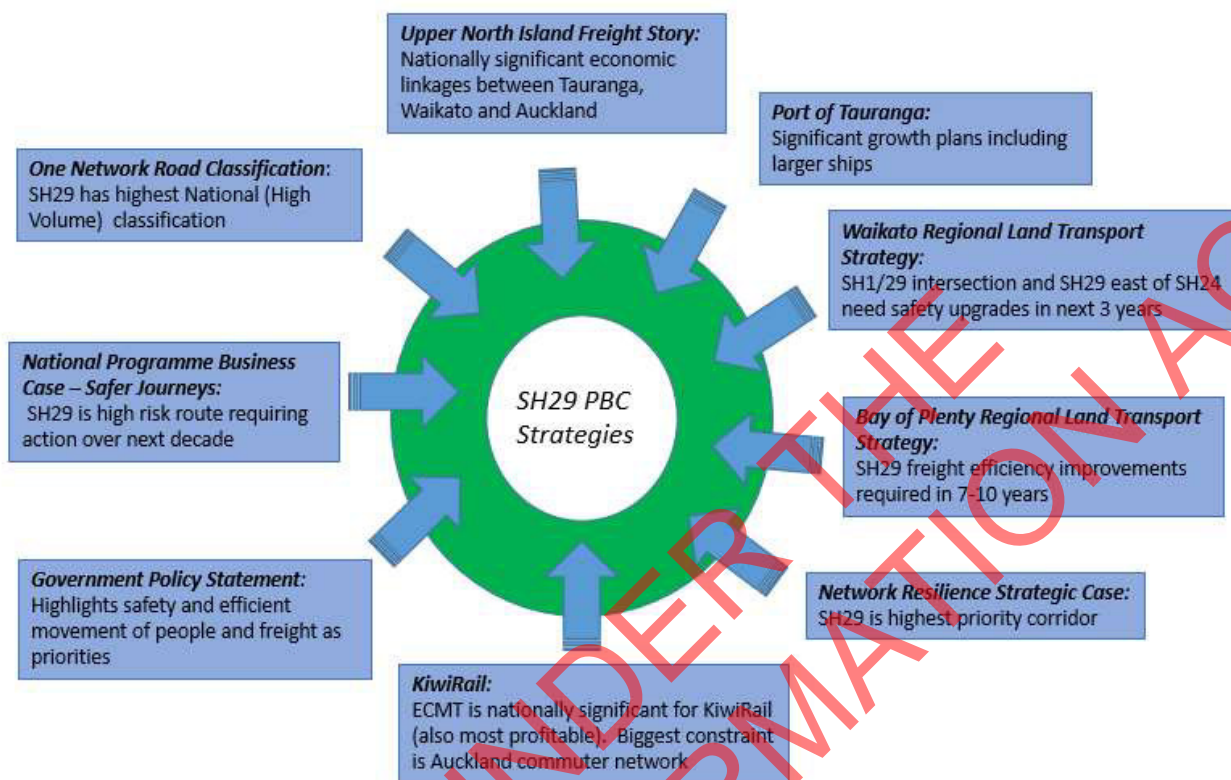
4.3 ALIGNMENT TO EXISTING STRATEGIES / ORGANISATIONAL GOALS

This section summarises how the proposed investment outcomes align to relevant national, regional, sector and organisational strategies. Figure 6 summarises these relevant documents and how they relate to the SH29 PBC.

These strategies identify SH29 as a key corridor for freight and transport movement between Tauranga and the Waikato. These documents also confirm the problems identified at a high level, with safety and efficiency considered to be of particular importance. Appendix B provides a detailed

assessment of the applicable strategies.

Figure 6: National and Regional Strategy Documents



4.4 CONSTRAINTS AND OPPORTUNITIES

There are a number of environmental and topographical constraints and opportunities along the corridor that will need to be considered in the development of this PBC.

Figure 7 shows the landform and settlements along the route. Of particular note are settlements at Hinuera, Te Poi and Tauriko, which are located immediately on the corridor. Integration with these townships should be a particular area of focus. Figure 7 also indicates the significant landform of the Kaimai Ranges. Appendix C includes other environmental constraint plans, which show Outstanding Natural Landscapes and Features immediately adjacent to the route in the Kaimai Ranges. Although it is important to ensure that any new infrastructure sensitively addresses these features, they also represent an opportunity to attract visitors, potentially through well-designed stopping places.

Appendix C identifies cultural and heritage features along the route. It highlights a particular concentration of archaeological and pa sites around Tauriko and Lower Kaimai. Recreation and tourism opportunities along the corridor are also highlighted, including the walking / cycling tracks through the Kaimai Ranges. A key consideration for this PBC is how best to maximise these opportunities.

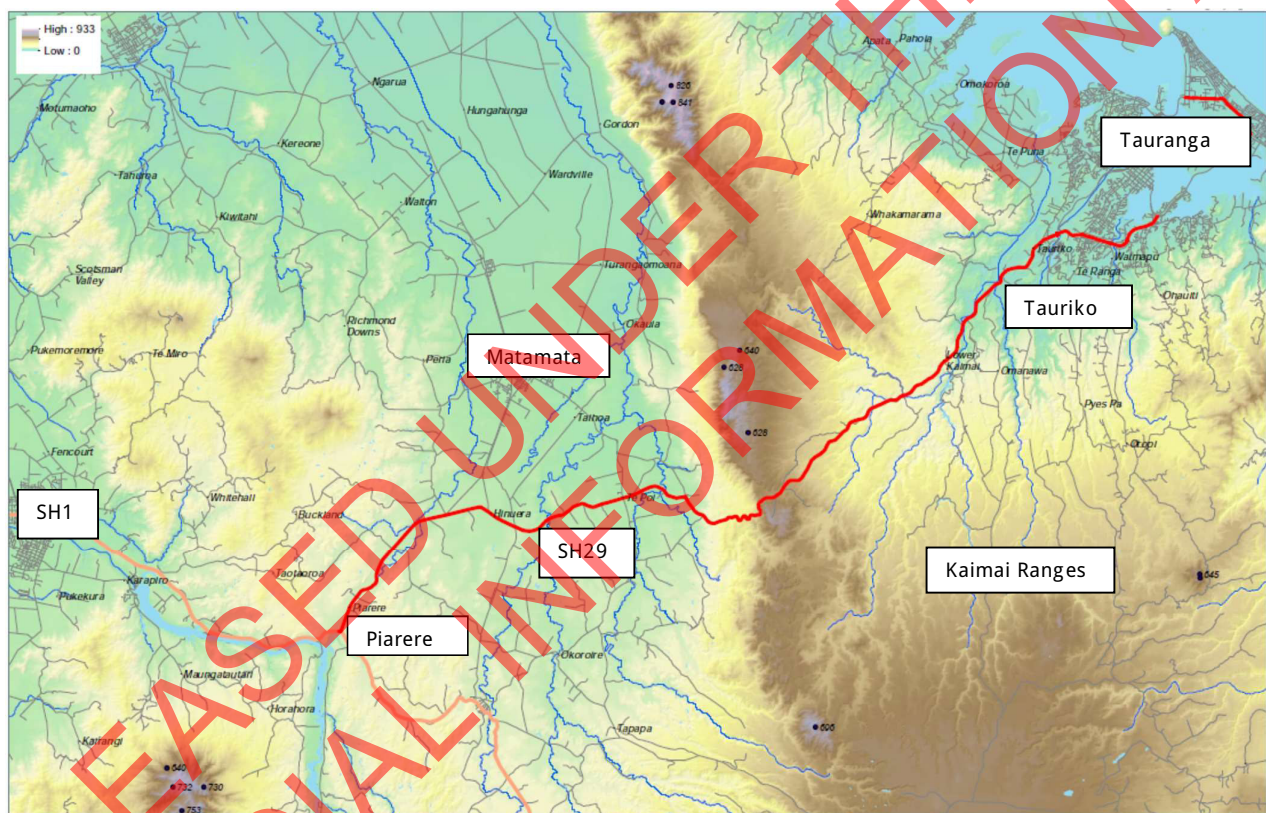
A number of other environmental, cultural and social constraints along the corridor will also need to be considered as programmes.

Environmental and social issues and opportunities were discussed at the stakeholder workshop. A range of issues and opportunities were identified for the corridor. These issues and opportunities

will be key inputs into the development of a social and environmental filter to test options against. The social and environmental issues and constraints specific to this corridor are as follows:

- ∩ Areas of cultural and heritage significance
- ∩ Sensitive ecological areas and receiving environments
- ∩ Landscape character, and protected landscapes
- ∩ Topography and soil types
- ∩ Biosecurity (e.g. Kauri die-back)
- ∩ Land use (e.g. productive landscapes)
- ∩ Safety concerns for townships along the route
- ∩ The quality of the journey, visual quality, tourism experience and stopping places
- ∩ Severance, accessibility, walking and cycling, including national pathways

Figure 7: Landform and Settlements



4.5 UNCERTAINTY LOG

During the development of the Investment Objectives, the stakeholders also considered the uncertainty of key assumptions that should be factored into the consideration of the PBC as it develops. Table 3 outlines the uncertainties identified by the stakeholders for consideration.

Table 3 : Uncertainty Log

Factor	Time	Uncertainty	Impact on programme	Comments
Factors affecting demand				
Completion of Waikato Expressway	2017	Near certain - committed	Medium-high	Currently under construction is expected to increase through demand
Role of Port of Tauranga in Upper North Island Freight Task	2020	Hypothetical	Medium-high	Competition with Ports of Auckland could see an increase or decrease in Port movements if role of POT changes.
Port of Tauranga growth in market share	2020	Near Certain	Low-medium	Larger ships, growth in productivity (TEUs).
Tauranga resident population increase of approx. 64,000 (35%) by 2045	2045	Hypothetical	Medium	Based on 30-year infrastructure / SmartGrowth projections, base year 2013, NIDEA, 2014. Large proportion of expected growth surrounding Tauriko end of corridor.
Hamilton population increase of approx. 69,000 (44%) by 2044	2044	Hypothetical	Medium	Based on 30-year growth projections, base year 2015, Hamilton City Growth Strategy, 2008.
Hamilton employment increase of approx. 39,000 (+63%)	2041	Hypothetical	Medium	Waikato Regional Transport Model Assumptions, based on 2006 base year and projections (to be confirmed)
Tauranga employment increase of approx. 18,000 jobs (+46%)	2041	Hypothetical	Medium	Waikato Regional Transport Model Assumptions, based on 2006 base year and projections (to be confirmed)
Increased uptake of HPMV Programme	2020	Reasonably Foreseeable	Medium	Move to HPMVs as the programme is delivered. More freight on fewer trucks. Different infrastructure demands.
FAXY Frozen Dairy Goods Manufac.	2017	Near certain	Low-Medium	International frozen dairy demand, factory located in Waikato, expected to go through Port

Factor	Time	Uncertainty	Impact on programme	Comments
Fonterra Central manufacturing location	2017	Near certain	Medium-High	Proposed Fonterra Freight Hub in the Waikato – in planning
Factors affecting supply				
Completion of Waikato Expressway	2017	Near certain - committed	Medium-high	Currently under construction – will provide faster link to Auckland
Waikato Inland Port	2020	Near certain	High	Current proposal is Ruakura. Other proposals in competition. Will provide a central handling location for many local and Auckland industry.
ECMT Rail line upgrade (tunnel floor, level crossings)	2017	Near certain - committed	Medium	Expected to influence the mode of freight transport between the Port and Hamilton (including the proposed inland port).
Safety and efficiency enhancements to SH2	2019	Reasonably Foreseeable	High	At programme business case stage. Findings to be confirmed.
Corridor classification and network role	2020	Hypothetical	High	Re-evaluation of State Highway roles and classification.
Factors affecting cost of travel				
Travel time improvements due to the Waikato Expressway, Or longer travel times due to increased use	2025	Reasonably Foreseeable	High	Based on traffic projections, baseline assuming no infrastructure change other than Waikato Expressway.
Increased freight use of ECMT	2025	More than likely	Medium-high	Port of Tauranga and Freight Transport contacts indicate that increased use of Rail Line is preferred

4.6 PROBLEM 1: ECONOMIC DEVELOPMENT AND RESILIENCE

4.6.1 The Evidence

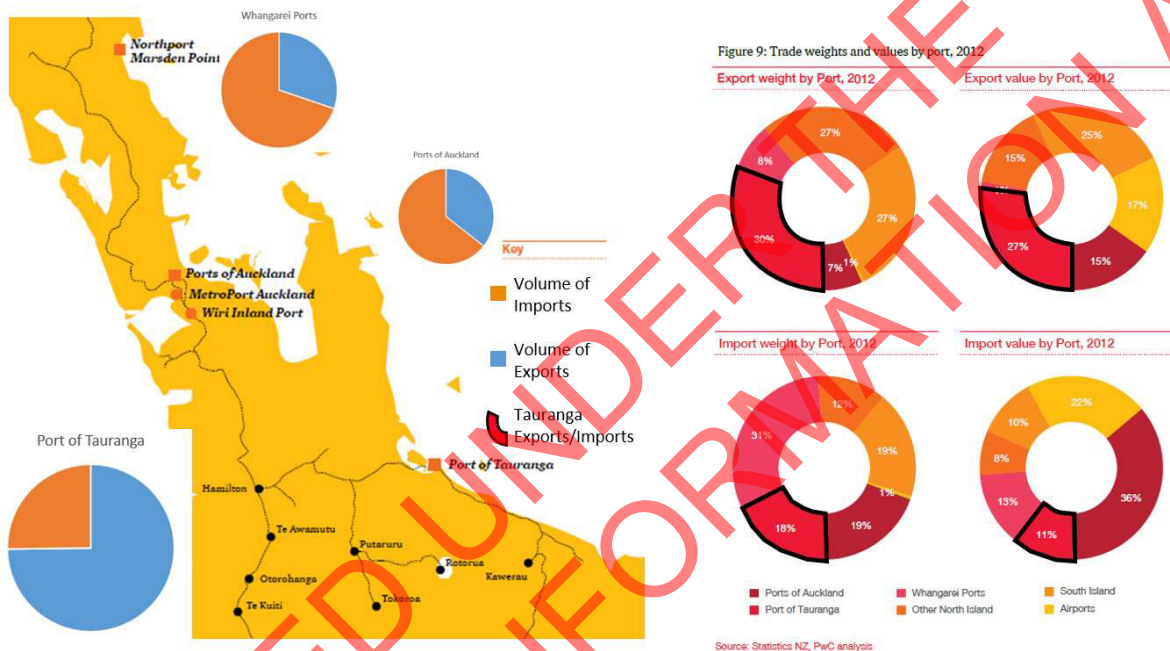
The Port of Tauranga (PoT) is one of New Zealand's busiest ports and a key part of the Upper North Island Freight story. As outlined in Figure 8, the PoT is New Zealand's biggest port by tonnage and

makes a significant contribution to the New Zealand economy. The close proximity of the PoT to Auckland and the Waikato means the percentage of national GDP generated in this area of the country and in particular by the PoT is substantial.

The key component of a port's ability to successfully service its customers and markets is the ability to get goods to and from the port; transport accessibility and surety of this access are critical to a port's success.

There is evidence that SH29 does not provide this surety of access as it is prone to unplanned closures and detour routes are significant. This increases the cost of goods and therefore impacts on the wider economy.

Figure 8 : Port Volumes



In 2015, Port of Tauranga traded approx. 20 million tonnes of freight, or 850,000 TEUs. It is the largest port by total volume in NZ.

The Port of Tauranga moves approximately 40% of its freight by rail and 60% by road.

KiwiRail has confirmed that the ECMT is currently operating successfully with no significant issues affecting scheduling and their customers. KiwiRail has robust plans in place to address any incidents that may occur that could result in the closure of their lines. There is no evidence to suggest incidents occur regularly, and no evidence to suggest there is an adverse impact on the road network as a result.

KiwiRail has substantially increased the capacity of the ECMT in the past 5 years, and is planning to increase capacity by raising the axle load of the line in order to accommodate heavier gross weight wagons. This will allow more of some types of freight (typically denser loads such as dairy products or steel that exceed weight before volume capacity) to be carried per wagon and per train. KiwiRail has purchased a large fleet of 80 tonne gross weight capacity wagons for use across its network, but cannot load them to their full capacity on the ECMT until a major rehabilitation (strengthening) of the Kaimai tunnel floor is complete. This is currently underway.

All timber bridges between Auckland and Tauranga have been replaced. The Kaimai tunnel is

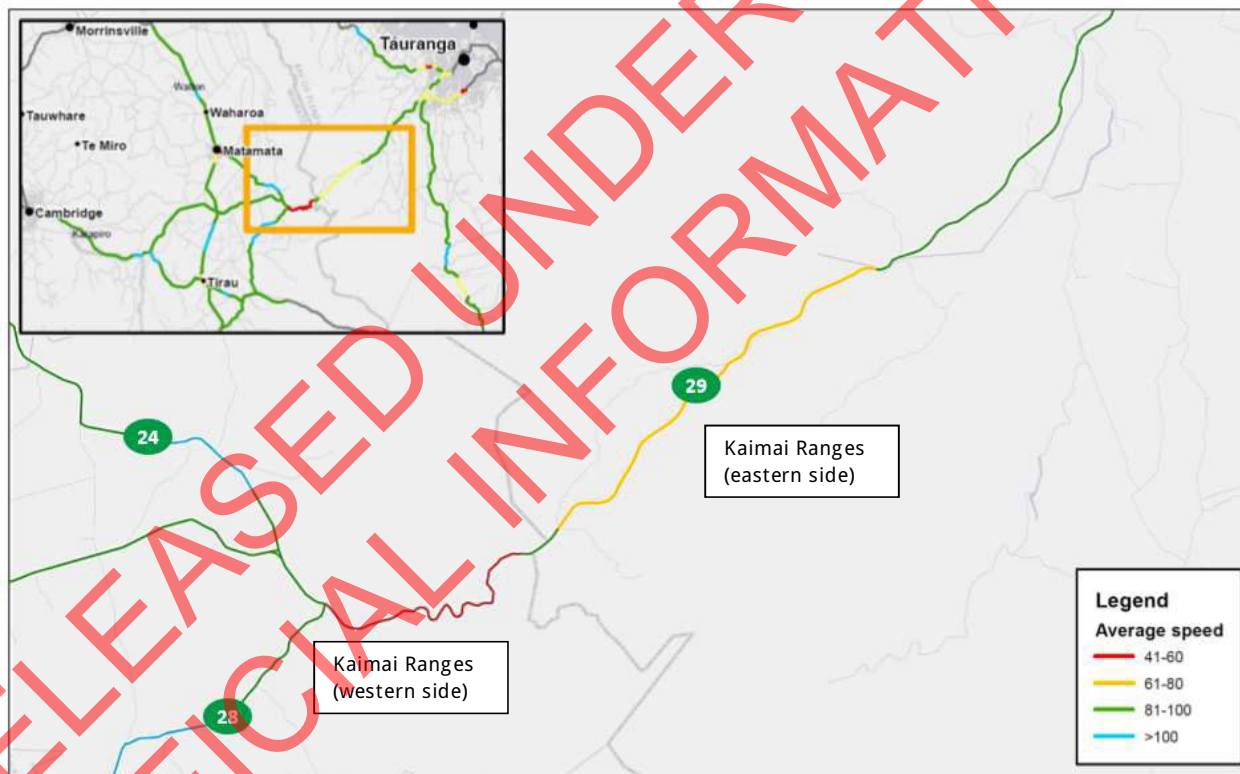
considered structurally sound and expected to function for another 60 - 80 years. The tunnel is not a real capacity constraint in the foreseeable future; the risk issues relate to the tunnel floor, which is in the process of being strengthened.

Efficiency on the ECMT for KiwiRail means optimising the use of these larger capacity (heavier axle load) wagons across the wider network, in order to capture and retain a viable market share of the forecast growth in freight demand. This, however, cannot be achieved until network-wide track and bridge axle load restrictions are removed. This requires significant investment and is only partly funded through the Rail Turnaround Plan.

SH29 provides an important transport link for heavy vehicles accessing the port, the wider Waikato region and beyond. The PoT considers SH29 less reliable than the ECMT due to the impact of unplanned incidents and the efficiency of the road.

This is illustrated in Figure 9, which shows the effect of the significant grades in the Kaimai Ranges on heavy vehicle speeds. The steeper the grades, the slower the travel speeds, which in turn affects the travel time of other vehicles. This is particularly noticeable on the western side of the Ranges, where speeds are approximately 40km/h slower than on the flat sections of SH29.

Figure 9 : Kaimai Ranges Speeds



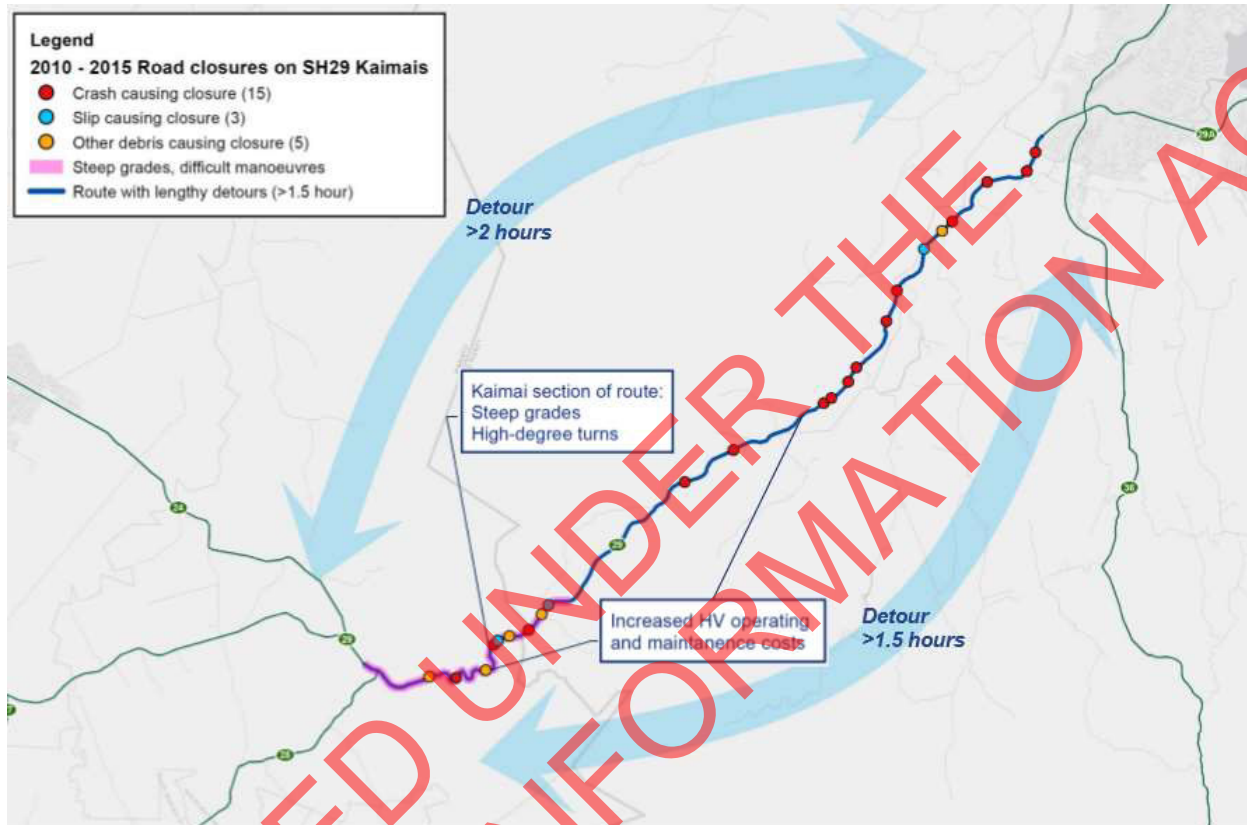
The evidence also shows that SH29 is susceptible to unplanned incidents. In 2014, there were nine full closures, with an average delay of five hours each time. Of these closures, five related to crashes, with the rest resulting from spills, fallen trees, slips and other factors. This is over 40 hours of full closures in a single year.

Partial closures are more frequent. Although the durations of these partial closures are typically short and traffic may still be able to get through the disrupted sections, they nevertheless add to the

increased costs faced by the freight industry. Between 2010 and 2014 there has been over 100 hours of full closures.

It is also important to understand that the detour routes, when SH29 is closed, may be of substantial length. Depending on the destination of vehicles and the location of the disruption, the detour could add over 90 minutes to a journey, as outlined in Figure 10.

Figure 10 : Unplanned Incidents on SH29



4.6.2 Implications of the Evidence

This most recent evidence supports and strengthens the previous evidence gathered in the strategic case. There is a resilience issue associated with the availability of SH29 over the Kaimai Ranges due to the number of unplanned events. This is mainly related to crashes; however, other factors including weather, slips and spills also affect the availability of SH29.

This resilience issue results in considerable delays to vehicles on the route. SH29 is an important link for traffic to and from the Port of Tauranga and certainty of transport accessibility is a critical element of a port's successful operation and performance. As Tauranga is one of New Zealand's busiest ports, any performance / capacity reduction will have significant flow on impacts onto the New Zealand economy.

The evidence therefore supports the following problem:

_Disruption to freight movement to and from the Port of Tauranga results in an economic loss to New Zealand:.

A 40% weighting was identified for this problem, as this is a significant issue for the corridor.

Addressing this problem would make a real difference to the performance of the Port of Tauranga and the Bay of Plenty in general.

4.7 PROBLEM 2: SAFETY

4.7.1 The Evidence

A review of the most recent crash data was undertaken using the Transport Agency's CAS system. For the years 2010 to 2014, a total of 340 crashes occurred on SH29 between SH1 at Piarere and Belk Road at Tauriko. Of these 340 crashes, there were nine fatal and 36 serious injuries. Approximately 60 additional crashes occurred within a 20 metre buffer at intersections on SH29.

As outlined in Figure 11, the majority of these fatal and serious crashes occurred on the steep and windy sections of the Kaimai Ranges. Further to this evidence, Figure 12 shows the most common movement types for crashes by location.

This evidence shows that 47% of all crashes were a result of cornering, 10% related to loss of control on a straight and 10% resulted from head-on movements.

Of the 340 crashes, 57, or 17% were related to heavy vehicles, which is a higher representation than the number of heavy vehicles in the average daily flow (15%). Cornering was also the highest movement type in heavy vehicle crashes.

Figure 11 : Fatal and Serious Accidents on SH29

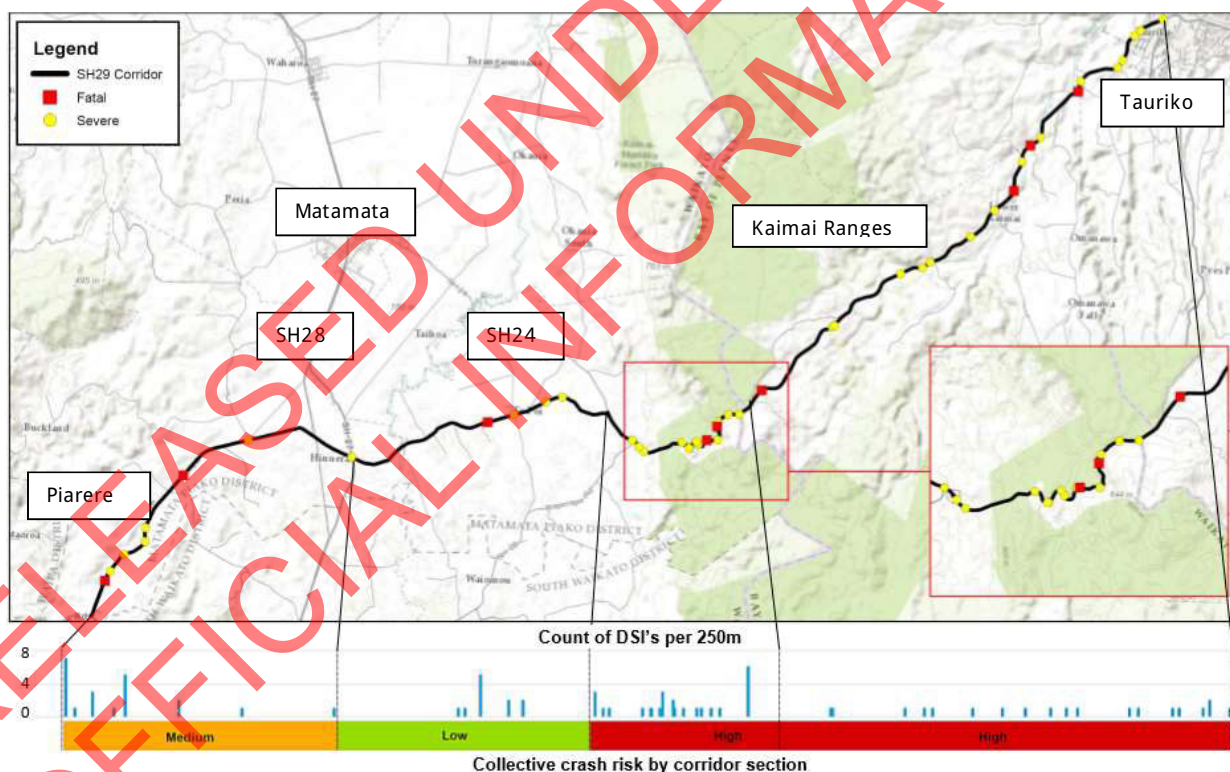
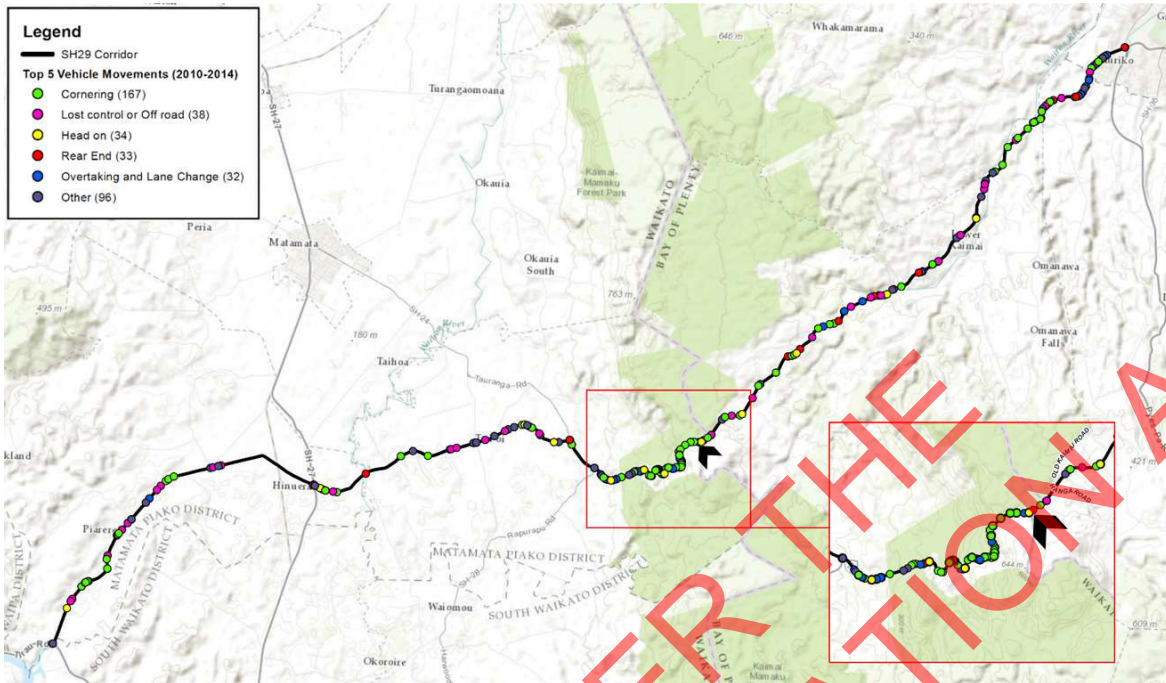


Figure 12 : Crash Factors for SH29



This crash history results in the Collective and Personal Risk, as defined by the KiwiRAP process, shown in Figure 13. This shows that the western side of the Kaimai Ranges has a crash rate significantly higher than the rest of SH29 and considerably above the 'High' KiwiRAP rating. This section of SH29 has New Zealand's 7th highest collective and personal risk. The remainder of the route was not identified in the Top-30 sections.

Figure 13 : KiwiRAP Collective and Personal Risk



The ONRC includes provisional Customer Levels of Service (CLOs) that relate to safety.

- High Volume National: Mostly forgiving roads and roadsides, equivalent to KiwiRAP 4-Star standard. User hazards absent or mitigated, including head on risk. Active road users

generally do not have access - if present, they are provided with separate space or are physically separated. The road form provides road user guidance

The current route is predominantly 2 or 3 star standard. This does not meet the 4-star standard sought for a National High Volume route. KiwiRAP also ranks sections of the SH29 corridor within the top 30 riskiest links nationally.

The National Safer Roads and Roadsides Programme (NSRRP) Business Case identifies the SH1-29 corridor as a High Risk Rural Road of priority for safety interventions. The NSRRP includes SH29 in its preferred programme (within the 2015/18 NLTP).

Safety also has a significant impact on the resilience of the route (due to closures because of incidents) and it is noted that the ONRC also seeks the following resilience standard for a National route:

- ∴ Resilience Level of Service - 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

The evidence assessed to date confirms the problem identified in the Strategic Case.

4.7.2 Implications of the Evidence

In accordance with the ONRC, this National High Volume state highway should have at least a 3-4 star KiwiRAP rating. Currently the corridor has no 4-star rated sections and 36% of its length is rated 2-star.

The evidence shows that the current SH29 safety record is poor and is not commensurate with its ONRC. The evidence also shows that the worst section of risk exposure is the western side of the Kaimai Ranges.

This section of the corridor is defined by a number of geometric constraints resulting in tight horizontal and steep vertical alignment. The crash history reflects this with high proportions of cornering and loss of control crashes of high severity. Cornering crashes are particularly prevalent in minor and non-injury crashes, and are the highest proportion of crash incidents overall. This results in an unacceptable level of death and serious injuries.

The evidence also shows that crashes are not as a result of the interaction of inter-regional and access vehicle movements as originally thought, when the strategic case was looking at SH29 in the context of the Hamilton to Tauranga strategic case. Given this evidence, the following problem has been identified:

As a consequence of steep and winding nature of the road over the Kaimai Ranges, people are exposed to an unacceptable risk of death or serious injury:.

A 40% weighting was identified for this problem as this is a significant issue for the corridor and addressing this problem would significantly improve the corridor's performance.

4.8 PROBLEM 3: ROUTE CHOICE

4.8.1 The Evidence

As outlined in the Transport Context section of this report, the Transport Agency and regional partners have identified the SH29 route as the key freight route for vehicles travelling between Pokeno and Tauranga. Investment in the Waikato and Bay of Plenty strategic network has been based

on a strategy of 'getting the right traffic on the right roads'. This strategy is now 10 years old. It prioritised a higher level of service on SH1 from Auckland to Tirau than for SH2 from Pokeno to Tauranga i.e., focusing investment in the Waikato Expressway Road of National Significance (RoNS) and Hamilton Ring Road.

The One Network Journey Approach and ONRC are consistent with this original strategy, although they have introduced new concepts such as clearly defined outcomes that are differentiated for each journey.

The Waikato Expressway is still 5 years from being fully completed and as outlined in Figure 14, SH29 is still not the preferred route for freight between Pokeno and Tauranga. Heavy vehicles continue to use SH2 (and the Karangahake Gorge) with 12% heavy vehicles. SH27 also carries a high proportion of heavy vehicles with 17% measured just north of SH29.

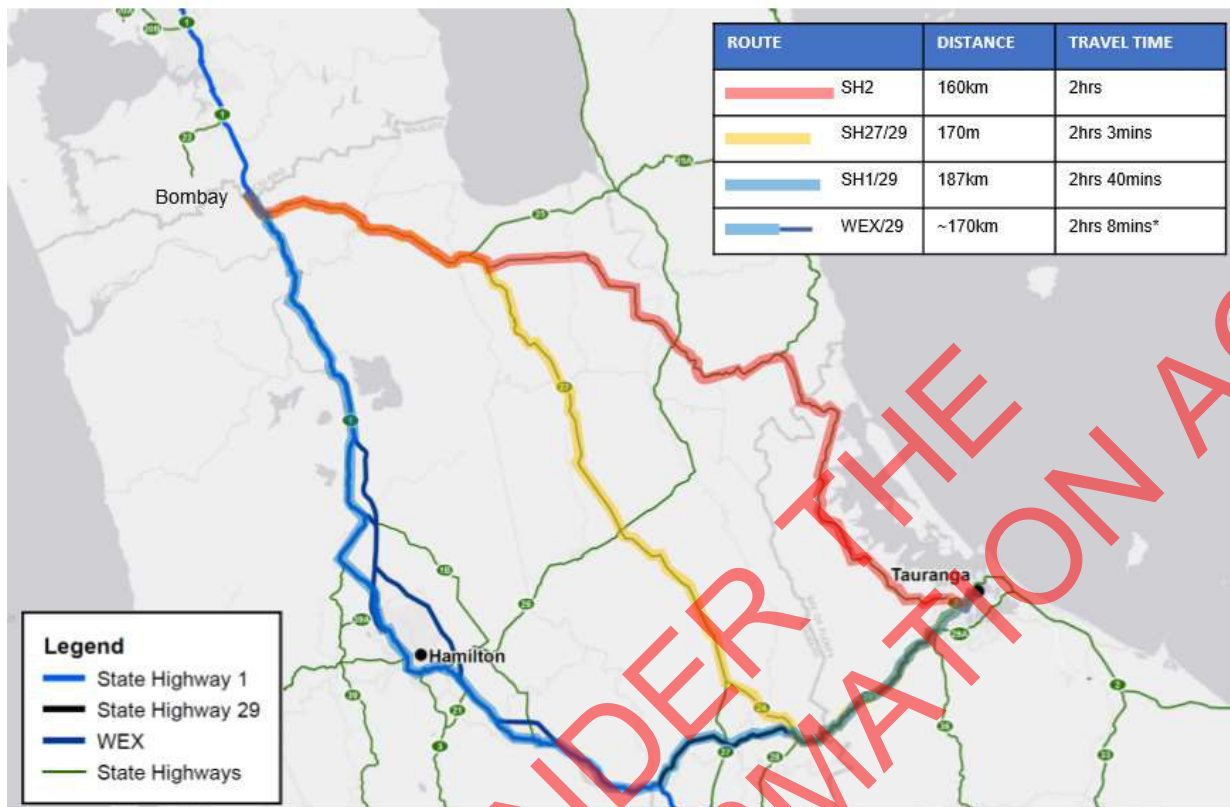
Figure 14 : 2010 Freight Movements



This is due to a number of factors; however, a key element is as outlined in Figure 15. Compared with the alternative routes, the SH1/29 route is currently more than 20km longer and takes nearly 20 minutes longer than SH2. In effect, the SH1/29 simply costs freight operators more than the alternatives.

Even with the Waikato Expressway complete, the route is not predicted to be quicker than SH2 and this is confirmed by Waikato Regional Transport Model (WRTM) predictions.

Figure 15 : Journey times (Pokeno to Tauranga) for different routes



*based on future average travel speed and congestion assumptions to be confirmed.

4.8.2 Implications of the Evidence

Despite the constraints of increased adjacent land use, traffic growth and the Karangahake Gorge, SH2 remains the preferred route for tourists and other road users. Currently SH2 also attracts a significant number of heavy vehicles, as does SH27. This occurs because SH29 is not currently the most efficient route for freight.

This outcome is not consistent with the ONRC and results in vehicles travelling on roads they are not intended for, with resultant cost and safety implications for all users.

A 20% weighting was identified for this problem, as this is an important issue for the corridor. However, it was considered less significant than the safety and resilience problems. In part, addressing the safety and resilience problems will also address this problem.

4.9 INVESTMENT OBJECTIVES

A workshop was held with stakeholders on 15 February 2016 to confirm the identified problems and benefits. The workshop was also used to develop PBC investment objectives.

SMART investment objectives were developed with reference to the key benefits sought. Investment objectives must provide enough information to enable an investor to make a sound investment decision. Four investment objectives were identified as outlined below.

4.9.1 Investment Objective 1: Resilience

Problem 1 and Benefit 1 identified disruption to SH29 as a key freight route as an issue, with the benefit being the opportunity to increase economic growth (as a result of more reliable and available transport accessibility). Linking this problem and benefit, the following investment objective was developed:

_We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures resulting in a delay of more than 2 hours by 2030:

Important considerations for this investment objective were:

- ζ Full closures cause the most significant delays for users and are the most measurable, as the Transport Agency specifically collects this data. Partial closures often occur in an ad hoc manner and are not always reported.
- ζ A 2-hour limit was selected, as this is the upper end of the required detour for an unplanned incident.
- ζ The year 2030 was selected as it allows time after the Waikato Expressway opens to implement improvements.

4.9.2 Investment Objective 2: Performance

Problem 3 relates to the current lack of alignment between road usage and road classification in the corridor and surrounds, with Benefit 2 seeing an opportunity to enhance the performance of the entire transport network if the right journeys are on the right routes. Benefit 1 identifies the economic opportunity that could result if reliable freight journeys were enabled, as outlined in Problem 1. Linking these problem and benefits, the following investment objective was identified:

_We will improve the cost of travel of SH29 such that SH1 and SH29 is the preferred route for road based freight vehicles between Tauranga and Pokeno by 2030:

Important considerations for this investment objective were:

- ζ This identifies the need to reduce the cost of travel on SH29 so that it is consistent with its ONRC role
- ζ SH1 is also included in the words to ensure that it is clear that it is the SH1/29 route that is identified as the preferred route for freight
- ζ Both operational and CAPEX schemes could respond to this objective
- ζ Improving the cost of travel will contribute to economic development as well as getting the 'right vehicles on the right routes'.
- ζ It is important that rail remains the preferred mode for appropriate freight and this investment objective specifically targets road based freight.
- ζ The year 2030 was selected as it allows time after the Waikato Expressway opens to implement improvements.

An important component of transport journeys in this area is the role of rail. The evidence has shown that rail currently provides a cost competitive advantage for some freight. The evidence indicates that the ECMT is fit for purpose and currently operates at market capacity, with significant spare capacity available, if demand increases. Therefore, a specific investment objective relating to rail freight mode share has not been included in this PBC. However, it is important to include the ongoing role of rail in assessments of corridor performance and not focus solely on road-based solutions at the expense of rail. Whilst not a specific investment objective, this has been an important investment consideration in this PBC.

4.9.3 Investment Objective 3: Safety

There is a real safety problem in the corridor and an opportunity to enhance the lives of users when this is addressed. Linking Problem 2 and Benefit 3, the following investment objective was identified:

“We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths and serious injuries to a Medium Personal and Collective Risk by 2030:

Important considerations for this investment objective were:

- ∩ Consideration was given to the Regional Transport Strategy aim of a 50% reduction in deaths and 25% reduction in serious injuries. This is inconsistent with current Transport Agency approach of not separating our deaths and serious injuries and therefore was not adopted.
- ∩ The KiwiRAP Collective and Personal Risk provides a nationally benchmarked standard that will drive a consistent national outcome.
- ∩ Using both personal and collective risk criteria addresses the crash history as well as exposure rate.
- ∩ The year 2030 was selected as it allows time to complete the likely interventions

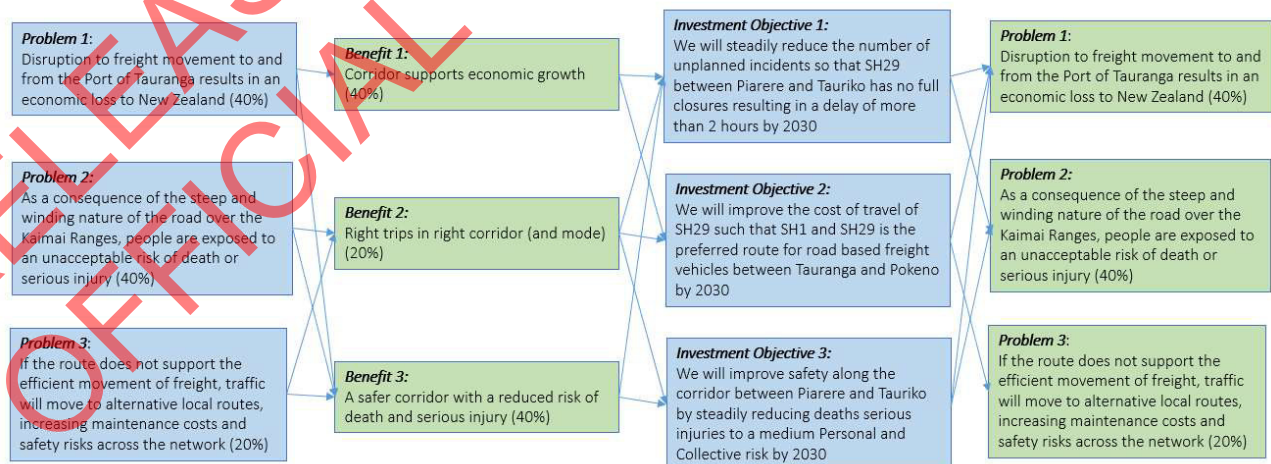
4.9.4 Summary

PBC Investment Objectives have been developed based on the problems and benefits identified through engagement with stakeholders and project partners. Three investments have been identified as follows:

- ∩ Investment Objective 1 : “We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures resulting in a delay of more than 2 hours by 2030:
- ∩ Investment Objective 2 : “We will improve the cost of travel of SH29 such that SH1 and SH29 is the preferred route for road based freight vehicles between Tauranga and Pokeno by 2030:
- ∩ Investment Objective 3 : “We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths serious injuries to a medium Personal and Collective risk by 2030:

Figure 16 shows that the investment objectives will address the identified problems and benefits.

Figure 16: Investment Objective Linkages



PART B – DEVELOPING THE PROGRAMME

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5 ALTERNATIVES AND OPTIONS

5.1 ALTERNATIVE AND OPTION GENERATION

In order to develop a programme of works for the SH29 corridor, options and alternatives must be developed and subsequently combine to create programmes of work. This section presents an overview of the methodology adopted with respect to the generation of a long list of options and alternatives and summarises the options and alternatives considered.

Options and alternatives were developed to address the problem statements and deliver the agreed investment objectives as agreed with stakeholders. The agreed problem statements and investment objectives for the corridor are set out in Part A - Strategic Case.

The methodology adopted for this process was:

- z Initial development of options by project team
- z Workshops with Transport Agency technical specialists to further develop and identify new options
- z Workshop with stakeholders on 17th March 2016 to further develop and identify new options
- z Preparation of assessment criteria by project team, based on Transport Agency guidelines
- z Presentation and endorsement of assessment criteria at workshop on 11th May 2016
- z Assessment of options and ranking by project team
- z Internal project team workshop 24th May 2016
- z Endorsement of option assessment by wider team

Assessment criteria were taken from NZ Transport Agency guidelines for option evaluation, agreed with stakeholders and used to evaluate the identified options and alternatives with respect to their relative ability to deliver against the agreed investment objectives for the corridor.

This allowed the options to be ranked, with the ranking informing the compilation of programmes.

The assessment criteria agreed for this project and endorsed by the stakeholders is shown in Table 4.

The assessment criteria have been grouped according to a number of headline categories, relating to investment objectives, ability to be implemented and an assessment of effects and opportunities.

The ability for an option to be implemented was further broken down into feasibility, affordability and public / stakeholder support. The assessment of effects and opportunities was broken down into cultural heritage, environmental, social and community wellbeing, economy and safety considerations.

A specific consideration of right mode, right route: was added to the assessment criteria to capture the important role of rail freight in this corridor.

At the option long list stage, options were considered against these headline categories, while the more detailed considerations were used to evaluate the performance of programmes.

Table 4: Assessment Criteria

Objectives	Considerations	Measures
Investment Objective 1	We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures, resulting in a delay of more than 2 hours by 2030	Reduced volume, duration and impact of SH29 closures
Investment Objective 2	We will improve the cost of travel of SH29 such that it is the preferred route for road based freight vehicles between Tauranga and Pokeno by 2030	Reduced deaths and serious injuries on the corridor
Investment Objective 3	We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths by 50% and serious injuries by 25% by 2030	Assessment of Travel time and VOC for freight vehicles
Implementability Appraisal		
Feasibility	How straightforward is it to implement this alternative / option?	Level of complexity. I.e. tunnelling, community consultation, challenging ground conditions
	Are innovative technologies involved?	Level of innovation
	Are there significant hazards that may pose a health, safety in design risk?	Level of hazards
	Are there likely to be property risks to delivery?	Impact of project on property
	Are other infrastructure providers affected?	Other organisations beside NZTA
	Are there consenting risks that could affect delivery or cost risk?	Level of consenting risk for option
	Are there factors likely to affect the ability to operate / maintain the option over its projected life without major additional costs?	Maintenance and operation costs
Affordability	What are the funding risks of the alternative/option?	Included in the RLTP to no funding allocation
	Can the alternative be funded traditionally? (economic efficiency)	Estimated economic efficiency of project
	Are alternative funding mechanisms required?	yes / no
	Are there cashflow risks that might affect the delivery programme?	yes / no
	Are there ongoing operating cost risks?	Level of operating costs
	Are operating subsidies required? How will these be funded?	Tolling / PQP procurement
	Has the alternative been made public?	Yes / no

Objectives	Considerations	Measures
Public / Stakeholders	How acceptable is the alternative?	Level of anticipated acceptance
	Are there real or anticipated objections from the community or stakeholders?	Level of anticipated acceptance by stakeholders
Road / Rail Integration	To what extent does the option maintain the current rail mode share for freight trips between Tauranga and Auckland	
Assessment of Effects		
Cultural heritage, environmental, social and community wellbeing	Are there any sites or features (including their setting) of significance to Maori (archaeological or existent) affected?	
	Are there any historic heritage places (including their setting) (e.g. archaeological or buildings, sites, remnants) affected?	
	Are any (first tier) outstanding landscapes or natural features, or (second tier) significant/special landscape or natural features affected?	Environmental mapping
	Are there any ecological areas, or areas with habitat value (inc large areas of native vegetation) affected?	
	Are there any coastal marine areas, wetlands, lakes, rivers, streams or their margins affected?	Environmental mapping
	Are there any areas of contaminated land affected?	
	Are there community facilities (park/schools/hospitals etc.), or residential or other sensitive land uses in the area that could be affected by adjacency effects (e.g. noise, disruption, vibration, air quality etc.)?	Assessment of proximity to settlements
	Are there potential effects from hazards or risks (including from future climate change) from erosion, flooding, fault lines, sea level rise	
	Extent to which the option integrates transport and land use to make best use of existing networks and infrastructure.	Extent of integration with land use aspirations
	Are there any communities affected by reduced cohesion, connectivity, or accessibility?	Qualitative assessment of access to the road network
	Are there opportunities to enhance the active travel modes - cycling and walking and/or linkages to other national or regional recreational cycle networks for longer distance cyclists?	Qualitative assessment of access to alternative modes
Extent and significance of land take, severance; negative and positive opportunities	Severance / connectivity	

Objectives	Considerations	Measures
Economy	How will the alternative/option affect traffic volumes?	Level of growth catered for.
	Does the option provide an opportunity to reduce vehicular travel time between Auckland and Tauranga?	Qualitative evaluation
	Does the option improve journey time reliability?	Qualitative evaluation
	Are there gainers and losers (modes / regions)? What is the overall effect?	Qualitative assessment of overall benefits to surrounding communities
	Does the option provide for more efficient freight supply chains between Auckland and Tauranga	Route quality
	How well does the option integrate with land use with reference to regional growth strategies	Consistency with regional growth strategies
	How well does the option enhance the development potential of adjacent land / attract new jobs / help existing businesses?	Qualitative assessment of access to land use
	How well does the option preserve the function of SH29 as a National High Volume route, consistent with ONRC	Qualitative evaluation
	How well does the option address route security, resilience and flexibility	Extent to which the option improves route resilience
Safety	How will the alternative enhance safety for different types of transport users?	Alternative mode safety
	Will it involve gainers and losers in terms of safety?	Adverse safety effects from the option.
	Are there impacts on personal safety / security?	Assessment of the reduction in crash risk
	What is the impact on fatal / serious injuries?	Assessment of reduction in DSI

5.2 OPTION LONG LIST

A list of more than 150 options was developed with reference to the Agency's intervention hierarchy, in order to optimise investment in the corridor.

Firstly, a range of options that aimed to better integrate land use and transport were identified, such as safer access to rest areas, bypassing settlements and rationalising property accesses onto the State Highway.

Options that delivered a more resilient outcome were identified next. These options are intended to reduce or remove the closure of the existing state highway and improve the alternative routes available to customers.

A further suite of options focussed on making the best use of the existing network was identified as

well as operational solutions. These options include a review of road marking and advisory signage to ensure consistency across the corridor. Side barriers, shoulder widening, speed restrictions and police enforcement to manage travel speeds were also considered. Social programmes focussed on the current safety issues related to alcohol and driving standards were identified.

A wide range of new infrastructure solutions were also identified, from very large offline schemes, to smaller corner realignments and intersection improvements. These were evaluated based on the level of service requirements for the corridor as well as affordability and realistic need.

The SH29 transport corridor is multi-modal and therefore options for the enhancement of other modes to address the investment objectives were considered. This included options that increased the capacity of the rail network, including tunnel widening and rail sidings and active mode options.

The full list of options is included in Appendix D as well as further detail on how the assessment criteria was applied to the assessment of each option.

5.3 ALTERNATIVE AND OPTION ASSESSMENT

An initial assessment was undertaken for each 'head' criteria. A seven point assessment system was used, ranging from +++ for a strongly positive performance to --- for a strongly negative performance in comparison with the do minimum. This is a coarse system, given the broad nature of the assessment, however is considered appropriate at this long list stage. Appendix D outlines this process in more detail and the assessment of individual options.

The application of the assessment criteria to the options identified the following key outcomes:

- ∩ Generally, the higher cost options had greater benefits, but also greater effects.
- ∩ With such a broad range of options and a relatively limited number of assessment criteria, the ability to distinguish between options is difficult. This is shown in the cost assessment where options between \$10M and \$300M have the same score.
- ∩ Investment in the ECMT was not considered necessary, given recent KiwiRail investment in the corridor.
- ∩ Two pedestrian options were assessed to not have a noticeably positive effect on any of the investment objectives, although these may represent opportunities for combination with an ultimate programme to maximise investment in the corridor at small additional cost.
- ∩ The tunnel options through the Kaimai Ranges scored the highest as these provide an entirely new, shorter, high-quality route with lower gradients than the existing route. Because in this high-level evaluation, cost is only considered as a single factor, it does not significantly affect option ranking.
- ∩ Offline schemes through the Kaimai Ranges were the next best performing options
- ∩ Other more localised offline improvements were next best performing, along with low cost way-finding options.
- ∩ The worst performing option was relocating the Port of Tauranga, closely followed road users charges on SH29 and restricting heavy vehicles from SH2.

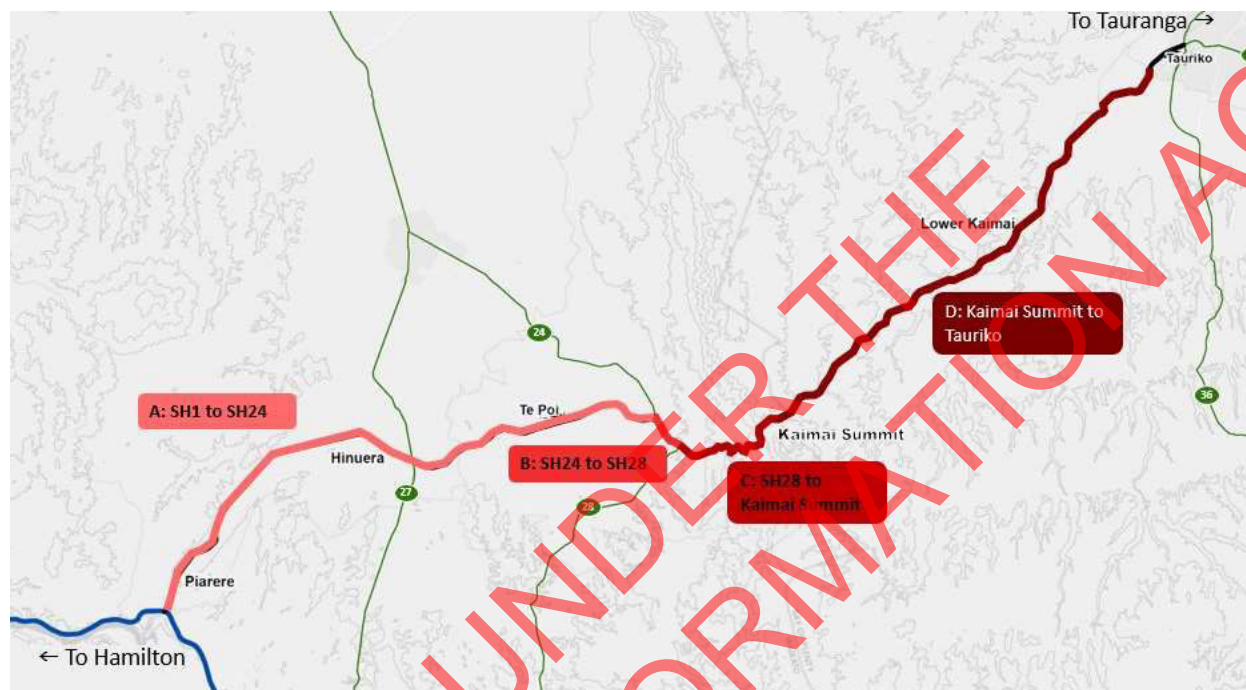
Overall, the conclusion of this long list assessment is that there is a wide range of options and ways to meet the project objectives from cheaper operational options, through to large-scale capital-intensive interventions.

5.3.1 Option Analysis

In order to analyse options in more detail, the corridor was divided into sections and a number of potential options for each section identified. For example, a range of capacity improvements such as

1+1, 2+2, offline and online were identified for the section through the Kaimai Ranges. None of these options was discarded, but some options were considered to respond better to specific issues than others. For example, an offline alignment reduces the gradient on the western section, reducing vehicle operating costs while side barriers reduce the severity of cornering crashes (which are highly represented), but do not completely remove the likelihood that they will occur. Figure 17 shows the corridor sections used for this analysis.

Figure 17 : Corridor Sections



Option analysis considerations are summarised by section below:

- ∩ SH1 to SH24 ∙ SH29 intersects with SH1 on the journey from Cambridge to Taupo, providing a link to the Kaimai Ranges and Tauranga. This section of the journey is characterised by low traffic volumes, low accident rates, and reasonably high speeds. The terrain is flat and the alignment mostly straight, although some out of context bends provide localised safety concerns. It passes through two minor settlements. The highest ranking option for this section was an expressway standard upgrade, either online or offline. It ranked well due to the extent of expected travel time and safety benefits. Other full corridor upgrades (online or offline) were considered beneficial to this section. Intersection upgrades to the SH27, Totman Road and Hopkins Road intersections were also considered as important elements to improve the safety and efficiency of this section, although these did not score as well against the investment objectives. Corner easing was considered a highly beneficial addition to improvements on this section.
- ∩ SH24 to SH28 ∙ This section of the route gradually builds in grade as it connects the flatter terrain areas of the Waikato region to the Kaimai Range section of the route. It also connects SH24 (from Matamata, SH27) and SH28 (to Tirau and Taupo). The best scoring options are generally consistent across the corridor, and include full online upgrade to 2+1 or 2+2 lane arrangements. The intention is that this section of the corridor would integrate with the upgrades proposed for the adjacent Kaimai Ranges. Other noteworthy options include a potential safety upgrade to the existing alignment, and improvements to the intersections

with SH28 and SH24, such as a realignment at SH24, to give priority to SH29 traffic.

- ∩ SH28 to Kaimai Summit – The western side of the Kaimai Ranges is the steepest, slowest part of the route with the highest rate of serious crashes. The grades on this section range between 8-11% and are combined with high degree turns in successive ‘S’ shape bends. Many of the problems identified on the route are concentrated over this section, which is also constrained by challenging topography. The options that score the best on this section include an online 2+2 upgrade, the Kaimai Tunnel option, and the Kaimai Loop (offline 2+2) alignment. These options address safety, efficiency and resilience as well as a number of other outcomes. The Kaimai Loop (an offline option) was considered to more effectively address the problems than an online upgrade. Other noteworthy options include the trialled VMS on the Kaimai Ranges, pavement strength and quality upgrade and longer (continuous) slow vehicle lanes. It was considered that these options would also improve safety and resilience on the corridor.
- ∩ Kaimai Summit to Tauriko – The long stretch of SH29 between the Kaimai summit and Tauriko has a high rate of serious crashes, lack of viable alternative routes and is susceptible to weather related closures, resulting in resilience problems. The efficiency of this section is sub-standard due to discontinuous passing opportunities, high degree, and frequent curves and road narrowing coupled with a high proportion of heavy vehicle activity. The topography also constrains options for the corridor. The best scoring options include a full expressway standard (2+2) upgrade of the corridor, and the Kaimai Ranges tunnel. These options ultimately address all of the problems, notably reducing crashes and improving travel times. Other noteworthy options included more slow vehicle lanes on steeper sections of the corridor and a complete 2+1 upgrade allowing for more passing opportunities, safety upgrades at specific intersections and access points such as the Kaimai School and Ruahihi Road. It is considered that upgrades to address safety concerns also have the potential to improve the efficiency and reliability of the corridor.
- ∩ Corridor Wide – Several operational or corridor-wide strategies were considered important to include as either ‘design principles’ or for consideration in view of partnerships with other operators, e.g. police and emergency services. These are in response to observations about the corridor journey, such as inconsistent road environments, barely visible warnings and the need for facilities that encourage use of the corridor, as well as safety. Some of the best scoring options include skid resistant pavement and the inclusion of safe and attractive stopping places, which may be integrated with other upgrades. Increased police presence and enforcement is also an opportunity to influence safety on the corridor and improve resilience.

5.3.2 Excluded Options

During the long list assessment, some options were excluded, as they fundamentally did not address the investment objectives. These options included:

- ∩ Investment in the ECMT. KiwiRail has confirmed that the ECMT is fit for purpose and has no current capacity constraints.
- ∩ Speed limit reductions throughout corridor. These were considered likely to make SH29 less attractive for all vehicles.
- ∩ Anti-icing agent during winter. This is not considered a critical issue for SH29.
- ∩ Restrict HV permit on SH2. This was not considered feasible, given the extent of communities adjacent to SH2 that require HV access.

- ∫ Relocating the Port of Tauranga. This was not considered feasible.
- ∫ Passenger rail between Hamilton and Tauranga. This would require substantial investment to implement (new rolling stock and station upgrades) and is likely to attract only a small proportion of general traffic from the corridor, therefore having limited impact on the investment objectives.

In isolation, the walking and cycling options were not considered to specifically meet the investment objectives however; many of these options represent opportunities to enhance the journey experience of the corridor at little cost. They could therefore be considered further with respect to the recommended programme.

Very few options did not deliver against any of the investment objectives and therefore represent critical failures against these objectives. However, as will be discussed in subsequent sections, not all remaining options were included in a programme in the next stage.

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6 PROGRAMME OPTIONS DEVELOPMENT AND ASSESSMENT

6.1 PROGRAMME DEVELOPMENT

6.1.1 Initial Programme Development

The SH29 PBC is a programme of works to address the problems identified by the stakeholder group in the corridor and to deliver on the agreed investment objectives. The ultimate programme will almost certainly be a package comprising a number of options.

This section summarises the development of possible programmes to meet the agreed investment objectives and demonstrates that the development of programmes has been undertaken in a robust and transparent manner. The Transport Agency's Alternatives and Preferred Programme templates have been used to describe each programme. These templates and a detailed description of how programmes were developed is provided in Appendix E.

The assessment of long list options against the above criteria and relative scoring between options was a key consideration when developing each programme. Initially, five 'foundation programmes' were developed to address individual investment objectives and some of the key uncertainties identified on the corridor.

The foundation programmes were developed by examining sections of the route and reviewing the options assessment to identify the best performing options for the assessment criteria related to each foundation programme. An example is Programme 1 where the best performing resilience options along the corridor were identified and compiled.

These 'foundation programmes' were

- ⌘ Foundation Programme 1 ' Low Cost Safety: This programme addresses critical safety issues, predominantly using the existing route. It deliberately chooses interventions that are online, and require minimal road widening, therefore typically at a lower cost than these larger intervention, including shoulder widening, corner realignments, access rationalisation, wire rope barriers, online improvements through the Kaimai Ranges, rest areas, travel time signage to combat fatigue and minor intersection improvements. It also recommends increased police enforcement and driver education campaigns targeted at fatigue and speed.
- ⌘ Foundation Programme 2 ' Cost of Travel Efficiency: This programme aims to achieve a travel time that would make SH1/29 comparative to SH2 and SH27 for a relatively modest cost. This programme includes the provision of a 2+1 arrangement from SH1 to the foot of the Kaimai Ranges and includes intersection improvements (including grade separation), the 'Kaimai Loop' on the western side of the Kaimai Ranges and a general straightening of the alignment on the eastern side of the Ranges. This programme also includes interventions on SH2 and SH27 to slow traffic speeds and increases enforcement including weigh stations on these routes to make SH29 more attractive.
- ⌘ Foundation Programme 3 ' One Network Road Classification (ONRC): This programme aims to address the ONRC aspirations of this National High Volume corridor. It provides a full 2+2 expressway standard route between Piarere and Tauriko, including a tunnel through the Kaimai Ranges and grade separation at key intersections along the route.
- ⌘ Foundation Programme 4 - Resilience: This programme addresses critical resilience issues

on the corridor and specifically aims to reduce full closures of more than 2 hours with no viable alternative route. This includes minor safety improvements, shoulder widening along the majority of the route, the 'Kaimai Loop', and strengthening of the pavement on the steep sections of the Ranges. It also improves early warning of closures and viable detour route signage and provides rest areas and truck stop locations along the route.

- ¿ Foundation Programme 5 - Least Impact: This programme aims to address the investment objectives while having the lowest possible physical impact on corridor. Therefore, a number of minor online safety improvements and minor intersection improvements are recommended, as well as several rest areas and investment in police enforcement and improved detour and hazard warning signage.

6.1.2 Further Programme Development

Following the development of the foundation programmes, the project team undertook an assessment against the MCA criteria to establish the effectiveness of each. This assessment was presented to the stakeholder group at Workshop 3. Stakeholders were given the opportunity to comment on each programme and its assessment.

Each foundation programme was developed to address a specific project objective or issue. With the knowledge of how each foundation programme performed with respect to the MCA; at Workshop 3, stakeholder groups were asked to develop programmes that best responded to all of the investment objectives. Groups were asked to take the best aspects of each foundation programme (as well as any other options that they felt would be appropriate) to create a recommended programme. Then another two programmes were developed after the workshop by the project team. Programme 10 is a combination of the most popular programme elements at the workshop and Programme 11 builds further upon Programme 3. Using this approach, six further programmes were developed, being:

- ¿ Programme 6 targets key problem areas, recommending larger scale safety and efficiency improvements through the Kaimai Ranges and only minor improvements to intersections between SH1 and SH24.
- ¿ Programme 7 recommends a 2+1 upgrade for the full length of the corridor, with realignments at problem curves and minor intersection safety improvements.
- ¿ Programme 8 recommends a full upgrade to 2+2 on the Kaimai Ranges, with realignment of problem corners, and a combination of barriers, shoulder widening and intersection upgrades between SH1 and SH24.
- ¿ Programme 9 - similar to Programme 7, it proposes a 2+1 upgrade for most of the corridor, with only widening for passing lanes within existing publicly owned land between SH1 and SH24. Minor safety upgrades and speed limit restrictions through Matamata and on SH27 are also proposed.
- ¿ Programme 10 a combination of the most popular elements proposed by workshop attendees, including a 2+1 upgrade on the Kaimai Ranges, the Kaimai Loop, additional passing opportunities, curve easing and localised safety improvements.
- ¿ Programme 11 A variant of programme 3, with further measures on SH2 and SH27 to make the SH1/29 corridor more attractive for freight users.

Appendix E describes these programmes in detail.

6.2 DO-MINIMUM

A Do Minimum programme has been developed for this corridor, against which the recommended programmes are assessed. In the first instance, the Do Minimum was developed through engagement with relevant areas of the Transport Agency. It was endorsed by the project stakeholders at Workshop 2.

The Do Minimum network for this corridor includes projects that are currently under construction, or are planned/committed have been included. The Do Minimum is summarised in Table 5.

Table 5: Do Minimum

Project	Do Minimum	Discussion
Waikato Expressway Rangiriri to Cambridge	Yes	Due for completion 2019, currently under construction in various stages
SH2 Upgrade	Yes	Efficiency and safety improvements by 2020
Ruakura Inland Port	Yes	Inland port serviced by rail, assumed complete 2021
Rail Network	Yes	ECMT Rail Line tunnel floor upgraded by 2020
Ongoing Upgrades	Yes	NOC Agreements

6.3 PROGRAMME ASSESSMENT

A three-stage programme assessment approach was used. Firstly, the foundation programmes were assessed against the MCA criteria and then the programmes developed in collaboration with the stakeholders were assessed against the same criteria. The third step was the consideration of other factors outside of the MCA. Appendix E describes the assessment undertaken for the programmes, including completion of the Transport Agency programme assessment forms. A summary of the assessment undertaken is included in this section of the report.

6.3.1 Foundation Programme Assessment

The foundation programmes were developed to best address a specific issue, being one of the investment objectives, low impact, or ONRC aspirations. These programmes therefore performed very well against some, but not necessarily all, assessment criteria.

Of these programmes, Programme 4 (Resilience) and 5 (Least Impact) delivered the least well against the assessment criteria. Programme 4 did not result in substantive improvements to safety or the overall efficiency of the route. The proposed shoulder widening, whilst improving resilience, did not offer a step change in resilience for the corridor and had a considerable impacts particularly associated with implementation through the Kaimai Ranges.

Programme 5 conversely has little impact on the environment and from a cost perspective provides exceptional value, however the scale of expected outcomes against the investment objectives was considered low. These two programmes were therefore discounted from consideration as a preferred programme.

Programmes 1 (Safety) and 2 (90km/h) were the next best performing. Programme 1 performed very well against the safety objective, however comparatively it did not perform as well as against the

other investment objectives. Programme 2 conversely delivered very well against the performance objectives; however, it did not deliver as well against the investment objectives in comparison with Programme 3. Programme 2 was therefore discounted as comparatively other programmes delivered better investment outcomes. Programme 1 was discounted from consideration as a preferred programme due to the lack of investment outcomes achieved compared with other programmes.

This left Programme 3 (ONRC), which performed the best of the foundation programmes overall and delivered well against all of the investment objectives. It is however noted that Programme 3 does not perform well from an economic efficiency perspective, as it is very expensive (three time more than other programmes). However, as the best performing foundation programme that delivers well against the agreed investment objectives, Programme 3 remains in contention for the recommended programme.

As outlined previously, further programmes were then developed, taking the best from each foundation programme. These programmes were assessed and compared against the best performing foundation programmes.

6.3.2 Further Programme Assessment

Programmes 6-10 were assessed against the same criteria as the foundation programmes. Interestingly, although developed separately by each stakeholder group, all five programmes are similar in form and therefore perform similarly against the assessment criteria.

Programme 7 was the best performing of these four programmes, best meeting the investment objectives and delivering strong outcomes.

Programmes 6 and 8-10 performed slightly below Programme 7. These four programmes performed very similarly and were considered to deliver similar (or less) outcomes for a greater effect than Programme 7. Therefore, these four programmes were discounted, leaving Programmes 7 and 11.

This left Programmes 3, 7 and 11 still 'in play'. Figure 18 summarises the programme assessment, relative ranking of the programmes and the outcomes expected for the investment. The initially discarded programmes are 'greyed' out, to highlight the four programmes still in 'in play' for the recommended programme.

Figure 18: Programme Assessment

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Summary											
Objective 1 – reduce full closures more than 2 hours	+	++	+++	+	0	+	++	++	++	++	+++
Objective 2 – reduce cost of travel on SH29	+	++	+++	+	0	+	++	+	++	+	+++
Objective 3 – reduce deaths and serious injuries	++	++	+++	+	0	++	++	++	++	++	+++
Feasibility	-	-	--	0	0	-	-	-	-	-	--
Affordability	-	-	--	-	++	-	-	-	-	-	--
Public / Stakeholders	-	0	-	-	-	0	0	0	-	0	-
Right traffic / Right mode / Right route	0	-	--	0	0	0	0	0	0	0	--
Cultural, Social and Environmental Effects	0	-	-	0	0	-	-	0	-	0	-
Safety	++	++	+++	+	0	++	++	++	++	++	+++
Economy	+	+	++	+	0	+	+	+	+	+	++
Ranking	9	7	2	10	11	8	1	5	4	6	2
Average score	4.8	5.7	7.0	2.9	1.9	5.5	7.8	6.4	6.8	6.1	7.0
Cost lower bound (\$M)	\$ 280	\$ 475	\$ 3,300	\$ 180	\$ 0.8	\$ 287	\$ 327	\$ 485	\$ 340	\$ 328	\$ 3,305
Cost upper bound (\$M)	\$ 430	\$ 770	\$ 5,900	\$ 295	\$ 1.3	\$ 490	\$ 530	\$ 850	\$ 545	\$ 532	\$ 5,905
Cost lower bound NPV (\$M) 2025	\$ 139	\$ 236	\$ 1,640	\$ 89	\$ 0	\$ 143	\$ 163	\$ 241	\$ 169	\$ 163	\$ 1,643
Cost upper bound NPV (\$M) 2025	\$ 214	\$ 383	\$ 2,932	\$ 147	\$ 1	\$ 244	\$ 263	\$ 422	\$ 271	\$ 264	\$ 2,935
Programme Benefits NPV 2025 (\$M)	\$ 143	\$ 222	\$ 994	\$ 55	\$ 10	\$ 166	\$ 225	\$ 186	\$ 225	\$ 190	\$ 994
BCR lower	0.7	0.6	0.3	0.4	14.7	0.7	0.9	0.4	0.8	0.7	0.3
BCR upper	1.0	0.9	0.6	0.6	23.9	1.2	1.4	0.8	1.3	1.2	0.6
Average score	P2	P3	P5	P1	P4	P6	P7	P8	P9	P10	P11
Investment Objective 1 – reduction of closures (5 years)	9	12	16	9	1	10	12	15	12	12	16
Investment Objective 2 – Reduce Cost of Travel(time savings (mins))	2.3	3.8	6.1	1.3	0.2	1.9	3.5	1.5	3.6	2.8	6.1
Investment Objective 3 – Crash exposure rating (collective, previously medium-high)	Medium	Medium	Low-medium	Medium-high	Medium-high	Medium	Medium	Low-medium	Medium	Medium	Low-medium
Reduction in hours SH29 is closed (5 years)	38	48	64	34	3	39	48	59	48	47	64
Reduction in DSI's per 5 years	18	24	32	17	2	19	24	29	24	23	32

The three remaining programmes, as shown in Figure 18, are the three highest ranked programmes based on the MCA. At a macro scale, the three programmes perform similarly with respect to the investment outcomes sought. There are however, differences between the three programmes. This is summarised as follows:

- ¿ Resilience – All of the three remaining programmes deliver well against this objective, with each programme resulting in 100% of the corridor meeting the investment objective. Total closures are anticipated to reduce by between 48 and 64 hours over a five-year period. Not all of the previous discarded programmes achieve this level of outcome. All three programmes will improve safety performance and provide additional space to move around incidents to deliver significant reductions in the number of incidents causing closures.
- ¿ Cost of Travel – Programmes 3 and 11 deliver the greatest outcome for this objective, with a travel time saving of over 6 minutes, equating to a travel time between Piarere and Tauriko of 2 hours and 02 minutes (2:02). This would make the route 2 minutes slower than SH2¹ and 1 minute faster than SH27. Programme 7 provides a three and a half minute saving, which equates to a travel time between Piarere and Tauriko of 2:05, making the route 5 minute slower than SH2 and 2 minutes slower than SH27.
- ¿ Safety – Programmes 3 and 11 deliver the greatest reduction in DSI's with the corridor meeting the objective of a medium KiwiRAP Collective and Personal Risk rating or better. These programmes would provide a Low rating and 32 DSI's forecast to be saved in a five-year period. Programme 7 delivers an overall Collective and Personal Risk KiwiRAP rating of Medium and over 24 DSI's forecast to be saved in a five-year period.

Correspondingly, the NPV economic benefits for these three programmes have a wide range.

¹ Based on WEX and travel time outlined in Figure 15

Programme 3 and 11 have a NPV benefit of nearly \$1Bn, with Programme 7 by comparison \$225M.

Sensitivity testing of the MCA was undertaken by doubling the weighting for specific criteria. This is summarised in Figure 19. This shows some changes in order, but fundamentally, the ranking of a programme stayed within one position of its base ranking, indicating that there was not a significant sensitivity to a particular category. Programme 7 is the best performing programme in the MCA. It drops to third when the individual investment objectives are given double weighting, with Programmes 3 and 11 switching to first equal.

Figure 19 : Programme Sensitivity Testing

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Summary											
Objective 1 – reduce full closures more than 2 hours	+	++	+++	+	0	+	++	++	++	++	+++
Objective 2 – reduce cost of travel on SH29	+	++	+++	+	0	+	++	+	++	++	+++
Objective 3 – reduce deaths and serious injuries	++	++	+++	+	0	++	++	++	++	++	+++
Feasibility	-	-	--	0	0	-	-	-	-	-	--
Affordability	-	-	--	-	++	-	-	-	-	-	--
Public / Stakeholders	-	0	-	-	-	0	0	0	0	0	-
Right traffic / Right mode / Right route	0	-	--	0	0	0	0	0	0	0	--
Cultural, Social and Environmental Effects	0	-	-	0	0	-	-	0	-	0	-
Safety	++	++	+++	+	0	++	++	++	+	++	+++
Economy	+	+	++	+	0	+	+	+	+	+	++
Ranking	9	7	2	10	11	8	1	5	4	6	2
Average score	4.8	5.7	7.0	2.9	1.9	5.5	7.8	6.4	6.8	6.1	7.0
Cost lower bound (\$M)	\$ 280	\$ 475	\$ 3,300	\$ 180	\$ 0.8	\$ 287	\$ 327	\$ 485	\$ 340	\$ 328	\$ 3,305
Cost upper bound (\$M)	\$ 430	\$ 770	\$ 5,900	\$ 295	\$ 1.3	\$ 490	\$ 530	\$ 850	\$ 545	\$ 532	\$ 5,905
Cost lower bound NPV (\$M) 2025	\$ 139	\$ 236	\$ 1,640	\$ 89	\$ 0	\$ 143	\$ 163	\$ 241	\$ 169	\$ 163	\$ 1,643
Cost upper bound NPV (\$M) 2025	\$ 214	\$ 385	\$ 2,932	\$ 147	\$ 1	\$ 244	\$ 263	\$ 422	\$ 271	\$ 264	\$ 2,935
Programme Benefits NPV 2025 (\$M)	\$ 143	\$ 222	\$ 994	\$ 55	\$ 10	\$ 166	\$ 225	\$ 186	\$ 225	\$ 190	\$ 994
BCR lower	0.7	0.6	0.3	0.4	14.7	0.7	0.9	0.4	0.8	0.7	0.3
BCR upper	1.0	0.9	0.6	0.6	23.9	1.2	1.4	0.8	1.3	1.2	0.6
Sensitivity Testing	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Objective 1 – reduce full closures more than 2 hours	5.3	7.0	9.1	3.5	1.7	5.9	8.9	7.7	8.0	7.4	9.1
Objective 2 – reduce cost of travel on SH29	5.3	7.0	9.1	3.5	1.7	5.9	8.9	6.8	8.0	6.5	9.1
Objective 3 – reduce deaths and serious injuries	6.2	7.0	9.1	3.5	1.7	6.8	8.9	7.7	8.0	7.4	9.1
Feasibility	4.4	4.3	4.6	2.6	1.7	5.0	7.1	5.9	6.2	5.6	4.6
Affordability	3.6	4.2	4.8	2.2	1.9	4.0	6.3	5.1	5.4	4.7	4.8
Public / Stakeholders	3.8	4.6	4.6	1.9	3.5	4.4	6.5	5.3	5.6	4.5	4.6
Right traffic / Right mode / Right route	3.9	5.2	5.9	2.2	1.3	5.5	7.6	5.9	5.7	6.0	5.9
Cultural, Social and Environmental Effects	4.2	4.4	5.8	2.7	1.9	4.6	6.6	5.6	5.7	5.2	5.8
Safety	6.2	7.0	9.1	3.5	1.7	6.8	8.9	7.7	8.0	7.4	9.1
Economy	5.4	6.5	8.1	3.1	1.7	6.2	8.3	7.0	7.4	6.7	8.1
Sensitivity Ranking	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Average, unequal weights	9	7	1	10	11	8	3	5	4	6	1
Objective 1 – reduce full closures more than 2 hours	9	5	1	10	11	8	3	6	4	7	1
Objective 2 – reduce cost of travel on SH29	9	7	1	10	11	8	3	5	4	6	1
Objective 3 – reduce deaths and serious injuries	8	9	6	10	11	5	1	3	2	4	6
Feasibility	9	7	4	10	11	8	1	3	2	6	4
Affordability	9	4	5	11	10	8	1	3	2	7	5
Public / Stakeholders	9	8	3	10	11	7	1	5	6	2	3
Right traffic / Right mode / Right route	9	8	2	10	11	7	1	5	4	6	2
Cultural, Social and Environmental Effects	9	7	1	10	11	8	3	5	4	6	1
Safety	9	7	2	10	11	8	1	5	4	6	2

6.3.3 Other Considerations

A significant difference between the programmes is affordability, with Programme 7 approximately 10% of the cost of the other two programmes. Programme 7 delivers a quarter of the benefits of Programme 3 and 11 for a tenth of the cost.

Therefore, whilst Programmes 3 and 11 deliver significantly more transport benefits and outcomes, the cost of achieving these additional outcomes is substantial. The BCR range for Programme 3 and 11 is therefore only of 0.3 to 0.6, whereas Programme 7 is 0.9 to 1.4.

Figure 20 and Figure 21 show the relative performance of the programmes from an economic efficiency perspective and the level of transport benefits the investment can sustain (based on the problems identified, with 'green' area of graph indicating more benefits have been realised than the

problems warrant and 'red' less benefits than the problems warrant). This confirms that the recommended Programme 7 strikes the best balance to deliver the available level of benefits in the corridor for an economically efficient investment.

Figure 20 : Comparative Economic Efficiency of Programmes

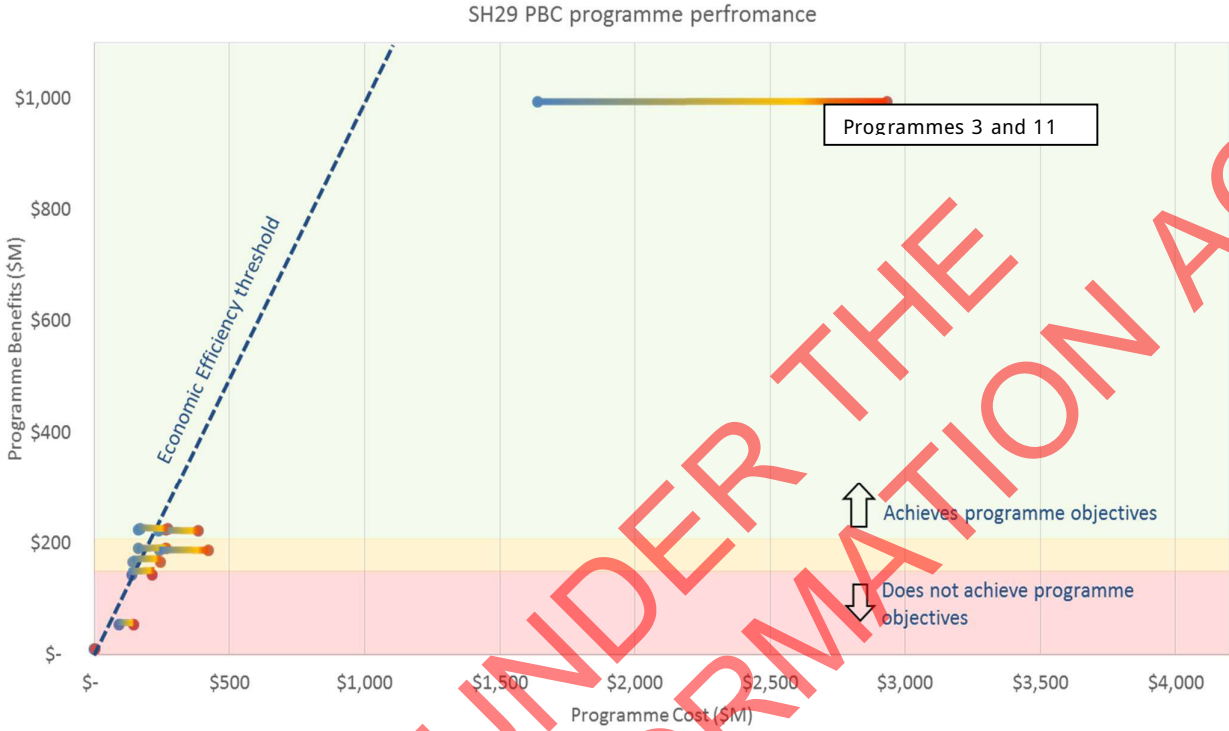


Figure 21 : Economic Efficiency Focus



Given the considerable cost of programmes 3 and 11 Figure 20 shows that Programme 3 and 11 result in a step change in transport benefits and costs in comparison with the other programmes. The tunnel is significantly more expensive than other options (approximately \$3B) but does deliver considerably more transport benefits. Figure 20 also indicates the level of outcomes identified by the agreed investment objectives. It shows that Programmes 3 and 11 deliver a much greater outcome than is considered necessary in this corridor. This indicates that the transport benefits alone are not sufficient to justify the costs at this time.

There may be other reasons to justify further investment in transport outcomes that have not been considered as part of this assessment (including Wider Economic Benefits as an example). Further work would be required to quantify and justify this additional investment if additional outcomes were desired.

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7 RECOMMENDED PROGRAMME

7.1 PROGRAMME OVERVIEW

The vision for this corridor is that SH1/SH29 is the preferred route for road based freight traffic accessing the Port of Tauranga, consistent with SH29's ONRC aspirations.

An important component of transport journeys in this area is the role of rail. The evidence has shown that rail currently provides a cost competitive advantage for some freight is fit for purpose and currently operates at market capacity, with significant spare capacity available, if demand increases. Therefore, while the corridor vision does not specify investment in the ECMT, it recognises that road-based solutions should not be implemented at the expense of the rail network.

In an unconstrained, high-volume environment, this vision may indicate that a four lane expressway standard alignment is required. However, this business case indicates that the transport benefits available in the corridor alone do not warrant investment of the scale necessary to deliver that outcome within the next 30 years.

The recommended programme for SH29 between SH1 and Tauranga therefore comprises a range of interventions, including operational, supporting infrastructure (rest areas and service centre) and both online and offline alignment enhancements. The schemes that make up the recommended programme are outlined in Table 6 and Figure 22 (pictorially).

Table 6 : Recommended Programme Components

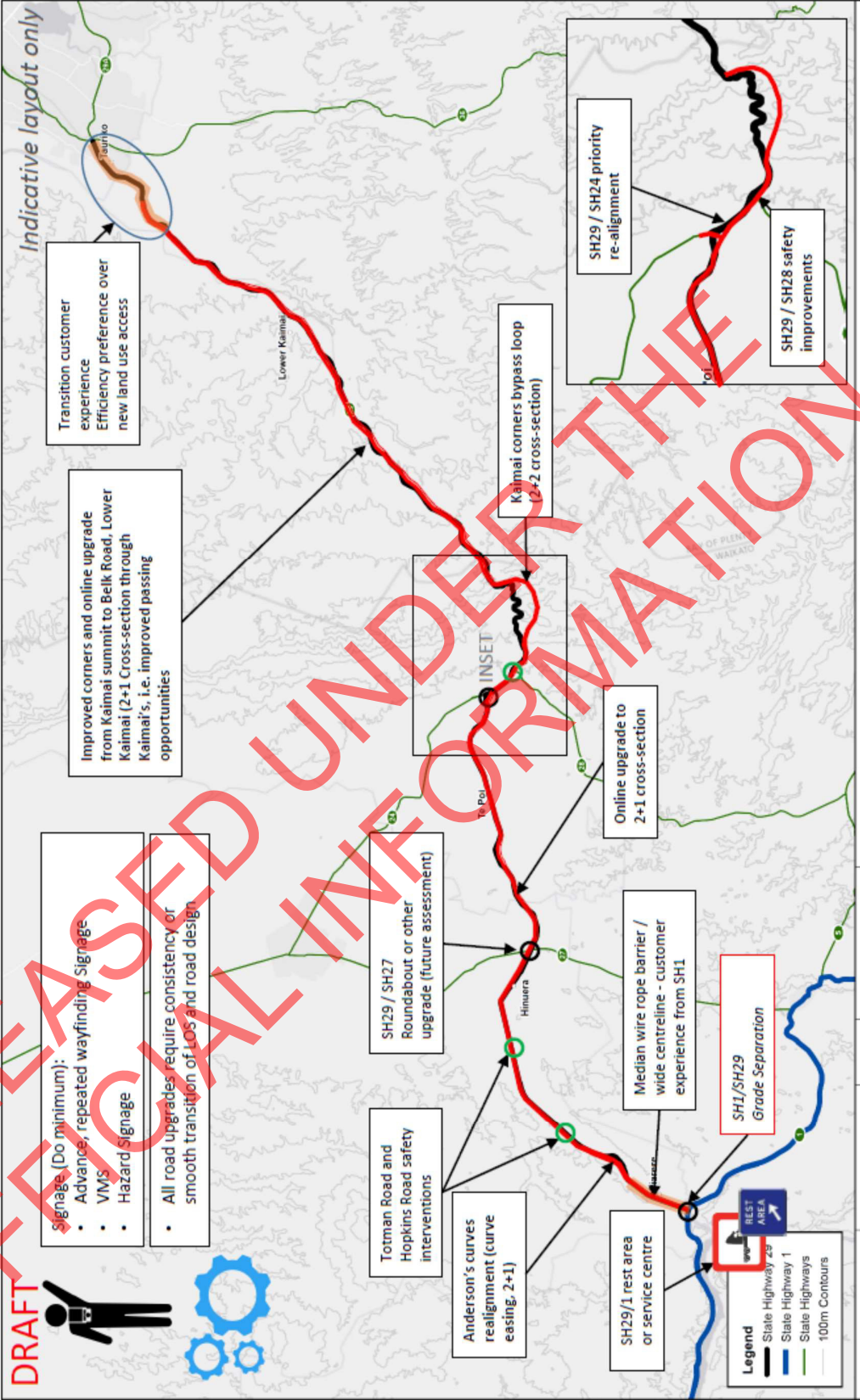
Section	Infrastructure Investment
SH1 Intersection	Provision of wayfinding signage and transition of road design from SH1 to SH29, which may include wide centrelines, linemarking and barriers. Location of a Truck Stop/Service Centre on a corner of the intersection accessible by customers on both SH1 and SH29.
SH1 to SH24	Online safe system upgrade 1+1 with sections of 2+1 (passing opportunities, mostly contained within the existing corridor) and corner easing at Andersons Corner, approaching Hinuera township and approaching Te Poi from both east and west. Upgrade linemarking for visibility in all conditions and alignment of approach to corners.
Totman and Hopkins Road intersections	Minor safety upgrades to Totman Road intersection including sight distance and turn lanes as required. Minor safety upgrades to Hopkins Road intersection, including improved signage in advance of the intersection, line marking and turn lanes.
SH27 intersection	Potential upgrade to single roundabout with wayfinding signage.
SH24 to SH28	Realignment of priority of SH24 intersection, such that SH29 through movement is main movement. Transition to 2+2 to connect with Kaimai bypass loop, Gateway signage to Kaimai's, linemarking and surfacing improvements Minor safety upgrades to SH28 intersection to further remove conflicts between turning vehicles and through movement.
SH28 to Kaimai Summit	Offline 2+2 alignment loop to bypass Kaimai bends to the south. Smooth loop to eliminate high radius turns. Existing alignment maintained as alternative route.

	Car parking and pedestrian access to stopping place at summit lookout and hot springs.
Kaimai Summit to Tauriko	Completion of 2+1 online upgrade, including extension and relocation of passing lanes with safety enhancements at intersections and property access points, bridge widening and side barriers. Upgrade linemarking for visibility in all conditions and alignment of approach to corners.
Belk Road, Tauriko	Integration with the Omanawa Road to Tauriko realignment, including appropriate transition of linemarking, signage and lane widths. Gateway Signage for Kaimai Hills
Driver education and enforcement	Increased police enforcement – Increasing budget to the Police to undertake road enforcement, targeting Kaimai Hills. Safe Police observation, pullover and turnaround bays. Potential for automated enforcement as police presence on Kaimai Hills. Weigh-in-motion station at strategic location along SH29.
Wayfinding	Tourist signage – increased advanced warning of Hobbiton turn-off, and available routes through the region. Wayfinding signage with distance and travel time advice for SH1-19 route, including at SH1/SH2 junction (Pokeno), within Tauranga and SH29/SH24 junction. VMS warning, speed limit and detour advance warning at key decision points on journey, particularly either side of Kaimai Hills. Continue current trial of WAVSL signs, with local Traffic Operations Centre.

The total cost of the recommended programme is between \$330M to \$530M as developed by Bond CM. A range of costs have been provided, given the level of detail of the estimates developed, as this is a programme business case and individual options are in many instances not defined in detail.

This cost range includes operational and capital projects, however excludes the maintenance costs of the programme (which are not assumed to create a significant additional maintenance burden). The individual projects within the Do Minimum are not included in the programme costs as they are assumed committed already.

Figure 22 : Recommended Programme (7)



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7.1.1 Supporting Investment

This PBC has identified a number of other projects outside of SH29 that should be considered for implementation to further support and strengthen the outcomes of Programme 7. These include:

- ∩ 3rd Main (Wiri to Westfield) – The ECMT line has recently been upgraded by Kiwirail and can carry significantly more services than it currently handles. However further rail expansion to the Port of Tauranga is likely to be constrained upstream in Auckland between Wiri and Westfields where passenger services and freight trains compete for rail paths. Provision of a 3rd track in this area would provide greater resilience and capacity for freight between Auckland and Tauranga
- ∩ SH2 and SH27 Function – To support the ONRC hierarchy and aspiration for SH1/29 to be the preferred route for inter-regional travel between Auckland and Tauranga further investment in the efficiency of either SH2 or SH27 should not be supported and if there is the opportunity to infact slow vehilces on these routes this should be explored
- ∩ Road User Charges – Investigation should continue into the option of variable RUC and SH29 would be an ideal test route to further incentivise travel on the SH1/29 route

7.2 PROGRAMME IMPLEMENTATION STRATEGY AND TRIGGER POINTS

The implementation of the recommended programme has been considered in its development. The programme, whilst consisting of predominantly Transport Agency projects, will also require implementation by other parties.

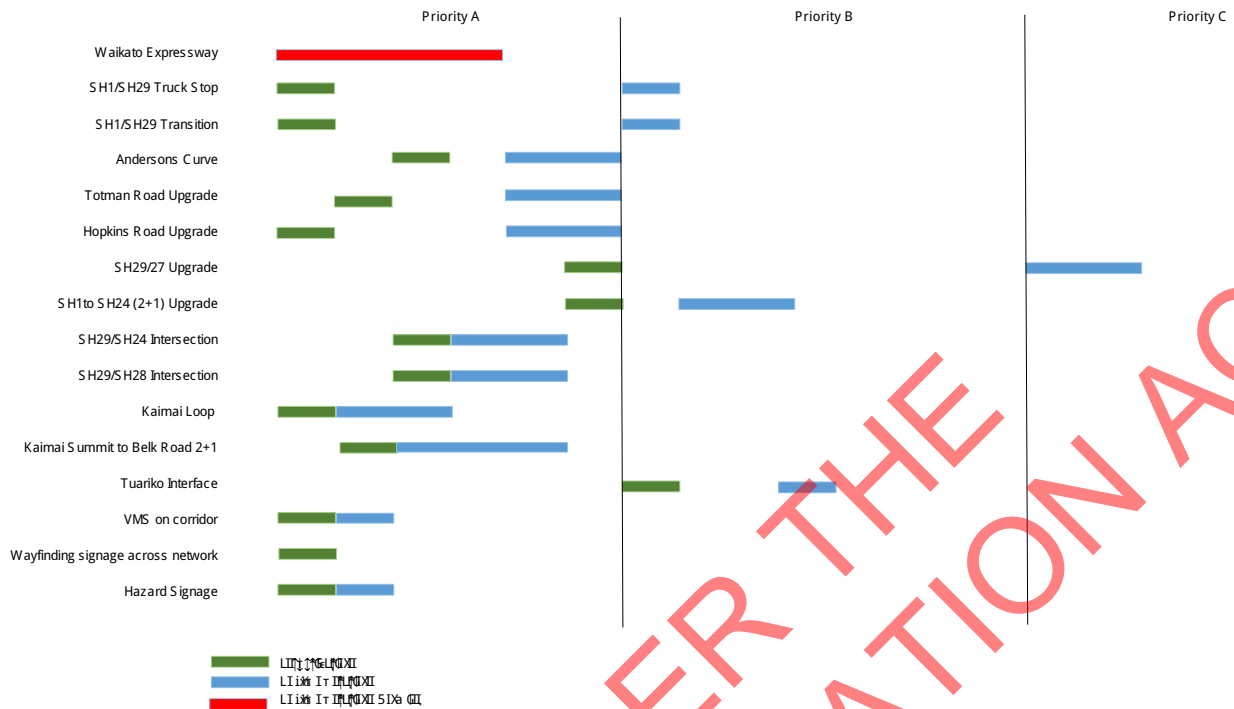
7.2.1 Timing and Triggers

In determining the timing for the implementation of the individual projects within the programme, a number of factors has been considered, including the demand, economic efficiency, and the need to best meet the investment objectives. Prioritisation has been made by balancing a number of criteria and applying the Transport Agency Performance Assessment Framework, with the following priority of criteria applied:

- ∩ network performance and capability
- ∩ safety
- ∩ health
- ∩ environment
- ∩ cost

Based on this assessment, the implementation strategy for the programme from a timing perspective is outlined in Figure 23. This separately identifies the investigation and physical implementation components of each project as some warrant early investigation to understand preferred alignments and interface with others projects is considered important.

Figure 23 : Recommended Programme Implementation



The key aspects of this implementation strategy include:

- ∩ The safety and alignment improvement of the Kaimai Loop on the western side of the Kaimai Ranges is the most urgent part of the programme given the current safety problems and opportunity to reduce the cost of travel
- ∩ Addressing the safety, resilience and efficiency problems on the remaining sections of the Kaimai Ranges is the next area of focus
- ∩ In parallel to the Cambridge to Piarere IBC, investigation of the SH1/29 transition and Truck Stop should be undertaken. This should take the form of an IBC and consider the long-term solutions, including compatibility with the proposed SH1 upgrades.
- ∩ Between SH1 and SH24, the priority is the safety improvements at Hopkins Road, then Totman Road and finally the Anderson curves. Investigations should start immediately, with implementation ready for the opening of the Waikato Expressway
- ∩ The intersections of SH29 with SH28 and SH24 should be investigated jointly and as the Kaimai Loop works come to a conclusion
- ∩ The SH1 to SH24 upgrades to 2+1 should occur after the above works are complete. The investigation could be considered with the intersection and safety improvements along this section; however, this is not strictly necessary.
- ∩ The final physical works should be the intersection upgrade of SH29/27. The timing will depend on the flows through this intersection, with a total flow of 7,000vpd on SH29 suggested as the trigger for investigation.
- ∩ The operational projects proposed in the programme should be progressed early in the programme, with the signage and behaviour programmes taking priority over the enforcement projects

The above summary is outlined with specific dates in Table 7 below. This provides guidance for the

inclusion of options in the NLTP.

Table 7 : Implementation Plan

Section	Investigation	Implementation
SH1/SH29 Truck Stop and Transition	IBC/DBC 2017 in collaboration with Cambridge to Piarere project	2022 ' Construction of upgrade completed
Andersons Curves	IBC-DBC 2017/18	2021 ' Construction of upgrade completed
Safety Upgrade near Totman Road	IBC-DBC 2017/18	2021 - Construction of upgrade completed
Safety Upgrade near Hopkins Road	IBC-DBC 2017/18	2021 - Construction of upgrade completed)
SH29/27 Intersection Upgrade	IBC-DBC 202/2021	2030- Construction of upgrade completed
SH1 to SH24 2+1	IBC-DBC 2017/18, done with above safety projects as a potential package	2025- Construction of upgrade completed
SH29/SH24/SH28 Intersection	IBC-DBC 2017/18 done in collaboration with Kaimai Loop investigation potentially	2022 - Construction of upgrade completed
Kaimai Loop	IBC-DBC 2017/18	2020 ' Construction upgrade completed
Kaimai Summit to Belk Road 2+1	IBC-DBC 2018/19	2025 ' Construction upgrade completed
Tauriko Interface/Gateway	IBC-DBC 2021	2028 ' Construction upgrade completed
Wayfinding <ul style="list-style-type: none"> ð Tourist signage ð Travel time signage ð VMS detour advance warning 	IBC-DBC 2017/18	2019 ' Complete and operational

7.2.2 Implementation Partners

The recommended programme requires implementation from others. This includes local Councils and partnerships in some of the behavioural options. The behavioural options will require close collaboration and implementation with the Police and other government entities to ensure the most effective implementation of these options

8 RECOMMENDED PROGRAMME ' ASSESSMENT

A comprehensive assessment process has been undertaken to select Programme 7 as the recommended programme. A completed Transport Agency Programme Assessment Form for Programme 7 is included in Appendix E.

Programme 7 was selected as it best strikes the balance between delivering the outcomes sought for the corridor in an economically efficient manner. It also balances investment in the road corridor without investing so substantially that it attracts freight demand from the rail corridor.

Programme 7 offers a value for money programme that is affordable and able to be implemented in stages over the next 30 years, in a socially cohesive manner with a manageable impact on the environment and culturally sensitive areas.

Programme 7 delivers the following outcomes:

Investment Outcomes

- 3.5 min travel time saving (5 minutes slower than SH2 and slower than SH27)
- 24 fewer deaths and serious injuries (5 years)
- \$325M - \$530m cost, over 30 years

8.1 PROGRAMME OUTCOMES

The investment objectives describe the outcomes sought from investing in this corridor. A summary of the outcomes achieved by the recommended programme is provided below:

8.1.1 Resilience

A substantial improvement in resilience is delivered by Programme 7. The Kaimai Ranges are the main resilience problem area. The proposed 'Kaimai Loop' and other improvements in the Kaimai Ranges will reduce gradients and improve the alignment to improve safety and therefore the resilience of the route through fewer incidents.

Additional capacity provided by a 2+1 upgrade on the remaining section from SH1 to SH24 will improve resilience by providing the ability to operate contra-flow arrangements if an incident blocks one traffic lane. The improved alignment and other safety upgrades are also expected to reduce the severity of incidents such that the overall time required for closures is also reduced.

It is forecast that Programme 7 will deliver approximately 10 hours of savings per year for unplanned incidents, representing a 20% reduction over the existing situation.

8.1.2 Safety Outcome

Programme 7 improves safety through localised interventions addressing specific problems areas between SH1 and SH28. Over the Kaimai Ranges, the safety problem on the western side is addressed by the Kaimai Loop and elsewhere through a general enhancement to the alignment, creating a safer road for all users. . This programme achieves the objective of a medium KiwiRAP rating for the corridor length. This rating is achieved in all areas along the corridor with the

exception of the western side of the Kaimai Ranges where a medium/high rating is achieved².

Programme 7 is expected to save 144 deaths and serious injuries over the next 30 years. This will provide a significant improvement over the current safety performance for all road users, including freight and tourists.

8.1.3 Cost of Travel Outcome

Programme 7 provides a three and a half minute saving, which equates to a travel time between Pokeno and Tauranga of 2:05, making the route 5 minute slower than SH2 and 2 minutes slower than SH27.

Whilst still slightly slower than the SH2 and SH27 routes, this difference is within a few minutes and reasonable travel time variation. Given the quality of the route proposed for the entire journey between Pokeno and Tauranga (including the completed Waikato Expressway) this difference is not considered a fatal flaw for the scheme.

We note that by spending more than an additional \$2B on a tunnel, only a further two and a half minutes in travel time saving can be achieved, which would still be slower than SH2.

It is noted that this travel cost remains consistent with the cost of freight travel by rail, striking a balance between modes.

8.1.4 Benefits Delivered Spatially

These outcomes are indicatively represented by the forecast transport benefits of the programme. Figure 24 shows the benefits available by delivering the desired level of investment outcomes for each corridor section. It compares this with the actual benefits realised by Programme 7.

Figure 24 shows that Programme 7 slightly 'over invests' at the western end of the corridor between SH1 and SH28 and under invests over the Kaimai Ranges for the scale of the problems.

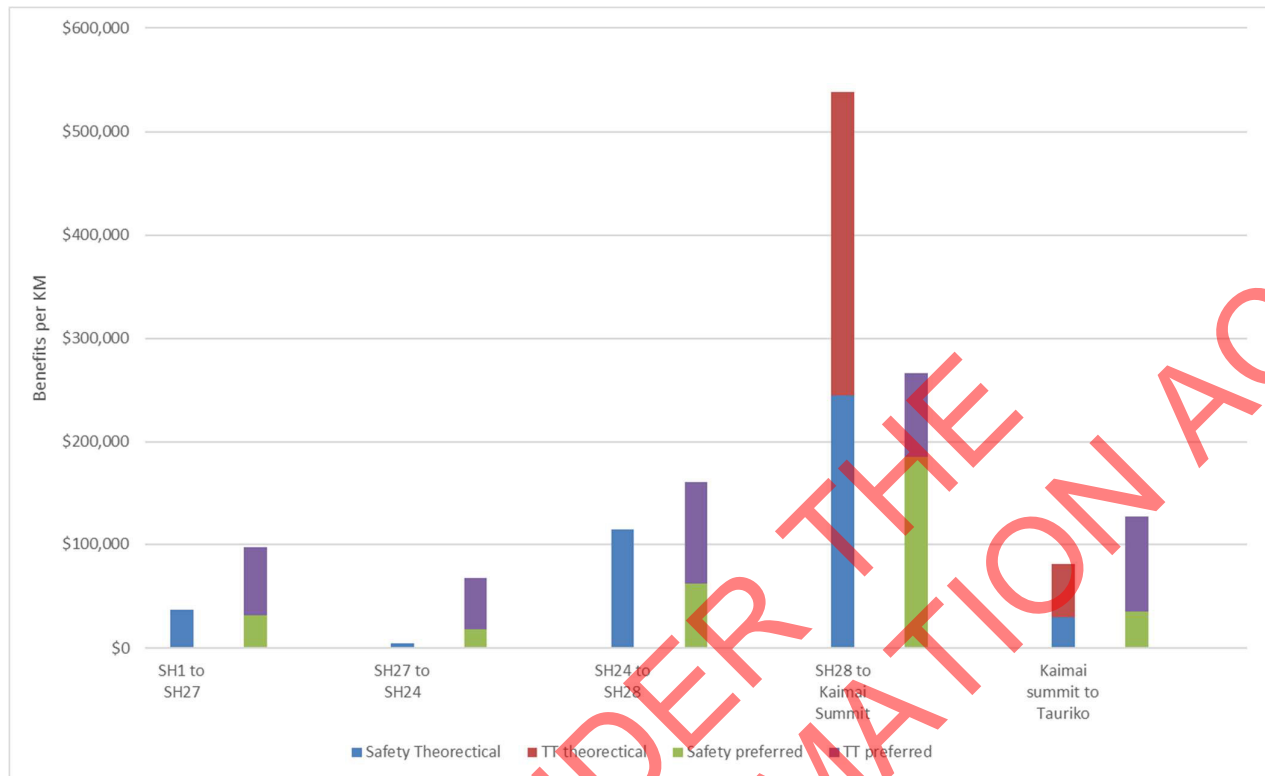
The slight 'over' investment in the western section is a conscious effort to provide a step up in the quality of alignment in this section. The risk of under-investing in this section is that, by only investing in the Kaimai section, the SH27 route would gain all of the benefit of any improvement and therefore potentially result in more traffic using SH27/SH29 instead of the SH1/SH29 preferred route. Providing a high quality alignment and facility between SH1 and SH28 is commensurate with the SH1/SH29 preferred route objective.

The relative 'under' investment in the Kaimai section relates to the significant level of investment required to substantially improve outcomes (reduced gradient and improved horizontal alignment to increase average travel speed). However it is noted that Programme 7 is 'right sized' for the safety problem and available benefits. The 'under investment' therefore relates to the cost of travel and not safety.

The level of investment required to fully capture the cost of travel benefits available (a tunnel) is not part of the recommended programme given the lack of current or forecast demand over the next 30 years. To put this into perspective, preliminary analysis indicates that the level of investment required for a tunnel (which best delivers to the available benefits) is not warranted by demand for almost 75 years, based on current growth levels and demand forecasts.

² A 77% reduction in accidents is required to achieve a medium rating given the number and severity of the incidents

Figure 24 : Recommended Programme Benefits



8.2 PROGRAMME RISK

The recommended programme has a number of risks associated with its implementation that were assessed as part of the programme assessment framework. These are summarised below:

8.2.1 Feasibility

Programme 7 was considered to have minor risks with respect to feasibility. Generally, the options proposed are straightforward, well understood, and 'standard' in nature.

The Kaimai Loop project carries the largest risk within the programme, given the scale of new alignment in challenging terrain that is of environmental value. This will also carry property and consenting risk.

The works from SH1 to SH28 will likewise carry consenting and implementation risks such as property, however these are considered relatively standard in nature and manageable.

The operational options carry some risk, as they require careful collaboration with other parties, including the Police and other government organisations to ensure implementation is appropriately planned and rolled out.

8.2.2 Affordability

Programme 7 is considered relatively affordable, given its BCR range (1.0 - 1.4) is above the minimum threshold. Therefore, it is considered that the programme is likely to be efficient and fundable through the National Land Transport Fund (NLTF).

However, with an expected cost of between \$330M and \$530M, the programme represents a prioritisation risk, with respect to the potentially limited funds available through the NLTF. It is likely

that construction would be staged over a number of years.

Further, detailed analysis is required to confirm these funding arrangements, as projects are developed in more detail through Indicative and Detailed Business Case phases.

Some programme options could potentially use alternative funding sources given their design, which could make tolling options possible. Further investigation would be required to understand the benefits and impacts of this funding option.

Aspects of the programme will require implementation by other parties. The details of these funding arrangements are yet to be confirmed.

8.2.3 Stakeholder / Public Considerations

Stakeholder and public perspective are always a risk for infrastructure projects. To mitigate this risk and ensure that as many perspectives as possible were included in the development of the PBC; stakeholders were invited to attend a number of interactive workshops.

Options and alternatives were developed collaboratively with stakeholders at a workshop. Assessment criteria were taken from NZ Transport Agency guidelines for option evaluation agreed with stakeholders and used to evaluate the identified options and alternatives with respect to their relative ability to deliver against the agreed investment objectives for the corridor. Stakeholders then participated in a workshop to develop a range of potential programmes for the corridor. Programme 7 was developed by one of these stakeholder groups with only minor refinements made by the project team.

There will likely be differences of perspective with respect to the proposed implementation plan. In particular, different groups are likely to have differing views with respect to the options that should be prioritised for early implementation. Specific management plans will need to be developed and actioned as the programme is developed further and implemented.

Programme 7 is considered likely to attract both support and opposition like most infrastructure projects. Fundamentally, it is considered that the key aspects of the project, providing a safer and higher quality alignment for SH29, will be supported by the majority of stakeholders and the public. However, some reactions may be more adverse given the likely desire from some stakeholders for a greater level of investment than Programme 7 delivers. This assessment is based on the feedback from stakeholders through this PBC process.

8.2.4 Cultural Heritage, Environmental and Social Responsibility Considerations

There are identified areas of significance from a cultural heritage, environmental and social perspective along the corridor. Programme 7 is considered to carry some risk in this area however as it does not affect any specifically identified significant areas it is considered that this risk can be managed.

Culturally there are areas of significance throughout the corridor. Detailed investigation will be undertaken as part of individual project development, however based on what is known at this time, the programme does not directly affect any specific cultural heritage sites and therefore it is considered that this risk can be avoided or mitigated appropriately.

Environmentally sensitive areas exist along the route and large-scale infrastructure projects will have an effect on the environment. These will need to be managed. The main areas of concern relate to the Kaimai Loop, as this is a new offline alignment. Like the cultural issues, more work is needed to understand these issues in detail; however, no significant concerns have been identified at this stage.

There will be social enhancements with the improved safety and accessibility delivered by Programme 7. This must be balanced with the potential social impacts of property purchase and severance caused by the alignments recommended in Programme 7.

Residents and businesses located in the townships along the route will require engagement and interface during the specific project implementation stages such that this risk is managed effectively.

8.2.5 Safety

This risk is closely related to the Safety Objective, with Programme 7 providing a safer corridor. Appropriate implementation planning to ensure safety during this construction will be required. This risk is well understood with the options proposed as part of the overall programme.

8.2.6 Economy

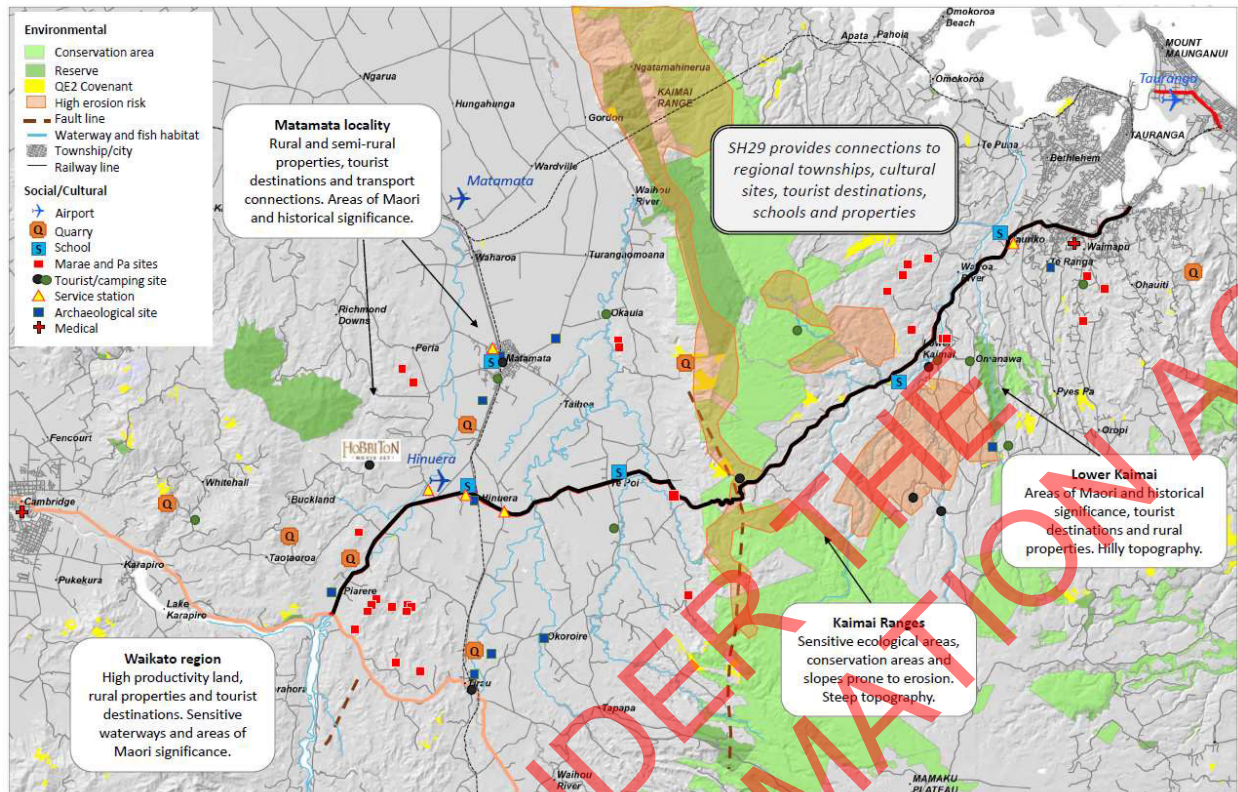
Programme 7 improves the safety, reliability, and performance of SH29 between Piarere and Tauranga. Improving travel times along the route by approximately 3:30mins will result in increased confidence in the corridor, improved economic efficiency, and growth.

8.3 PROGRAMME OPPORTUNITIES

The proposed programme delivers against the investment outcomes sought and results in some risks to implementation as outlined above. The recommended programme also offers a number of opportunities to users, investors and the wider community. These are shown in Figure 25 and include:

- ¿ Social – The recommended programme includes improvements to some small townships, including Te Poi and Hinuera. These enhancements represent an opportunity to potentially redevelop and redefine the towns. The increased resilience and improved signage of roads in this area presents an opportunity to attract more tourists and users to their communities. In addition, the social programmes designed to address safety problems, such as the license support programme, offer greater social and community opportunities than simply the safety benefits directly claimed as part of this programme.
- ¿ Tourism – The proposed programme provides an enhanced route for tourists to utilise. With Hobbiton access on SH29 there is an opportunity to encourage tourists to travel further along SH29 and potentially to Tauranga. The enhanced route over the Kaimai Ranges will improve access to the DoC walkway and offer opportunities for other tourist focussed activities.

Figure 25: Programme Opportunities



8.4 VALUE FOR MONEY

Programme 9 balances the cost of achieving the investment outcomes sought, particularly compared to the other programmes assessed. With NPV benefits of \$225M and a cost range of \$330M to \$530M, a BCR of between 0.9 and 1.4 is forecast.

Detailed analysis is required for each individual option within the programme, during subsequent IBC and DBC phases; however there is a good benefit stream that indicates a good value for money story.

This BCR analysis has been based on appropriate assumptions for a programme at this stage, with further benefits envisaged as more detailed analysis is undertaken.

Wider economic benefits have not been included, which if applied could further strengthen the value for money proposition of this programme.

8.5 SENSITIVITY ANALYSIS

The forecasting of future costs and benefits at the programme level involves a degree of uncertainty and the economic analysis is sensitive to the assumptions or predictions inherent in the analysis.

To ensure that the recommended programme has been selected on a robust basis, reference is made to the uncertainty log agreed with stakeholders as part of the Strategic Case and outlined in Table 8. Four scenarios were developed to assess the sensitivity of Programme 7 as the recommended programme. These scenarios were:

- 2 Growth forecast increases 1. A sensitivity test was undertaken to understand the effect on

the programme if current forecast growth rates doubled. From a transportation demand perspective, this means average growth rates increasing from 1.5% to 3% pa.

- ¿ Growth forecast reduces – A scenario was developed assuming that current growth forecasts were not realised and the traffic growth rate halved to 0.75% pa.
- ¿ Port of Tauranga expansion – If PoT significantly increased its tonnage due to rationalisation of ports across the Upper North Island, this could result in increased demand for road-based freight trips (1000 trucks / day assumed) and increased rail demand.
- ¿ Rail mode share reduces – This scenario tests the effect on the programme if constraints in the upstream rail network (Auckland) for freight increase and therefore all freight growth must travel by truck on SH29.

8.5.1 Scenario Outcomes

The potential outcome of these scenarios is summarised in Table 8.

Table 8 : Sensitivity Analysis Outcomes

Scenario	Safety Objective	Cost of Travel	Resilience Objective	Economic Efficiency
Increased Growth	Medium KiwiRAP rating achieved for route	Average speed slows slightly and increases demand on SH29, accelerating need for projects. Does not justify tunnel option.	Increased demand may accelerate implementation of Kaimai projects	Increases to approx. 1.1-1.6
Reduced Growth	Medium KiwiRAP rating achieved for route	Average speed increases slightly and extends the implementation timeframe for some interventions	Timeframes for interventions would be delayed, in particular the 2+1 solution between SH1 and SH24.	Reduces to approx. 0.8-1.2
POT Expansion	Medium KiwiRAP rating achieved for route	Average speed slows slightly and accelerates requirement for the tunnel option (but still not within 30 years)	Increased demand may accelerate implementation of Kaimai Ranges projects	Increases to approx. 1.1-1.6
Rail Mode Share	Medium KiwiRAP rating achieved for route	Average speed slows slightly and potentially accelerates timing of some projects. Does not justify tunnel option. Kaimai Ranges bypass	Increased demand may accelerate implementation of Kaimai Ranges projects	Increases to approx. 1.0-1.5

Overall, the conclusion of this sensitivity analysis is that the timing of options within the programme could be delayed or accelerated dependent on the scenario. If the scale of the change was significantly faster than anticipated, it may be necessary to revisit the need for some of the options. Conversely, if growth was slower, the option of a 2+1 online enhancement between SH1 and SH28 could be delayed further and potentially not needed at all.

It is important to note that none of these scenarios resulted in the justification of a tunnel through the Kaimai Ranges within the 30 year time period.

The rail mode share and Port of Tauranga scenarios would result in additional freight movements on the corridor, which could require the acceleration of options to improve the Kaimai Ranges within the programme.

Overall, it is considered that the recommended option responds to these sensitivity scenarios well.

8.6 ASSESSMENT PROFILE

An assessment profile of H/H/L has been determined for the programme using the Transport Agency's Investment Assessment Framework as detailed below:

8.6.1 Strategic Fit

Strategic fit of the problem, issue or opportunity that is being addressed: H/M/L

Overall the corridor has been given a high strategic fit as the problems and benefits defined by the project partners, and supported by the currently available evidence, are closely aligned with achieving the Government's goals for land transport and the Transport Agency's three-year strategic priorities on predictable journeys for urban customers and improved freight network productivity.

The Strategic Case confirms that the key problems relate to safety, efficiency, reliability and resilience, particularly for freight, and that these are significant from a national perspective.

Evidence collected through the Strategic Case indicates that the gap between current customer levels of service on the corridor and that considered appropriate for a National High Volume corridor is significant.

In line with the Transport Agency's current Investment and Revenue Strategy, the Strategic Case also focuses on improving SH29 as a national route by:

- ∩ Contributing to economic growth and productivity through improving the cost of travel along SH29, especially for the movement of freight
- ∩ Improving the safety of the corridor so that it is consistent with requirements for a National High Volume route, resulting in a reduced number of crashes involving injury and death
- ∩ Improving the resilience of the corridor between Tauranga and key markets to remove constraints on economic growth and investor confidence

This indicates a high Strategic Fit.

8.6.2 Effectiveness

Effectiveness of the proposed solution: H/M/L

Overall, the corridor has indicatively been given a high effectiveness rating subject to further investigation. Whilst options have not yet been considered in detail, the following provides an indicative view of the potential effectiveness of improving the SH29 corridor.

This is based on the intent and potential scope of the preferred programme(s) to deliver against the range of effectiveness criteria set out in the current Investment Assessment Framework, as set out below.

Component	Explanation	Rating
Outcomes focused	<ul style="list-style-type: none"> ∩ tangible change in addressing the problem, issue or opportunity identified in the Strategic Fit assessment ∩ consistency with levels of service in an appropriate classification system 	<u>L/M/H</u>

Component	Explanation	Rating
Integrated	<ul style="list-style-type: none"> ∩ consistency with the current network and future transport plans ∩ consistency with other current and future activities ∩ consistency with current and future land use planning ∩ accommodates different needs across modes ∩ support as an agreed activity across partners 	L/M/ <u>H</u>
Correctly scoped	<ul style="list-style-type: none"> ∩ the degree of fit as part of an agreed strategy or business case ∩ has followed the intervention hierarchy to consider alternatives and options including low cost alternatives and options ∩ is of an appropriate scale in relation to the issue/opportunity ∩ covers and/or manages the spatial impact (upstream and downstream, network impacts) ∩ mitigates any adverse impacts on other results 	L/M/ <u>H</u>
Affordable	<ul style="list-style-type: none"> ∩ is affordable through the lifecycle for all parties ∩ has understood and traded off the best whole of life cost approach ∩ has understood the benefits and costs between transport users and other parties and sought contributions as possible 	L/M/ <u>H</u>
Timely	<ul style="list-style-type: none"> ∩ delivers enduring benefits over the timeframe identified in the justified strategy or business case ∩ provides the benefits in a timely manner 	L/M/ <u>H</u>
Confidence	<ul style="list-style-type: none"> ∩ manages current and future risk for results/outcomes ∩ manages current and future risk for costs 	L/M/ <u>H</u>
Overall	∩ Assessment based on lowest rating of all components	L/M/ <u>H</u>

Achieving the agreed benefits would support and promote the National High Volume role of SH29.

Based on the problems identified, there is sufficient scope to identify appropriate alternatives that would make a significant contribution to achieving the multiple impacts of the GPS.

The agreed problems and benefits are integrated, and therefore there is scope to make a significant contribution to multiple outcomes including:

- ∩ Improving safety outcomes for the corridor
- ∩ Improving journey time reliability
- ∩ More efficient and productive freight supply chains
- ∩ Improving route resilience and route security

8.6.3 Efficiency

Benefit and cost appraisal: H/M/L

Details of the benefit and cost appraisal are provided in Section 8.4, above.

9 PROGRAMME FINANCIAL CASE

9.1 INDICATIVE COST

The cost of the programme was compiled through the development of costs for each individual option that made up the recommended programme. These individual costs were then combined to give a total cost.

Bond CM developed these costs through their knowledge of Transport Agency projects and previous costings for options from early investigations (where this existed). All cost estimates are expressed as a range, i.e. upper-bound and lower-bound values only have been provided.

Given the strategic nature of a programme business case, detailed option development has not been undertaken and therefore a cost range best represents the costs at this stage in the programme life cycle. Table 9 shows the cost per project element within the programme.

It indicates that the expected total cost range for Programme 7 is \$330 to \$530M.

Table 9: Programme Cost

Section	Road Infrastructure Investment	Cost of project (undiscounted)
SH1 Intersection	Wayfinding signage and integration of projects Truck Stop/Service Centre	<\$1 million
SH1 to SH24	1+1 online safe system upgrade with sections of 2+1 (passing opportunities) and corner easing	\$60-\$120 million
Totman and Hopkins Road intersections	Minor safety upgrades	\$0.6-1 million
SH27 intersection	Roundabout	\$3-5 million
SH24 to SH28	SH24 Priority realignment Transition to 2+2, Gateway signage, linemarking and surfacing	\$3-5 million
SH28 to Kaimai Summit	2+2 Kaimai bends bypass loop (offline) Access to stopping place at summit	\$160-240 million
Kaimai Summit to Tauriko	Completion of 2+1 online upgrade with safety enhancements at intersections and property access	\$100-\$160 million
Belk Road, Tauriko	Transition to Omanawa Road to Tauriko realignment Gateway Signage	\$0.2-0.3 million
TOTAL		\$328-532 million

9.2 FUNDING ARRANGEMENTS

The expected programme BCR is above the minimum threshold. Therefore, it is considered that the programme will be efficient and fundable through the National Land Transport Fund (NLTF).

However, with an expected cost of between \$330M and \$530M, the programme represents a prioritisation risk, with respect to the potentially limited funds available through the NLTF.

It is likely that construction would be staged over a number of years, with the Kaimai Loop recommended to be completed within 5 years, while the full programme is not expected to be constructed for more than 20 years.

Further, detailed analysis is required to confirm these funding arrangements, as projects are developed in more detail through Indicative and Detailed Business Case phases.

Funding will need to be confirmed through the inclusion of individual components of the programme in the 2018-2021 National Land Transport Plan, which is due for development for the next 3+3+3 years in June 2017.

Aspects of the programme will require implementation by other parties. The details of these funding arrangements are yet to be confirmed.

9.3 AFFORDABILITY

As indicated above, it is considered that the recommended programme will be efficient and fundable through the NLTF. Implementation would be staged over several years.

The recommended programme will be jointly progressed in coordination with Road Controlling Authorities Matamata Piako District Council, Tauranga City Council, and the Western Bay of Plenty District Council, as a number of the operational options will need support from these organisations. This approach is proposed, as several programme elements are located on the local road network, under the control of these organisations.

PART C ' DELIVERING AND MONITORING THE PROGRAMME

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10 MANAGEMENT CASE

The management case assesses whether a programme is deliverable. It tests the programme planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance. It sets out a plan to ensure that the programme benefits are realised and includes measures to assess and evaluate this. .

10.1 PROGRAMME GOVERNANCE AND REPORTING

The programme will be led by the NZ Transport Agency. Some components of the programme will require investment from other organisations including Matamata Piako District Council, Tauranga City Council, Western Bay of Plenty District Council, and the NZ Police.

A project management team will be responsible for the day-to-day management of the project. A project control group will meet fortnightly to consider and endorse key project milestones.

The project team will engage Professional Services specialists to develop Indicative and Detailed Business Cases for individual projects as required. These Professional Services resources would report directly to the in-house project team.

In addition, inputs from a number of Transport Agency teams will be required. The table below shows the responsible person in each case:

Role	Responsible Person
Programme Sponsor	Iain China
Stakeholder / Comms	TBA
Transport Planning	Iain China
Planning and Investment Case Manager	Andrew Myles
Road Safety	Adam Francis
Network Operations	Liam Ryna
Network Management	Liam Ryan
Project Services	TBA

10.2 STAKEHOLDER ENGAGEMENT AND COMMUNICATIONS PLAN

The key stakeholders for the PBC are listed below. The stakeholders have been identified based on the practical and technical details of the range of issues, interactions and alternatives/options that may be considered. Most of the stakeholders have been engaged through participation in the PBC workshops including confirming the strategic case, developing alternatives/options and the preferred option(s) workshops. They will also be included in the circulation of the related business case documents for review and agreement.

- ¿ NZ Transport Agency (Waikato / BoP Region)
- ¿ KiwiRail
- ¿ Waikato Regional Council
- ¿ Bay of Plenty Regional Council

- ¿ Tauranga City Council
- ¿ Western Bay of Plenty District Council
- ¿ Matamata-Piako District Council, also representing Waikato and Waipa District Councils
- ¿ Port of Tauranga
- ¿ Freight Logistics Action Group (FLAG)
- ¿ NZ Police
- ¿ Automobile Association
- ¿ Road Transport Association

Different stakeholders will bring specialist judgement or bring different perspectives and skills at different stages. A stakeholder plan will be developed to ensure these relationships are appropriately managed and to optimise the development of individual IBCs and DBCs.

Stakeholders will be managed through the Programme Manager, with support from the Agency's communications team, who knows the stakeholders well and will assist with organisation and preparation for this stakeholder engagement.

A Stakeholder Engagement Plan will be prepared to address the specific details for each stakeholder, including key contact person and approach for engagement.

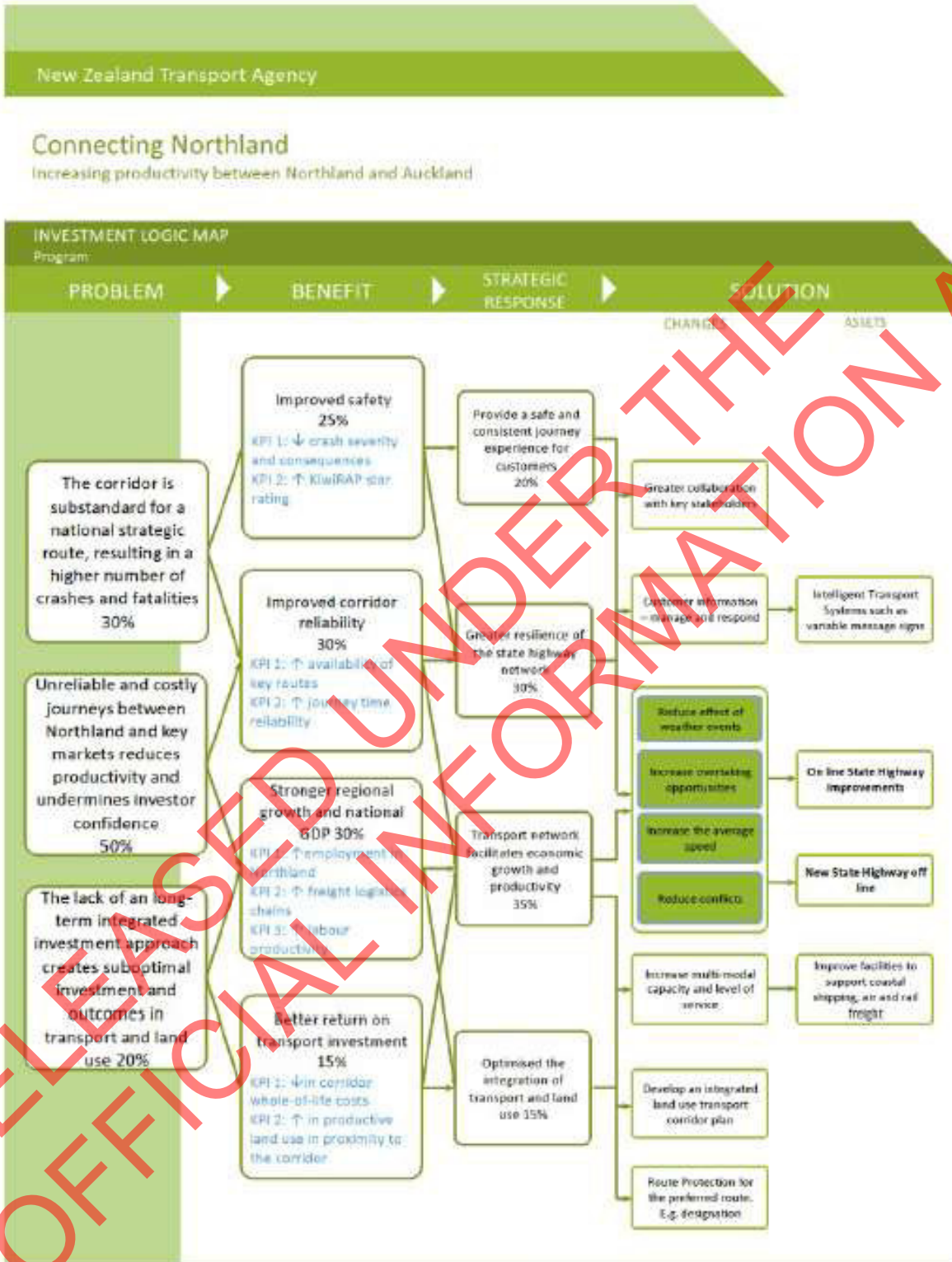
External communications will be managed through the Programme Manager, with support from the Agency's communications team, who will assist with organisation and preparation for these communications. A Communications Plan will be prepared.

10.3 PROGRAMME PERFORMANCE AND REVIEW

It is important that performance against the investment objectives and desired outcomes be reviewed following implementation of each programme element. This review may indicate that other parts of the programme may not need to be pursued or that triggers may need to be reviewed.

With respect to the SH29 Piarere to Tauriko corridor programme, it is likely that the Kaimai Loop will be delivered ahead of other programme components, based on current safety concerns. As such, a performance review hold-point is recommended following construction to determine whether triggers for further interventions remain appropriate.

APPENDIX A - INVESTMENT LOGIC MAP



Investor: Jim Seghton
Facilitator: Lauren Jewell
Accredited Facilitator: No

Version no: 1.5
Initial Workshop: 17/02/2015
Last modified by: Jim Seghton: 15/04/2015
Template version: 3.0

APPENDIX B – STRATEGY DOCUMENTS

Government Policy Statement on Land Transport 2015/16 – 2024/25

The NZ Transport Agency must give effect to the Government Policy Statement (GPS), which sets out the Government's strategic direction for investment in the land transport network. The GPS places particular importance on investment in the state highway network, in recognition of its importance to the efficient movement of people and freight, and addressing the safety problems across the network. Whilst the focus of the GPS is very much on delivering the current Roads of National Significance programme, the associated long-term results sought are intended to directly support economic growth and productivity through provision of better access to markets and employment.

Regional Land Transport Strategy 2011-2041

The current Regional Land Transport Strategy (RLTS) identifies six strategic outcomes. Four of these priorities are key to supporting the outcomes that are desired for the SH29 corridor:

- ¿ Economic development
- ¿ Safety and personal security
- ¿ Access and mobility
- ¿ Land use and transport integration

The RLTS recognises the importance of transport corridors such as SH29 to the region's growth and performance:

The transport system is integrated with well planned development, enabling the efficient and reliable movement of people and goods to, from and throughout the region. The transport system supports economic development by providing user options, applying efficient pricing mechanisms and prioritising higher value trips.:

NZ Transport Agency

National Programme Business Case - Safer Journeys (Roads & Roadsides)

The National Programme Business Case for Safer Roads and Roadsides identifies the SH29 corridor as a high-risk road requiring action over the next 10-year period. This confirms the case for change to improve road safety along the whole of this PBC corridor, and that this will contribute to reducing deaths and serious injuries.

Network Resilience - National Strategic Case

The Transport Agency is currently preparing a National Resilience Business Case to assist planning for investment to improve network resilience. This study has identified three key problem areas and associated benefits, each of which are relevant to SH29:

- ¿ Poor highway resilience may impede critical services from providing disaster response and recovery support.
- ¿ Unreliability of some highways affects businesses and undermines economic growth.
- ¿ The risky environment of some roads increases the possibility of harm to road users.

The development of the National Resilience Programme Business Case is ongoing. However current indications are that a preferred programme focus will be to keep the state highway network open or to ensure that alternative routes are always available. The indication at this stage is that priority will be given to the national routes and high volume routes. This confirms that resilience (and route security) issues along SH29 are significant and support the case for future improvement.

High Productivity Motor Vehicles – National Strategic Case

The Transport Agency has prepared a Strategic Case that outlines the case and context related to allowing heavy vehicles to operate outside the current mass and dimension limits. Beyond the Strategic Case, work to develop and assess alternative programmes to achieve the associated productivity gains is ongoing. The National Strategic Case for HPMV confirms the investment routes for the 2012-15 period and this includes SH29. Physical works have been undertaken to strengthen bridges in the corridor, allowing the route to be used by full HPMVs.

One Network Road Classification (ONRC)

The ONRC has been developed by the Road Efficiency Group (which is a collaboration between Road Controlling Authorities across New Zealand) as a classification system that identifies the level of service, function and use of road networks and state highways. It is based on criteria in relation to safety, resilience access, traffic volume and other measures. There are also Level of Service guidelines for how the different types of classification should be performing against the above criteria. The Transport Agency uses this system to classify all of the state highways in the country.

The SH29 road corridor is identified as a National (High Volume) route, the highest classification, due to its role providing access between the Bay of Plenty, Waikato and the rest of New Zealand. The National classification is the highest classification in the system and is defined as:

National: These are roads that make the largest contribution to the social and economic wellbeing of New Zealand by connecting major population centres, major ports or international airports and have high volumes of heavy commercial vehicles or general traffic. They must meet the thresholds for 3 criteria, including at least one of the following movement criteria (Typical Daily Traffic, Heavy Commercial Vehicles or Buses, Urban Peak) and at least one of the economic and social criteria (i.e. 3 in total). To be included in the high volume subset a road must meet one of the high volume criteria for typical daily traffic or HCVs.

This confirms the strategic importance of this road.

Upper North Island Freight Story

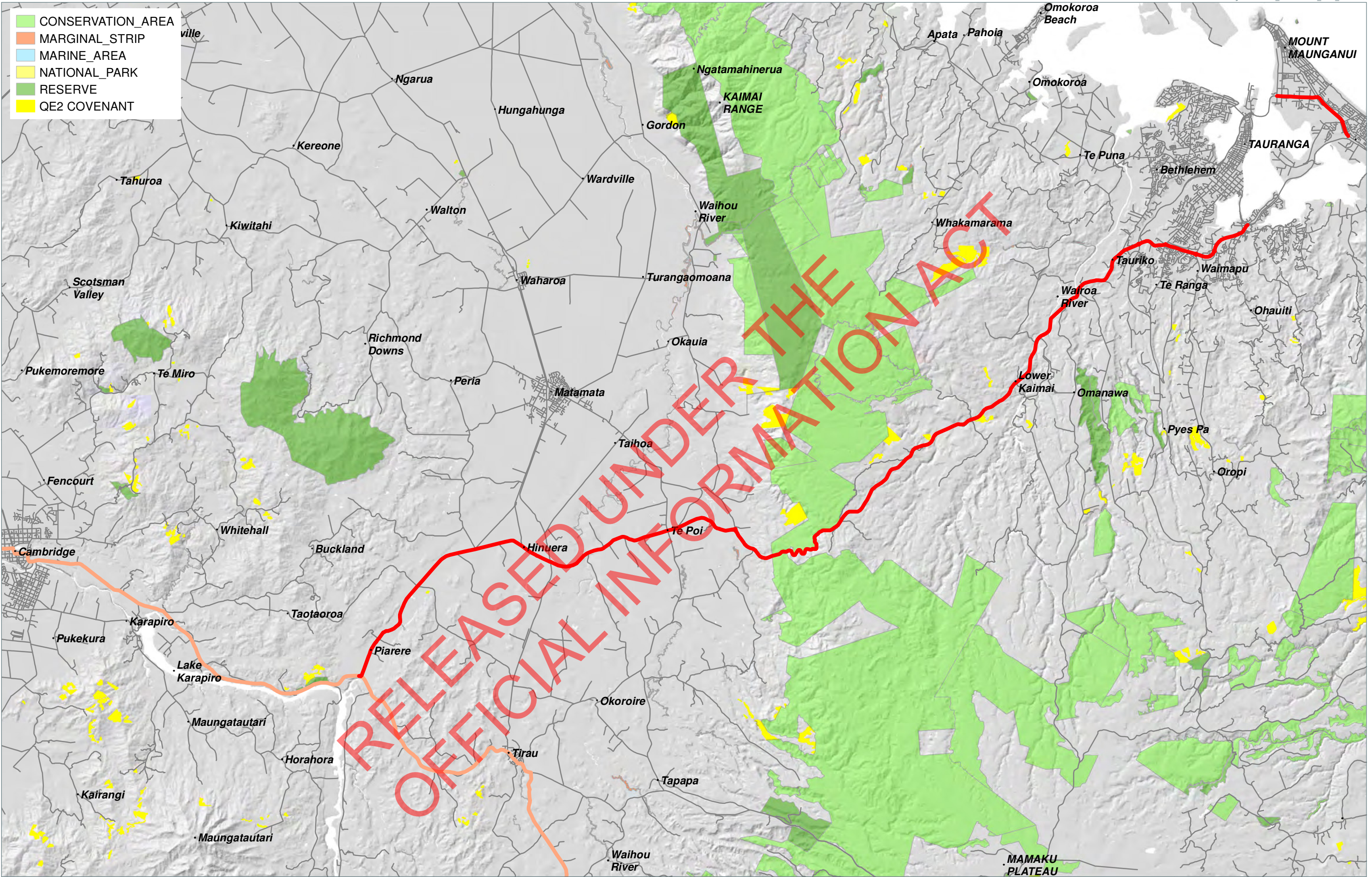
The Upper North Island Strategic Alliance undertook work in 2013 to support informed decision making on key land use, infrastructure and investment, to improve the economic performance of the Upper North Island and New Zealand. The Freight Story sought to understand the supply and demand of industrial land, promote a strategic and integrated approach towards land use and transport planning and identify constraints on the Upper North Island's strategic rail and road networks.

The problems and potential outcomes for the SH29 corridor are consistent with a number of the critical freight issues that the Upper North Island Freight Story seeks to address. The Freight Story confirmed strategic road and rail network constraints as their top critical issue and in particular, ranks highly the inter-regional road corridor (Auckland/ Waikato/ Bay of Plenty) in terms of 'scale of benefit of collective partner focus' in reducing the cost to do business.



APPENDIX C ' ENVIRONMENTAL PLANS

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Data Sources: Land Cover data sourced from the Ministry for the Environment, LCDB database version 4.

Projection: NZGD 2000 New Zealand Transverse Mercator

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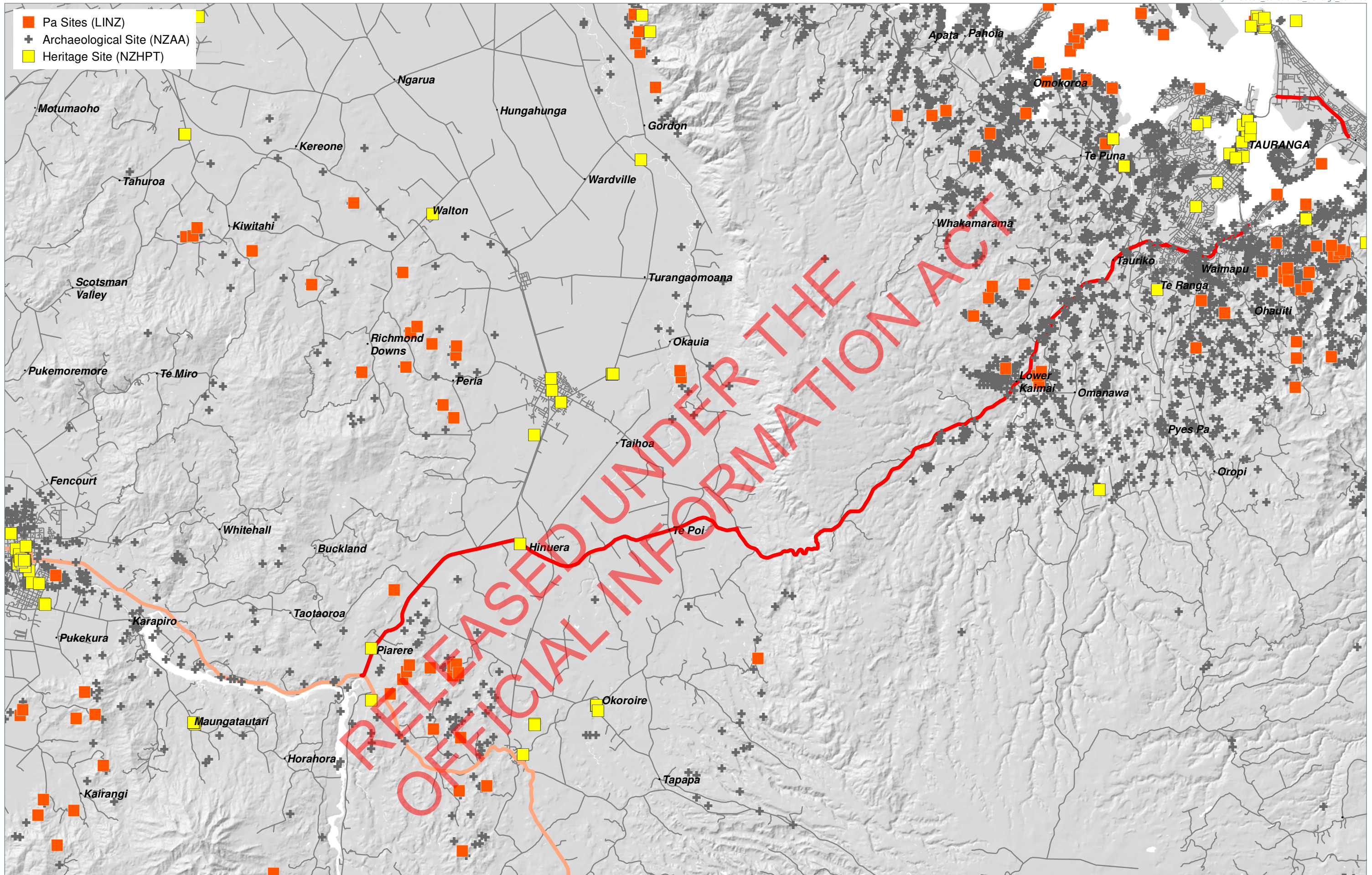
SH29 - PIARERE TO TAURIKO - OPPORTUNITIES & CONSTRAINTS

CONSERVATION AREAS

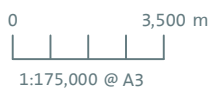
Date: 4 March 2016 | Revision: 0

Plan prepared for NZTA by Boffa Miskell Limited

Project Manager: robert.schofield@boffamiskell.co.nz | Drawn: PMo

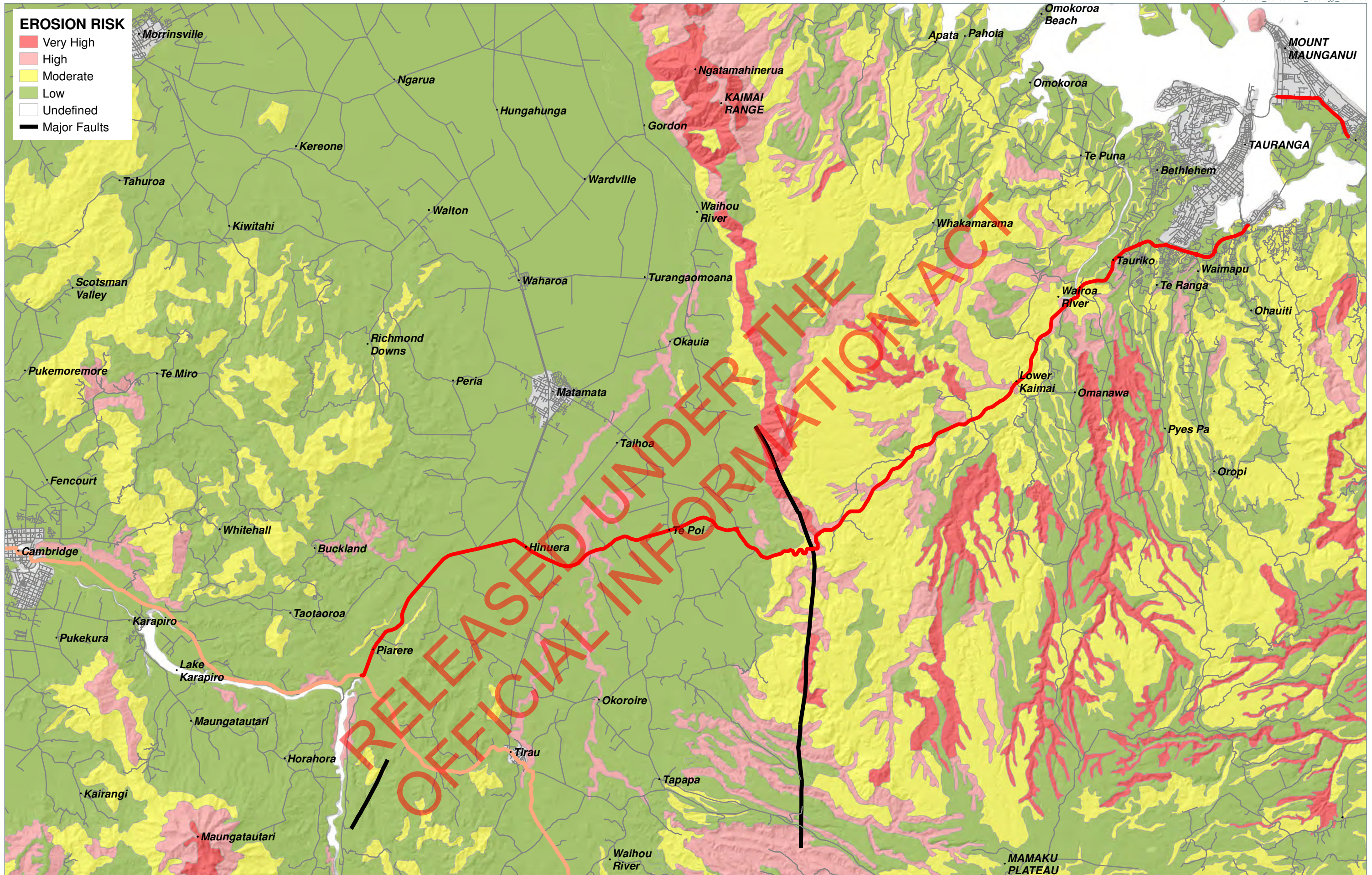


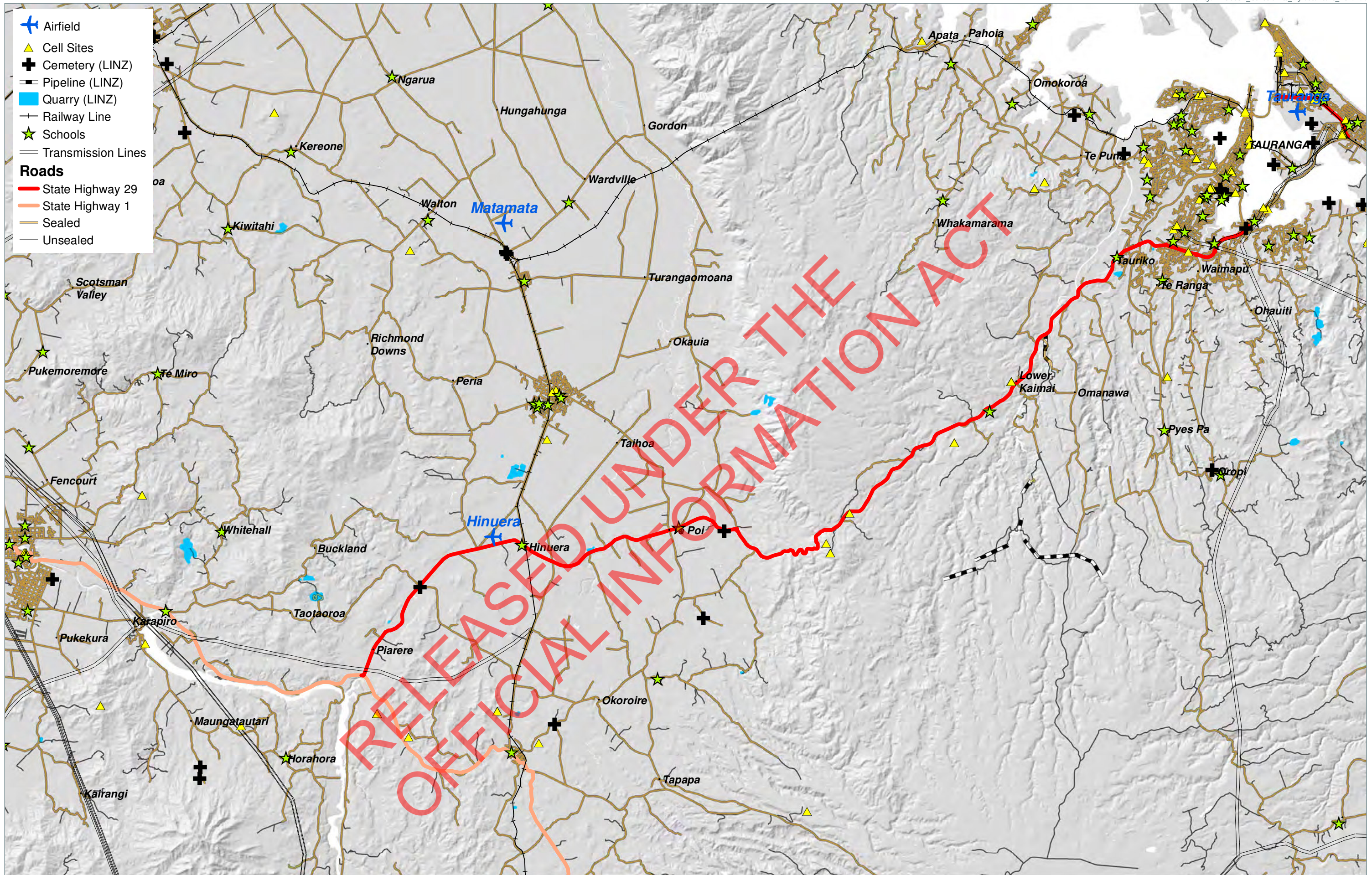
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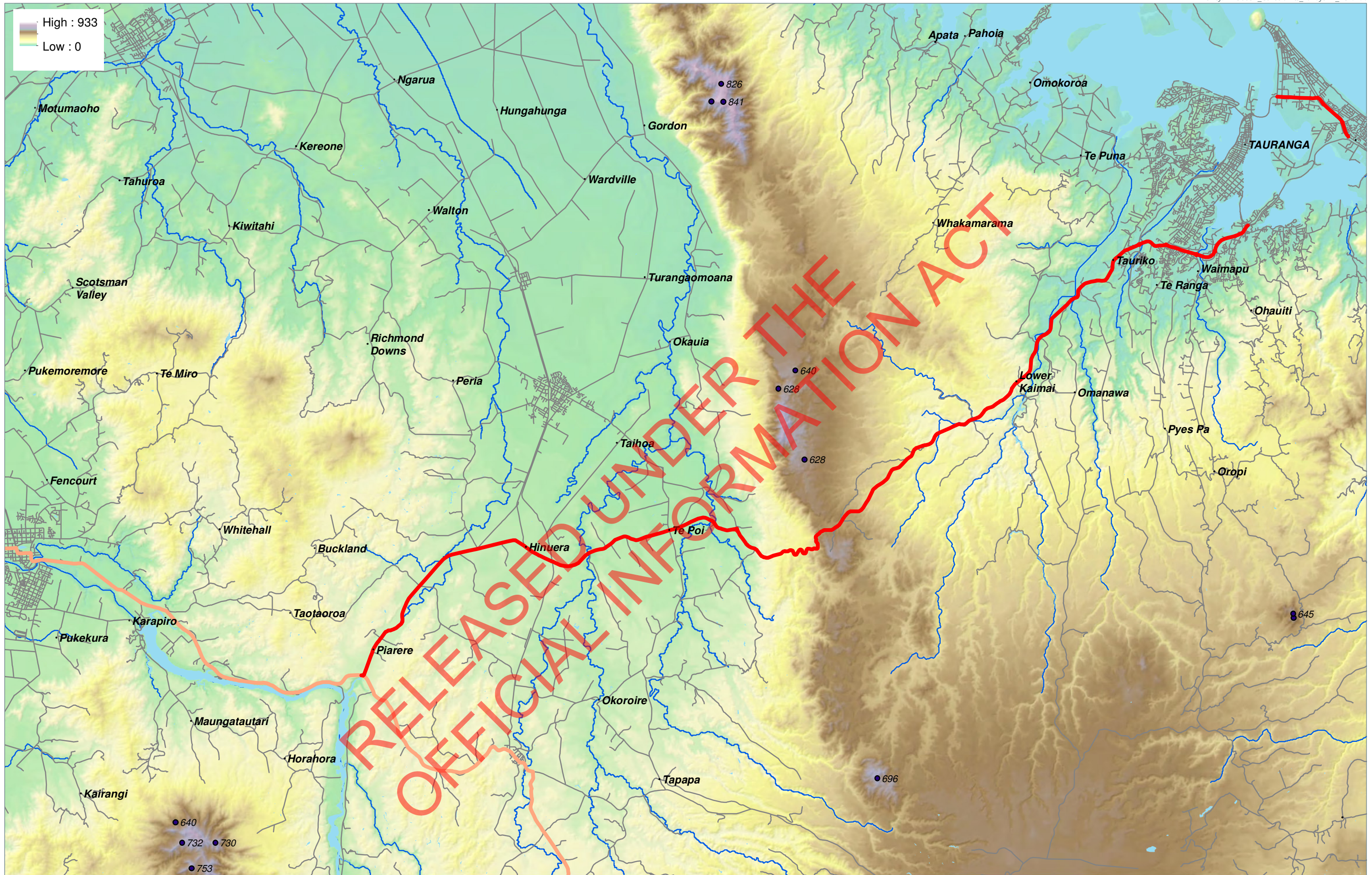
Projection: NZGD 2000 New Zealand Transverse Mercator

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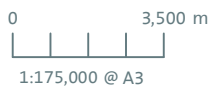




- Airfield
- Cell Sites
- Cemetery (LINZ)
- Pipeline (LINZ)
- Quarry (LINZ)
- Railway Line
- Schools
- Transmission Lines
- Roads**
- State Highway 29
- State Highway 1
- Sealed
- Unsealed

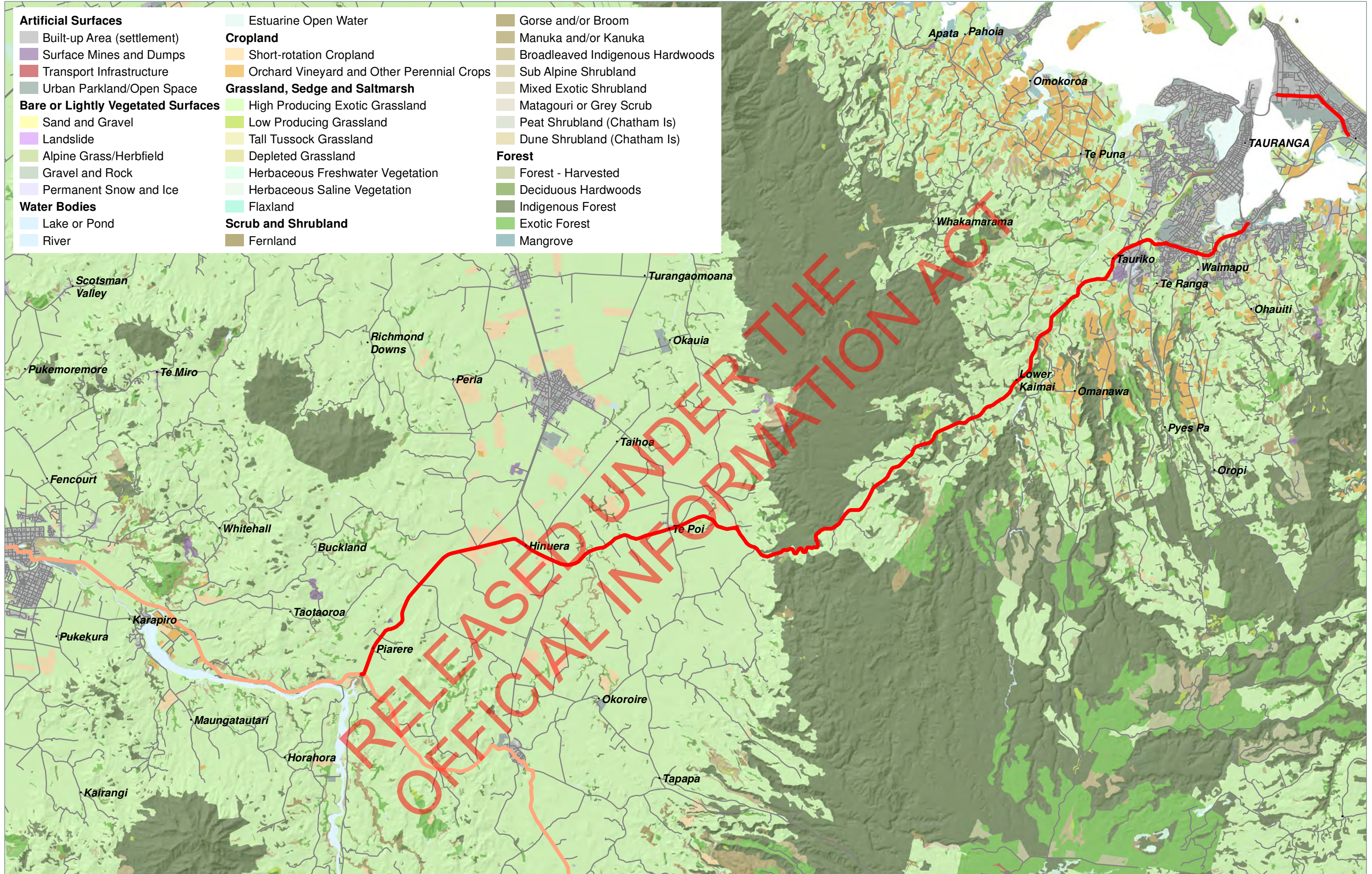


Data Sources:



Projection: NZGD 2000 New Zealand Transverse Mercator

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Artificial Surfaces

- Built-up Area (settlement)
- Surface Mines and Dumps
- Transport Infrastructure
- Urban Parkland/Open Space
- Bare or Lightly Vegetated Surfaces**
- Sand and Gravel
- Landslide
- Alpine Grass/Herbfield
- Gravel and Rock
- Permanent Snow and Ice
- Water Bodies**
- Lake or Pond
- River

■ Estuarine Open Water

Cropland

- Short-rotation Cropland
- Orchard Vineyard and Other Perennial Crops

Grassland, Sedge and Saltmarsh

- High Producing Exotic Grassland
- Low Producing Grassland
- Tall Tussock Grassland
- Depleted Grassland
- Herbaceous Freshwater Vegetation
- Herbaceous Saline Vegetation
- Flaxland

Scrub and Shrubland

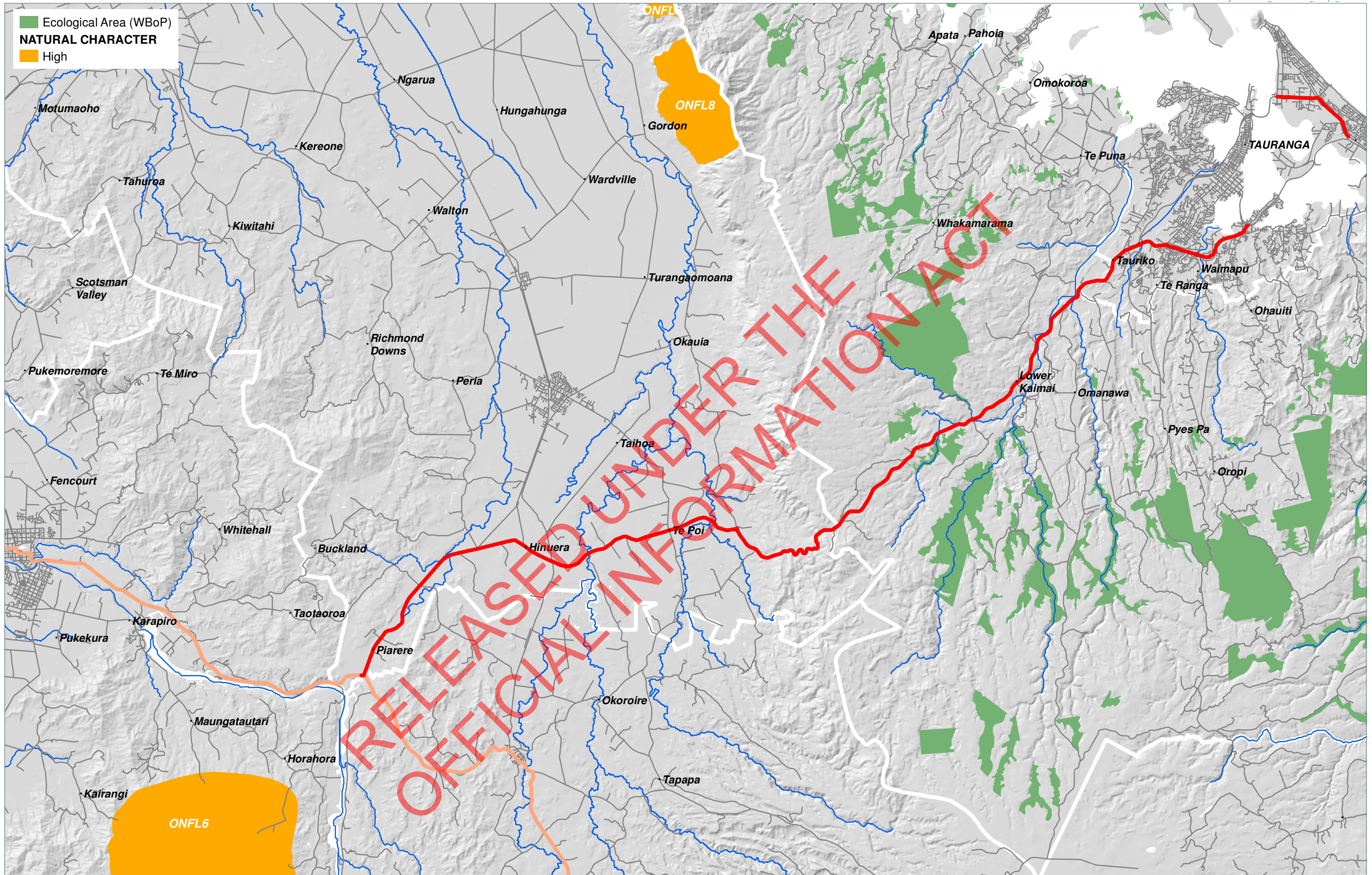
- Fernland

■ Gorse and/or Broom

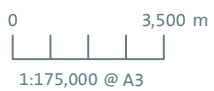
- Manuka and/or Kanuka
- Broadleaved Indigenous Hardwoods
- Sub Alpine Shrubland
- Mixed Exotic Shrubland
- Matagouri or Grey Scrub
- Peat Shrubland (Chatham Is)
- Dune Shrubland (Chatham Is)

Forest

- Forest - Harvested
- Deciduous Hardwoods
- Indigenous Forest
- Exotic Forest
- Mangrove

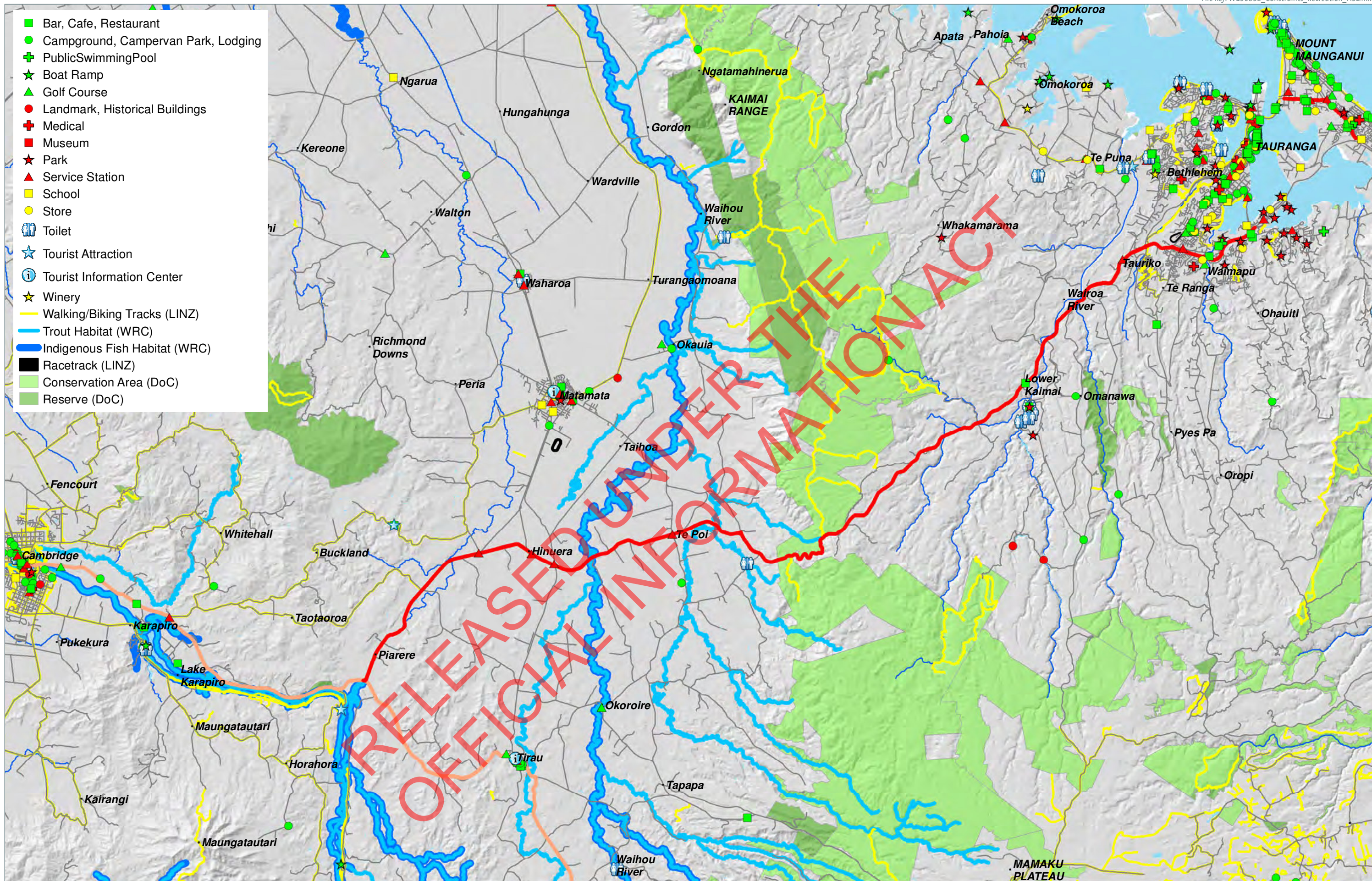


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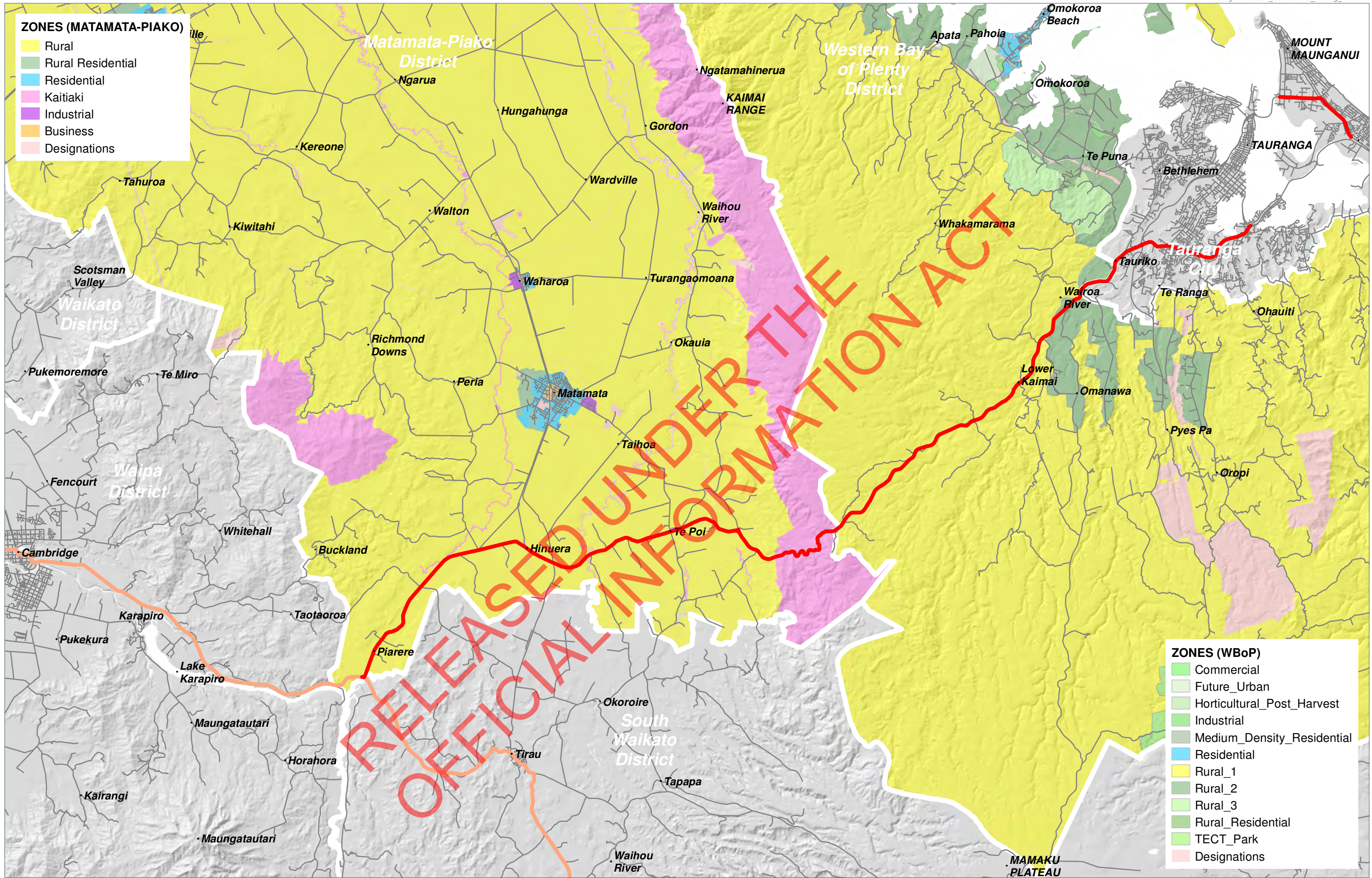


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APPENDIX D ' OPTION DEVELOPMENT AND ANALYSIS

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Contract No: NO15-075

State Highways Programme Business Case

SH 29 Piarere to Tauriko

Options and Alternatives Development and
Assessment

April 2016

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Boffa Miskell



State Highways Programme Business Case

SH 29 Piarere to Tauriko

Rev	Date	Details
A	02/05/16	Draft for comment
B	22/06/16	Appendix to Programme Business Case

Revision Details			
Author:	I Dowling	Date: 26/4/16	Signature:
Reviewer:	T Innes	Date: 29/04/16	Signature:
Approver:	D McCoy	Date: 02/05/16	Signature:

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Document owners
WSP PB New Zealand Limited Commute Transportation Consultants Limited Boffa Miskell Level 9 Zurich House 21 Queen Street Auckland 1023 PO Box 3935 Auckland 1140 New Zealand Tel: +64 9 377 9941 Fax: +64 9 377 9946

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1 SH29 Option Development and Assessment

1.1 Introduction

This note summarises the Programme Business Case option development phase for the SH 29 Piarere to Tauriko Corridor. This includes the development of the long list of options to address the problem statements with the stakeholder group, development of assessment criteria and the application of this assessment criteria against the option long list.

The purpose of this report is to set out the process adopted, the long list options identified and the resultant ranking following the assessment.

1.2 Process

The SH 29 Piarere to Tauriko PBC will be a programme of works to address the problems identified in the corridor. The agreed problem statements and investment objectives for the corridor are set out in the Part A - Strategic Case. The ultimate programme will almost certainly be a package comprising a number of individual options that will vary in scale, timeframe and cost.

To ensure that appropriate programmes were identified, a long list of improvement options and interventions was initially developed and assessed at a high level against agreed criteria. These criteria were taken from NZ Transport Agency guidelines for option evaluations for business cases. This allowed the options to be ranked. The option ranking informed the development of programmes for further and more detailed assessment in the next phase of the PBC development.

The methodology adopted for this process was:

- Initial development of options by project team
- Workshops with Transport Agency technical specialists to further develop the long list
- Development of options with stakeholders at workshop on 17th March 2016
- Preparation of assessment criteria by project team
- Presentation and endorsement of assessment criteria at stakeholder workshop on 17th March 2016
- Assessment of options and ranking by project team
- Endorsement of assessment by wider team

The assessment criteria used are shown in Table 1 overleaf.

Objectives	Considerations	Measures
Investment Objective 1	We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures, resulting in a delay of more than 2 hours by 2030	Assessment of Travel time and VOC for freight vehicles
Investment Objective 2	We will improve the cost of travel of SH29 such that it is the preferred route for road based freight vehicles between Tauranga and Pokeno by 2030	Reduced deaths and serious injuries on the corridor
Investment Objective 3	We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths by 50% and serious injuries by 25% by 2030	Reduced volume, duration and impact of SH1 closures
Implementability		
Feasibility	How straightforward is it to implement this alternative / option?	Level of complexity. I.e. tunnelling, community consultation, challenging ground conditions...
	Are innovative technologies involved?	Level of innovation
	Are there significant hazards that may pose a health, safety in design risk?	Level of hazards
	Are there likely to be property risks to delivery?	Impact of project on property
	Are other infrastructure providers affected?	Other organisations beside NZTA
	Are there consenting risks that could affect delivery or cost risk?	Level of consenting risk for option
	Are there factors likely to affect the ability to operate / maintain the option over its projected life without major additional costs?	Maintenance and operation costs
Affordability	What are the funding risks of the alternative/option?	Included in the RLTP to no funding allocation
	Can the alternative be funded traditionally? (economic efficiency)	Estimated economic efficiency of project
	Are alternative funding mechanisms required?	yes / no
	Are there cashflow risks that might affect the delivery programme?	yes / no
	Are there ongoing operating cost risks?	Level of operating costs
	Are operating subsidies required? How will these be funded?	Tolling / PQP procurement
Public / Stakeholders	Has the alternative been made public?	Yes / no

Objectives	Considerations	Measures
	How acceptable is the alternative?	Level of anticipated acceptance
	Are there real or anticipated objections from the community or stakeholders?	Level of anticipated acceptance by stakeholders
Assessment of Effects		
Cultural heritage, environmental, social and community wellbeing	Are there any sites or features (including their setting) of significance to Maori (archaeological or existent) affected?	
	Are there any historic heritage places (including their setting) (e.g. archaeological or buildings, sites, remnants) affected?	
	Are any (first tier) outstanding landscapes or natural features, or (second tier) significant/special landscape or natural features affected?	Environmental mapping
	Are there any ecological areas, or areas with habitat value (including large areas of native vegetation) affected?	
	Are there any coastal marine areas, wetlands, lakes, rivers, streams or their margins affected?	Environmental mapping
	Are there any areas of contaminated land affected?	
	Are there community facilities (park/schools/hospitals etc.), or residential or other sensitive land uses in the area that could be affected by adjacency effects (e.g. noise, disruption, vibration, air quality etc.)?	Assessment of proximity to settlements
	Are there potential effects from hazards or risks (including from future climate change) from erosion, flooding, fault lines, sea level rise	
	Extent to which the option integrates transport and land use to make best use of existing networks and infrastructure.	Extent of integration with land use aspirations
	Are there any communities affected by reduced cohesion, connectivity or accessibility?	Qualitative assessment of access to the road network
Are there opportunities to enhance the active travel modes - cycling and walking and/or linkages to other national or regional recreational cycle networks for longer distance cyclists?	Qualitative assessment of access to alternative modes	

Objectives	Considerations	Measures
	Extent and significance of land take, severance; negative and positive opportunities	Severance / connectivity
Economy	How will the alternative/option affect traffic volumes?	Level of growth catered for?
	Does the option provide an opportunity to reduce vehicular travel time on SH1 between the Auckland and Northland regions?	Qualitative evaluation
	Does the option improve journey time reliability?	Qualitative evaluation
	Are there gainers and losers (modes / regions)? What is the overall effect?	Qualitative assessment of overall benefits to surrounding communities
	Does the option provide for more efficient freight supply chains between the Auckland and Northland regions	Route quality
	How well does the option integrate with land use with reference to regional growth strategies	Consistency with regional growth strategies
	How well does the option enhance the development potential of adjacent land / attract new jobs / help existing businesses?	Qualitative assessment of access to land use
	How well does the option preserve the function of SH1 as a National High Volume route, consistent with ONRC	Qualitative evaluation
	How well does the option address route security, resilience and flexibility	Extent to which the option improves route resilience
Safety	How will the alternative enhance safety for different types of transport users?	Alternative mode safety
	Will it involve gainers and losers in terms of safety?	Adverse safety effects from the option?
	Are there impacts on personal safety / security?	Assessment of the reduction in crash risk
	What is the impact on fatal / serious injuries?	Assessment of reduction in DSI

Table 1: Evaluation Assessment Framework

The assessment criteria have been grouped into “headline categories”, relating to Investment Objectives, Implementability and an assessment of effects and opportunities. This also includes a criteria for an ‘Integrated Transport’ network, relating to support of rail mode share for freight journeys.

The ability for an option to be implemented was further broken down into feasibility, affordability and public / stakeholder support. The assessment of effects and opportunities was broken down into cultural heritage, environmental, social and community wellbeing, economy and safety considerations.

At the long list stage, options have been considered against these headline categories, while the more detailed considerations will be used to evaluate the performance of programmes, once these are developed.

1.3 Option Long List

A list of 150 options were developed to address the corridor problems, ranging from improved traveller information and education, through to major infrastructure improvements. The key options identified were classified into the following categories:

- Road infrastructure projects (online and offline capacity improvements)
- Rail infrastructure projects
- Land use integration (access rationalisation, township treatments)
- Public transport and alternative modes for freight
- Cycling and walking
- Tourism interventions (stopping places, rest areas, signage)
- Improved signage and wayfinding (including VMS)
- Upgrades to alternative routes (including HPMV capacity)
- Minor safety works (corner realignments, wire rope medians, shoulder widening)
- Maintenance
- Police enforcement
- Driver education
- Other improvements

The full list of options is included in Appendix A.

2 Option Assessment

An initial assessment was undertaken for each 'main' criterion. A seven point assessment scoring system was used, as outlined below. This is a coarse system given the broad nature of the assessment, however was considered appropriate at this long list stage.

Figure 2-1: Assessment Criteria

Correspondence Table		
+++	3	+++
++	2	++
+	1	+
0	0	0
-	-1	-
--	-2	--
---	-3	---

The following key conclusions that can be drawn from the application of this scoring to the previously outlined considerations are summarised in the following sections.

2.1 Investment Objective 1: RESILIENCE

Options that were considered to provide greater resilience were ranked higher. Offline improvements were ranked higher (due to enhanced alignment and route design options) with the tunnel options the highest rating (+++) and other offline options allocated ++.

Options that predominantly enhanced the existing route were given a + rating.

2.2 Investment Objective 2: EFFICIENCY

The level of potential travel time improvement was estimated for each option. No specific travel time analysis was undertaken, rather an engineering judgement was made based on a comparison of current speeds with the potential improvement provided by the option. The best performing options were the road tunnels followed by off line enhancements. Some options were given a negative rating as they were likely to increase travel times over current levels.

Options were evaluated with respect to the scale and likely effect of the safety improvement. At this stage a detailed crash reduction analysis was not undertaken, but engineering judgement was applied by the experienced evaluation team.

Offline motorway standard improvements were given a ++ rating and localised safety improvements a single +. No options were considered to make safety worse than the current situation. Operational solutions were largely given a single + due to general improvement offered.

2.3 Investment Objective 3: SAFETY

Options were evaluated with respect to the scale and likely effect of the safety improvement. At this stage a detailed crash reduction analysis was not undertaken, but engineering judgement was applied by the experienced evaluation team.

Offline expressway standard improvements were given a +++ rating and localised safety improvements a single +. No options were considered to make safety worse than the current situation. Operational solutions were largely given a single + due to the general level of improvement offered.

2.4 Implementability

An assessment was made with respect to the likely ability to implement an option. Consideration was given to the ease with which resource consents could be obtained and also practicality.

Tunnels were scored the lowest at ---, with online improvements – and options between these two -. Location specific constraints were considered, for example it was more feasible to widen on the flat section of SH29 than over the Kaimai Ranges

2.5 Affordability

Cost estimates for new options were not developed, although for most of the larger options feasibility cost estimates were available from previous work. Where this information was unavailable, engineering judgement was used to assess whether an option had a likely cost of less than \$10M, or above \$300M.

Options less than \$10M were given a – rating, options above \$300M a --- rating and those in between were --.

2.6 Stakeholders

An assessment of the likely reaction from external organisations and the wider community to an option was made. This included the general public as well as key stakeholders, including freight users.

It was acknowledged that options would have differing perspectives from the public. Most options were seen as being positive in the public's mind. However there were some options that were seen as negative, being those that artificially forced driver behaviour (such as changing road user charges). It was also considered there would be a slightly negative view taken of the roadside improvement options on the flat section that would impact on the settlements along the route and options for minor works over the Kaimai Hills, due to public and stakeholder expectations.

2.7 Assessment of Effects: Cultural, Social and Environmental

A high level assessment of the potential effects on the cultural, social and environmental values of the corridor was undertaken. Where the option had the potential (but no certainty) that it would adversely affect some value (as it would depend on the location, extent and nature of the particular work), it was scored with a – rating. Where it was certain that a value would not be adversely affected or, alternatively, not be enhanced, it was scored with a 0 rating.

Given the nature of the corridor, the principal areas of effects were in relation to the townships and/or the natural values of the Kaimai Range. In general, the greater the scale of physical work required, the more significant the potential effects, recognising that route selection and/or detailed design could reduce the level of impact.

2.8 Economy

The same scores as those given for the efficiency investment objective 1 were given to this criterion.

2.9 Safety

The same scores as for the safety investment objective 3 were given to this criterion.

2.10 Key Assessment Outcomes

The application of this assessment criteria to the options identified the following key outcomes:

→ Generally, the higher cost options had greater benefits, but also greater effects.

- With such a broad range of options and a relatively limited number of assessment criteria, the ability to distinguish between options is difficult. This is shown in the cost assessment where options between \$10M and \$300M have the same score.
- Two pedestrian options were assessed to not have a noticeably positive effect on any of the investment objectives
- The tunnel options through the Kaimai Hills scored the highest. The cost impact of these options is not a significant factor at this stage of the evaluation
- Offline schemes through the Kaimai Ranges were the next best performing options
- Other more localised offline improvements were next best performing, along with low cost way-finding options.
- The worst performing option was relocating the Port of Tauranga, closely followed road users charges on SH29 and restricting heavy vehicles from SH2

Generally, the assessment has shown that the options which require the greatest investment deliver the most benefits; the better performing options against each of the investment objectives will go forward to the development of programmes for improving the corridor. It is at this stage that the economic efficiency of each of the options will be quantified.

Three options do not deliver against any of the investment objectives and therefore represent critical failures against these objectives. These options are relocating the Port of Tauranga and the two pedestrian options. It is recommended that these options are discarded and not considered as part of the programme development phase.

The option long list assessment framework is shown in Appendix B.

3 Option Evaluation Summary by section

This section summarises how options within a route section performed with respect to the assessment criteria described above.

3.1 State Highway 1 to State Highway 24

Piarere to Tauriko Programme Business Case	DoMin																
	EA	SE	AE	AI	NA	NE	NC	NO	NR	NH	NE	NC	NR				
Bypass Te Poi - lots of side friction crashes																	
Te Poi / Hmuera - locate new residential to maximise safety - e.g. on side of road only																	
Rural intersection actuated warning sign (RIAWS), SH27, SH28, Te Poi Road, local roads, local accesses																	
Parallel service roads - farm machinery: SH1 - SH24, Kaimias																	
SH27 / SH29 - roundabout																	
SH27 / SH29 - grade separation																	
SH27/SH29 - SH27 overpass of SH29 (or vice versa) in longer term with flip planning + alternative route for local traffic turning left/right																	
SH1 & SH29 - deceleration lanes, minor improvements																	
Totman Road / Totman Roads - minor improvements																	
Hopkins / Puketutu Road - crash location - visibility problem? Review sight distance, warnings, visual cues, turning space																	
2+1, safe system cross section: full corridor length OFFLINE																	
Expressway 2+2 cross section: full corridor length OFFLINE																	
New SH1/SH29 alignment - SH1N Karapiro to SH29 at rail crossing Hindera																	
Corner easing																	
2+1, safe system cross section: full corridor length ONLINE																	
Expressway 2+2 cross section: full corridor length ONLINE																	
Summary																	
Objective 1 – reduce full closures more than 2 h	0	0	0	0	0	0	0	0	0	0	0	+	++	+	++	++	
Objective 2 – reduce cost of travel on SH29	0	+	+	0	0	+	+	+	+	+	+	+	++	+	0	++	
Objective 3 – reduce deaths and serious injuries	0	+	+	+	+	+	+	+	+	+	+	++	++	++	++	++	
Feasibility	0	-	-	0	0	0	0	0	0	0	0	--	--	-	-	-	
Affordability	0	-	-	0	-	-	-	-	-	-	-	-	-	-	-	-	
Public / Stakeholders	0	-	-	+	+	+	+	+	+	+	+	++	++	+	+	++	
Cultural, Social and Environmental Effects	0	-	-	0	-	0	0	+	-	0	0	--	---	-	-	-	
Safety	0	+	+	+	+	+	+	+	+	+	+	++	++	++	++	++	
Economy	0	+	+	0	0	+	+	+	+	+	+	+	++	+	0	++	
Ranking	137	149	149	48	119	40	86	87	64	28	28	105	5	15	57	12	2

State Highway 29 intersects with State Highway 1 on the journey from Cambridge to Taupo, providing a link to the Kaimai Ranges and Tauranga. This section of the trip is characterised by low traffic volumes, low accident rates and reasonably high speeds. The terrain is flat the route mostly straight with some out of context bends. It passes through two minor settlements.

The highest ranking option for this section was an expressway standard upgrade online or offline, which ranked well due to the benefits and improvements the upgrade would achieve, such as travel time and safety improvements. Other full corridor upgrades (online or offline) were considered beneficial to this section.

Intersection upgrades to SH27 junction, Totman Road and Hopkins road were also considered as important elements to improving safety and efficiency along this section of the corridor, although did not rank as highly against the investment objectives. Corner easing was considered an highly beneficial addition to improvements on this section.

3.2 State Highway 24 to State Highway 28

Piareere to Tauriko Programme Business Case	DoMin	Review pavements and upgrade deteriorated sections: Kaimais (west)											
		12T	12R	12Q	12P	12O	12N	12M	12L	12V	12W	12X	
		SH24 / SH29 - change priority to through movement for SH29 (short term)											
		SH24 / SH29 - roundabout (medium term)											
		SH24 / SH29 - grade separation (long term)											
		SH28 / SH29 intersection - minor turning movement restrictions and signage, vehicle approach warning signal											
		SH28 / SH29 Grade separation longer term -											
		ATP / high performance pavement markings: Kaimais											
		1+1, safe system cross section: full corridor length ONLINE											
		2+1, safe system cross section: full corridor length ONLINE											
		Expressway 2+2 cross section: full corridor length ONLINE											
Summary													
Objective 1 – reduce full closures more than 2 h	0	+	0	0	0	0	0	+	+	++	++		
Objective 2 – reduce cost of travel on SH29	0	0	+	+	+	+	+	0	+	+	+	++	
Objective 3 – reduce deaths and serious injuries	0	+	+	+	+	+	+	+	++	++	++	++	
Feasibility	0	0	0	0	0	0	0	-	-	-	-	-	-
Affordability	0	-	-	-	-	-	-	-	-	-	-	-	-
Public / Stakeholders	0	+	+	+	+	+	+	+	+	+	+	++	
Cultural, Social and Environmental Effects	0	0	0	-	-	-	-	0	-	-	-	-	-
Safety	0	+	+	+	+	+	+	+	++	++	++	++	
Economy	0	0	+	+	+	+	+	0	+	+	+	++	
Ranking	137	48	28	78	105	78	105	89	20	12	2		

This section of the route gradually builds in grade as it connects the flatter terrain areas of the Waikato region to the Kaimai Hill section of the route. It also connects State Highway 24 (from Matamata, State Highway 27) and State Highway 28 (to Tirau and Taupo).

The best scoring options are generally consistent across the corridor, and include full online upgrade to 2+1 or 2+2 lane arrangements. The intention is that this section of the corridor would integrate with the upgrades proposed for the next section on the Kaimai Hills. These upgrades are considered to provide the greatest efficiency and safety improvements.

Other noteworthy options include a potential safety upgrade to the existing alignment, and improvements to the intersections with State Highway 28 and 24, such as a priority realignment at State Highway 24.

3.3 State Highway 28 to Kaimai Summit

Piarere to Tauriko Programme Business Case	DoMin	Review pavements and upgrade deteriorated sections: Kaimais (west)														
		2C	3C	4C	4D	4L	4M	4S	4T	4U	4V	4W	4X	4Y	4Z	
		Better resourced emergency response / vehicle access plan for Kaimais / SH29, diones for post crash investigation time														
		(Warning) Vehicle Messaging Signs (VMS): Deteriorated conditions during weather events / maintenance, closure/incident warning message, advance notice of closure eastern side of Kaimais (Speed) Vehicle Messaging Signs (VMS): Reduced speed limits during incidents/weather (continue from trial), current speed feedback														
		Replace all roadside fencing with frangible fences														
		Regular stopping / breakdown bays: Kaimais														
		ATP / high performance pavement markings: Kaimais														
		Kaimai corners bypass loop - SH28 to Kaimai summit (2+2)														
		Kaimai Tunnel - Southern alignment (SH29 Tauriko to lower Kaimais)														
		Continuous slow vehicle lanes - Kaimais														
		Median barrier: SH28 - Kaimai Summit														
		Corner easing - Kaimais western side														
		2+1, safe system cross section: full corridor length ONLINE														
		Expressway 2+2 cross section: full corridor length ONLINE														
Summary																
Objective 1 - reduce full closures more than 2 h	0	+	++	0	0	0	0	0	+	++	+++	+	+	+	++	++
Objective 2 - reduce cost of travel on SH29	0	0	0	0	0	0	0	0	0	+	++	+	0	0	+	++
Objective 3 - reduce deaths and serious injuries	0	+	++	+	+	+	+	+	+	++	+++	++	++	++	++	++
Feasibility	0	0	0	0	0	0	0	0	-	-	---	-	-	-	-	-
Affordability	0	-	--	0	0	0	0	0	-	-	---	-	-	-	--	--
Public / Stakeholders	0	+	0	+	+	+	+	+	+	+	++	-	+	+	+	++
Cultural, Social and Environmental Effects	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-
Safety	0	+	+	+	+	+	+	+	+	++	+++	++	++	++	++	+++
Economy	0	0	0	0	0	0	0	0	0	+	+++	+	0	0	+	++
Ranking	137	48	33	48	48	123	119	89	10	4	24	66	57	12	2	

The western side of the Kaimai Hill is the steepest, slowest part of the route with the highest rate of serious crashes. The grades on this section are up to the range of 8-11% and are combined with high degree turns in successive 'S' shape bends. Many of the problems identified on the route are concentrated over this section, which is also constrained by surrounding challenging topography.

The options which scored the best on this section include an online 2+2 upgrade, the Kaimai Tunnel option and the Kaimai Loop (offline 2+2) alignment. These options dealt with safety, efficiency and resilience as well as a number of other outcomes. The Kaimai Loop (an offline option) was considered to be more effective in dealing with the problems, as opposed to an online upgrade.

Other noteworthy options include the trialled VMS messaging on the Kaimai Hills, pavement strength and quality upgrade and longer (continuous) slow vehicle lanes. It was considered that these options would significantly improve safety and resilience on the corridor.

3.4 Kaimai Summit to Tauriko

Piarere to Tauriko Programme Business Case	DoMin																	
	5C3	5C4	5C5	5C6	5C7	5C8	5C9	5C10	5C11	5C12	5C13	5C14	5C15					
	Kaimai School: High risk school due to traffic environment. Relocate school access away from SH	Better resourced emergency response / vehicle access plan for Kaimais / SH29, drones for post crash investigation time	(Warning) Vehicle Messaging Signs (VMS): Deteriorated conditions during weather events / maintenance, closure/incident warning message, advance notice of closure, eastern side of Kaimais	(Speed) Vehicle Messaging Signs (VMS): Reduced speed limits during incidents/weather (continue from trial), current speed feedback	Regular stopping / breakdown bays: Kaimais	Side barriers: Kaimais eastern side, high-risk locations	Kaimais eastern side - property accesses and local road intersections - improve sight lines, visibility and staged turning / right turn lanes	Ruahihi Road and SH29, reviews speed/ sight distance at road cres to SH29, signage and markings OR realignment of intersection	Bek Road / SH29 - Right turn lanes into Bek Road and opposite commercial properties	Poripori Road Right turn bay	Kaimai School: left out / left in, review safety of passing lane / merge lane	Kaimai Tunnel - Southern alignment (SH29 Tauriko to lower Kaimais)	Wire rope: Kaimai Summit to Tauriko	Passing lanes: Kaimais Summit to Tauriko, longer lanes - Kaimais steep section, SH1 - SH24, Hopkins Road - Totman Road WB	Slow vehicle lanes for all downhill sections >6%	2+1, safe system cross section: full corridor length ONLINE	Expressway 2+2 cross section: full corridor length ONLINE	
Summary																		
Objective 1 – reduce full closures more than 2 h	0	0	++	0	0	0	0	0	0	0	0	0	++	+	+	++	++	
Objective 2 – reduce cost of travel on SH29	0	0	0	0	0	0	0	+	+	+	+	+	++	0	+	+	++	
Objective 3 – reduce deaths and serious injuries	0	+	++	+	+	+	+	+	+	+	+	+	++	++	++	++	+++	
Feasibility	0	-	0	0	0	0	0	0	0	0	0	0	+	+	+	+	-	
Affordability	0	-	-	0	0	0	0	-	0	-	-	-	+	+	+	+	-	
Public / Stakeholders	0	+	0	+	+	+	+	+	+	+	+	+	+	+	+	+	++	
Cultural, Social and Environmental Effects	0	-	0	0	0	-	0	-	-	-	0	0	-	-	-	-	-	
Safety	0	+	++	+	+	+	+	+	+	+	+	+	++	++	++	++	++	
Economy	0	0	0	0	0	0	0	+	+	+	+	+	++	0	+	+	++	
Ranking	137	137	33	48	48	119	48	44	44	44	28	28	4	66	23	24	12	2

The long stretch of corridor between the Kaimai summit and Tauriko is particularly problematic section of the corridor due to the high rate of serious crashes, weather activity, lack of viable alternative routes and resulting resilience problems. The efficiency on this section is considered sub-standard due to discontinuous passing opportunities, high degree and frequent curves and road narrowing coupled with a high proportion of heavy vehicle activity. The topography on this section also constrains options for the corridor.

The best scoring options include a full expressway standard (2+2) upgrade of the corridor, and the Kaimai Hills tunnel. These ultimately deal with all of the problems, notably reducing crashes and improving travel times.

Other noteworthy options included more slow vehicle lanes on steeper sections of the corridor and a complete 2+1 upgrade allowing for more passing opportunities, safety upgrades at specific intersections and access points such as the Kaimai School and Ruahihi Road. It was assumed that upgrades which addressed safety concerns also had the potential to improve efficiency and reliability of the corridor.

3.5 Operational and Corridor-wide strategies

Piarere to Tauriko Programme Business Case	DoMin	Safer speed areas	Stopping places	Stronger pavements	Skid resistant pavement	Consistent signage	Upgrade Road Markings	Shoulder widening	Self-explaining speed environments	Bridge/culvert widening strategy	Havey vehicle run off bays
		IA	IB	IC	ID	IE	IF	IG	IH	II	II
Summary											
Objective 1 – reduce full closures more than 2 h	0	+	0	0	+	0	0	+	+	+	+
Objective 2 – reduce cost of travel on SH29	0	-	+	0	0	0	0	0	+	0	0
Objective 3 – reduce deaths and serious injuries	0	++	+	+	++	+	+	+	++	+	+
Feasibility	0	0	0	-	0	0	0	-	-	0	0
Affordability	0	0	-	--	-	0	0	-	--	-	-
Public / Stakeholders	0	+	++	+	+	+	+	0	+	0	+
Cultural, Social and Environmental Effects	0	0	0	0	0	0	0	-	0	-	-
Safety	0	++	+	+	++	+	+	+	++	+	+
Economy	0	-	+	0	0	0	0	0	-	0	0
Ranking	137	26	10	137	15	78	78	137	131	131	105

There were several operational or corridor-wide strategies that were considered to be critical to include as either ‘design principles’ or for consideration in view of partnerships with other operators, e.g. police and emergency services. This are in response to observations about the corridor journey, such as inconsistent road environments, barely visible warnings and the needed for facilities which encourage use of the corridor, as well as safety.

Some of the best scoring options include skid resistant pavement and the inclusion of stopping places (like picnic area rest stops) which may be integrated with other upgrades. Speed reductions were also considered a viable opportunity.

As listed in the specific sections of the corridor, police enforcement is also an opportunity to influence safety on the corridor and promote improved resilience.

Appendix A Option Long List

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Ref #	Section / Category	Option Description
0	Do Minimum	
Operational Strategies		
1A	Full-corridor	Safer Speed Areas' - speed limit reductions at high risk sections, e.g. local settlements
1E		Upgrade signage: consistency, to standard, high performance
1F		Upgrade road markings: consistency, to standard, high performance
1G		Shoulder widening
1H		Self-explaining speed environments: online and road-sides
1I		Bridge/culvert widening strategy
1K		Consistent messaging through settlements - signage and linemarking
1B	Stopping / resting places:	Kaimai Summit Lower Kaimai Hinuera / SH1
1C	Kaimai Hills west	Upgrade pavement to Asphalt with increased design life
1D		Targeted skid-resistant pavement surfacing on Kaimai Hills west
1J	Kaimai Hills	HV emergency run-off bays at steep downhill sections
Operations and Maintenance		
2A	Kaimai Hills	Local diesel spill kits at high risk locations on Kaimai Hills
2B		Upgrade stormwater drainage structure and locations on Kaimai Hills
14A	Emergency Response	Upgrade access to helipad at Kaimai Summit
14B		Helipad location - Kaimai Hills - relocate and utilise for turning / emergency bay
14C		Improve emergency response / technology response plan for Kaimai Hills, SH29
14D		Support (resources/funding) Police Winter Action Plan
14E	Police & Enforcement	Point to point speed cameras or other speed enforcement technology
14F		Strategic positioned police parking bays and pull-over opportunities on shoulders (or bays)
14G		Increased funding for resourcing presence on corridor
14H	Awareness Campaigns	Programme of school educational Police visits: - Licensing - Road Safety awareness - buying and driving a safe vehicle
13C	HV Enforcement	Innovative weigh-in process on SH29, e.g. weigh in motion
13D		Increase weigh-in stations and enforcement on SH2
Wayfinding and Communication		
3A	Wayfinding	Guide destination signage: SH29 recommended route to Auckland at Tauriko/Tauranga
3B		Self-explanatory road environment - signage and rline marking
3C	Technology and Comms	Improve communications strategy during incidents/road closures, e.g. VMS and TOC
13A		Vehicle Fleet - discourage use of older/poor quality fleet vehicles(weigh-in, subsidies, etc)

Ref #	Section / Category	Option Description	
13B		In-vehicle technology enhancements - speed warnings, speed limiting, smart speed adapt	
Roadside Improvements			
4A	Corridor-wide	Signage upgrade, road safety and consistency between Waikato and Bay of Plenty:	
4C		(Warning) Vehicle Messaging Signs (VMS) - weather, incidents, closures	
4D		(Speed) Vehicle Messaging Signs (VMS) - weather, incidents	
4E		Road marking upgrades - high performance (ATP), durable, upcoming hazards, corner alignments	
4B	Rural intersection actuated warning sign (RIAWS):	SH29 / Hopkins Road	
		SH29 / SH27	
		SH29 / Te Poi Road	
		SH29 / SH28	
4F	Move power poles / trees at high risk locations:	SH1 to SH28	
4G	SH1 to SH24	Sh1 to SH24 - cornering crashes - improve visual cues to upcoming curves.	
4G	Kaimai Hills	Kaimai Summit to Tauriko - cornering crashes - improve visual cues to upcoming curves.	
4H		Side barriers on Kaimai hills eastern side	
4J		Kaimai School safety improvements - warning signage, flashing lights signage, relocate passing lane	
4K		Remove non-standard roadside fences on Kaimai Hills west side	
4L		replace and install all roadside fencing with frangible fencing - Kaimai bends	
4M		Regular stopping/breakdown bays on Kaimai Hills	
Land Use integration			
5B		SH1 to SH24	Te Poi / Hinuera - locate new residential to maximise safety - e.g. one side of road only.
5L	Service centre for HVs		
5M	SH1 to SH24	Change access to land use in Matamata - redirect users along other routes (rather than SH29) if not necessary	
4I		Parallel service roads for farm machinery. SH29 between SH1 and SH24, including Passing bays, layby areas, extended lead in to property access roads	
5C	Tauriko	Tauriko - Require new developments to provide access to other routes, e.g. SH2 and trip planning	
5D	Kaimai School	Kaimai School - relocate school away from SH	
5E		Kaimai School - consider closing school and/or transfer resource/funding to Tauriko School	
5H	Kaimai Hills	Relocate tourism land uses (and access) from SH29 corridor to other corridors	
5I		Old property conversions to Bed & Breakfasts- promote tourism.	
5J		Car park for DOC staff and tourists and bikers	

Ref #	Section / Category	Option Description
5K		Freedom camping route
5F	Corridor-wide	Rationalise property access between SH1 and Tauriko
5N		Move copper kettle / Flying pig cafes to SH29
5G	External	Optimise Port land-side transport capacity
Pedestrian		
6A	Kaimai Hills	Protected pedestrian paths near tourist destinations, including connections to parking overflow
6C		Pedestrian fencing approaching Tauriko
6B	Pedestrian presence warning signage on approach to settlements/tourist areas:	- Hinuera - Te Poi - Whitewater Rafting in Kaimai hills
6D		Cycle lanes or cycleway through route (encourage alternate mode)
PT/Rail		
8A	Alternative modes	Re-allocate funding partially to rail line and nodes (Ports), reduce freight operator dependence on SH29
8B		Passenger rail service Hamilton - Tauranga
8C		Second rail tunnel
8D		Rail funded as if it were road corridor - transfer full funding
8E		Longer rail wagons (60ft)
8F		Additional and longer rail loops
8G		3rd Rail / WIRI
8H		More private rail sidings
8I		Inland Port @ Hamilton
8J		Cruise Ship loop (Auckland-Tauranga)
Policy		
7B	Policy controls	Lower Road User Charge for use of SH29
7C		Restrict farm machinery access to State Highways (above certain volume?)
7D		Permitting SH29 - Heavier vehicle weight
7F		Restrict vehicle weight, length and speed on other routes (SH27, SH2)
7G		Dedicate SH2 as tourist route (signage, etc0
Education		
9A	Education and campaigns	Safe HVs: rural roads truck driver training
9B		General safety awareness campaigns at stopping places along route: - Drive to the conditions education campaign (target areas) - Motorcyclists - safe use of passing lanes
9C		Vehicle loading / fixing loads campaign
9D		Sponsor defensive driver training - region targeted, school-aged etc.
9E		Promote vehicle and license renewal
9F		Freight operators education of staff drivers - safe operation of heavy / long vehicles
Intersection Improvements		

Ref #	Section / Category	Option Description
10A	SH27 / SH29	Roundabout
10B		Grade separated interchange
10C		SH27 overpass of SH29 (or vice versa) in longer term - with trip planning +alternative route for local traffic turning left/right
10D	SH1 / SH29 Interface	deceleration lanes, minor improvements
10E		Roundabout
10F		Grade separation
10G	Local Roads SH1 to SH24	Taotaoroa / Totman intersection minor improvements - visibility
10H		Hopkins Road and Puketutu Road - crash location - improve sight distance, warnings, visual cues, turning space
10N		SH29 / Te Poi Road right turn bay, improve existing turn bay alignments and widths
10S		Poripori Road Right turn bay
10I	SH24 / SH29	change priority to through movement for SH29
10J		roundabout short/medium term
10K		grade separation
10L	SH28 / SH29	minor turning movement restrictions and signage, vehicle approach warning signal
10M		Grade separation longer term -
10O	Kaimai Hills East	Property accesses and local road intersections - improve sight lines, visibility and turn lanes
10P		Ruahihi Road and SH29, improve sight distance at road crest to SH29. signage and markings OR realignment of intersection
10Q		Belk Road / Sh29 - Right turn bay into Belk Road and opposite commercial properties
10R		Grade separate local road intersections on Kaimais: Old Kaimai Road, Soldiers Road, McLaren falls Road, Poripori Road, Ruahihi Road, Belk Road
10T		Kaimai School - left out / left in. review safety of passing lane
10U	Rail Crossing	Slower speed limit and Grade Separate
Offline Improvements		
11C	Corridor-wide	Full corridor length, SH 1 Piarere to Tauriko, Expressway 2+2 cross section (offline - realignments)
11J		New SH29 alignment: Scotsman Valley, follow ECMT rail line through Kaimai Hills, connect to SH2
11D	Kaimai Hills East	From Summit to Omanawa Road (eastern side of Kaimai Hills) new 'straightened' alignment to improve access from side roads, maintain existing alignment as local road
11L		Tunnel through Kaimai Hills - southern alignment SH29 Piarere to Lower Kaimai
11M		Tunnel through Kaimai Hills - Northern alternative alignment - Waitao to Aongatete
11N		Tunnel through Kaimai Hills - Central alignment, Waharoa to Apata, parallel to ECMT
11E	Kaimai Hills West	Kaimai corners Bypass loop - SH24 to Kaimai summit and Tuakopai Stream

Ref #	Section / Category	Option Description	
11F	SH1 Interface	SH1 - Cambridge to Piarere business case: potential offline connection between Cambridge and Sh1/29 intersection	
11G		SH1 - Cambridge to Piarere business case: Minor re-alignment of SH1 at bends	
11K		New SH1/SH29 alignment - SH1N Karapiro to SH29 at Rail crossing/Hinuera	
11H	SH1 to SH24	Anderson's realignment - Straight through curve (near SH1), past existing Hinuera Stone Quarry (depending on Quarry life) - reduce need for upcoming bridge/culvert replacement on curve	
11I		From last curve near Rail Crossing to SH29/24 intersection - direct/straight alignment, north of Hinuera and Te Poi	
11O		two-lane Bypass Hinuera with Rail overbridge	
Online Improvements			
12A	Corridor-wide	Realign approach to out of context curves along corridor, using linemarking.	
12B		Audio tactile paving (ATP) centrelines and edge lines High performance pavement markings, Kaimai Hills sections	
12G		Improve camber on corners - targeting out of context curves along whole route.	
12R		All access to Highway left-in, left-out.	
12U		Road safety audits for passing lanes, corners and merge points with upgrades at high risk locations	
12V		Full corridor length, SH 1 Piarere to Tauriko, 1+1, safe system cross section	
12W		Full corridor length, SH 1 Piarere to Tauriko, 2+1, safe system cross section	
12X		Full corridor length, SH 1 Piarere to Tauriko, Expressway 2+2 cross section	
12C		wide centrelines: between SH1 and SH24	
12I	SH1 to SH24	Corner alignment easing - 'Anderson's curve' adjacent Hinuera Stone (quarry)	
12J		Corner alignment easing - west of Pond Road	
12K		Corner alignment easing - Hinuera	
12L		Improve out of context curves east of Hinuera	
12Q		Median barrier and wide centreline transition from SH1 intersection to SH29	
12C		wide centrelines: Kaimai hills	
12E		Additional slow vehicle lanes through Kaimai Hills (grades >6% or sections identified to cause high speed differential between trucks and cars, e.g. Kaimai Hills West - westbound	
12P		Kaimai Hills	Dedicated truck lanes on Kaimai Hills- SH28 to Tauriko
12S			Reduce road grades e.g. to maximum 5% - target Kaimai Hills - additional road length required
12T	Relocate overtaking lanes/broken centrelines away from corners with low visibility on Kaimai Hills		
12F	Kaimai Hills West	Concrete median barrier between SH28 and Kaimai Summit	
12H		Corner alignment easing - Kaimai Hills western side	
12D	Kaimai Hills East	Wire rope centreline - Kaimai Summit to Belk Road, Tauriko	

Ref #	Section / Category	Option Description
12O		Omanawa to Redwood Lane Realignment - connections to corridor
12M	Passing lanes	Add and lengthen lanes Kaimai Hills Summit to Tauriko
12M		Kaimai Summit to SH28 westbound
12M		New passing lanes between SH1 and SH24
12M		Hopkins Road to Totman Road WB Note Crown land on straight section SH1-SH27

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Appendix B Option Evaluation Table

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APPENDIX E ' PROGRAMME ANALYSIS AND ASSESSMENTS

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Contract No: NO15-075

State Highways

Programme Business Case

SH 29 Piarere to Tauriko

Programme Development and Assessment

June 2016

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TRANSPORTATION CONSULTANTS

Boffa Miskell



Programme Business Case

SH 29 Piarere to Tauriko

Rev	Date	Details
A	31 May 2016	Draft for comment
B	22 June 2016	Appendix for Programme Business Case

Revision Details			
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Document owners
WSP PB New Zealand Limited Commute Transportation Consultants Limited Boffa Miskell Level 9 Zurich House 21 Queen Street Auckland 1023 PO Box 3935 Auckland 1140 New Zealand Tel: +64 9 377 9941 Fax: +64 9 377 9946

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1 Introduction

This report summarises the Programme Business Case (PBC) programme development phase, including development of the programmes, assessment criteria and the application of this assessment criteria against the programmes.

The purpose of this report is to set out the process adopted, the assessment criteria and the evaluation of each programme.

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2 Methodology

The SH29 Piarere to Tauriko PBC is a programme of works intended to address the problems identified in the corridor. The ultimate programme will be a package comprising a number of options spread over a 40-year timeframe.

To ensure that appropriate programmes are considered, a long list of options was developed and assessed at a high level against agreed criteria. This process ranked the options and is described in more detail in the Option Development and Assessment paper.

Ranking of individual options against the agreed evaluation criteria enabled options to be compiled into programmes for further and more detailed assessment.

The methodology adopted for this process was:

- Initial development of options by project team
- Workshops with Transport Agency technical specialists to further develop the long list
- Development of options with stakeholders at workshop on 23rd March 2016
- Preparation of assessment criteria by project team
- Presentation and endorsement of assessment criteria at workshop on 23rd March 2016
- Assessment of options and ranking by project team
- Endorsement of assessment by wider team

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3 Evaluation Criteria

Critical to the ranking of options is the assessment criteria that each option is assessed against. Table 1 outlines the evaluation criteria developed by the project team and endorsed by the stakeholder team.

A seven point assessment criteria was used, where each option was compared against a do minimum option. Options that performed better than the do minimum were scored positively and options that performed less well were scored negatively. 0 was considered to represent a negligible difference from the do minimum.

Programmes will be assessed against the same criteria that was used to assess individual options.

For option assessment, only the high level criteria was used, being:

- Investment objectives
- Implementability
 - Feasibility
 - Affordability
 - Stakeholders
- Assessment of Effects and Opportunities
 - Cultural, Social and Environmental
 - Economy
 - Safety

When assessing the programmes, each of the high level criteria was expanded to include a range of considerations as outlined in Table 1.

Table 1: Assessment Criteria

Objectives	Considerations	Measures
Investment Objective 1	We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures resulting in a delay of more than 2 hours by 2030	Reduced volume, duration and impact of SH1 closures
Investment Objective 2	We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths and serious injuries to a Medium Personal and Collective Risk by 2030	Reduced deaths and serious injuries on the corridor
Investment Objective 3	We will improve the cost of travel of SH29 such that SH1 and SH29 is the preferred route for road based freight vehicles between Tauranga and Pokeno by 2030	Assessment of average speed in the corridor
Implementability		
Feasibility	How straightforward is it to implement this alternative / option?	Level of complexity i.e. tunnelling, community consultation, challenging ground conditions.
	Are innovative technologies involved?	Level of innovation

Objectives	Considerations	Measures
	Are there significant hazards that may pose a health, safety in design risk?	Level of hazards
	Are there likely to be property risks to delivery?	Impact of project on property
	Are other infrastructure providers affected?	Other organisations beside NZTA
	Are there consenting risks that could affect delivery or cost risk?	Level of consenting risk for option
	Are there factors likely to affect the ability to operate / maintain the option over its projected life without major additional costs?	Maintenance and operation costs
Affordability	What are the funding risks of the alternative/option?	Included in the RLTP to no funding allocation
	Can the alternative be funded traditionally? (economic efficiency)	Estimated economic efficiency of project
	Are alternative funding mechanisms required?	yes / no
	Are there cashflow risks that might affect the delivery programme?	yes / no
	Are there ongoing operating cost risks?	Level of operating costs
	Are operating subsidies required? How will these be funded?	Tolling / PQP procurement
Public / Stakeholders	Has the alternative been made public?	Yes / no
	How acceptable is the alternative?	Level of anticipated acceptance
	Are there real or anticipated objections from the community or stakeholders?	Level of anticipated acceptance by stakeholders
Assessment of Effects		
Cultural heritage, environmental, social and community wellbeing	Are there any sites or features (including their setting) of significance to Maori (archaeological or existent) affected?	
	Are there any historic heritage places (including their setting) (e.g. archaeological or buildings, sites, remnants) affected?	
	Are any (first tier) outstanding landscapes or natural features, or (second tier) significant/special landscape or natural features affected?	Environmental mapping
	Are there any ecological areas, or areas with habitat value (including large areas of native vegetation) affected?	
	Are there any coastal marine areas, wetlands, lakes, rivers, streams or their margins affected?	Environmental mapping
	Are there any areas of contaminated land affected?	
	Are there community facilities (park/schools/hospitals etc.), or residential or other sensitive land uses in the area that could be affected by adjacency effects (e.g. noise, disruption, vibration, air quality etc.)?	Assessment of proximity to settlements

Objectives	Considerations	Measures
	Are there potential effects from hazards or risks (including from future climate change) from erosion, flooding, fault lines, sea level rise	
	Extent to which the option integrates transport and land use to make best use of existing networks and infrastructure.	Extent of integration with land use aspirations
	Are there any communities affected by reduced cohesion, connectivity or accessibility?	Qualitative assessment of access to the road network
	Are there opportunities to enhance the active travel modes - cycling and walking and/or linkages to other national or regional recreational cycle networks for longer distance cyclists?	Qualitative assessment of access to alternative modes
	Extent and significance of land take, severance; negative and positive opportunities	Severance / connectivity
Economy	How will the alternative/option affect traffic volumes?	Level of growth catered for?
	Does the option provide an opportunity to reduce vehicular travel time on SH1 between the Auckland and Northland regions?	Qualitative evaluation
	Does the option improve journey time reliability?	Qualitative evaluation
	Are there gainers and losers (modes / regions)? What is the overall effect?	Qualitative assessment of overall benefits to surrounding communities
	Does the option provide for more efficient freight supply chains between the Auckland and Northland regions	Route quality
	How well does the option integrate with land use with reference to regional growth strategies	Consistency with regional growth strategies
	How well does the option enhance the development potential of adjacent land / attract new jobs / help existing businesses?	Qualitative assessment of access to land use
	How well does the option preserve the function of SH1 as a National High Volume route, consistent with ONRC	Qualitative evaluation
	How well does the option address route security, resilience and flexibility	Extent to which the option improves route resilience
Safety	How will the alternative enhance safety for different types of transport users?	Alternative mode safety
	Will it involve gainers and losers in terms of safety?	Adverse safety effects from the option?
	Are there impacts on personal safety / security?	Assessment of the reduction in crash risk
	What is the impact on fatal / serious injuries?	Assessment of reduction in DSI
Rail	Supports opportunities for rail freight to and from the Port of Tauranga	Investment which does not shift preference to road freight journeys

4 Programme Options

The SH29 PBC is a programme of works to address the problems identified by the stakeholder group in the corridor and to deliver on the agreed investment objectives. The ultimate programme will almost certainly be a package of a number of options.

The long list options and assessment against the high level criteria is set out in the SH29 Options and Alternatives report. The assessment of long list options against the above criteria and relative scoring between options was a key consideration when developing each programme.

Five 'Foundation' programmes have been developed for the SH29 corridor. These programmes have been developed to best address the investment objectives and some of the key uncertainties identified on the corridor. Importantly each programme was intended to focus on one primary outcome, e.g. resilience or safety. The following foundation programmes have been developed:

- **Foundation Programme 1 - Resilience:** A programme addressing critical resilience issues on the corridor. This includes corridor intervention and alternate route strengthening.
- **Foundation Programme 2 - Safety:** A programme addressing critical safety issues where these are located in the corridor.
- **Foundation Programme 3 - ONRC:** A programme aiming to best reflect the National State Highway classification of the corridor. This has been developed by considering a 90km/hr average speed for vehicles.
- **Foundation Programme 4 - Least Impact:** A programme looking to address the investment objectives while having the lowest possible impact on corridor. This includes making best use of existing infrastructure and operational enhancements.
- **Foundation Programme 5 - ONRC:** A programme looking at the potential long term solution to best assist in the inter-regional connectivity and development of Tauranga and in particular the Port of Tauranga.

Following the development of the five foundation programmes, the project team undertook an assessment against the Assessment Criteria, described in Table 1, to establish their effectiveness.

The foundation programme assessment was presented to the stakeholder group at Workshop 3. Stakeholders were given the opportunity to comment on the foundation programmes and each assessment.

Following the critical evaluation of the six foundation programmes, stakeholder groups were asked to develop programmes that best responded to all of the investment objectives. Five new programmes were developed by stakeholder groups during the workshop, and Programme 10 was produced as a combination of the most popular programme elements at the workshop:

- **Programme 6** – looks at targeting key problem areas, such as larger scale safety and efficiency through the Kaimai's and minor improvements to intersections only between SH1 and SH24.
- **Programme 7** – considers up to a 2+1 upgrade for the full length of the corridor, with realignments at problem curves and minor intersection safety improvements.
- **Programme 8** – considers a full upgrade to 2+2 on the Kaimai Hills, with realignment of problem corners, and a combination of barrier and shoulder widening and intersection upgrades between SH1 and SH24.
- **Programme 9** – similar to programme 7, proposes 2+1 upgrade for most of the corridor, with only widening for passing lanes within existing publicly owned land between SH1 and SH24 and minor safety upgrades. This programme also proposes speed limit restrictions through Matamata and on SH27.

- **Programme 10** – a combination of the most popular corridor elements as proposed by workshop attendees, this includes 2+1 upgrade on the Kaimai hills with the Kaimai west bypass, and additional passing opportunities, curve easing and localised safety improvements through the corridor.
- **Programme 11** – a variation on programme 5, 'ONRC' considering additional opportunities to enhance use of SH29, including access control of other State Highways and improved standard of the route.

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5 Initial Assessment Outcome

This section summarises the performance of each programme against the evaluation criteria outlined in Section 3.

5.1 Investment Objectives

5.1.1 Investment Objective 1: Resilience

"We will steadily reduce the number of unplanned incidents so that SH29 between Piarere and Tauriko has no full closures resulting in a delay of more than 2 hours by 2030"

Assessment of number of likely serious injury or fatal road crashes, in combination with alternative route options and improved incident response was used as a measure of this objective.

Two programmes were considered to meet this objective fully (i.e. comparable alternate route for the Kaimai hills or new route), being P5 and P11 the Lead infrastructure programmes. These programmes provide a viable alternative route should either the Kaimai tunnel or the overland route be closed. Both also proposed a higher standard of road.

P3 (efficiency), P7, P8, P9 and P10 would all similarly provide an improved standard of route which reduce crashes, with additional lane capacity to manage closures and improved technological response. P3 and P8 would rank the best with resilience, with 2+2 upgrade over the Kaimai hills, thus opportunity for partial closures and traffic management.

The remaining options – P1 (resilience), P2 (Safety), and P6 (targeting problem areas) provide less improvements mostly relating to the level of reduction of serious injury crashes and traffic management options. Noting that the resilience focus programme did not rank as high as others due to the intent that a resilience focus was also limited to a lower level of expenditure, and that ultimately, shorter alternate routes are only possible with new roads or a tunnel.

5.1.2 Investment Objective 2: Efficiency

Programme 5 (Lead Infrastructure) and Programme 11 were deemed to fully meet this criteria and were assessed as performing the best, including a tunnel which most significantly shortens the route.

P3 (efficiency) meets this objective slightly better than most of the other programmes, with efficiency improvements over the whole corridor, including major online upgrades on the Kaimai Hills. In addition, P7 and P9 were expected to meet this objective with reasonably consistent efficiency improvements across the corridor.

Given the presence of intersection upgrades likely to increase delay, or the lack of significant travel time or speed improvements, P1 (resilience), P2 (Safety), P6, P8 and P10 were expected to improve efficiency but overall corridor speed and travel time are not expected to be as efficient as other programmes.

5.1.3 Investment Objective 3: Safety

"We will improve safety along the corridor between Piarere and Tauriko by steadily reducing deaths and serious injuries to a Medium Personal and Collective Risk by 2030"

Assessment of the likely reduction in deaths and serious injuries on the corridor was used to evaluate the extent to which each programme delivered against this objective.

Three programmes were expected to meet this objective fully and with the highest reliability, being the Lead Infrastructure programmes (P5 & P11), and P8 which includes a 2+2 upgrade over the Kaimai Hills. These programmes target the section of the route with the highest record of DSI

crashes and mostly eliminate the root causes of the problem (high radius turns, unexpected corners and lack of safe passing opportunities).

P7, P9 and P10 are the next best ranked programmes with regard to reduction in DSI's. These are followed closely by P2 (Safety), P3 (efficiency programmes) and P6 (target key problem areas). Largely, these six programmes were all considered to have a very similar reduction in DSI crashes as all proposed a 'bypass' of the western side of the Kaimai Hills – a higher standard road – where a large proportion of serious crashes occur. All also propose upgrades to the remainder of the Kaimai Hills section.

The resilience programme is not expected to improve safety on the corridor as dramatically, since it will not address the root cause of crashes, though would reduce the severity.

5.2 Implementability

5.2.1 Feasibility

This criteria was not a significant differentiator. P5 and P11 (Lead infrastructure) were the worst performing programme, due to the consenting and property risk associated with the scale of offline upgrades proposed and being the least straightforward.

P8 (Kaimai's 2+2) and P3 (efficiency) was assessed as being high impact on property and consenting due to the road widening proposed.

The other programmes were largely assessed as having feasibility risks, however it was assessed that on balance that these were largely manageable.

5.2.2 Affordability

This assessment sought to address the estimated cost and economic efficiency of each programme.

These criteria were largely assessed as being negative for most programmes with the exception of P4 (Low impact) which was assessed as being '+' due to its likely efficiency rating of above 10, and P7 and P9 which reached a BCR of just over 1. The next best performing programmes (smaller adverse impact) were P6, P10 and P2 (Safety), however these programmes have indicative BCRs less than one and are therefore not considered to be economically efficient.

P5 & P11 (Lead infrastructure) were considered to be the least affordable due to very low BCR, in turn due to very high costs of implementation.

5.2.3 Stakeholders

None of the schemes have yet been made public. Therefore, some broad assumptions have been made with respect to likely feedback. In this regard, it is considered that options already recommended commonly by stakeholders are likely to be reasonably well received. In addition options that address both improve efficiency (speed) and address safety to some extent will be received positively by the public and stakeholders.

There is very little differentiation in this category due to lack of programme exposure and similar level of intervention. However P1 and P2 (Resilience and Safety) and P4 (low impact) are expected to be received negatively due to lack of popular options, and P9 is expected to generate negative feedback due to interventions in nearby Matamata.

5.3 Assessment of Effects and Opportunities

5.3.1 Cultural, Social and Environmental

The best performing programmes are those that have the least impact, including P1 (resilience), P2 (Safety), P4 (least impact), P8 and P10 which scored "0", indicating that the programmes are

likely to deliver opportunities as well as impacts from a cultural, environmental and social perspective.

The remaining six programmes were assessed as having slightly greater impacts.

5.3.2 Economy

The best performing option against these criteria was P5 and P11 (Lead Infrastructure) as both provide the highest level of service and capacity for economic growth through a predominantly 2+2 offline expressway and tunnel through the Kaimai Hills. The feeling of greater connection and reduced cost of travel would drive increased growth.

Other programmes were considered to provide minor opportunities for growth, as the corridor will seem safer and more attractive.

5.3.3 Safety

This assessment criteria was considered to be essentially the same as the Investment Objective related to safety. The major change in assessment related to the impact on all modes. In that regard the three strongest performing options P5, P11 and P8 were scored slightly better in providing enhanced impacts to reduction in crashes and personal safety.

5.4 Summary Findings

Figure 3 summarises the assessment undertaken. It indicates that P7 (2+1 online upgrade whole corridor) is the top ranked option. Further sensitivity analysis was undertaken by double weighting each of the headline criteria. This is also shown in Figure 3. Sensitivity analysis shows that P7 remains the preferred programme in all of the sensitivity tests. P5 and P9 rank closely second with a number of the criteria.

Figure 3: Initial Programme Assessment Summary

Piarere to Tauriko Programme Business Case	Programmes										
	Safety	90km/h Efficiency	ONRC	Resilience	Low impact	Target key problem areas (Stakeholder Group 1)	Kaimais – safety; Flat section – efficiency (Stakeholder Group 2)	Safety; Kaimais – 2+2 (Stakeholder Group 3)	2+1 and access restrictions (Stakeholder Group 4)	Programme 10	ONRC Plus
	P2	P3	P5	P1	P4	P6	P7	P8	P9	P10	P11
Summary											
Objective 1 – reduce full closures more than 2 hours	+	++	+++	+	0	+	++	++	++	++	+++
Objective 2 – reduce cost of travel on SH29	+	++	+++	+	0	+	++	+	++	+	+++
Objective 3 – reduce deaths and serious injuries	++	++	+++	+	0	++	++	++	++	++	+++
Feasibility	-	-	--	0	0	-	-	-	-	-	--
Affordability	-	-	--	-	++	-	+	-	+	-	--
Public / Stakeholders	-	0	-	-	-	0	0	0	-	0	-
Right traffic / Right mode / Right route	0	-	--	0	0	0	0	0	0	0	--
Cultural, Social and Environmental Effects	0	-	--	0	0	-	-	0	-	0	-
Safety	++	++	+++	+	0	++	++	++	++	++	+++
Economy	+	+	++	+	0	+	+	+	+	+	++
Ranking	9	7	3	10	11	8	1	6	2	5	3
Sensitivity Testing	P2	P3	P5	P1	P4	P6	P7	P8	P9	P10	P11
Objective 1 – reduce full closures more than 2 hours	9	7	2	10	11	8	1	6	4	5	2
Objective 2 – reduce cost of travel on SH29	9	5	2	10	11	8	1	7	4	6	2
Objective 3 – reduce deaths and serious injuries	9	7	2	10	11	8	1	6	4	5	2
Support rail mode share for freight	8	9	6	10	11	5	1	4	2	3	6
Feasibility	9	7	4	11	10	8	1	6	2	3	4
Affordability	9	7	5	11	10	8	1	4	2	3	5
Public / Stakeholders	9	8	4	10	11	7	1	6	2	3	4
Cultural, Social and Environmental Effects	9	8	3	10	11	7	1	6	2	5	3
Safety	9	7	2	10	11	8	1	6	4	5	2
Economy	9	7	3	10	11	8	1	6	2	5	3

5.5 Indicative Economic Assessment

An indicative cost estimate for each programme has been developed based on its component projects. Existing information has been used where available to inform the cost estimation process. Project and programme cost estimates have been expressed as a range reflecting the limited information available.

An assessment of indicative programme benefits has been undertaken, focusing on expected changes to travel time and the likely crash risk of each route section.

Figure 4 outlines the expected programme cost range (lower to upper estimates) against the indicative corridor benefits. The economic efficiency threshold (BCR of 1.0) is also shown in Figure 1.

Figure 1: Programme Performance

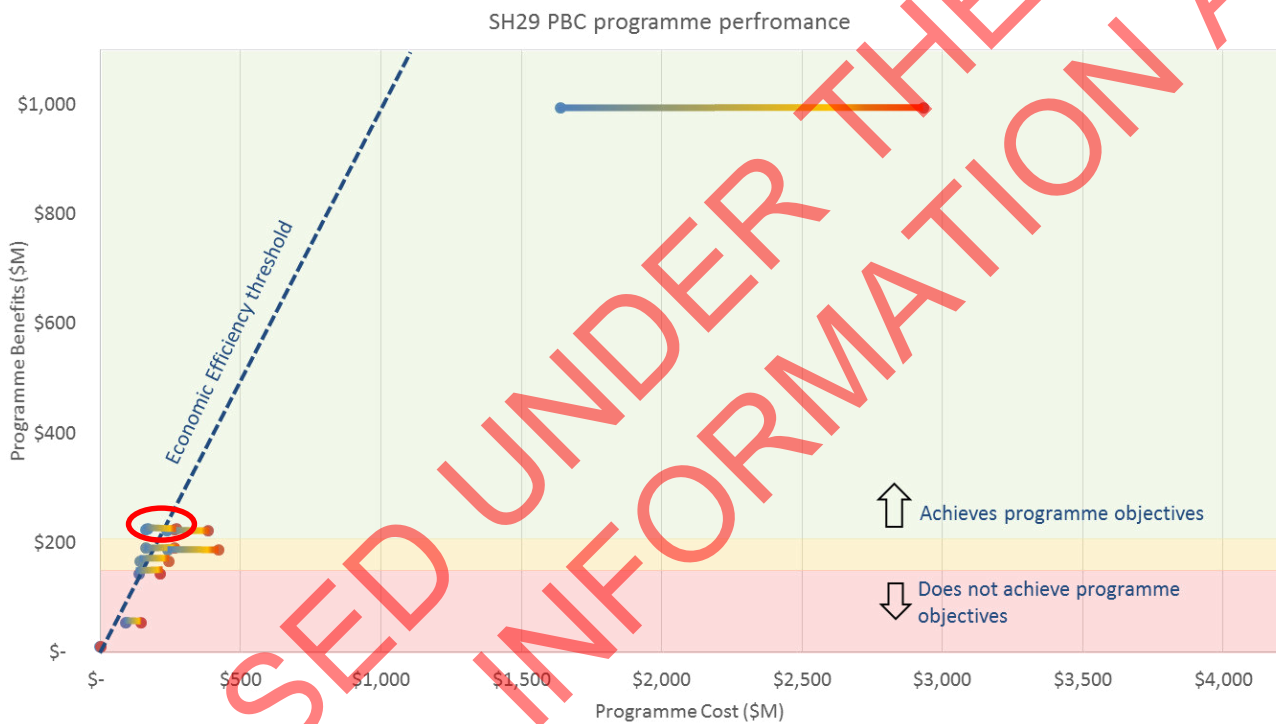


Table 2 outlines the expected outcomes for each programme including approximate travel time savings and reduction in DSI's. It also includes upper and lower cost ranges for each programme, indicative benefits and the likely BCR range at programme level.

While P7 (2+1 online upgrade), P9, P5 and P11 (Lead Infrastructure) scored highest against the evaluation criteria, economic analysis shows that P5 and P11 are likely to be less economically efficient than other programmes, with costs outweighing benefits. However P7 is expected to have one of the highest efficiency ratings.

P7 emerges as the recommended programme, providing a comparable level of benefits to P9 and P3, with a reduced cost.

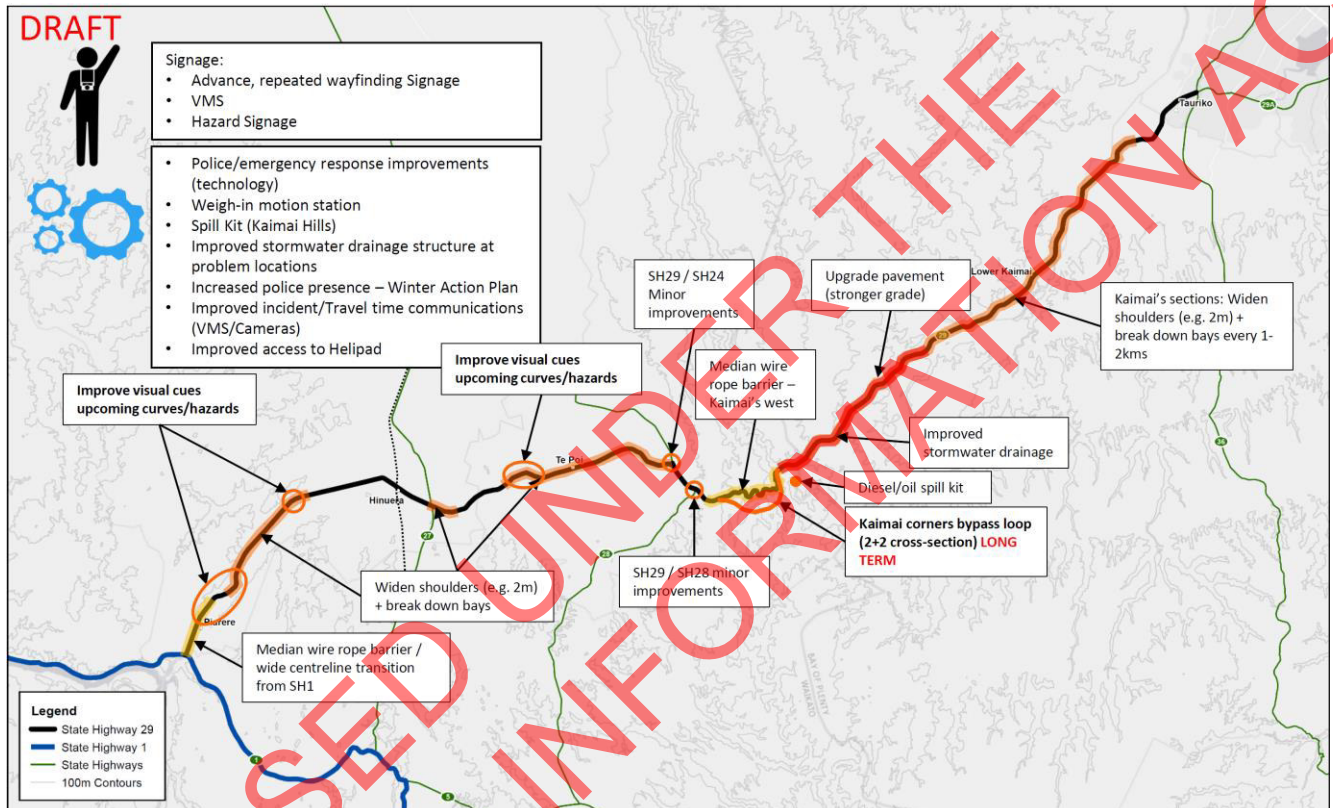
Table 2: Programme Costs and Benefits

Piarere to Tauriko Programme Business Case	Programmes										
	Safety	90km/h Efficiency	ONRC	Resilience	Low impact	Target key problem areas (Stakeholder Group 1)	Kaimais – safety: Flat section – efficiency (Stakeholder Group 2)	Safety: Kaimais – 2+2 (Stakeholder Group 3)	2+1 and access restrictions (Stakeholder Group 4)	Programme 10	ONRC Plus
	P2	P3	P8	P1	P4	P6	P7	P8	P9	PR	PII
Average score	4.8	5.7	7.3	2.4	1.9	5.5	9.1	6.4	8.1	6.6	7.3
Cost lower bound (\$M)	\$ 280	\$ 475	\$ 3,300	\$ 180	\$ 0.8	\$ 287	\$ 327	\$ 485	\$ 340	\$ 328	\$ 3,305
Cost upper bound (\$M)	\$ 430	\$ 770	\$ 5,900	\$ 295	\$ 1.3	\$ 490	\$ 530	\$ 850	\$ 545	\$ 532	\$ 5,905
Cost lower bound NPV (\$M) 2025	\$ 139	\$ 236	\$ 1,640	\$ 89	\$ 0	\$ 143	\$ 163	\$ 241	\$ 169	\$ 163	\$ 1,643
Cost upper bound NPV (\$M) 2025	\$ 214	\$ 383	\$ 2,932	\$ 147	\$ 1	\$ 244	\$ 263	\$ 422	\$ 271	\$ 264	\$ 2,935
Programme Benefits NPV 2025 (\$M)	\$ 143	\$ 222	\$ 994	\$ 55	\$ 10	\$ 166	\$ 225	\$ 186	\$ 225	\$ 190	\$ 994
BCR lower	0.7	0.6	0.3	0.4	14.7	0.7	0.9	0.4	0.8	0.7	0.3
BCR upper	1.0	0.9	0.6	0.6	23.9	1.2	1.4	0.8	1.3	1.2	0.6

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Programme business case Assessment of alternatives summary table

Programme 1: Resilience



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PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 1 - Investment Objective Resilience Focus

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to meet the investment objective for resilience. It is focused on reducing the likelihood and timeframe of closures of more than 2 hours, at relatively low cost to differentiate it from other programmes which also improve resilience.</p> <p>As shown above, this includes minor online improvements with a short offline alignment.</p> <p>A number of operational enhancements (as well as physical) are also proposed, targeting resilience of the corridor, emergency response and to address signage (VMS) for increased driver information during incidents.</p> <p>Dependencies :</p>
--------------------------	--

Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):		\$89million
Net property cost (\$m):		0	0
Opex (\$m/30yr):			
Maintenance (\$m/30yr):			
Present value of cost to govt. (\$m):		\$89million	\$147 million
Estimated BCR range:		0.4	0.6

Timing of need:	Optimal programme:	Construction 2022 Opening 2025 40 years	Likely:	Construction 2022 Opening 2025 40 years
IAF profile:	Strategic fit:	H/M/L	Effectiveness:	H/M/L
			Efficiency:	H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 1

Criterion	Score	Discussion
Objective 1 : Resilience	+	<p>This programme aims to improve resilience at low cost, thus provides minor resilience improvements compared to programmes with higher expenditure and significant safety and capacity improvements.</p> <p>Importantly, this programme proposes to also realigned SH29 on the western side of the Kaimai Hills which would reduce the likelihood of crashes causing closure and would provide opportunity to improve shoulders enabling emergency vehicle access.</p>
Objective 2 : Safety	+	<p>This programme achieves safety improvements through a section of new road alignment, and with more forgiving roadsides. The crash rate is expected to reduce in addition to other improvements.</p>
Objective 3 : Cost of travel	+	<p>This programme provides small benefits to travel time or cost of travel, with the inclusion of the Kaimai loop, thus would partially meet this investment objective.</p>
Feasibility:	0	<p>This option scored '0' overall. This was largely due to a combination of adverse impacts, which were generally around – rating, balanced with opportunities. The most impact to feasibility was associated with operational and maintenance costs, due to proposed enforcement options.</p> <p>The programme was not expected to affect other infrastructure providers in a significant way, and was expected to provide opportunities for innovative technology use.</p> <p>There would be minor delivery and property risks.</p>
Affordability:	-	<p>This option scored a '-' overall due to a balance of likely funding risks. It is expected that some of the funding would not come from the NLTP and no new funding sources are required. However ongoing operating costs would be a risk.</p> <p>Given the likely economic efficiency of this programme, this programme could be funded by traditional means.</p>
Public/Stakeholders:	-	<p>This programme has had no exposure to the public or other stakeholders and is expected to be negatively received due to the proposals for increased Police presence and the perception that 'more could be done' to improve the corridor.</p>

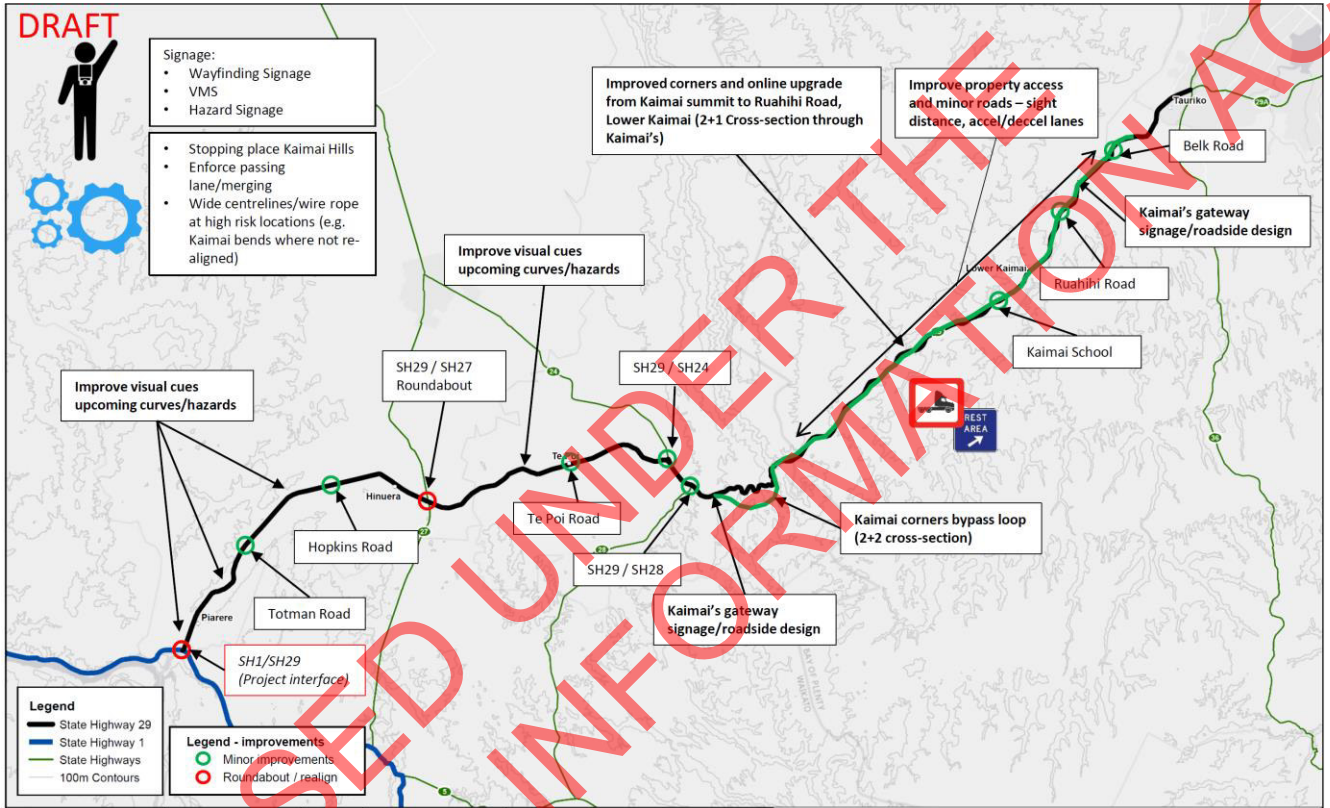
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Safety:	+	This programme would provide a low level of safety improvements including substituting the road section with highest safety risk with an improved standard of alignment. It is expected that there would also be minor safety benefits associated with the other minor improvements.
Economy:	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, thus encouraging a small increase in traffic demand. Journey time reliability would also improve.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor or provide significant improvements for regional/long distance journeys.</p>
Environmental and social:	0	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Little improvement in terms of amenity values, community cohesion and access, access to public transport.</p> <p>Little land take required.</p>
Environmental opportunities	Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment	
Social opportunities	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
Rationale for selection or rejection of alternative.	This option ranked of the 10 th of the 11 programmes due to the lack of significant benefits or ratings against the investment objectives and low level of improvements compared to the other programmes. This may signal need to examine further opportunities for improvements to resilience.	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 2: Safety



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 2 - Investment Objective Safety Focus

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to best meet the investment objective 3, focussed on enhancing safety.</p> <p>As shown on the right, this includes a number of physical on line and off line upgrades, with a mix of 2+2, 2+1 and minor online improvements depending on the extent of collective/personal risk rating.</p> <p>A number of operational enhancements (as well as physical) are also proposed, targeting the SH1 to SH28 section and to address signage (VMS) for resilience purposes.</p> <p>Dependencies : None</p>		
Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):	\$139 million	\$214 million
	Net property cost (\$m):		
	Opex (\$m/30yr):		
	Maintenance (\$m/30yr):		
	Present value of cost to govt. (\$m):	\$139 million	\$214 million
Estimated BCR range:		0.7	1.0
Timing of need:	Optimal programme:	Construction 2022 Opening 2025 10 years?	Likely: Construction 2022 Opening 2025 10 years?
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 2

Criterion	Score	Discussion
Objective 1 : Resilience	+	This programme performs well against this criteria as improvements to safety generally contribute to improvements to resilience, and it is anticipated that there will be good improvements to safety as a result of the proposed infrastructure upgrades. In addition, the upgrades provide opportunity for enhances to incident mitigation.
Objective 2 : Cost of travel	+	This programme performs moderately well as an enhancement to the overall journey due to the realignment on the west side of the Kaimai Hills, targeting the slowest section of the route, and the improved perception of safety.
Objective 3 : Safety	++	This programme achieves strong safety improvements, and is expected to meet the safety objective, however is not as safe as more costly offline improvements, particularly due to the nature of the crash problem on this route. A rating of only ‘++’ was assigned as this programme considered more affordable safety improvements, rather than ultimate improvements covered in other programmes.
Feasibility:	-	<p>This option scored a – overall. This was largely due to a combination of adverse impacts, ranging from - to ---. This implies there are implementation risks, however these are manageable.</p> <p>The most challenging element of the programme is the proposed new alignment on the western side of the Kaimai Hills.</p> <p>The programme was considered somewhat not straightforward due to the various improvements recommended along the Kaimai hills. These alignment changes are likely to have high property risks. Some documentation and concept sketching has been completed for these options.</p> <p>The programme is largely online, with minor improvements, thus there are fewer significant hazards and impacts on services. There are also expected to be few maintenance and operational costs.</p> <p>No substantive change in maintenance is envisaged, with opportunities to reduce maintenance needs with new alignments.</p>

[DATE]

Affordability:	-	<p>This option scored a '-' overall. This was largely due to a combination of opportunities and minor cost impacts. There are some risks with ongoing costs and cost of the short realignment, however it is expected that this programme could potentially be funded via the NLTP.</p> <p>Given the likely economic efficiency of this programme, it is expected that there will be minor funding risks.</p> <p>Operating costs are not likely to be a large risk for this programme..</p>
Public/Stakeholders:	-	<p>This programme has had little to no exposure to the public or stakeholders, however is likely to receive negative response from some of the stakeholders.</p>
Safety:	++	<p>The programme will improve safety, largely meeting the medium rating target set in the investment objectives. The programme targets the highest problem area on the corridor (the Kaimai Hills) with changes to road layout expected to significantly reduce cornering crashes.</p>
Economy:	+	<p>This option will improve the attractiveness of the journey along SH29, with both safety and minor travel time improvements. It is expected that more road users across user groups will consider using SH29 as the safety, and resilience of the route will make it viable for a broader range of drivers.</p> <p>It is not considered that this option will drive increased activity directly adjacent to the corridor, thus any increases will be smaller and associated with through traffic and safer long distance journeys.</p>
Environmental and social:	0	<p>Little environmental impacts along most of existing corridor, other than Kaimai section where there would be moderate impact on the landscape and on the ecology to make the necessary safety improvements.</p> <p>Little gain in amenity values along the route (for example, from noise).</p> <p>No improvement to risks from natural hazards.</p> <p>Would improve the ability of the route to be used for other modes and for public transport.</p> <p>Some localised land take</p>
Environmental opportunities		<p>There are few environmental opportunities associated with this programme.</p>
Social opportunities		<p>There are few social opportunities associated with this programme.</p>

[DATE]

Rationale for selection or rejection of alternative:

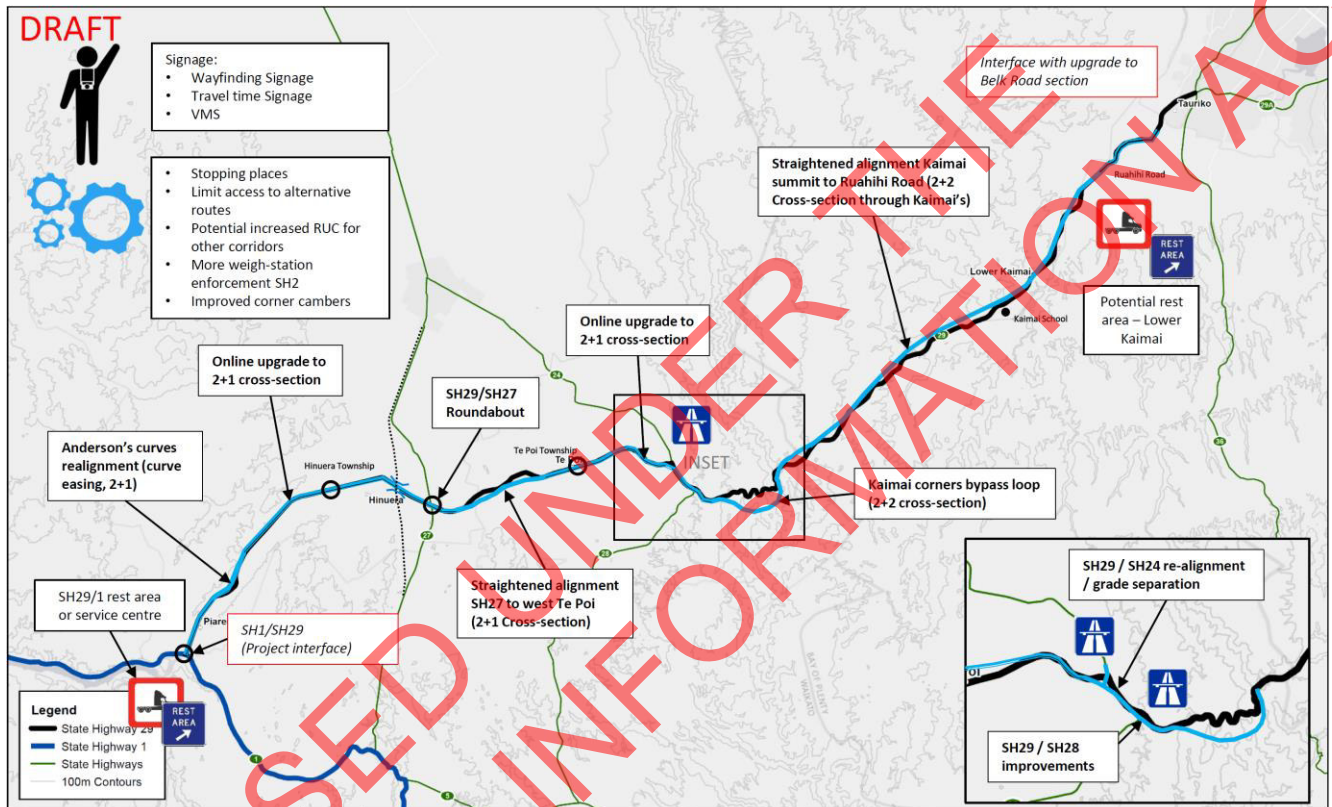
This option ranked 9th of 11 programmes because it was relatively low impact and and low improvement by comparison to other programmes. One of the biggest problems on the corridor is safety – this typically drives resilience and corridor attractiveness in combination with travel time reliability.

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[DATE]

Programme business case Assessment of alternatives summary table

Programme 3: Efficiency (90 km/hr)



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 3 - Investment Objective Efficiency Focus

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to best meet the investment objective 3, focussed on enhancing route efficiency and attractiveness.</p> <p>As shown above, this includes a number of physical online and offline upgrades, with a mix of 2+2 and 2+1 road layouts depending on the traffic volumes justifying investment.</p> <p>A number of operational enhancements (as well as physical) are also proposed, targeting the attractiveness of this route and to address signage (VMS) for increased driver information.</p> <p>Dependencies : None</p>
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Estimated total public sector funding requirement:	Lower		Upper	
	Capital cost (\$m):	\$236 million		\$383 million
Net property cost (\$m):				
Opex (\$m/30yr):				
Maintenance (\$m/30yr):				
Present value of cost to govt. (\$m):	\$236 million		\$383 million	
Estimated BCR range:	0.6		0.9	

Timing of need:	Optimal programme:	Construction 2022 Opening 2025 40 year assessment	Likely:	Construction 2022 Opening 2025 40 year assessment
IAF profile:	Strategic fit:	H/M/L	Effectiveness:	H/M/L
			Efficiency:	H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 3

Criterion	Score	Discussion
Objective 1 : Resilience	++	This programme performs well against this criteria as it proposes new alignment which would reduce the likelihood of crashes causing closures and provide opportunity to improve other resilience-related issues. The new alignments would also enable the old alignment to be used as a more viable detour route in the event of a closure.
Objective 2 : Cost of travel	++	This programme performs well as an enhancement to the overall journey due to the realignment on the east and west side of the Kaimai Hills, targeting the slowest sections of the route, and sections where delays are caused by significant differences in vehicle travelling speeds. It does not perform as efficiently as the ultimate programme options.
Objective 3 : Safety	++	This programme achieves strong safety improvements, and is expected to meet the safety objective as well as the cost of travel objective. Safety improvements are inherently linked to alignment improvements.
Feasibility:	-	<p>This option scored a – overall. This was largely due to a combination of adverse impacts, ranging from - to ---. This implies there are implementation risks, however these are manageable.</p> <p>The most challenging element of the programme is the proposed new alignments on the Kaimai Hills. Other changes are minor by comparison.</p> <p>The programme was considered somewhat difficult due to the various improvements recommended along the Kaimai hills. These alignment changes are likely to have high property risks. Some documentation and concept sketching has been completed for these options.</p> <p>The programme is a combination of online and offline, with realignments at corners and winding sections, thus there are a few significant hazards and potential impacts on services at these locations.</p> <p>No substantive change in maintenance is envisaged, with opportunities to reduce maintenance needs with new alignments.</p>

[DATE]

Affordability:	-	<p>This option scored a '-' overall due to likely funding risks for a project of this proportion. There are risks with ongoing costs of implementation and operation, and justification within traditional methods is assumed to be possibly but unlikely.</p> <p>Given the likely economic efficiency of this programme, further investigation into affordability and justification might be warranted.</p>
Public/Stakeholders:	0	<p>This programme has had little to no exposure to the public or stakeholders, however is considered to be well-received by some of the stakeholders in balance to any negative response due to property impacts.</p>
Safety:	++	<p>The programme will provide significant improvements to safety, meeting and likely exceeding the medium rating target set in the investment objectives. The programme targets the highest problem area on the corridor (the Kaimai Hills) with changes to road layout expected to reduce cornering crashes.</p>
Economy:	+	<p>This option will dramatically improve the attractiveness of the journey, with both safety and travel time improvements. It is expected that more road users across user groups will consider using SH29 as the safety, efficiency and resilience of the route will make it feel safer for more drivers.</p> <p>It is not considered that this option will drive increased activity directly adjacent to the corridor, thus any increases will be smaller and associated with through traffic and safer long distance journeys.</p>
Environmental and social:	-	<p>May adversely affect heritage sites or sites of significance to Māori along the route.</p> <p>Potentially significant effects on the landscape and ecology, particularly in the Kaimai section.</p> <p>Little gain in amenity values along the route (for example, from noise) or community cohesion.</p> <p>No improvement to risks from natural hazards.</p> <p>Moderate amount of land take and severance.</p>
Environmental opportunities		<p>Few environmental opportunities would be presented by this programme, although some offset mitigation could be required for impacts on Kaimai section.</p>

<p>Social opportunities</p>	<p>Social opportunities associated with this programme are minimal, although the improvements would potential justify increased tourism land use along the corridor, given the safety and capacity improvements.</p> <p>Should the programme enable significant traffic growth, there may be further growth in adjacent settlements justified in the longer term.</p>
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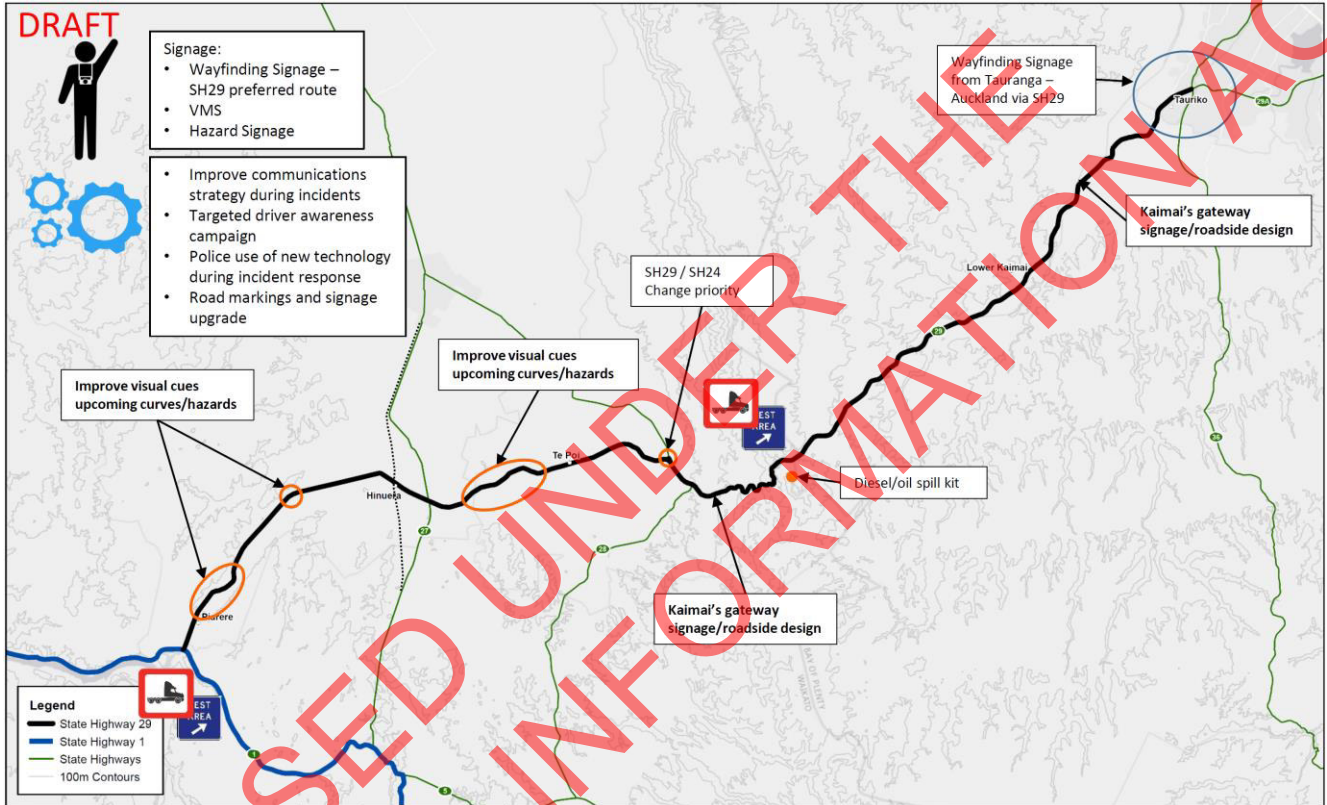
<p>Rationale for selection or rejection of alternative:</p>	<p>This option ranked 7th of the 11 programmes because it provided few opportunities and benefits than other schemes and is likely to be more challenging to implement with reasonably feasibility impacts.</p>
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Programme business case Assessment of alternatives summary table

Programme 4: Least Impact



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 4 - Investment Objective Resilience Focus

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) which generally meet at least one of the investment objectives and which are considered 'easy to achieve' or low impact.</p> <p>As shown above, this includes minor online improvements and a number of operational enhancements, targeting the communications, safety and to address signage (VMS) for increased driver information during incidents.</p> <p>Dependencies :</p>		
Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):	\$0.4 million	\$0.6 million
	Net property cost (\$m):		
	Opex (\$m/30yr):		
	Maintenance (\$m/30yr):		
	Present value of cost to govt. (\$m):	<\$1 million	<\$1 million
Estimated BCR range:		15	24
Timing of need:	Optimal programme:	2017 Construction 2018 Opening 10 year benefits	Likely: 2017 Construction 2018 Opening 10 year benefits
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L
			Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 4

Criterion	Score	Discussion
Objective 1 : Resilience	0	This programme provides no significant resilience improvements.
Objective 2 : Cost of travel	0	This programme provides no significant travel cost benefits.
Objective 3 : Safety	0	This programme achieves very minor safety enhancement, which are not considered on the same scale as the safety programme. These enhancements may or may not reduce the number of serious accidents.
Feasibility:	0	This programme scored '0' overall, higher than most other programmes. This was largely due to the fact that the proposed options were very straightforward with low impact to properties, other infrastructure and traffic. There would also be no consenting risks and very minimal operational and maintenance costs.
Affordability:	++	This programme is expected to be fundable under current regional and NLTP funding programmes, and elements are already being considered by NZTA or the Police.
Public/Stakeholders:	-	This programme has had no exposure to the public or other external stakeholders and could be negatively received due to the insignificance of the improvements.
Safety:	0	This programme would provide minimal safety improvements as discussed under the safety objective.
Economy:	0	This programme would at best persuade some motorists to use SH29 over SH2, and it is expected there would be no significant increase to traffic demand or land use activity. No significant travel time or reliability improvements are expected.

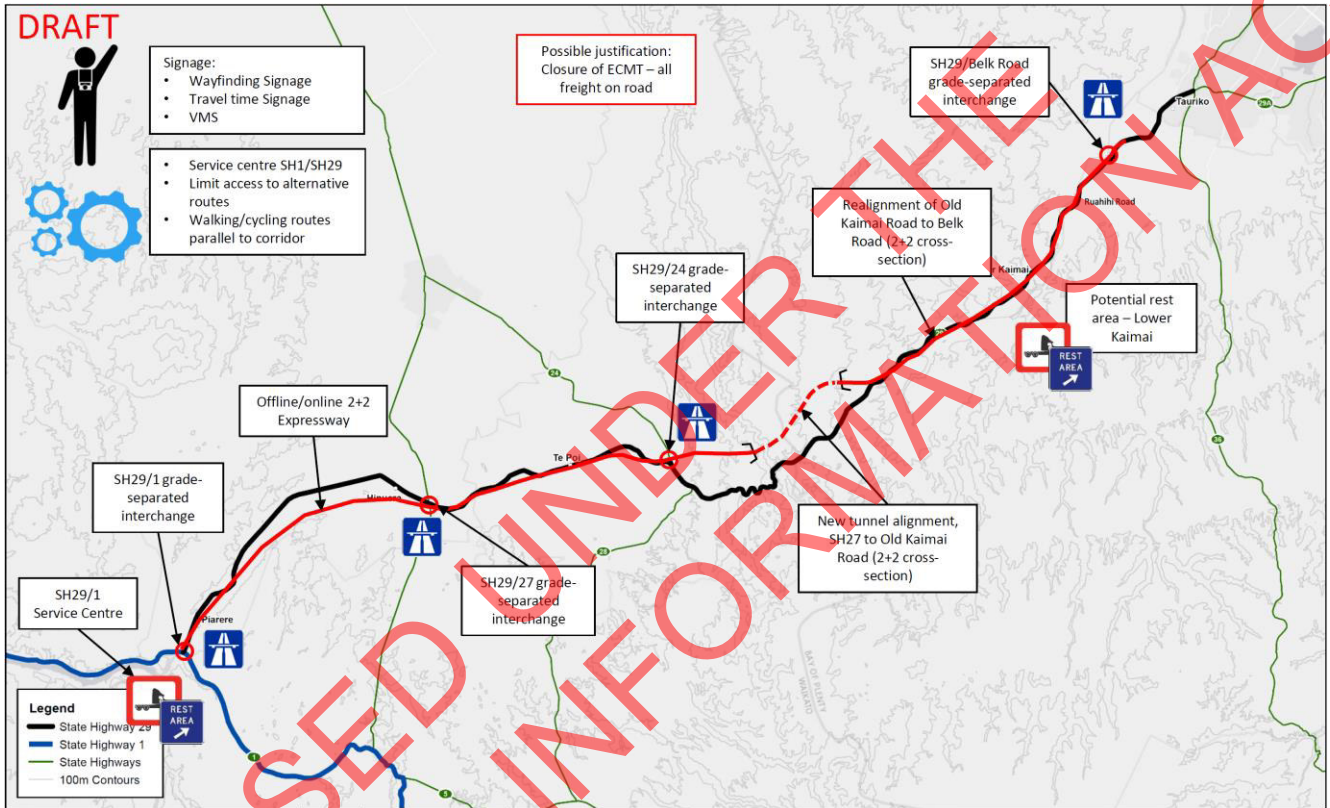
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Environmental and social:	0	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Little improvement in terms of amenity values, community cohesion and access.</p> <p>Some improvement to access to public transport, walking and cycling facilities.</p> <p>Little land take required, and best use of existing infrastructure.</p>
Environmental opportunities	Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.	
Social opportunities	Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.	
Rationale for selection or rejection of alternative:	This option ranked 11 th of the 11 programmes due to the lack of significant benefits or ratings against the investment objectives.	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 5: Lead Infrastructure



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 5 - Ultimate Scenario Focus (ONRC)

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to best meet all of the objectives and present the ultimate improvement scenario, thus is focussed on enhancing route efficiency, safety, resilience and attractiveness.</p> <p>As shown above, this includes a realigned SH29 at 2+2 expressway standard (ONRC), with fewer bends, grade separated intersections, limited access and a tunnel through the Kaimai Hills.</p> <p>A number of operational enhancements (as well as physical) are also proposed, targeting the attractiveness of this route and to address signage (VMS) for increased driver information.</p> <p>Dependencies : Justification is likely dependant on closure of the ECMT railway, and increased freight volumes on the route.</p>
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Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):		
	Net property cost (\$m):		
	Opex (\$m/30yr):		
	Maintenance (\$m/30yr):		
	Present value of cost to govt. (\$m):	\$1.6 billion	\$2.9 billion
Estimated BCR range:		0.2	0.4
Timing of need:	Optimal programme:	2035 Construction 2040 Opening 40 year Assessment	Likely: 2035 Construction 2040 Opening 40 year Assessment
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L
			Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 5

Criterion	Score	Discussion
Objective 1 : Resilience	+++	This programme performs the best against this criteria as it proposes new and efficient alignment which would reduce the likelihood of crashes causing closures and provide opportunity to improve other resilience-related issues. It also decreases road grades where they are currently in excess of 8%. The new alignments would also enable the old alignment to be used as a more viable detour route in the event of a closure.
Objective 2 : Cost of travel	+++	This programme provides the most travel time benefits by shortening the corridor and increasing travel speeds, replacing the slowest sections of the route, and sections where delays are caused by significant differences in vehicle travelling speeds.
Objective 3 : Safety	+++	This programme achieves significant safety improvements, and is expected to exceed the safety objective as well as meet the cost of travel objective. The crash rate is expected to reduce significantly, acknowledging that there are safety implications associated with road tunnels.
Feasibility:	--	<p>This option scored '--' overall. This was largely due to a combination of adverse impacts, ranging from - to ---. There are a few significant implementation risks which would require extensive investigation, planning and mitigation.</p> <p>The programme was considered somewhat difficult due to the proposed tunnel and road realignments. The alignment changes are likely to have high property risks and the tunnel inherently indicates a level of technical difficulty. Some documentation and concept sketching has been completed for these options.</p> <p>There are also expected to be significantly life-time operational and maintenance costs associated with the tunnel.</p>
Affordability:	--	<p>This option scored a '--' overall due to likely funding risks for a project of this proportion. There are risks with ongoing costs of implementation and operation, and justification within traditional methods is assumed to be highly unlikely.</p> <p>Given the likely economic efficiency of this programme, further investigation into affordability and justification would be warranted.</p>

[DATE]

Public/Stakeholders:	-	This programme has had some exposure to the public and other stakeholders, and is considered to be well-received by some of the stakeholders which could balance with any negative response due to the greater property, affordability or environmental impacts.
Safety:	+++	This programme would provide a high level of improvements to safety, meeting and likely exceeding the medium rating target set in the investment objectives. The programme substitutes a sub-standard corridor with a higher efficiency and safety standard of route. It is also important to acknowledge the safety implications associated with road tunnels.
Economy:	++	<p>This option would dramatically improve the attractiveness of the journey, with both safety and travel time improvements. It is expected that there will be increased traffic demand due to closure of the ECMT, decreased travel time and improved resilience of the route. It would make it feel safer for more drivers, and the Kaimai Hills would be perceived as less of a barrier.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor, thus increased travel demand would be associated with through traffic and safer long distance journeys.</p>
Environmental and social:	-	<p>May adversely affect heritage sites or sites of significance to Māori along the route.</p> <p>Potentially moderate adverse effects on the landscape and ecology, particularly in the Kaimai section.</p> <p>Minor gain in amenity values along the existing route (for example, from noise) from offline options, and some benefits for public transport, cycling and access in those sections.</p> <p>No improvement to risks from natural hazards.</p> <p>Moderate amount of land take and severance.</p>
Environmental opportunities		Environmental opportunities associated with this programme are minimal, although impact on Kaimai could require offset mitigation.

[DATE]

Social opportunities	<p>Social opportunities associated with this programme are minimal, although the improvements would potential justify increased tourism land use along the original corridor, given the decreased in daily traffic on the old alignment.</p> <p>Should the programme enable significant traffic growth, there would be further growth in adjacent settlements justified in the longer term.</p>
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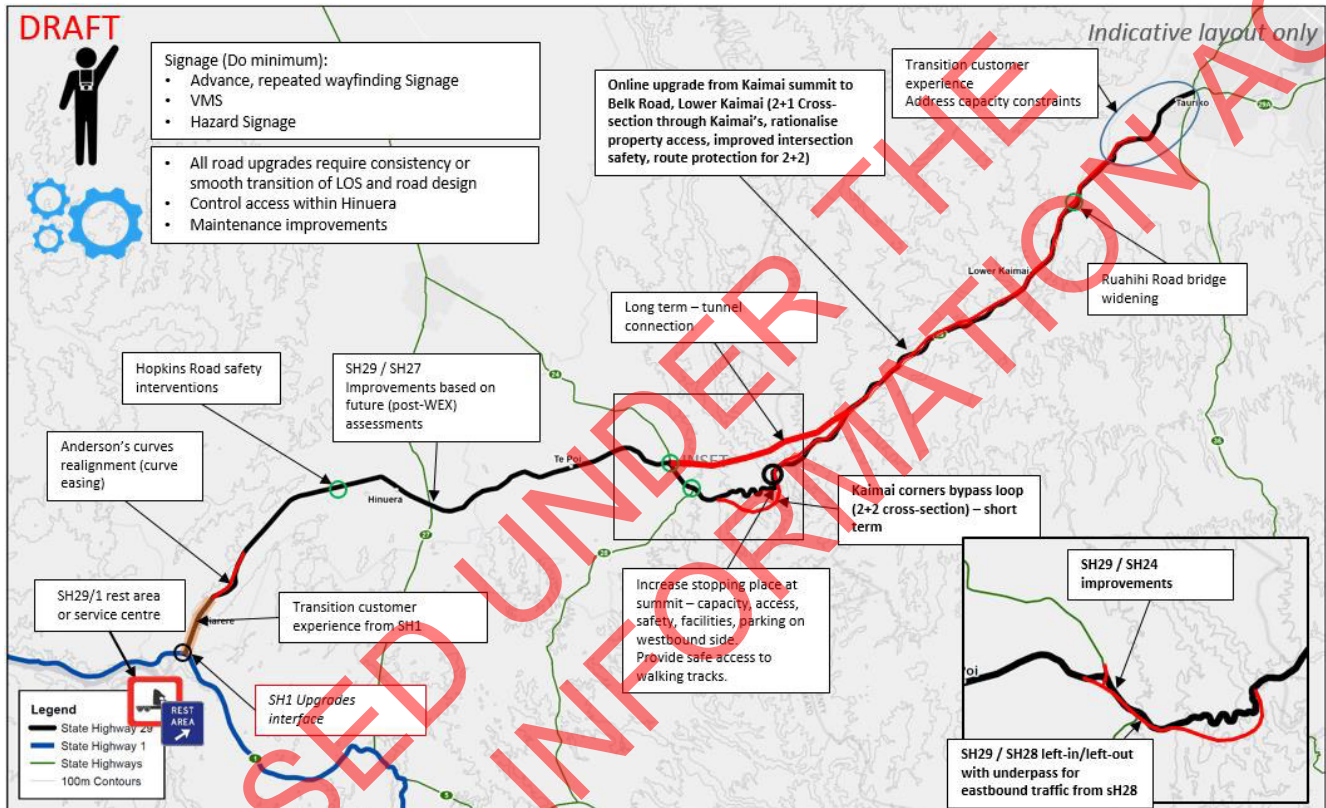
Rationale for selection or rejection of alternative:	<p>This option ranked 3rd of 11 programmes because the cost and feasibility challenges of the programme being balanced with significant benefits achieved and opportunities considered.</p>
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Programme business case Assessment of alternatives summary table

Programme 6: Targeted key problem areas



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 6 - Combination programme - Target key problem areas

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to provide safety and efficiency improvements (route reliability). It is focused on improving corridor safety and efficiency of the journey on the Kaimai Hills via a 2+1 online upgrade with local access rationalisation and safety improvement. Minimal upgrades are proposed between SH1 and SH24 due to the lower volume of demand. A tunnel through the Kaimai hills is proposed in the longer term, with post WEX opening assessment proposed.</p> <p>This also includes stopping places at the SH1 junction and the top of the Kaimai Hills, as well as consistency of road treatments and safe transitions between sections of the road network.</p> <p>A number of operational enhancements (as well as physical) are also proposed, regarding consistency of driver experience (design) and signage (VMS) for increased driver information during incidents.</p> <p>Dependencies :</p>
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		Lower	Upper	
Estimated total public sector funding requirement:	Capital cost (\$m):			
	Net property cost (\$m):			
	Opex (\$m/30yr):			
	Maintenance (\$m/30yr):			
	Present value of cost to govt. (\$m):	\$143 million	\$244 million	
Estimated BCR range:		0.7	1.2	
Timing of need:	Optimal programme:	Construction 2022 Opening 2025 Assessment: 40yrs	Likely: Construction 2022 Opening 2025 Assessment: 40yrs	
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L	Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 6

Criterion	Score	Discussion
Objective 1 : Resilience	+	This programme provides only minor resilience improvements via the Kaimai Hills west bypass (with decreased accidents and alternative route) and through other minor safety improvements at intersections on the Kaimai's and between SH1 and SH24. A future tunnel would also provide resilience improvements but in the longer term.
Objective 2 : Cost of travel	+	This programme addresses efficiency by providing minor gains on the Kaimai Hills with the bypass, increased passing opportunities, and in the longer term with the tunnel (not assessed). This is considered more than other programmes with online upgrades on only 1 or sections, but doesn't provide significant journey time improvements over the length of the corridor.
Objective 3 : Safety	++	This programme addresses the locations with highest safety rating, although does not eliminate the risk of crashes since realignment is confined to small sections of the route. Generally the safety across the full route would improve noticeably.
Feasibility:	-	This option scored '-' overall, if the tunnel does not eventuate. This was largely due to a combination of adverse impacts, some of which are expected to be extensive (e.g. the tunnel and construction of the bypass) while others like infrastructure impacts would be less. The programme was expected to provide opportunities for innovative technology use. There would also be reasonable property and maintenance risks with some of the new alignments.
Affordability:	-	This option scored a '-' overall due to a few funding risks. It is expected that this programme might not be funded traditionally, with the cost of the works on the Kaimai Hills, however it is less affordable if the tunnel eventuated. There are various cashflow risks and operating costs associated with these options.
Public/Stakeholders:	0	This programme has had no exposure to stakeholders or the public and would have a balanced (positive and negative) response from stakeholders.
Safety:	++	This programme would provide safety improvements including substituting the road section with highest safety risk with an improved standard of road cross section. It is expected that there would also be minor safety benefits associated with the other minor improvements and increased passing opportunities.

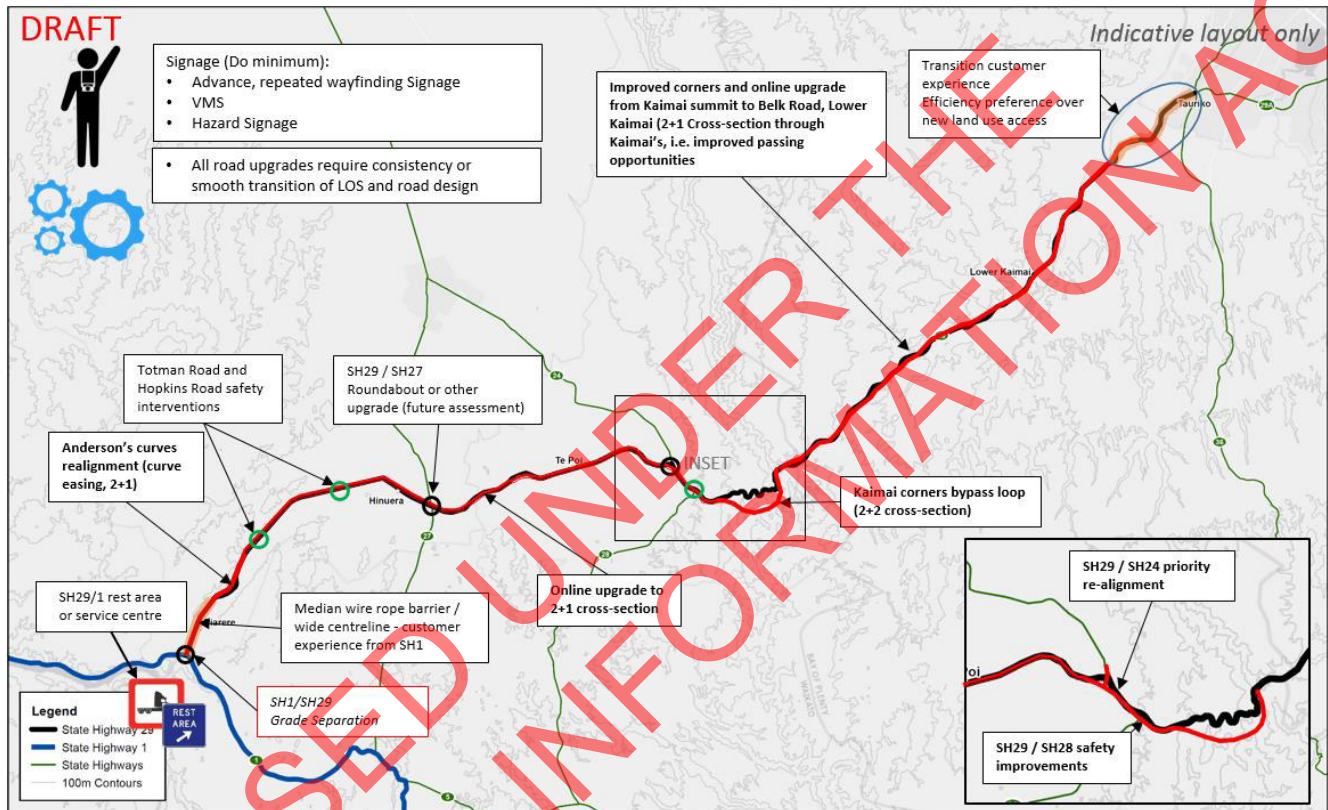
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Economy:	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, thus encouraging a small increase in traffic demand. Journey time reliability would also improve.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor or provide significant improvements for regional/long distance journeys.</p>
Environmental and social:	-	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Little improvement in terms of amenity values, community cohesion and access, access to public transport.</p> <p>Some land take required on the Kaimai Hills with regard to the western side deviation and upgrades between the summit and Tauriko.</p>
Environmental opportunities	<p>Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment</p>	
Social opportunities	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
Rationale for selection or rejection of alternative:	<p>This option ranked 8th of the 11 programmes, if not considering the cost and impact of the longer term proposed tunnel. This is due to the scheme achieving fewer benefits than other programmes, particularly with cost of travel and safety. It scores closely with a number of the other programmes.</p>	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 7: Kaimai's Safety and Flat Section Reliability (2+1)



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[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 7 - Combination programme - Kaimai's Safety and Flat Section Reliability (2+1)

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to provide safety and minor efficiency improvements (route reliability). It is focused on improving corridor safety and reliability of the journey. Specifically this focuses on consistent design, LOS treatments and passing opportunities (2+1 online upgrade).</p> <p>As shown above, this includes online improvements, minor intersection improvements with a short offline alignment at the western side of the Kaimai Hills.</p> <p>A number of operational enhancements (as well as physical) are also proposed, regarding consistency of driver experience (design), a service centre and signage (VMS) for increased driver information during incidents.</p> <p>Dependencies :</p>					
Estimated total public sector funding requirement:		Lower	Upper			
	Capital cost (\$m):					
	Net property cost (\$m):					
	Opex (\$m/30yr):					
	Maintenance (\$m/30yr):					
	Present value of cost to govt. (\$m):	\$163 million	\$263 million			
Estimated BCR range:		0.9	1.4			
Timing of need:	Optimal programme:	Construction 2022 Opening 2025 Assessment: 40yrs	Likely:	Construction 2022 Opening 2025 Assessment: 40yrs		
IAF profile:	Strategic fit:	H/M/L	Effectiveness:	H/M/L	Efficiency:	H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 7

Criterion	Score	Discussion
Objective 1 : Resilience	++	This programme provides reasonable resilience improvements via the Kaimai Hills west bypass (with decreased accidents and alternative route) and through other minor safety improvements.
Objective 2 : Cost of travel	++	This programme addresses efficiency by providing minor gains on both the Kaimais and the flat section with passing opportunities and the Kaimai Hills bypass. This is considered more than other programmes with online upgrades on only 1 or sections, but doesn't provide significant journey time improvements.
Objective 3 : Safety	++	This programme focuses on safety improvements in addition to safe passing opportunities, targeting highest risk sections of the road, including the Kaimai Hills. It would achieve reasonable safety improvements but is not as effective as complete realignments of the Kaimai Hills sections.
Feasibility:	-	<p>This option scored '-' overall. This was largely due to a combination of adverse impacts, which were generally minor by comparison to major road upgrades. The greatest impact to feasibility was associated with the Kaimai Hills bypass.</p> <p>The programme was not expected to affect other infrastructure providers in a significant way, and was expected to provide opportunities for innovative technology use.</p> <p>There would also be reasonable property and maintenance risks with some of the new alignments.</p>
Affordability:	+	This option scored a + overall due low funding risks. It is expected that it is possible that this programme would be funded traditionally, however the Kaimai Hills west bypass would be costly.
Public/Stakeholders:	0	This programme has had no exposure to stakeholders or the public but is expected to be neutrally received.
Safety:	++	This programme would provide safety improvements including substituting the road section with highest safety risk with an improved standard of alignment. It is expected that there would also be minor safety benefits associated with the other minor improvements and increased passing opportunities.

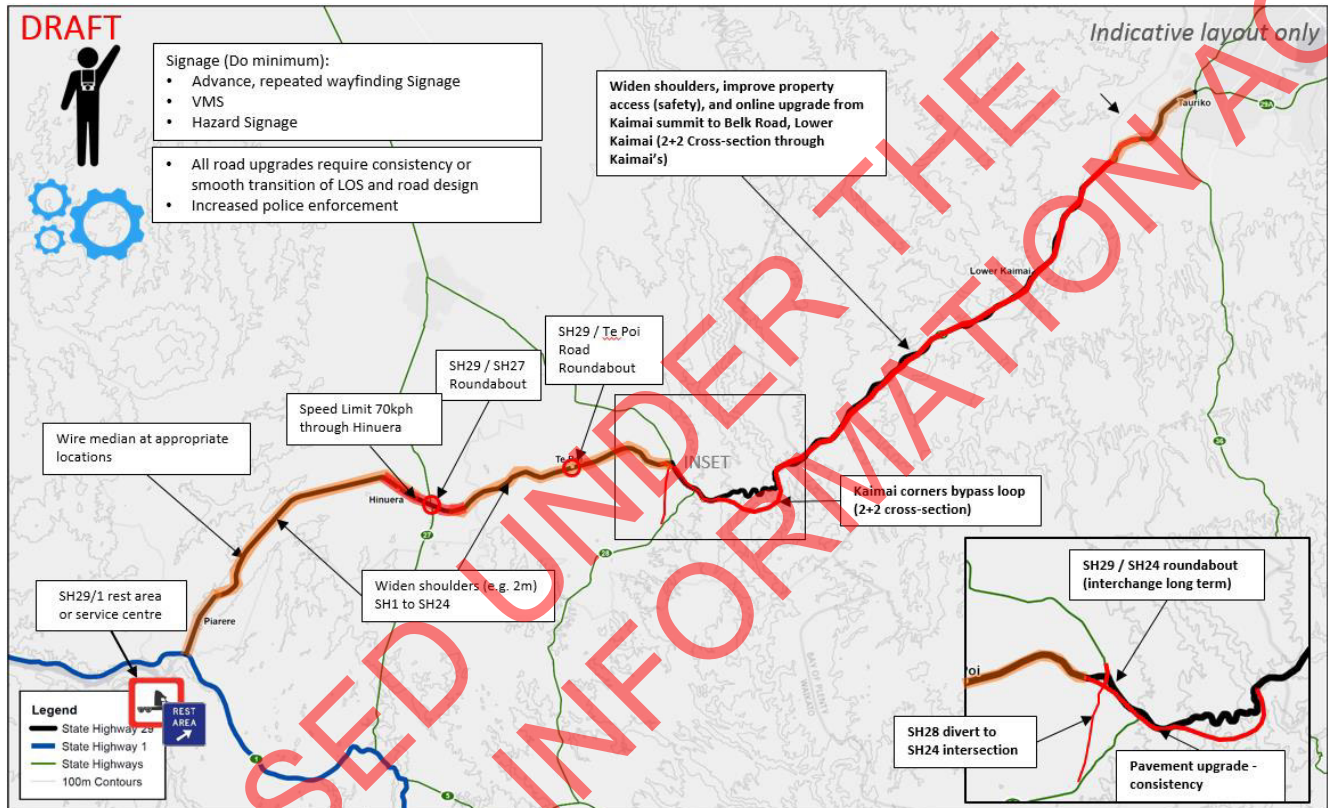
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<p>Economy:</p>	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, thus potentially encouraging a small increase in traffic demand. Importantly, Journey time reliability would improve.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor but would provide some improvements for regional/long distance journeys.</p>
<p>Environmental and social:</p>	-	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Little improvement in terms of amenity values, community cohesion and access, access to public transport.</p> <p>Some land take required where realignments are proposed land take required.</p>
<p>Environmental opportunities</p>	<p>Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment</p>	
<p>Social opportunities</p>	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
<p>Rationale for selection or rejection of alternative:</p>	<p>This option ranked 1st of the 10 programmes due to the balance achieved between constructability and costs and the tangible benefits as well as positive impacts of the programme. There is a focus on whol-of-corridor intervention for a consistent driving experience, which is considered to have a good overall impact in terms of all of the investment objectives.</p>	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 8: Safety and 2+2 Kaimais upgrade



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 8 - Combination programme - Safety and Kaimais 2+2 upgrade

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to provide safety and minor efficiency improvements (route reliability). It is focused on improving corridor safety between SH1 and dSH24 and reliability of the journey via a 2+2 online upgrade with wide shoulders on the Kaimai Hills. Specifically this focuses on consistent design and pavement throughout corridor.</p> <p>As shown above, this includes online improvements, minor and major intersection improvements with a short offline alignment at the western side of the Kaimai Hills.</p> <p>A number of operational enhancements (as well as physical) are also proposed, regarding consistency of driver experience (design), a service centre and signage (VMS) for increased driver information during incidents.</p>
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Dependencies :

	Lower	Upper
Estimated total public sector funding requirement:		
Capital cost (\$m):		
Net property cost (\$m):		
Opex (\$m/30yr):		
Maintenance (\$m/30yr):		
Present value of cost to govt. (\$m):	\$241 million	\$422 million

Estimated BCR range:	0.4	0.8
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Timing of need:	Optimal programme:	Construction 2022 Opening 2025 Assessment: 40yrs	Likely:	Construction 2022 Opening 2025 Assessment: 40yrs
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IAF profile:	Strategic fit:	H/M/L	Effectiveness:	H/M/L	Efficiency:	H/M/L
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[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 8

Criterion	Score	Discussion
Objective 1 : Resilience	++	This programme provides reasonable resilience improvements over the Kaimai's, with an improved cross-section, as well as improved road cross section between SH1 and SH24. These improvements are assumed to increase safety and the ability of incident teams to respond effectively.
Objective 2 : Cost of travel	+	This programme addresses efficiency by providing travel time gains on the Kaimais and passing opportunities on the flat section. However speed limit reduction through Hinuera and other interventions are expected to slow some of the journey by comparison. Overall it is a minor improvement.
Objective 3 : Safety	++	This programme focuses on safety improvements in addition to safe passing opportunities, targeting highest risk sections of the road, including the Kaimai Hills. It would achieve reasonable safety improvements but is not as effective as complete realignments of the Kaimai Hills sections.
Feasibility:	-	<p>This option scored '-' overall. This was largely due to a combination of adverse impacts, which were generally minor by comparison to major road upgrades. The greatest impact to feasibility was associated with the Kaimai Hills bypass.</p> <p>The programme was not expected to affect other infrastructure providers in a significant way, and was expected to provide opportunities for innovative technology use.</p> <p>There would also be reasonable property and maintenance risks with some of the new alignments.</p>
Affordability:	-	This option scored a - overall due to a few likely funding risks. It is expected that it is possible that this programme could be funded traditionally, however the Kaimai Hills west bypass would be costly.
Public/Stakeholders:	0	This programme has had no exposure to stakeholders or the public and is expected to have minor reactions, both positive and negative.
Safety:	++	This programme would provide safety improvements including substituting the road section with highest safety risk with an improved standard of alignment. It is expected that there would also be minor safety benefits associated with the increased passing opportunities, improved intersections and 2+2 road cross section on the Kaimai Hills.

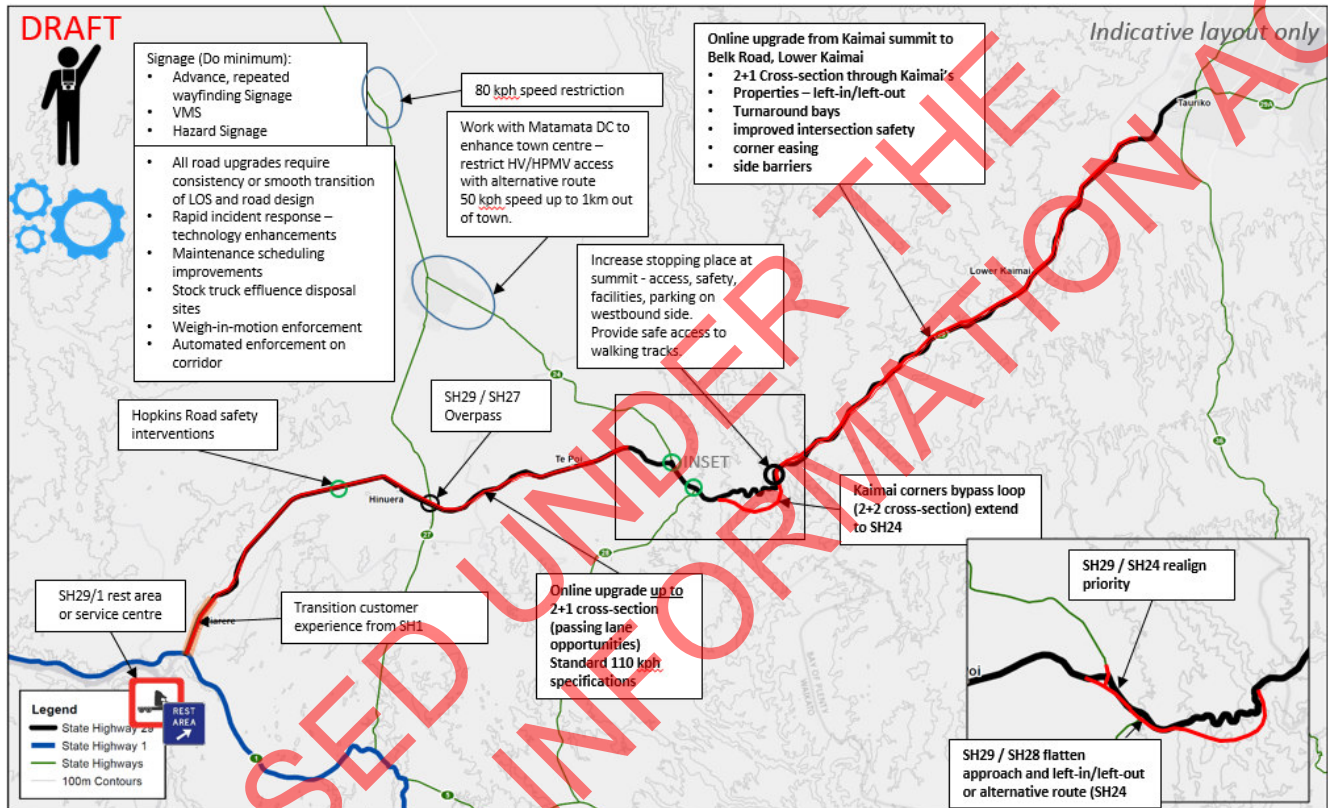
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<p>Economy:</p>	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, potentially encouraging a small increase in traffic demand. Journey time reliability would also improve due to increased capacity on the Kaimai hills for vehicles of varying travel speeds.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor but would provide significant improvements for regional/long distance journeys.</p>
<p>Environmental and social:</p>	0	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Some improvement in terms of amenity values, community cohesion and access, access to public transport. Improvement to community adjacency to noise.</p> <p>Little land take required.</p>
<p>Environmental opportunities</p>	<p>Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment</p>	
<p>Social opportunities</p>	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
<p>Rationale for selection or rejection of alternative:</p>	<p>This option ranked 6th of the 10 programmes, and is similar to programme 3, 6 and 10.</p>	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 9: 2+1, safety and access restriction



[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 9 - Combination programme - 2+1, safety and access restriction

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to provide safety and efficiency improvements (route reliability). It is focused on improving corridor safety and efficiency of the journey on the Kaimai Hills via a 2+1 online upgrade with local access rationalisation and safety improvement. Online upgrades are proposed between SH1 and SH24 with passing lanes where easily achieved (least property impacts). Access to SH24/SH27 is proposed to be restricted.</p> <p>This also includes stopping places at the SH1 junction and the top of the Kaimai Hills, as well as consistency of road treatments and safe transitions between sections of the road network.</p> <p>A number of operational enhancements (as well as physical) are also proposed, regarding consistency of driver experience (design) and signage (VMS) for increased driver information during incidents as well as improved technology leading to better enforcement and incident response.</p> <p>Dependencies :</p>
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Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):		
	Net property cost (\$m):		
	Opex (\$m/30yr):		
	Maintenance (\$m/30yr):		
	Present value of cost to govt. (\$m):	\$169 million	\$271 million
Estimated BCR range:		0.8	1.3
Timing of need:	Optimal programme:	Construction 2022 Opening 2025 Assessment: 40yrs	Likely: Construction 2022 Opening 2025 Assessment: 40yrs
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 6

Criterion	Score	Discussion
Objective 1 : Resilience	++	This programme provides reasonable resilience improvements via the Kaimai Hills west bypass (with decreased accidents and alternative route) and through other minor safety improvements.
Objective 2 : Cost of travel	++	This programme addresses efficiency by providing minor gains on both the Kaimais and the flat section with passing opportunities and the Kaimai Hills bypass. This is considered more than other programmes with online upgrades on only 1 or sections, but doesn't provide significant journey time improvements.
Objective 3 : Safety	++	This programme focuses on safety improvements in addition to safe passing opportunities, targeting highest risk sections of the road, including the Kaimai Hills. It would achieve reasonable safety improvements but is not as effective as complete realignments of the Kaimai Hills sections.
Feasibility:	-	<p>This option scored '-' overall. This was largely due to a combination of adverse impacts, which were generally minor by comparison to major road upgrades. The greatest impact to feasibility was associated with the Kaimai Hills bypass. There would be some challenges associated with implementing restrictions on SH27/24.</p> <p>The programme was not expected to affect other infrastructure providers in a significant way, and was expected to provide opportunities for innovative technology use.</p> <p>There would also be reasonable property and maintenance risks with some of the new alignments.</p>
Affordability:	+	This option scored a + overall due low funding risks. It is expected that it is possible that this programme would be funded traditionally, however the Kaimai Hills west bypass would be costly.
Public/Stakeholders:	-	This programme has had no exposure to stakeholders or the public but is expected to be potentially negatively received due to the impacts to stakeholders on and off the route.
Safety:	++	This programme would provide safety improvements including substituting the road section with highest safety risk with an improved standard of alignment. It is expected that there would also be minor safety benefits associated with the other minor improvements and increased passing opportunities.

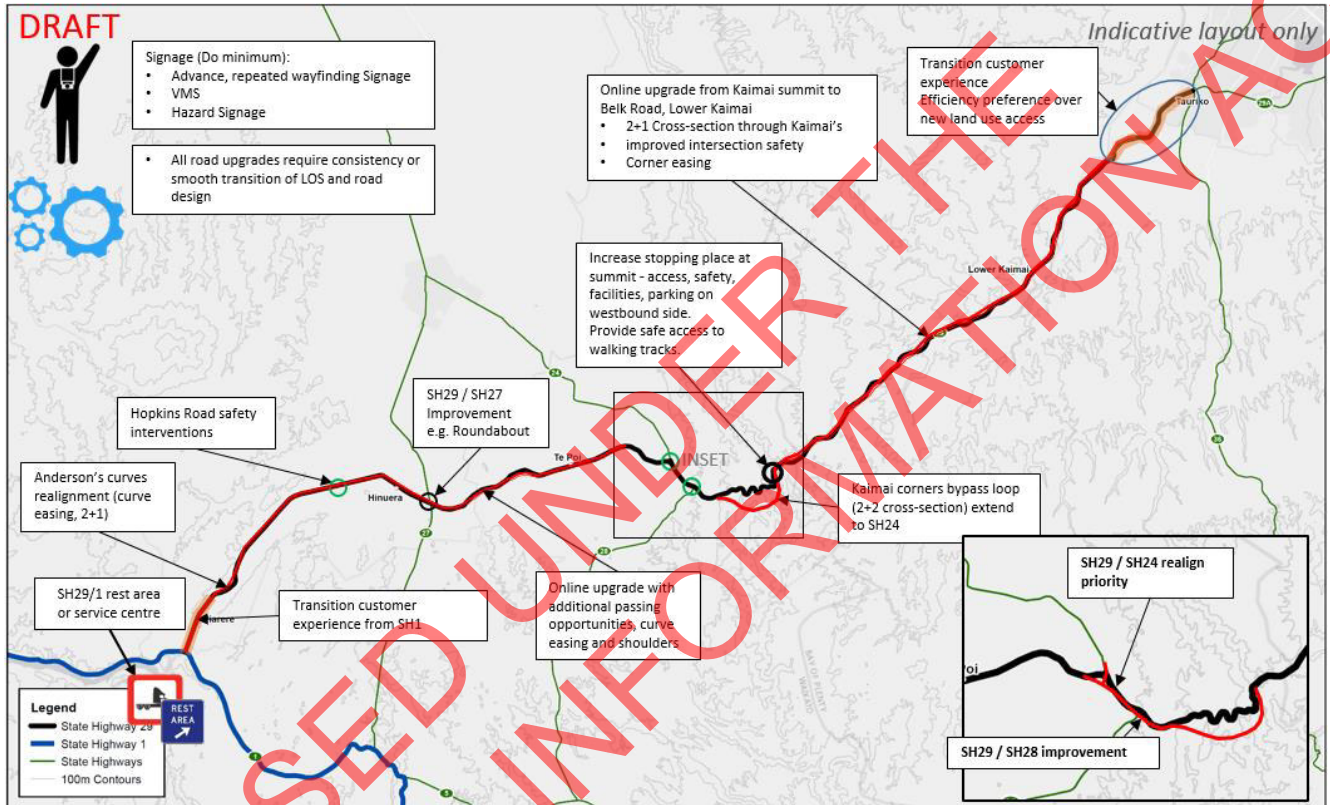
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<p>Economy:</p>	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, thus potentially encouraging a small increase in traffic demand. Importantly, Journey time reliability would improve.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor but would provide some improvements for regional/long distance journeys.</p>
<p>Environmental and social:</p>	-	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Some negative effects in terms of amenity values, community cohesion and access.</p> <p>Some land take required.</p>
<p>Environmental opportunities</p>	<p>Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment</p>	
<p>Social opportunities</p>	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
<p>Rationale for selection or rejection of alternative:</p>	<p>This option ranked 2nd of the 10 programmes due to the relative benefits and opportunities of this programme, the economic efficiency, which includes the benefits associated with the safety and resilience gains.</p>	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 10: Stakeholder's choice



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[DATE]

PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 10 – Combination stakeholders choice

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to provide a balance of safety, resilience and efficiency improvements over the full length of the corridor. It is focused on safer and more frequent passing opportunities coupled with an upgraded 2+2 / 2+1 route over the Kaimai Hills.</p> <p>This also includes a service centre at the SH1 junction and upgrade to the rest stop at the top of the Kaimai Hills, as well as consistency of road treatments and safe transitions between sections of the road network.</p> <p>A number of operational enhancements (as well as physical) are also proposed, including increased automated enforcement, rapid response technology for incidents and signage (VMS) for increased driver information during incidents.</p> <p>Dependencies :</p>		
Estimated total public sector funding requirement:		Lower	Upper
	Capital cost (\$m):		
	Net property cost (\$m):		
	Opex (\$m/30yr):		
	Maintenance (\$m/30yr):		
	Present value of cost to govt. (\$m):	\$163 million	\$264 million
Estimated BCR range:		0.7	1.2
Timing of need:	Optimal programme:	Construction 2022 Opening 2025 40 year appraisal	Likely: Construction 2022 Opening 2025 40 year appraisal
IAF profile:	Strategic fit:	H/M/L	Effectiveness: H/M/L Efficiency: H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 10

Criterion	Score	Discussion
Objective 1 : Resilience	++	This programme provides reasonable resilience improvements via the Kaimai Hills west bypass (with decreased accidents and alternative route) and through other minor safety improvements at intersections on the Kaimai's and between SH1 and SH24.
Objective 2 : Cost of travel	+	This programme addresses efficiency by providing minor gains on the Kaimai Hills with the bypass and increased passing opportunities. This is considered similar to other programmes with online upgrades, but doesn't provide significant journey time improvements over the length of the corridor.
Objective 3 : Safety	++	This programme addresses the locations with highest safety rating, although does not eliminate the risk of crashes since realignment is confined to small sections of the route. Generally the safety across the full route would improve noticeably.
Feasibility:	-	<p>This option scored '-' overall. This was largely due to a combination of adverse impacts, some of which are expected to be challenging while others like infrastructure provider impacts would be less. The greatest impact to feasibility was associated with the proposed Kaimai Hills west alignment.</p> <p>The programme was expected to provide opportunities for innovative technology use.</p> <p>There would also be some property and maintenance risks with some of the new alignments.</p>
Affordability:	-	This option scored a '-' overall due to a few funding risks. It is expected that this programme may not be funded traditionally, with the cost of the works on the Kaimai Hills. There are various cashflow risks, property acquisitions and operating costs associated with these options.
Public/Stakeholders:	0	This programme has had no exposure to stakeholders or the public but is expected to be neutrally received.
Safety:	++	This programme would provide safety improvements including substituting the road section with highest safety risk with an improved standard of road cross section. It is expected that there would also be minor safety benefits associated with the other minor improvements and increased passing opportunities.

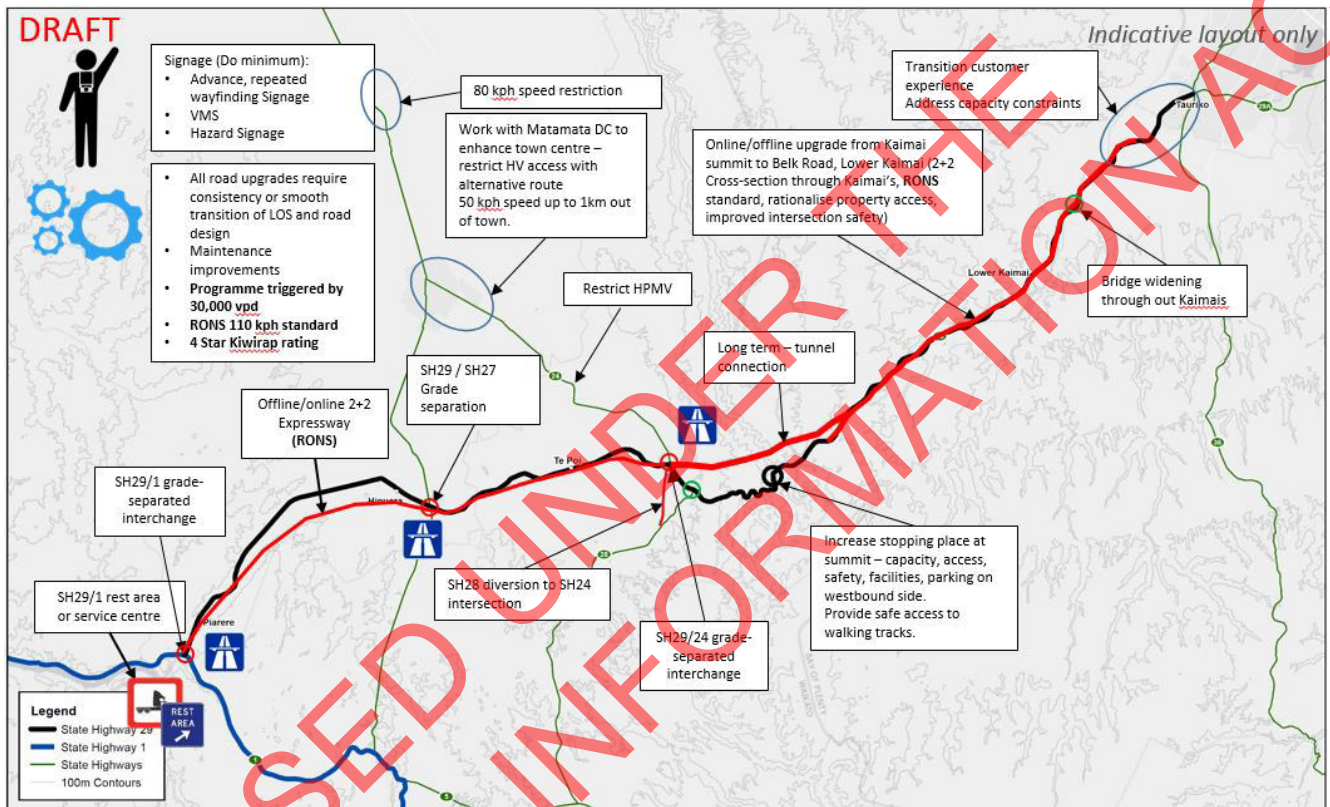
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Economy:	+	<p>This programme would provide minor improvements the overall perception of the resilience and reliability of this route, in addition to safety improvements, thus encouraging a small increase in traffic demand. Journey time reliability would also improve.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor or provide significant improvements for regional/long distance journeys.</p>
Environmental and social:	0	<p>Online work would have little environmental impact.</p> <p>Risks from natural hazards not improved.</p> <p>Little improvement in terms of amenity values, community cohesion and access, access to public transport.</p> <p>Little land take required.</p>
Environmental opportunities	Environmental opportunities associated with this programme are minimal not considered a benefit within the scheme assessment	
Social opportunities	<p>Social opportunities associated with this programme are minimal not considered a benefit within the scheme assessment.</p> <p>Should the programme enable traffic growth, there could be further growth in adjacent tourism in the longer term.</p>	
Rationale for selection or rejection of alternative:	This option ranked 5 th of the 10 programmes and is similar to programme 3, 6 and 8.	

[DATE]

Programme business case Assessment of alternatives summary table

Programme 11: Lead Infrastructure (ONRC) plus



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PROPOSAL DETAILS

Business case name:	SH29 – Piarere to Tauriko	Name of Project Manager & Region:	Iain China, Tauranga
Business case purpose:	To develop a programme of works to strengthen the transportation links between Hamilton and Tauranga, and by extension Auckland, considered a strategic freight and tourism route within the region, including the Port and remaining markets in New Zealand. A 40 year time horizon for this programme has been identified.		

Alternative number 11 – Ultimate Scenario (ONRC) plus

Alternative description:	<p>This programme focusses on a suite of interventions (both operational and physical) to best meet all of the objectives and present the ultimate improvement scenario, thus is focussed on enhancing route efficiency, safety, resilience and attractiveness, with additional opportunities to further support the strategic purpose of the route.</p> <p>As shown above, this includes a realigned SH29 at 2+2 expressway standard (ONRC), with fewer bends, grade separated intersections, limited access and a tunnel through the Kaimai Hills. In addition, disincentives are proposed on other routes.</p> <p>A number of operational enhancements (as well as physical) are also proposed, targeting the attractiveness of this route and to address signage (VMS) for increased driver information.</p> <p>Dependencies : Justification is likely dependant on closure of the ECMT railway, and increased freight volumes on the route.</p>
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		Lower	Upper			
Estimated total public sector funding requirement:	Capital cost (\$m):					
	Net property cost (\$m):					
	Opex (\$m/30yr):					
	Maintenance (\$m/30yr):					
	Present value of cost to govt. (\$m):	\$1.6 billion	\$2.9 billion			
Estimated BCR range:		0.3	0.6			
Timing of need:	Optimal programme:	2035 Construction 2040 Opening 40 year Assessment	Likely:	2035 Construction 2040 Opening 40 year Assessment		
IAF profile:	Strategic fit:	H/M/L	Effectiveness:	H/M/L	Efficiency:	H/M/L

[DATE]

MULTI CRITERIA ASSESSMENT – PROGRAMME 11

Criterion	Score	Discussion
Objective 1 : Resilience	+++	This programme performs the best against this criteria as it proposes new and efficient alignment which would reduce the likelihood of crashes causing closures and provide opportunity to improve other resilience-related issues. It also decreases road grades where they are currently in excess of 8%. The new alignments would also enable the old alignment to be used as a more viable detour route in the event of a closure.
Objective 2 : Cost of travel	+++	This programme provides the most travel time benefits by shortening the corridor and increasing travel speeds, replacing the slowest sections of the route, and sections where delays are caused by significant differences in vehicle travelling speeds.
Objective 3 : Safety	+++	This programme achieves significant safety improvements, and is expected to exceed the safety objective as well as meet the cost of travel objective. The crash rate is expected to reduce significantly, acknowledging that there are safety implications associated with road tunnels.
Feasibility:	--	<p>This option scored '--' overall. This was largely due to a combination of adverse impacts, ranging from - to ---. There are a few significant implementation risks which would require extensive investigation, planning and mitigation.</p> <p>The programme was considered somewhat difficult due to the proposed tunnel and road realignments. The alignment changes are likely to have high property risks and the tunnel inherently indicates a level of technical difficulty. Some documentation and concept sketching has been completed for these options.</p> <p>There are also expected to be significantly life-time operational and maintenance costs associated with the tunnel.</p>
Affordability:	--	<p>This option scored a '--' overall due to likely funding risks for a project of this proportion. There are risks with ongoing costs of implementation and operation, and justification within traditional methods is assumed to be highly unlikely.</p> <p>Given the likely economic efficiency of this programme, further investigation into affordability and justification would be warranted.</p>

[DATE]

Public/Stakeholders:	-	This programme has had some exposure to the public and other stakeholders, and is considered to be well-received by some of the stakeholders which could balance with any negative response due to the greater property, affordability or environmental impacts.
Safety:	+++	This programme would provide a high level of improvements to safety, meeting and likely exceeding the medium rating target set in the investment objectives. The programme substitutes a sub-standard corridor with a higher efficiency and safety standard of route. It is also important to acknowledge the safety implications associated with road tunnels.
Economy:	++	<p>This option would dramatically improve the attractiveness of the journey, with both safety and travel time improvements. It is expected that there will be increased traffic demand due to closure of the ECMT, decreased travel time and improved resilience of the route. It would make it feel safer for more drivers, and the Kaimai Hills would be perceived as less of a barrier.</p> <p>It is not considered that this option would drive increased activity directly adjacent to the corridor, thus increased travel demand would be associated with through traffic and safer long distance journeys.</p>
Environmental and social:	-	<p>May adversely affect heritage sites or sites of significance to Māori along the route.</p> <p>Potentially moderate adverse effects on the landscape and ecology, particularly in the Kaimai section.</p> <p>Minor gain in amenity values along the existing route (for example, from noise) from offline options, and some benefits for public transport, cycling and access in those sections.</p> <p>No improvement to risks from natural hazards.</p> <p>Moderate amount of land take and severance.</p>
Environmental opportunities		Environmental opportunities associated with this programme are minimal, although impact on Kaimai could require offset mitigation.

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Social opportunities	<p>Social opportunities associated with this programme are minimal, although the improvements would potential justify increased tourism land use along the original corridor, given the decreased in daily traffic on the old alignment.</p> <p>Should the programme enable significant traffic growth, there would be further growth in adjacent settlements justified in the longer term.</p>
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Rationale for selection or rejection of alternative:	<p>This option ranked 3rd of 11 programmes because the cost and feasibility challenges of the programme being balanced with significant benefits achieved and opportunities considered.</p>
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