highways and network operations

Business Case for Implementation

Detailed Business Case to proceed from Initiation to Implementation

Transmission Gully Motorway

25 September 2012

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0.4	28 August 2012	Pre-Implementation Trial updated for PPP Business Cases.

Contents

Glossary of Terms

Abbreviation	Term
AEE	Assessment of Environmental Effects
BCR	Benefit-Cost Ratio
CAPEX	Capital Expenditure
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CVIU	Commercial Vehicles Investigation Unit
CVO	Costed Viaduct Option
D&C	Design and Construct
DE	Design Estimate
EEM	Economic Evaluation Manual
EI	Everything Infrastructure
EIR	Environmental Impact Report
EOI	Expression of Interest
EPA	Environmental Protection Agency
FYRR	First Year Rate of Return
GATS	Greater Wellington Area Transportation Strategic
GPS	Government Policy Statement
GWRC	Greater Wellington Regional Council
HCV	Heavy Commercial Vehicle
HNO	Highways and Network Operations
HPT	Historical Places Trust
IAP2	International Association for Public Participation
ICE	In Case of Emergency
ILM	Investment Logic Map
IRS	Investment and Revenue Strategy
ITS	Intelligent Transport Systems
KCDC	Kapiti Coast District Council
KPI	Key Performance Indicator
LLR	Lessons Learnt Review
LTMA	Land Transport Management Act
M2PP	MacKays to Peka Peka
MOU	Memorandum of Understanding
MSE	Mechanical Stabilised Embankments
MVKT	Million Vehicle Kilometres Travelled
NES	National Environmental Standards
NIMT	North Island Main Trunk Railway Line

Abbreviation	Term
NIU	National Infrastructure Unit
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NOR	Notice of Requirement
NPC	Net Present Cost
NZCID	New Zealand Council for Infrastructure Development
NZTA (or the Agency)	The New Zealand Transport Agency
NZTS	New Zealand Transport Strategy
OPEX	Operating Expenditure
P&I	Planning and Investment
PBM	Proxy Bid Model
PCC	Porirua City Council
PCE	Parliamentary Commissioner for the Environment
PI	Performance Indicator
PMS	Project Management Services
PoPS	Portfolio Procurement Strategy
PPFM	Planning Programming and Funding Manual
PPM	Principal Project Manager
PPP	Public Private Partnership
PSC	Public Sector Comparator
PT	Public Transport
PTZ	Pan, Tilt and Zoom
PWA	Public Works Act
RAMM	Road Assessment and Maintenance Management
REMAT	RoNS Economic and Modelling Assessment Tool
RFP	Request for Proposal
RLT	Regional Land Transport
RLTS	Regional Land Transport Strategy
RMA	Resource Management Act
RoNS	Road of National Significance
RSE	Reinforced Soil Embankments
SAR	Scheme Assessment Report
SARA	Scheme Assessment Report Addendum
SE	Scheme Estimate
SH(#)	State Highway (number)
SKM	Sinclair Knight Merz
SOI	Statement of Intent
SSC	State Services Commission

Abbreviation	Term
SSEMP	Site Specific Environmental Management Plan
SSRC	Scope and Standards Review Committee
TA	Territorial Authority
TDM	Traffic Demand Management
TGP (or the Project)	Transmission Gully Project
TOC	Total Outturn Cost
VAC	Value Assurance Committee (formerly SSRC)
VMS	Variable Messages Sign
WCP	Western Corridor Plan
WEBs	Wider Economic Benefits
WTOC	Wellington (Johnsonville) Traffic Operations Centre
WTSM	Wellington Transport Strategy Model

1 Executive Summary

The Transmission Gully Project (TGP) has a long history as an alternative route to the existing State Highway 1 (SH1) corridor spanning 70 years through to the recent Board of Inquiry approval of the project in 2012.

Following the adoption of the Western Corridor Plan (WCP) in 2006, the decision was made to focus on the provision of an alternative State Highway corridor to the existing coastal route as an outcome of the 2006 Transit New Zealand (now New Zealand Transport Agency (NZTA)) Board decision.

The problems with the existing SH1 corridor can be defined in broad terms as congestion, local accessibility, use of inappropriate routes, safety, severance, lack of vulnerable road user provision and route security/resilience.

In addressing the above problems the TGP will:

- Create an alternative and resilient transport corridor to and from Wellington;
- Reduce travel time, variability and congestion for motorists on SH1 and the existing coastal route;
- Improve accessibility and safety for all transport users; and
- Facilitate economic development within the region and nationally.

The 2008 Scheme Assessment Report (SAR) looked at 38 different options and two alternative alignments in recommending that the TGP should be located outside of the earlier 2002 designation boundary. The Project consisted of a 27km long four-lane expressway standard road between Linden and MacKays Crossing (refer Figure below), with grade separated interchanges at Paekakariki, SH58, James Cook Drive and Kenepuru, and crawler lanes on steep sections of the corridor. The link roads connecting to the James Cook Drive Interchange and any modifications to the existing coastal route, subsequent to the TGP, would be progressed by the Porirua City Council.

Transmission Gully Project – Route Alignment and Existing State Highway Network

Work undertaken during the SAR highlighted the vulnerability of the existing SH1 corridor and adopted a design concept which reduced the vulnerability of the TGP, while also reducing the construction cost of the project.

In 2009, the decision was made to develop the Wellington Northern Corridor Road of National Significance (RoNS) project in which the TGP formed a critical part of the route between Wellington Airport and Levin. The Wellington Northern Corridor forms one of seven RoNS to be progressed as part of the Government Policy Statement (GPS) for transport.

The TGP is consistent with the GPS for transport and will deliver economic growth and productivity, value for money and improved road safety. At a regional level, this response will provide a critical linkage as part of the Wellington Northern RoNS project, develop a cost effective package of improvements, and avoid or mitigate environmental and cultural effects.

The work undertaken as part of the Assessment of Environmental Effects (AEE) and the Board of Inquiry process has confirmed the suitability of the project and resulted in future design improvements and associated cost reductions. This concluded in the Board of Inquiry approval of the Project in June 2012.

The TGP cost estimate has progressively reduced over the past four years as displayed in the table below. These cost reductions have been the result of significant design improvement's relating to earthworks optimisation, reduction in the total length of bridges, ground improvements, interchange design and reduced consenting risk.

TGP Cost Development

[redacted]

A number of business cases for RoNS are being progressed together and, when combined with other projects will put pressure on the National Land Transport Fund under a Pay-as-you-go model. Wider financial and commercial considerations in progressing the State Highway programme as a whole will be considered and discussed in a separate umbrella paper.

The Wellington Northern RoNS Business Case 2009 confirmed that the package of projects had a benefit-cost ratio (BCR) of between 1.1 and 1.4 (including wider economic benefits (WEBs)).

The following TGP benefit targets will provide the basis for the delivery of the GPS and the Wellington Northern RoNS project, and will:

- Provide an alternative State Highway corridor strategic connection between MacKays Crossing and Linden;
- Be designed to be resilient to withstand a maximum 7.5 Magnitude local earthquake with a maximum complete (all lanes) closure time for all classes of vehicle of three days;
- Be the route of choice (efficiency and productivity) for all national and regional freight through-trips using the TGP rather than a local road;
- Reduce journey times and variability from MacKays Crossing to Linden by at least five minutes and achieve no more than one minute journey time variability using a 2026 design year for a typical light vehicle trip;
- Reduce the accident rate and severity for TG and any SH's revoked following the construction of TGP between MacKays Crossing and Linden on a vehicle-km basis.

As a consequence of SH1's problems, the flow of people and freight in, through, and out of the region is currently restricting the region's economic growth. Accordingly, providing relief for these problems will help unlock some of this growth potential.

If the TGP is not progressed then congestion will worsen, journey times along the existing SH1 corridor will increase by up to 30% by 2026, and there will be increased driver frustration and accident rates at peak times.

The vulnerability of the northern access will severely affect response and recovery after a significant natural event, particularly a major earthquake. This will severely affect the economy of the region, and the nation as a whole, until secure road access can be established and recovery can begin.

Delays to the project and susceptibility to loss of access is increasingly affecting businesses consideration of the viability of being in Wellington, and could affect the economy of the region as a whole. This may lead to businesses relocating economically more advantageous locations within New Zealand, or offshore.

The form of procurement for the TGP is an important consideration not least because of the potential opportunity to employ an alternative to the NZTA's more traditional models, such as a public private partnership (PPP).

Work undertaken on procurement models prior to this Business Case indicated that D&C was a preferred option for the TGP (marginally ahead of Competitive Alliance) and that subject to guidance from the government, PPP was a feasible procurement model.

Work has been undertaken as part of this Business Case to reassess the feasibility of a PPP for the TGP. The assessment has taken into account that a PPP is a complex and significant commitment. It has a number of important features that are quite different to the NZTA's traditional procurement models. A PPP will involve a very long term contractual relationship with a private sector constructor, operator and, importantly, financiers. This brings a focus to risk allocation and financial and commercial issues that are not part of or not as transparent in the NZTA's more traditional procurement models.

The reassessment has reconfirmed PPP as a feasible procurement model for the TGP. Key factors supporting the feasibility of PPP are:

- It is a viable procurement model in that the outcomes required from the TGP can be unambiguously captured in a performance based contract that provides the basis for private sector design, construction, financing, maintenance and operation.
- Incentives can be put in place to encourage the contractor to deliver innovative design and construction techniques, especially with regards to improving operations and maintenance efficiencies, lifecycle optimisation and road user safety. Additionally, there will be opportunities for the NZTA, working in partnership with the contractor, to take the innovations and ideas delivered through the TGP with improved investment certainty and transfer them to the wider road network. By embracing the opportunities provided by this project, the NZTA can secure change in the effectiveness and efficiency of its approach to design, construction and operations.
- The private sector has demonstrated strong interest in the Project.
- NZTA has the capability and resources to manage the PPP procurement process effectively.
- The financial analysis and the review of available evidence from overseas is that the level of net financial gains that a contractor would have to achieve for the whole-of-life cost of the TGP under a PPP to be at least equal to if not less than the whole-of-life cost if the NZTA were to construct, finance and operate using a traditional approach is achievable. The expectation, and requirement, is that a well run procurement process to deliver the TGP through a PPP will produce bids that will "beat" the cost under traditional procurement and, at the same time:
    - Bring whole of life innovations and improved investment certainty that would not necessarily be available under traditional procurement where there is a separation of D&C and operation and, importantly, the incentives on efficiency that will be driven by private sector financiers are not present.

- Transfer to the contractor a range of whole-of-life risks that the NZTA would usually be responsible for under traditional procurement but which can be better managed by other parties.

The procurement process for a PPP is complex and time consuming. This reflects, in part, that it involves a very long term contract (25 years or more) and that the returns to the private sector financiers will be spread over most of the contract terms. All parties have an interest in ensuring that the contract will be enduring and provides for appropriate management of their respective risks and interests. The NZTA will have the benefit of the Treasury's standard form contract that has been tested in the two PPPs that have been completed to date. However, there will be specific features of the TGP that will need to be factored into the procurement process.

PART A – THE CASE FOR THE PROJECT

2 Background

The TGP is one of six projects which form the Wellington Northern Corridor Road of National Significance; one of seven RoNS projects which the government has tasked the NZTA with delivering with a focus on moving people and freight between and within and between key economic centres more safely and efficiently. The RoNS are 'lead infrastructure' projects – that is, they enable economic growth rather than simply responding to it.

The TGP has a long history as an alternative route to the existing SH1 corridor from studies of inland alternatives in 1940 to the present day Assessment of Environmental Effects (AEE) and Planning Approvals from a Board of Inquiry for the project to proceed to construction.

The evolution of the project has resulted in what is now considered to be a more resilient, cost effective and environmentally sound solution to what is a critical component of the Wellington Northern Corridor RoNS.

The National infrastructure Plan (2011) sets a vision for "*A transport sector that supports economic growth by achieving efficient and safe movement of freight and people*". This document and the GPS for transport tasks the NZTA with the delivery of the RoNS programme. The seven RoNS projects are based around New Zealand's five largest population centres. The focus is on moving people and freight between and within these centres more safely and efficiently. The RoNS are 'lead infrastructure' projects – that is, they enable economic growth rather than simply responding to it.

The Wellington Region's strategic transportation network has been developed around two key corridors, one consisting of SH1 and the North Island Main Trunk (NIMT) rail line along the western coastline of the region, and the other consisting of SH2 and the Wairarapa rail line extending north east from Wellington City into the Wairarapa. These two corridors join at the bottom of Ngauranga Gorge and are also connected by SH58, which runs between the Hutt Valley and Porirua.

2.1.1 Wellington Northern Corridor Road of National Significance

The SH1 corridor between Wellington Airport and north of Levin, has been identified as one of the seven RoNS, is of strategic importance both nationally and regionally. It serves the country's capital and third largest economic centre, and is the primary route into and out of Wellington from the rest of the North Island and because Wellington is the point from which ferry journeys to the South Island are made, carries a significant volume of inter-island traffic.

SH1 is classified as "National Strategic" in the NZTA's State highway classification system and is the backbone of the nation's and the region's State highway system. For a state highway to be classified as a "National Strategic" route, it is required to meet threshold levels for at least three of seven specified functional criteria. To be classified in the high volume subset of "National Strategic" routes, a highway section must also meet one of two higher threshold levels for traffic volumes.

The Wellington RoNS (SH1) meets the threshold levels for six of the seven criteria, including both of the higher threshold levels for traffic volumes. Accordingly, it easily meets the conditions required in order to be classified in the high volume subset of "National Strategic" routes. The relevant criteria thresholds that the Wellington RoNS meets are:

- Freight traffic volumes (more than 1,200 heavy commercial vehicles (HCVs) per day);
- Annual average daily traffic (more than 35,000 vehicles per day) (along part of the route);
- Centres of population (major city: more than 100,000);
- Port access for freight (more than 2 million tonnes or more than $3 billion annually in value);
- Airport access for passengers (more than 3 million passengers annually); and
- International tourist flows (more than 60,000 travellers on route annually).

The Wellington Northern Corridor RoNS has a total length of approximately 110km and extends along SH1 from Wellington Airport to approximately 10km north of Levin (as presented below in Figure 2-1:

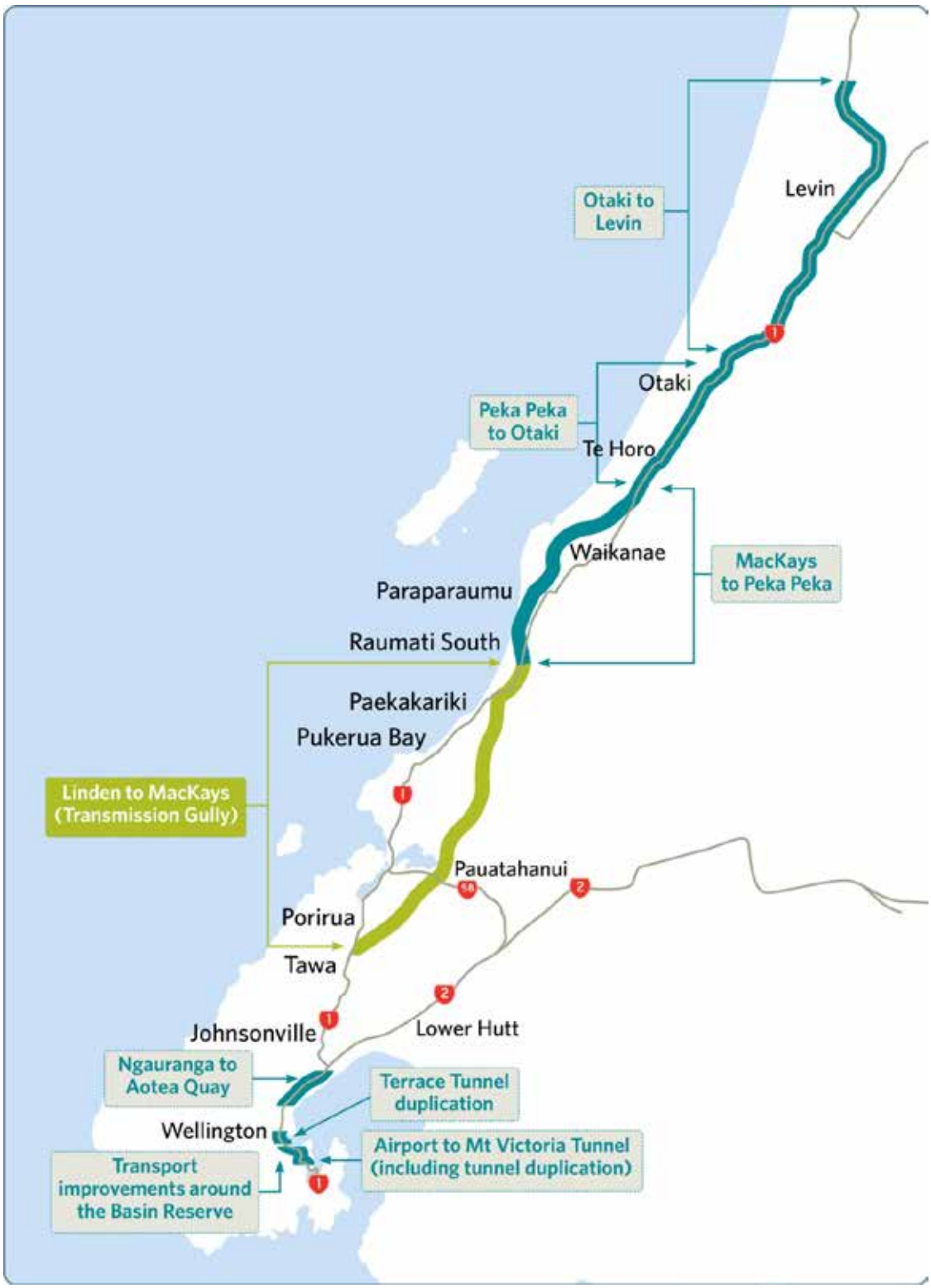


Figure 2-1: Wellington Northern Corridor Road of National Significance

The Government's aspiration is to generally[1] develop the RoNS as a four-lane expressway, thereby providing a range of regional and national benefits by improving the flow of people, goods and services along SH1 and throughout New Zealand.

The Wellington RoNS is a significant construction project that is programmed to be advanced over the next ten years. It entails both the construction of new road and works to parts of the existing state highway through varying environments both urban, peri-urban and rural areas, across six local authority boundaries and within two regions. In order to effectively manage the investigation, design and then construction of the Wellington RoNS it has been necessary to split it into smaller 'projects':- although each of these 'projects' are by themselves major construction exercises in their own right. This division of the RoNS into smaller projects (segments) allows the NZTA to more effectively investigate, understand and respond to issues appropriately.

To the north of the TGP project, NZTA Is developing a four-lane grade-separated expressway with adjacent off-road cycle, pedestrian and bridle pathway, between north of MacKays to north of Peka Peka road. To the south, improvements are being developed to provide relief to Ngauranga Gorge peak time travel level of service issues, combined with the provision of additional capacity between Ngauranga and Aotea Quay.

2.1.2 Importance of Transmission Gully within the Wellington RoNS

A number of these segments entail the construction of new road off-line from the existing state highway which, once complete, will become SH1. The TGP is one such offline segment: its alignment having been selected following an assessment of alternatives and then options over a long period of time, firstly through the Greater Wellington Area Transportation study in the 1980's, the designation process in 1996 - 2003, then through the Western Corridor Transportation Study and Plan leading up to the current consent applications, and granting of consents.

The Project will provide an alternative strategic road link into and out of Wellington between MacKays and Linden, and thus improves regional network and route security. It will better connect the major urban areas in Kapiti, Porirua, Wellington, Hutt, and Upper Hutt districts, and is thus a vital part of the Wellington RoNS. Without this segment of the route, the trip reliability and journey time savings sought to be achieved through the Wellington RoNS between these urban areas cannot be realised.

Therefore, the construction of the TGP main alignment is a vital part of the Wellington RoNS.

2.1.3 The Transmission Gully Section

The TGP route runs from Linden in the south to MacKays Crossing in the north over a distance of 27.5km as presented below in Figure 2-2:

[1] The Otaki to Levin section of the SH1 Wellington Northern Corridor Road of National Significance will see a staged upgrade, beginning with a series of safety improvements between Otaki and SH57 while also providing for a staged development to a higher standard highway as demand increases over time.

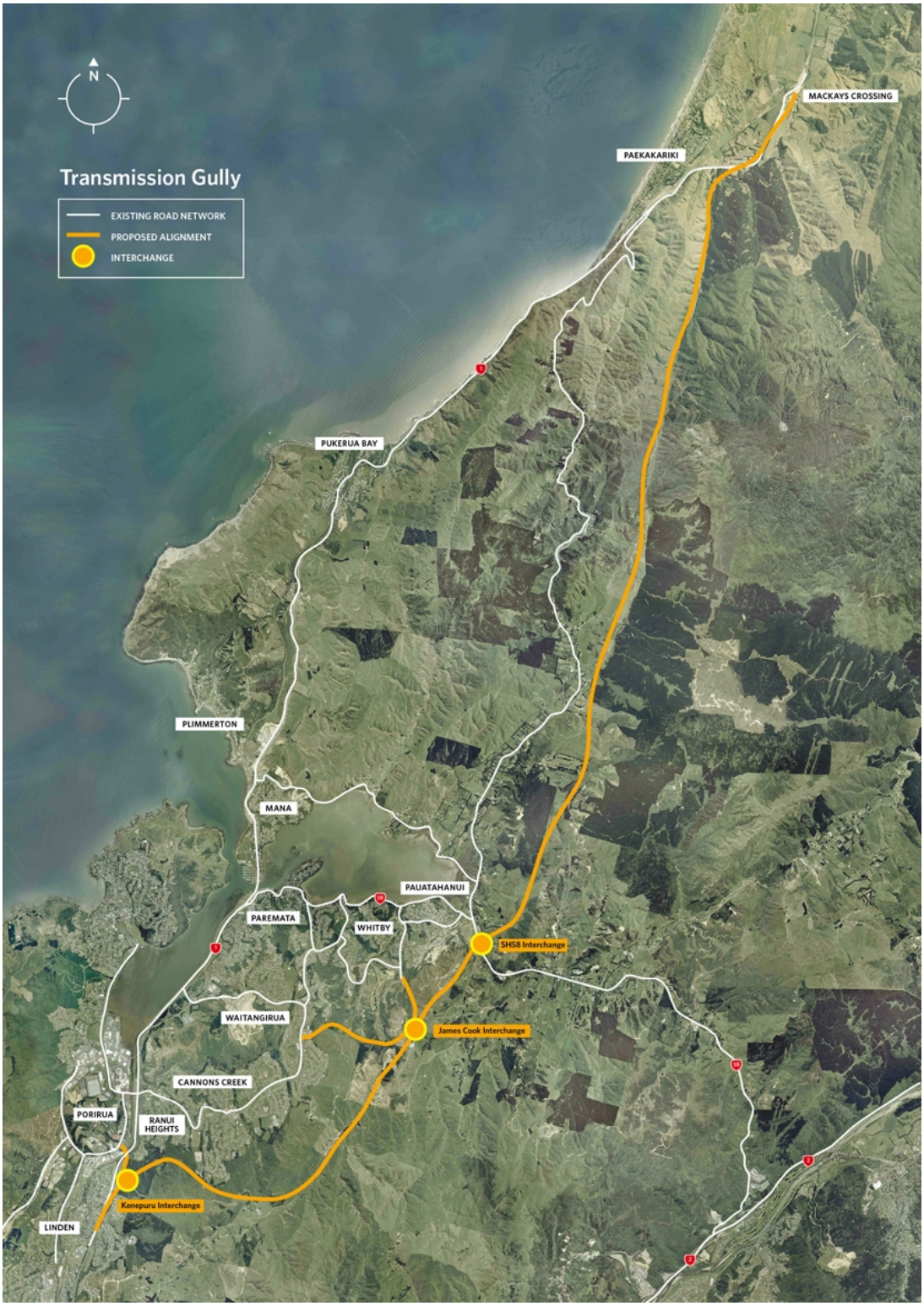


Figure 2-2: Linden to MacKays Corridor and Transmission Gully Project

The 2008 SAR provided the background to the project, a description of the problem, the project objectives, the alternatives considered, details of the preferred option and the associated environmental effects. This phase of the project took on board earlier work and decisions to confirm the problems and then developed a detailed identification and robust assessment of options. The results of this analysis was then reported and adopted by the NZTA Board in December 2008.

A broader indication of the process adopted by the Project Team since 2007 has been presented in Appendix A to demonstrate robustness of the approach and alignment with the strategic objectives of the RoNS corridor and the TG project.

The project development has sought to:

- Create an alternative and resilient, and secure transport corridor to and from Wellington;
- Reduce travel time, variability and congestion for motorists on SH1 and the existing coastal route;
- Improve accessibility and safety for all transport users;
- Develop a cost effective package of improvements;
- Avoid or mitigate environmental and cultural effects; and
- Facilitate economic development within the region and nationally.

The project outcomes remain aligned to the objectives of the SAR and the expectations of the current GPS in the delivery of the Wellington Northern RoNS project.

2.2 Work Completed to Date

The TGP has a long history as an alternative route to the existing SH1 corridor, the following summarises this history through to the recent Board of Inquiry approval of the project in 2012:

- 1940 – First talk of an inland alternative route for SH1 to bypass the coastal areas north of Wellington.
- 1987 to 2002 – The recommendations in the Greater Wellington Transportation Strategic Study led to an Environmental Impact Report being undertaken that concluded an inland route was more environmentally and socially acceptable than the coastal route. The favoured route was from MacKays Crossing to south of Tawa. The southern termination was later modified to Linden. Notices of requirement for the route were lodged in 1996 and a hearing followed in 1997. Appeals were resolved in 2002 and the designation was established.
- 2004 – Costs of the project were updated and the design refined with additional viaducts being incorporated. This option is referred to as the Costed Viaduct Option.
- 2006 – The Western Corridor Study concluded the TGP route should be constructed in ten years. It also identified a broader package of transport improvements to complement the project to be developed and delivered by a wider group of stakeholders. This decision was reaffirmed and adopted by the Transit New Zealand Board in 2006.
- 2007 to 2008 – The SAR went through the process of assessing the earlier 2002 designation, looking at other options to reduce the cost of the project and confirm the justification. This resulted in a modified alignment being identified for the TGP corridor. The NZTA Board adopted the recommendation in December 2008.
- 2009 to 2012 – An Assessment of Environmental Effects (AEE) and Planning Approvals which involved an extensive team of NZTA personnel and specialists carrying out an assessment of environmental effects, design refinement, determining appropriate levels of mitigation and gaining Resource Management Act (RMA) approval from the Board of Inquiry for the project to proceed to construction in 2012 without challenge.

The evolution of the project has resulted in what is now considered to be a more resilient, cost effective and environmentally sound solution to what is a critical component of the Wellington Northern RoNS corridor. TGP connects projects to the north and south currently being developed as part of the RoNS package of improvements.

2.3 Project Governance

It is recognised that robust and sustainable governance within the project (previous phases and subsequent phases) needs to applied. This governance is driven from the Project Sponsor and from the NZTA Highways and Network Operations Group governance framework.

2.3.1 Organisation structure

The most recent 2009 - 2012 "consenting phase" project organisation structure is shown below.

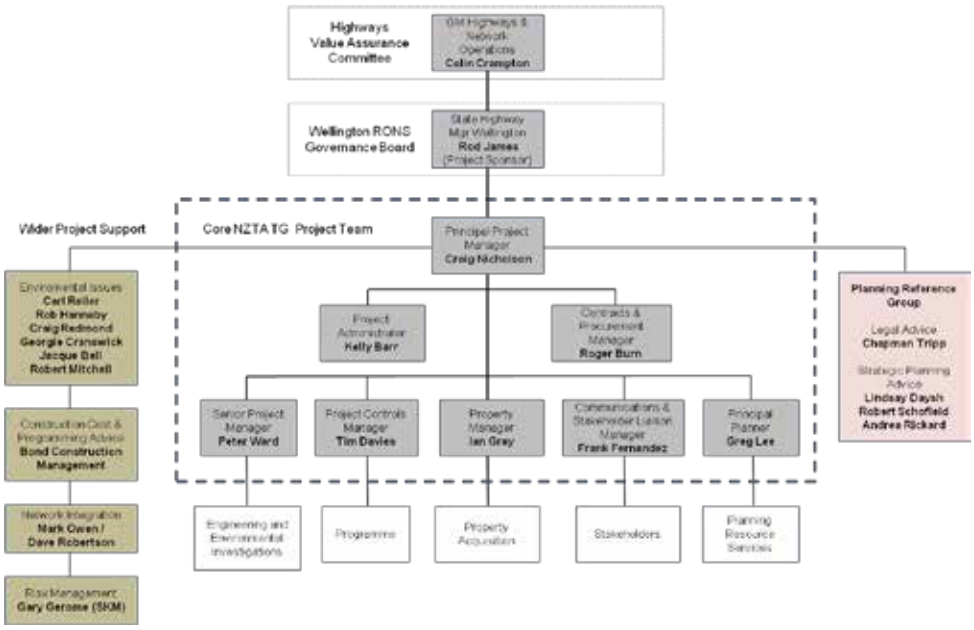


Figure 2-3: Transmission Gully: Phase 3 Organisation Structure

2.3.2 NZTA Board

The NZTA Board has overall responsibility for NZTA projects including TGP. The Board reports directly to the Minister of Transport and is responsible for:

- land transport planning
- managing the state highway network
- regulating access to, and participation in, the land transport network
- promotion of land transport safety and sustainability.

2.3.3 Highways and Network Operations Group Value Assurance Committee

The HNO Group Value Assurance Committee (VAC) is the most senior project decision making team within the HNO group, which comprises the National Manager Professional Services and various other senior managers and technical specialists.

2.3.4 Wellington RoNS Governance Board

The Wellington RoNS Governance Board has responsibility for the projects within the Wellington Northern Corridor RoNS including TGP. Decisions that are beyond its level of decision making delegation are escalated to the Highways VAC.

The Wellington RoNS Governance Board consists of the Regional Director – Central, Regional Manager – Planning and Investment, State Highways Manager Wellington. The Governance Board meets on a monthly basis. Wellington RoNS project progress is reported and any issues can be raised and guidance given to the Principal Project Manager (PPM).

2.3.5 Project Sponsor

The Project Sponsor is the State Highway Manager, Wellington. The Project Sponsor is responsible for:

- Ultimate authority and responsibility for the project
- Approving changes to scope, schedule, budget and quality
- Escalating and championing recommendations to the Highways VAC
- Providing policy guidance to the PPM
- Endorsing the Project Management Plan to confirm that project scope and deliverables are correct
- Reviewing progress and providing advice on resolution of issues
- Supporting the PPM
- Resolving issues beyond the PPM's authority.

3 Problems, Opportunities and Constraints

Key problems which the TGP is aiming to address are around network resilience and route security; congestion; accessibility and safety with a focus on contributing to the wider economic well-being of the greater wellington region.

In determining the key issues to address, a number of key environmental constraints have been identified which have guided the solution development processes. These have included areas of high iwi values (Ngati Toa domain), complex topographical, geotechnical and seismic constraints, as well as sensitive freshwater and marine receiving environments such as the Porirua Harbour.

3.1 Problems and Opportunities

The Wellington region is New Zealand's third largest centre after Auckland and Christchurch. The region currently produces 13% of the nation's gross domestic product (GDP), accounts for approximately 11% of the country's population. As New Zealand's capital, it is a focal point for the public sector and the location of many central government agencies. Its geographic location also means it is the main hub for the movement of people and freight between the north and south islands. Every year approximately seven million tonnes per year of long distance freight (road and rail) moves through Wellington, over one million passengers cross the Cook Strait and approximately five million passengers use the Wellington International Airport every year.

Currently, the section of SH1 between Levin and the Wellington International Airport is regularly congested, especially at peak travelling times (including holiday periods). This congestion often results in unreliable travel times for people and freight as there is no viable alternative route in and out of Wellington City. The lack of an alternative route for SH1 makes the Wellington region vulnerable to major natural disasters. At the northern end of the corridor, particularly between Otaki and Levin, SH1 serves as the only through route and thus has an appreciable local access function.

The route also has a poor safety record, with one of the highest number of fatal/serious crashes per kilometre in the country (KiwiRAP 2008). These safety risks, together with route security issues, often serve to exacerbate congestion problems on the route i.e. in the event of a car crash or flooding.

As a consequence of SH1's problems, the flow of people and freight in, through, and out of the region is currently restricting the region's economic growth. Accordingly, providing relief for these problems will help unlock some of this growth potential.

3.1.1 MacKays to Linden – Problems, Opportunities and Constraints

The problems, opportunities and constraints have been summarised in Appendix A and were documented in detail as part of the 2008 SAR. This section summarises each of these components and provides more detail around the need for the project (the problems), the benefits that the project will deliver (the opportunities) and the limitations/restrictions the project team, funders, and those constructing it will need to work within (the constraints).

The Sinclair Knight Merz (SKM) Assessment of Traffic and Transportation Effects 2011 (prepared as part of the 2012 AEE) documented the problems experienced on the existing SH1 corridor as self-evident to regular travellers in this area. The use of transport models has assisted in quantifying these problems, the degree to which these will intensify in the future and the extent of benefits which will be provided by the TGP.

Each of the issues identified have resulted in an opportunity to improve and enhance facilities for road users, coastal communities, the Wellington region and the wider New Zealand public. In addition to these problems, the TGP will also provide the following opportunities:

- Economic Development for Wellington region and the national economy due to improved accessibility, reliability and resilience.
- Realisation of growth potential in Porirua; particularly associated with existing development in the Whitby and Aotea areas, but also the Porirua Development Framework.
- Improved linkage between Kapiti and the rest of the Wellington region to the south of MacKays Crossing, including Wellington central business district (CBD) and the Wairarapa.
- Improved freight movement and accessibility to the Wellington CBD, Port of Wellington, Wellington Airport and other key regional industrial locations such as Seaview.

A summary of the problems is presented below.

Congestion

The corridor is currently subject to regular congestion during weekday peak periods. More severe congestion is experienced during holiday periods, or when incidents occur (such as crashes, slips, etc).

These problems are predicted to increase significantly as population growth occurs and travel demands increase into the future.

This results in increased travel times and a greater variability of travel times, making journey planning difficult for individuals and businesses (such as freight operators).

A consequence of these conditions is that travel behaviour changes to avoid expected congestion by travelling at other times, to alternative destinations, at lower frequencies or by other modes. Together, these changes result in inconvenience for travellers in the corridor and some suppression of traffic demand along the existing SH1 route.

The TGP will provide a new four-lane route that will reduce travel times and allow journeys to be planned with a greater level of certainty around travel times. Whilst the risks of any temporary closures will be significantly reduced, the consequences in terms of potential delays will also be reduced. As a result, travellers will benefit through being able to travel at times and in a manner which is most convenient for them, with efficiency benefits for both individuals and businesses.

Accessibility

Access between the Hutt Valley and SH1 to the north is currently poor, requiring the use of indirect routes by means of SH1 and SH2 via the Ngauranga Gorge, Grays Road or SH58 around the Pauatahanui inlet.

The TGP will provide a route between SH58 at Haywards and SH1 (north) which is significantly shorter and faster, resulting in an improved level of accessibility between these areas.

Similarly, poor road conditions for north-south travel along SH1 and resulting peak period congestion restricts accessibility between Kapiti / Horowhenua, areas to the south and locally along the corridor.

The TGP will allow reduced and more certain travel times at all time periods, removing deterrents to travel in the corridor and improving accessibility and regional cohesiveness.

Route Security and Resilience

The access routes into the greater Wellington Region have poor resilience and are vulnerable to closure in hazard events such as earthquakes, major storms and tsunami. Studies have indicated that SH1 will be cut off in a large earthquake between Pukerua Bay and Paekakariki due to large landslides, and SH2 at Rimutaka Hill and between Ngauranga and Petone due to landslides and failures of old retaining walls.

In a large earthquake event, land access into Wellington will be cut off for six months or more. Even smaller events could close the state highways as observed in the storm and debris flow events of 2005-2006. It should be noted that the SH3 Manawatu Gorge has been closed for over nine months due to a single landslide.

In Christchurch, response and recovery after the 2010-2011 Canterbury Earthquake sequence was unaffected by restrictions to road access because of the flat terrain and the availability of numerous alternative routes. In the Wellington Region, there are no secure alternative routes to the state highways, north of Porirua and east of Upper Hutt.

The lack of land transport access will severely affect response and recovery after a significant earthquake event. Restoration of other lifelines such as electricity, gas and communications will also be affected by the lack of land access. This will also severely affect the economy of the region, and the nation as a whole for a long time until secure road access can be established and then recovery can begin.

The TGP route will significantly enhance the resilience of access into the Wellington Region. It will bypass the most vulnerable sections between Paekakariki and Pukerua Bay as well as between Porirua and Paremata. Although the route also runs through steep terrain which is unavoidable in the region, a focus on resilience has meant that the road alignment, road form and scheme design has been developed to reduce the size of failures and also enable quick restoration of access. It is assessed that access can be restored in a few days to weeks after a large earthquake compared to many months along the existing transport corridors. It will be able to remain open in the more frequent moderate size events.

The access into Wellington is also vulnerable to normal operational incidents which can and do close the narrow two-lane sections of the highways. The availability of a wider motorway (TGP will be four-lane) and an alternative in the existing SH1 will also significantly enhance route security and access into the region.

After the Canterbury earthquakes businesses and insurance companies are much more aware of the risk of earthquakes and hazard events in New Zealand. Many organisations have started to look at the resilience of their buildings and businesses, and as they then consider the business continuance and insurance needs, they will be much more concerned about the recovery of their businesses after large events. While they can address the resilience of their own business facilities, they are not able to directly address the resilience of access into the region. The lack of action to enhance the resilience of access could severely affect their consideration of the viability of their business in Wellington, and could affect the economy of the region as a whole. This may lead to businesses relocating to elsewhere in New Zealand, Australia or other global locations.

Work undertaken as part of the SAR conservatively estimated that the cost to the region of a major event such as an earthquake which resulted in the long term closure of SH1 would be approximately $1.5 billion per annum in wider economic impacts such as lost employment; business relocation; and lost productivity. The recent Gateway Review in reviewing the project documentation considered that the route security benefits using a purely probabilistic approach may have underestimated the actual wider economic benefits of seismic resilience.

Therefore, there is an urgent need to address the resilience of access in and out of the region.

Economic Development

The existing SH1 coastal route north of Wellington is a considerable constraint to the growth of Wellington and the surrounding region. Journey times currently vary significantly according to the time of day and day of the week. Congestion is extensive and constrains travel at weekday peak periods as well as weekends and on public holidays. Failure to address these problems will impact on the economic viability of the region, accessibility and standards of living for the existing coastal communities, safety and general travel conditions for motorists and freight movements.

Assessments carried out for a number of linkages on the existing SH1 coastal route and SH58 display that they are already subject to significant delay, congestion, journey time variability, and safety issues and this is only predicted to increase as traffic grows and development occurs in Porirua and Kapiti. Assessments carried out at locations such as Paekakariki, Pukerua Bay, Mana Esplanade, Paremata Roundabout, Whitford Brown and SH58 between Paremata and Whitby highlight the extent of this problem and the relief that TGP will provide once constructed.

Delays to the construction of TGP will increase pressure on NZTA to deliver transport improvements at these locations. These improvements will not only have a significant cost, they will have little or no future value once TGP is built. In some cases, these improvements will also disbenefit transport users and economic growth in the short term. An example of this is the provision of signals at Paekakariki which will have benefits to the local community and safety; however, there will be a significant economic cost to SH1 users, with little or no need for signals at this location once TGP is built.

Use of Inappropriate Routes

Routes such as the Paekakariki Hill Road, Grays Road and SH58 along the Pauatahanui inlet suffer from poor geometry and safety history but are used by significant volumes of traffic between the Porirua / Kapiti areas and the Hutt Valley as alternatives to the congested SH1 corridor.

The TGP will provide a high-standard route for these traffic movements, resulting in significant benefits to the existing routes.

Safety

Although some improvements have been achieved in recent years along the existing SH1 route, the ability to achieve further reductions in the frequency and severity of crashes is constrained by the geometry of the route and the mix of local transport demands (vehicle, pedestrian and cycle) and strategic through trips. Similarly, high traffic volumes using inappropriate routes result in a poor crash record.

The TGP will be constructed to appropriate design standards, with limited access, continuous overtaking opportunities and grade-separated intersections. As a result, the frequency of crashes will be significantly reduced. Furthermore, the diversion of traffic away from roads with poor geometric standards will provide benefits in terms of a reduction in the overall number of crashes.

Severance

A number of existing communities in the corridor suffer severance and problems of accessibility arising from the barrier represented by high volumes of through traffic. In Paremata, Mana, Plimmerton and Paekakariki, community facilities are separated from residential areas by SH1. Crossing the route involves detours, delays and safety concerns. Pauatahanui village also experiences inappropriate volumes of through traffic with resulting severance and safety concerns, particularly for the movement of children to and from the primary school.

With the transfer of large volumes of through and long-haul traffic onto the TGP, these communities will benefit from improved levels of connectivity, accessibility and safety.

Vulnerable Road Users

Whilst the SH1 corridor has seen some improvements in pedestrian and cycle facilities in recent years, these road users can feel intimidated by the high volumes of traffic which affects the perceived safety and enjoyment of travel by these modes of transport.

Along the coastal route, the opportunities for providing safe and improved pedestrian and cycle facilities are limited due to the constrained width of the corridor, and the competing demands on space for freight, private vehicles and cyclists and pedestrians.

The project bisects two Regional Parks which has had an impact on the design, primarily with regard to access needs across the alignment, both formal (legal walkways), and farm and recreational tracks, as well as for logging and other purposes. A number of large parcels of rural land, and rights-of-way are divided by the project alignment, and access needs to be provided or alternatively lots amalgamated with adjacent parcels.

Public Transport Capacity

The TGP will lead to a transfer of some person trips from the rail network. Such an outcome was anticipated by the Western Corridor Transportation Study, and arises as a consequence of the implementation of a balanced package of improvements across both main modes of transportation within the corridor.

As the 2005 Consultation Document stated:

> *"Passenger transport infrastructure and Travel Demand Management strategies should be introduced before building new highway infrastructure. Making improvements to rail before the road infrastructure would encourage people to switch to rail and provide increased capacity for the shift from private to public transport that could be expected during any future roading improvements.*
>
> *An improved rail service would also retain a greater proportion of the shift to public transport following roading improvements, which would help achieve less traffic on the highway for longer."*

Commuters in the Region already show strong usage of public transport. Although further modal shift from private motor vehicles to public transport is desirable, this, in itself, will not replace the need for substantial upgrade of the roading infrastructure in the Western Corridor. Individuals who make the transfer may also provide some relief of peak period over-crowding on the rail network, and this was recognised when the decision was made to adopt the 2006 WCP.

Whilst an upgrade of the SH between Linden and MacKays is not expected to affect levels of bus patronage, reduced congestion on parts of the road network used by buses will lead to benefits in terms of improved time-keeping. For example, buses are currently subject to delays exiting the Paremata railway station, traversing the Kenepuru Drive / Titahi Bay Road intersection and turning right into Whitford-Brown Avenue. Traffic reductions in all of these areas will reduce delays and improve service reliability, which itself may encourage some increases in patronage.

3.2 Constraints

The Wellington northern corridor between MacKays and Linden and surrounding areas have a number of physical, environmental, social, and economic constraints relating to:

- Constrained corridor along existing SH1 route, including high density of properties, high iwi values (Ngati Toa domain);
- Oversteepened terrain vulnerable to natural events (earthquake, storm events, tsunami, sea level rise) competing with the NIMT within narrow beach platform along existing SH1 route;
- Existing infrastructure, particularly Transpower lines, high pressure distribution gas and water mains located within identified inland alternative transport corridor;
- Sensitive freshwater and marine receiving environment (Porirua Harbour catchment);
- Sensitive visual and landscape environment along inland corridor;
- Steep and confined terrain, making earthworks stormwater management and treatment difficult (both routes to varying degrees);
- Quiet environment with high lifestyle and recreational values (Regional Parks) along inland route.

3.3 Government Policies

The National infrastructure Plan (2011) sets a vision for *"A transport sector that supports economic growth by achieving efficient and safe movement of freight and people"*. It sets a number of success indicators:

- Reduced incidents of severe urban congestion;
- More efficient freight supply chains;
- A reduction in deaths and serious injuries;
- Better use of existing transport capacity;
- Resilient and secure transport network; and
- More transport mode choices.

The Land Transport Management Act (LTMA) 2003 requires the NZTA to assess all potential projects against the GPS, the relevant Regional Land Transport Strategy (RLTS) and the five New Zealand Transport Strategy (NZTS) objectives which are:

- Assisting economic development;
- Assisting safety and personal security;
- Improving access and mobility;
- Protecting and promoting public health; and
- Ensuring environmental sustainability.

Economic growth and productivity is a key priority for the Government which are reflected in three key areas of focus in the current GPS:

- Economic growth and productivity;
- Value for money; and
- Road safety.

The GPS also highlights the importance of the RoNS to "ease significant pressure points in the national network, reduce congestion in and around our five largest metropolitan areas, improve road safety and link our major sea and air ports more effectively into the state highway network". The transport initiatives within the state highway corridor between MacKays Crossing and Linden are part of the Wellington Northern Corridor RoNS project provide the critical link between Wellington CBD and the rest of the North Island.

4 Outcome Objectives

In requiring the NZTA to deliver the RoNS programme the government continues to reinforce its focus on increasing economic growth and productivity as a primary objective for land transport expenditure. As such, the delivery focus of the Wellington RoNS projects is:

To enhance inter-regional and national economic growth and productivity, by supporting a growing population and increasing freight volumes in the region;

To improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital;

To provide relief from severe congestion on the state highway and local road networks;

To improve the journey time reliability of travel on the section of SH1 between Levin and Wellington Airport; and

To improve the safety of travel on state highways.

Within this context the TPG project is aiming to:

provide an alternative strategic link for Wellington that improves regional network resilience and route security;

assist in remedying the safety concerns of, and projected capacity and associated journey time and trip variability problems on the existing SH1 by providing a safe and reliable route between Linden and MacKays Crossing in an environmentally sustainable manner;

assist in enabling wider national economic development by providing a cost-optimised route that better provides for the through movement of freight and people; and

assist integration of the land transport system by enabling the SH1 to be developed into a safe multi-functional (including pedestrian and cycle friendly) alternative to the proposed strategic link.

4.1 Strategic Objectives

4.1.1 The Roads of National Significance

The previous GPS 2009/10 – 2018/19 was published in May 2009. In it the Government listed an initial seven RoNS. The GPS describes the RoNS as seven of New Zealand's most essential routes that require significant development to reduce congestion, improve safety and support economic growth. The GPS states that:

> *"The purpose of listing roads as nationally significant is to ensure these priority roading developments are taken fully into account when the NZTA develops the NLTP. Planning for the future development of the land transport network should reflect the importance of these roads from a national perspective and the need to advance them quickly."*

One of the seven RoNS listed in the GPS is the Wellington Northern Corridor – SH1 (Levin to Wellington). The NZTA has a programme of projects planned which relate to the improvement of this corridor including the development of the TGP.

Also of relevance to the RoNS and to the Project, the GPS notes the following:

> *"Well-targeted land transport investment will keep people in employment, improve productivity, and lay the groundwork for robust economic growth in the future.*
>
> *Investing in the State Highway network is important as there are significant constraints on its current capacity to efficiently move freight and people, leading to congestion in New Zealand's major cities. Unless investment in State Highways is addressed, congestion will continue to negatively impact on economic growth and productivity. Investment in State Highways will also make some of our busiest roads safer."*

4.1.2 Government Policy on Land Transport Funding 2012/13 – 2021/22

The 2012 GPS describes the need to continue progress on the seven RoNS as being critical to economic and productivity growth and as being a significant part of the Government's National Infrastructure Plan.

The 2012 GPS goes on to describe the RoNS as being important to addressing the needs of our key supply chains, as they will ease the most significant pressure points in the national network, by reducing congestion, improving safety and by linking our major sea and airports more effectively into the state highway network.

Also of relevance to the RoNS and to the Project, the 2012 GPS notes the following:

> *"This GPS continues and reinforces the focus on increasing economic growth and productivity as the primary objective for land transport expenditure. The expectation is that land transport funding will be directed into high quality projects and activities that will support improved productivity and economic growth, particularly in the export sector."*

4.1.3 National Land Transport Programme

The NLTP sets out the NZTA's planned land transport investments, including for New Zealand's State highways, over the next three years. Activities are not eligible for funding from the National Land Transport Fund (NLTF) unless they are included in the NLTP.

The current NLTP, which outlines the NZTA's investment programme between 2012 and 2015, gives effect to the GPS by setting out activities proposed for funding over that three year period.

The current NLTP confirms and builds on the previous NLTP regarding the Wellington Northern Corridor RoNS, and has design and property committed to the MacKays to Linden section of the RoNS over the three year period, up to the end of June 2015.

The previous NLTP identified that the Government considers that the RoNS projects are New Zealand's "most essential" routes requiring significant investment. One of the priorities is planning for and delivering the RoNS:

> *"The NZTA's Investment and Revenue Strategy (IRS) communicates the NZTA Board's investment intentions. It's a high-level direction-setting and prioritisation tool that helps the NZTA to balance competing priorities and select the best possible mix of activities for funding – all with the goal of advancing progress against the objectives of the Land Transport Management Act 2003 (LTMA) and the Government policy statement on land transport funding 2009/10 – 2018/19 (GPS).*

The Investment and Revenue Strategy aims to ensure that the NLTP gives effect to the GPS in the short to medium term and, in the long term, that the NZTA's investment decisions and business priorities are aligned with the outcomes and impacts specified in: the LTMA; the NZTA's five strategic priorities, which are to: improve customer service and reduce compliance costs, improve road safety, freight efficiency and public transport effectiveness, and plan for and deliver roads of national significance."[2]

The importance and priority for the Wellington RoNS projects is succinctly outlined in the Wellington Regional Summary to the NLTP as follows:

"In Wellington, the entire length of SH1 between Levin and Wellington Airport has been identified as a RoNS because of the need to provide a quality link to service Wellington, the Kapiti Coast, Levin, Palmerston North and the wider lower North Island. Currently this route is regularly congested and has a relatively poor safety record, which inhibits the flows of people and freight and restricts economic growth.

The Wellington RoNS development will be scheduled in segments and progressed with different timeframes in the next 10 years. In the 2009–2012 NLTP most of the RoNS improvement programme will focus on detailed investigations into key projects that will improve efficiency and reduce congestion on SH1. This will enable construction phases to be appropriately staged, and ensure most improvements can be completed within 10 years. To ensure the full benefits of the RoNS are realised, the NZTA will work closely with local authorities and other agencies to integrate the programme with local road improvements and other transport connections."[3]

4.2 Programme Objectives

The programme objectives are those of the Wellington Northern Corridor RoNS package, which are:

- To enhance inter-regional and national economic growth and productivity, by supporting a growing population and increasing freight volumes in the region;
- To improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital;
- To provide relief from severe congestion on the state highway and local road networks;
- To improve the journey time reliability of travel on the section of SH1 between Levin and Wellington Airport; and
- To improve the safety of travel on state highways.

4.3 Linden to MacKays Project Objectives

The NZTA's objectives for the Project are:

- to provide an **alternative strategic link** for Wellington that improves regional network resilience and route security;
- to assist in remedying the **safety concerns** of, and projected **capacity and associated journey time and trip variability problems** on the existing SH1 by providing a safe and reliable route between Linden and MacKays Crossing in an environmentally sustainable manner;
- to assist in enabling **wider national economic development** by providing a cost-optimised route that better provides for the through movement of freight and people; and

[2] National Land Transport Programme 2009-2012 August 2009 – Page 6 The NZTA's Strategic Direction.
[3] National Land Transport Programme 2009-2012 August 2009 Wellington – Page 7 Roads of National Significance – SH1 Wellington Northern Corridor.

- to assist **integration of the land transport system** by enabling the SH1 to be developed into a safe multi-functional (including pedestrian and cycle friendly) alternative to the proposed strategic link.

In order to deliver the objectives of the RLTS to provide better east-west transport connections, and improved local connectivity to the Linden to MacKays Project from Eastern Porirua, Porirua City Council (PCC) has always signalled the need for arterial standard roads linking Eastern Porirua with the TGP.

The PCC's objectives for the link roads that connect Eastern Porirua to the Project are:

- To provide more efficient, safer and more reliable road access between eastern Porirua suburbs and the Hutt Valley, Wellington City and Kapiti Coast.
- To improve amenity values and the quality of the environment in Porirua by encouraging the use of TG for regional and inter-regional trips as opposed to the existing SH1 route through Mana, Plimmerton, Pukerua Bay and Paekakariki.
- To reduce the adverse effects of traffic on the environment in Porirua by encouraging the use of TG for regional and inter-regional trips, as opposed to roads directly adjacent to the Pauatahanui inlet and Onepoto arms of the Porirua Harbour.
- To provide alternative arterial routes and connectivity within eastern Porirua suburbs to support an integrated approach to regional and local land transport and development.
- To support the development and revitalisation of Waitangirua Village Centre as a focus for activity within the community by improving connectivity.

5 Stakeholders

Of the 5,993 submissions received in the public consultation on the Western Corridor Plan, 82% supported the construction of a route through Transmission Gully in preference to a coastal route upgrade, while only 2.4% of respondents supported an upgrade of the existing coastal route, with 96% being in opposition to an upgrade.

In response to consultation on a preferred route through the Gully in 2008, 88.6% of the 2,411 responses received supported the preferred route with 7.1% opposing it.

External stakeholder management implemented in-line with the core values of public participation as developed by the International Association for Public Participation (IAP2) has resulted in a high level of shared view of the purpose and scope of the project. The July 2012 Gateway Review on the TGP commended the NZTA's handling of its stakeholder relationships on the project and said that:

"Stakeholder engagement has been well-handled. There is strong stakeholder support for the project and for the way NZTA has undertaken engagement."

5.1 Consultation and Communication Approach

5.1.1 Background

From October 2005 to February 2006, public consultation was held on the Western Corridor Plan to seek the views of residents in the greater Wellington region on transport matters including the proposal for a TGP motorway alternative into and out of Wellington city as against an upgrade of the existing coastal SH1 route. The Western Corridor Plan was the product of the Western Corridor Transportation Study jointly commissioned by the Greater Wellington Regional Council and Transit New Zealand (predecessor of the NZTA).

Of the 5,993 submissions received in the public consultation on the Western Corridor Plan, 82% supported the construction of a route through Transmission Gully in preference to a coastal route upgrade, while only 2.4% of respondents supported an upgrade of the existing coastal route, with 96% being in opposition to an upgrade. In particular, there were significant concerns raised at the time about the accuracy of the relative cost comparison between the two options; however Treasury reviewed the two estimates and expressed confidence in them.

The next round of public consultation on a route through the Gully was undertaken in 2008 after Transit New Zealand had conducted preliminary investigations and planning on a preferred route through the Gully. Of the 2,411 responses received in the 2008 public consultation, 88.6% supported the preferred route with 7.1% opposing it.

5.1.2 External environment

Whilst media coverage of the TGP over the years in Wellington's only daily newspaper (The Dominion Post) has tended to focus on keeping alive the 'upgrade of the Coastal Route verses the TGP route' debate and providing an avenue for the views of those opposed to a TGP route to be publicised, the two rounds of public consultation in the greater Wellington region on matters pertaining to the TGP paint a different picture.

The high level of support for the construction of an alternative highway route through Transmission Gully in both the 2005/2006 and 2008 public consultations serves as a strong indicator that the majority of residents in the Greater Wellington region view the TGP route as a compelling roading value proposition.

Since the establishment by Transit New Zealand of a dedicated project team in 2007 to begin the task of investigating and developing the TGP, the relationship between the project team and stakeholders on the TGP continue to be solid and this can largely be attributed to the emphasis that Transit New Zealand and later, the NZTA have placed on keeping an active stakeholder management programme in place at all times.

This programme, implemented in-line with the core values of public participation as developed by the internationally-recognised International Association for Public Participation (IAPP), has seen multi-level relationships established, developed, enhanced and maintained with key stakeholders. All public engagement has been undertaken within a formal structure to ensure that views at all levels were heard and taken into consideration. This has resulted in stakeholders having a shared view of the purpose and scope of the project which has held the NZTA in good stead on the project particularly during the 2011-2012 regulatory consenting process which eventuated in final approval granted by the Board of Inquiry in June 2012 to all the regulatory consents and designations sought.

The project's favourable external stakeholder relationships and environment have been further highlighted in the July 2012 State Services Commission's "Gateway Review"[4] of the TGP which included an assessment of the project's stakeholder management and communications programme.

The July 2012 Gateway Review on the TGP commended the NZTA's handling of its stakeholder relationships on the project and said that:

> *"Stakeholder engagement has been well-handled. There is strong stakeholder support for the project and for the way NZTA has undertaken engagement."*

5.2 Professional Engagement Process

Development of the Detailed Business Case has involved key national and regional NZTA staff including national procurement team members, external risk, procurement specialists and cost estimation consultants.

The risk workshop for the Detailed Business Case development included a Treasury representative, commercial advisors (PricewaterhouseCoopers), NZTA senior project management and procurement staff, property, project controls and commercial managers, as well as the independent construction management team.

During the development of the project, NZTA has involved Public Private Partnerships (PPP) advisors, both from New Zealand and offshore (primarily Australia), along with the New Zealand Council for Infrastructure Development (NZCID).

5.3 Stakeholder Views

Stakeholders, particularly in the 2008 public consultation, have generally expressed a desire for early construction of an inland route. Comments focussed on a 'need to do something' and 'just get on and build-it'. The longevity of the project, the early and on-going desire of the Region for an inland alternative to the coastal route, and the existence of an inland alternative designation, have all meant that community and stakeholder preference for the TGP route has stayed high. Comments included:

- Important to have secure alternative route to Coastal Route.
- Alternative route necessary in event of disaster or emergency.
- Transmission Gully will offer an alternative when there are problems to the existing highway.
- The Capital should have more than one route north.
- Transmission Gully is needed as the Coastal Route is vulnerable to disruptions.
- Imperative to have new route into Wellington and the Hutt from north.
- Recent weather events see a need for Transmission Gully.
- Need quicker alternative route to reduce congestion.
- Need a highway that does not run through communities.

[4] The Gateway Review is an assurance process that examines programmes and projects at key decision points in their lifecycle to provide assurance that they can progress successfully to the next stage. A Gateway Review is Cabinet-mandated for high-risk capital projects in government departments and Crown Agencies.

- Wellington is vulnerable with only one access road.
- Will relieve traffic congestion on present SH1.
- Alternative route urgently required on economic and safety grounds.

This was in direct contrast to the findings of the consultation on the proposed Coastal road upgrade, where comments were heavily opposed to building an expressway standard highway through Mana, Plimmerton, Pukerua Bay and Paekakariki communities. Local Iwi and tangata whenua were strongly opposed to any upgrade of the coastal route, particularly through Mana (Ngati Toa domain), the South Beach at Plimmerton, and along the coastal section of SH1.

Comments about the coastal route included:

- Recent storms which closed part of the Coastal Route illustrates why Transmission Gully must be built.
- Coastal Route is slow, sub-standard, and a disgrace to the Capital.
- Current highway is clogged with frequent delays.
- Current SH1 is dangerous particularly between Pukerua Bay and Paekakariki.
- High volume of traffic and accident rate on Coastal Route.
- Coastal Route is woefully inadequate for current, let alone future traffic volumes.
- Widening the Coastal Route is a waste of money because of weather and flooding.
- Coastal Route often blocked or closed in stormy weather.
- Tired of bottle-neck traffic in Paremata/Paekakariki area during peak and long weekends.
- SH1 is too narrow and vulnerable to crashes, slips, high seas and closures.
- When accidents occur on the Coastal Route, there is no alternative route.
- Coastal Route should be protected and used as a beautiful recreational route, not as a major thoroughfare.

Given the stakeholder desire for an inland alternative to the existing SH1, failure to deliver might become a reputational risk if early delivery of an operational motorway/expressway does not materialise. This risk was mentioned in the July 2012 State Services Commission's Gateway Review of the TGP.

In summary, and if the considerations mentioned above are taken into account, in on-going stakeholder management on the project, the current external stakeholder environment augurs well for the strong relationships already established to be maintained during future phases of the project.

6 Alternative and Option Assessment

Identifying the optimal alignment for the TGP route has occurred over a long period of time as discussed in the project background. Comprehensive transportation modelling has been undertaken to understand travel demands in the Wellington area and on the TGP route itself.

The 2006 Wellington Western corridor multi-modal transportation study considered alternatives and options for the transportation corridor and the constitution of an overall package of transportation improvements between Peka Peka in the north and Ngauranga Gorge in the south. The final relevant outcome was that the TGP formed a critical component of the adopted WCP

The option identification process for the scheme assessment and design of the TGP route identified 38 different viable options in nine project sections, which were assessed against five key criteria (cost, timeliness, social and environmental impacts, physical environmental impacts and network flexibility.

6.1 Alternatives Analysed

Identifying the optimal alignment for the TGP route has occurred over a long period of time as discussed in the project background. Comprehensive transportation modelling has been undertaken to understand travel demands in the Wellington area and on the TGP route itself. The modelling has also assisted in identifying the optimal form of intersections. A detailed analysis of crash data on the existing network has also been undertaken. This work, together with a geotechnical appraisal of the route and extensive geotechnical investigations, has provided the key data necessary for the identification and assessment of alternative route options.

This section focuses on the alternatives analysed for the TGP route. However, it should be noted that the Western Corridor Study gave consideration to other alternatives (both in terms of transport mode and corridors) and has been captured below.

6.1.1 2002 Designated Alignment

In 1987 the Wellington Regional Council (now Greater Wellington) undertook the Greater Wellington Area Transportation Strategic (GATS) study, and associated Environmental Impact Report (EIR). Part of the study focused on the coastal section of SH1 and its limited capacity to provide for the predicted future growth and development of the Wellington region. The GATS study led to an EIR covering a number of options, both inland and coastal, to address the capacity problems on SH1. The EIR also examined public transport improvements as an alternative to road options, but concluded road improvements would better address the growing congestion on SH1. The EIR also concluded that the inland route was more environmentally and socially acceptable than the coastal route. The favoured route was from MacKays Crossing in the north to the Takapu Valley interchange on SH1 south of Tawa along the line of the electricity transmission towers.

The EIR was audited by the Parliamentary Commissioner for the Environment (PCE) who agreed in principle with the findings of the EIR, with some reservations and recommendations. Key recommendations from the PCE were to finalise the alignment of the inland route and lodge the designation, and to consult with the public to reduce uncertainty.

Further investigations by Greater Wellington of a number of southern alignments settled on an alignment with an interchange near Linden on SH1. The preferred alignment also included a link road into Porirua via Kenepuru Drive, and links to eastern Porirua / Whitby. This alignment was considered to offer benefits for Porirua traffic management, reduce traffic demand on SH58, and have less environmental and social effects than the Takapu Valley route.

As part of lodging the Notice of Requirement (NOR), the preliminary designs produced as part of GATS were reviewed and amended. Adjustments were made to reduce earthworks volumes and avoid very high cut slopes. In addition, viaduct structures were adopted as a solution to mitigate the effects of the Ohariu fault in the Wainui Saddle area. Following the abandonment of the Takapu Valley route, preliminary design work was undertaken for a new route from Cannons Creek to SH1 at Linden and a separate designation sought for a link road connection to Porirua via Kenepuru Drive.

The NOR's were lodged in April 1996. After providing additional information, a hearing was held before Commissioners in April and May 1997. A number of appeals were subsequently lodged, and these were finally resolved in 2002.

6.1.2 Costed Viaduct Option (2004)

In 2004 Transit New Zealand completed an update of the cost estimate for the TGP. The purpose of the commission was primarily to obtain more certainty regarding the cost of the project prior to committing funds for geotechnical investigations. In addition, the scope of work included further refinement of the designs submitted with the NOR's in 1996, together with an ecological study of the route. In addition to producing an updated cost estimate, a report outlining perceived risks and opportunities and providing a preliminary programme for construction was completed.

Design refinements carried out as part of this commission focused on further reductions in cut slope heights, as some of the very high cuts, particularly in the Wainui Saddle area, were considered to be impractical. The design refinements were largely constrained within the existing designation, and resulted in additional viaducts being proposed, hence this option being referred to as the Costed Viaduct Option (CVO).

6.1.3 The Western Corridor Transportation Strategy and Plan 2006

Options for progressing highway improvements along the western corridor were reviewed in 2004. The Western Corridor Transportation Study (WCTS) was carried out by GWRC and Transit New Zealand, with the assistance of the relevant territorial authorities (TA's). This multi-modal transportation study considered alternatives and options for the transportation corridor and the constitution of an overall package of transportation improvements between Peka Peka in the north and Ngauranga Gorge in the south.

Elements investigated and assessed as part of the WCTS included:

- Rail Improvements
- Travel Demand Management
- Highway (including local road) improvements.

For a summary of the various elements assessed, the packages developed are included in Appendix B, which included an inland alternative to the existing coastal SH1. At the time, the coastal route upgrade was considered more affordable and could be staged to spread the costs over time, so it was included in the technical advice to the Study partners and in the draft WCP, despite the TGP scoring higher overall in the remaining multi-criteria analysis / planning balance sheet process.

After an extensive public hearings process, the WCP Hearings Subcommittee recommended TGP as the preferred roading solution between Linden and MacKays Crossing, and the TGP was subsequently included in the final WCP.

Following the recommendations of the WCP Hearings Subcommittee, the Wellington Regional Transport Committee adopted the WCP in April 2006.

Both the Transit New Zealand Board and GWRC also adopted the WCP in 2006. In adopting the Plan, both agencies committed to the achievement of the following outcomes (as noted in the adopted WCP):

- A safer, more reliable road and rail corridor;
- User expectations for a consistent regional corridor are met;
- Reduced congestion on parts of the corridor; and

- Balanced investment in road and passenger transport, along with travel demand management.

The adopted WCP included a programme of specific projects that were planned to be implemented in the corridor. This programme gives effect to the strategic framework that was subsequently developed in the Wellington Regional Land Transport Strategy (WRLTS) 2007-2016 and more recently, the WRLTS 2010-2040.

The adoption of the WCP provided the mandate to carry out other transport improvements in the Western Corridor such as the rail duplication and extension of commuter service to Waikanae as documented in Section 6.2. The WCP addressed concerns raised by the PCE in 2002 and provides a multi-modal package of improvements that are not only focused on state highway improvements.

6.2 Recommended Package of Measures

The adopted package of alternatives for the Western Corridor Plan (refer to Appendix B) was discussed earlier and includes a number of transport improvements that have already been implemented as a result of the rail improvement plan. This has included extension of electrification and the commuter service to Waikanae, duplication of the rail corridor between MacKays Crossing and Waikanae, track, signal and overhead line improvements to the entire Kapiti line, and new trains which are currently being introduced.

The 2006 WCP also included a number of other roading projects in the Kapiti area, including the Kapiti Western Link Road (now the MacKays to Peka Peka RoNS project and the Peka Peka to Otaki Expressway. Both of these projects have now been incorporated into the Wellington Northern RoNS project and are currently being progressed to the same status as TGP.

A detailed review of the cost estimate for upgrading the Coastal Route was undertaken in 2009, using unit cost rates and other relevant information that had been derived during the Phase 1 SAR investigations into the TGP. This review found that the cost of upgrading the Coastal Route would be much higher (by approximately 55% to 65%) than had been estimated during the development of the draft WCP (refer to Appendix B, Bond Construction Management 2009).

The combination of a considerably reduced cost (by around 30%) for the TGP with a substantially increased cost (by approximately 55% to 65%) for upgrading the Coastal Route means that the TGP is now estimated to be substantially less expensive than upgrading the Coastal Route.

The final relevant outcome was that the TGP formed a critical component of the adopted WCP, although not before some spirited debate at a regional level about the relative merits of upgrading the existing SH1 coastal route or building the TGP.

6.3 Options Analysed

6.3.1 Scheme Assessment Phase 1 (2007 to 2008)

Phase 1 of the Project's development, undertaken throughout 2007 and 2008, involved a new evaluation of the inland corridor. A key objective was to identify the most advantageous TGP route alignment when considered against the overall Project objectives and social, environmental, economic and physical constraints.

A review of previous work (pre 2007) suggested that while there was some scope for alignment optimisation, there could be benefits in identifying options either wholly or partly outside the existing designation. Particular benefits could include cost-optimisation, as well as the mitigation of environmental and other adverse impacts of the in-designation route. It was therefore decided that the existing designation should not be a constraint, and that two alignments should be identified:

- The best practicable scheme design within the existing Designation (In-Designation Alignment); and
- An Unconstrained Alignment, unconstrained by the designation.

To facilitate this, the route was divided into discrete lengths (nine sections), and route options within each section were identified, developed and evaluated for cost, benefits, impact and feasibility. The best options within each section were developed so that, when combined, they would form the optimal alignment for the route as a whole.

In total, the option identification process identified 38 different viable options in the nine project sections. The options assessed as part of this process have been summarised in Appendix B.

These options were then assessed by the wider Project team against five key criteria;

1. **Cost** such as construction and operating/maintenance costs and current market value property costs;

2. **Timeliness** which included the RMA process timeframes, the construction programme based on the extent of works, access, complexity, and a subjective assessment of the timing and potential for adjacent land use changes and economic opportunities;

3. **Social and environmental impacts** which included an assessment of heritage and archaeological sites, an assessment of the social and community cohesion based on impact of traffic changes on urban areas, potential effects on existing residents by the proposed alignment and health and wellbeing (a subjective assessment of noise, fuel consumption, greenhouse gas emissions and additional pollutants on residential properties);

4. **Physical environmental impacts** related to land stability, sites of geological interest, the exposure to sedimentation risk, changes in catchment run-off, severity of effects, and space availability to control run-off, and natural habitats and fauna (loss of fresh water and terrestrial habitat and the effect on ecological integrity); and

5. **Network flexibility** which included traffic benefits, predicted accident savings, the integration with other transport modes, improvements to access and mobility, future-proofing and land transport integration which is to support regional growth.

Two alignments for the TGP route were identified following an exhaustive technical investigation and evaluation process, including traffic modelling, site visits, detailed option assessment and workshops involving a large number and variety of technical experts, and a thorough assessment of route alternatives and cost estimates.

One alignment was the best that can be achieved within the existing designation, the other the best alignment unconstrained by the designation. Of the two, the alignment unconstrained by the designation was preferred because it provided advantages in terms of route security/resilience, had less impact on environmentally important streams and Pauatahanui Inlet, was less intrusive on the landscape and was significantly cheaper than the best In-Designation Alignment.

In December 2008, the NZTA Board confirmed the preferred alignment (i.e. the Unconstrained Alignment) to be a more robust, cost effective and environmentally responsive proposal compared with the existing designations.

One of the Project objectives of the Phase 1 investigation was that TGP be a “cost-optimised” route. The refinements to the design have ensured this objective will be achieved in the following ways:

- The TGP has been designed to the NZTA’s “expressway” rather than “motorway” design standards, taking a value-for-money approach. As an example, the NZTA’s motorway standards utilise design speeds that are at least 10 km/h higher than the corresponding expressway standards, resulting in more extensive cuts and fills to achieve the desired road alignment, with associated greater environmental effects and costs;
- During the SAR investigations, the form and function of all of the previously proposed link roads and interchanges along the TGP were re-evaluated. As a result, the previously proposed link road from near the Takapu Road substation to Warspite Avenue in Cannons Creek was combined with the James Cook Interchange provided a more cost effective connection and better transport benefits;

- During the Phase 1 investigations, the consideration of various alternative alignments led to a preferred alignment for the TGP that was approximately [redacted] less expensive and had lower environmental effects than the best alignment that could be provided within the confines of the existing designation.

6.3.2 Scheme Assessment Phase 2 (2008 to Current)

Since the completion of the Phase 1 SAR, the NZTA has undertaken Phase 2 of the investigations into the TGP, which has involved more detailed investigations into the preferred alignment.

The Phase 2 investigations commenced in early 2009 and included the various engineering, environmental and planning investigations that led to the development of the technical reports that are appended to the AEE. The Phase 2 investigations also included a workshop to discuss issues by the various technical experts to ensure that an appropriate balance was achieved between different factors.

During the public consultation in July / August 2008, seven specific items were identified in submissions that the NZTA considered required further investigation and/or refinement before lodgement of the NOR's and resource consent applications for the Project. The seven items were:

- Pull-off and vehicle inspection areas;
- Property impacts at Paekakariki;
- Parks and Reserves / Farming operations;
- Bulk water mains;
- Access to existing properties at SH58;
- Alignment and form of the Whitby and Waitangirua link roads; and
- Alignment (both horizontal and vertical) and safety of the Kenepuru link road.

These seven specific items have been subject to further investigation and have all now either been fully resolved or have a clear path to resolution during the detailed design phase of the Project.

In addition to resolving the seven specific items described above, the preferred alignment has been continually refined throughout 2009 and 2010 on the basis of further, more detailed environmental and engineering investigations. The refinements have sought to reach the most appropriate balance between different, sometimes competing or conflicting factors such as the Project objectives, environmental effects and stakeholder views. Many relatively minor alignment changes were made to the design but the most important changes are described below in Section 7.

As for the Phase 1 investigation, "cost-optimisation" formed an important element of the scope of work. During the Phase 2 investigations, the design refinements to the preferred alignment have led to further cost savings of approximately [redacted] in real terms, primarily by reducing the overall quantity of earthworks and structures, and by achieving a much better cut to fill balance.

7 Recommended Project Option

The key design features of the recommended project option include:

Four lanes (two lanes in each direction with continuous median barrier separation)

Rigid access control (to be gazetted motorway)

Grade separated interchanges

Minimum horizontal and vertical design speeds of 100km/hr and 110km/hr respectively

Maximum gradient of 8%

Crawler lanes in some steep sections to address issues with significant speed differences between vehicles with different power-to-weight ratio's.

It should be noted that under a PPP approach, these design parameters could be superseded based on the outcomes approach required by the PPP model (ref. §10).

7.1 Scope

The TGP is approximately 27km of four-lane SH1 motorway from northern Paekakariki to southern Porirua. The route provides access to and from eastern Porirua and SH58 as well as forming the primary strategic through route for the Region (SH1).

The TGP route runs inland between MacKays Crossing and Linden as presented in Figure 7-1.

It passes mostly through farmland, regional parks and rural residential areas, with some areas of scrub and plantation forest towards the southern end of the route. While the route is entirely within the Wellington Region, it passes through the boundaries of Wellington City, Porirua City, Upper Hutt City (a very small section immediately south of the Wainui Saddle), and Kapiti Coast District.

NZTA's responsibility for the project can be described in summary as:

- The main alignment will provide an inland state highway between Wellington (Linden) and the Kapiti Coast (MacKays Crossing). Once completed, the main alignment will become part of SH1.
- The existing section of SH1 between Linden and MacKays Crossing will likely become a local road (responsibility of the PCC and the Kapiti Coast District Council (KCDC)).
- The Kenepuru Link will provide access to Porirua at the southern end of the project to a local road standard and will be constructed as part of the project (shown in blue on Figure 7- below.

PCC's responsibility for the project can be described in summary as:

- The PCC link roads (Whitby and Waitangirua Link Roads) linking Eastern Porirua with the TGP main alignment (shown in green on Figure 7-2 below).
- Any sections of SH1 and potentially SH58 (west of TG) that may be revoked following the construction of TGP.

Funding for the James Cook interchange will be the responsibility of NZTA but only needed when the first PCC link road is constructed.

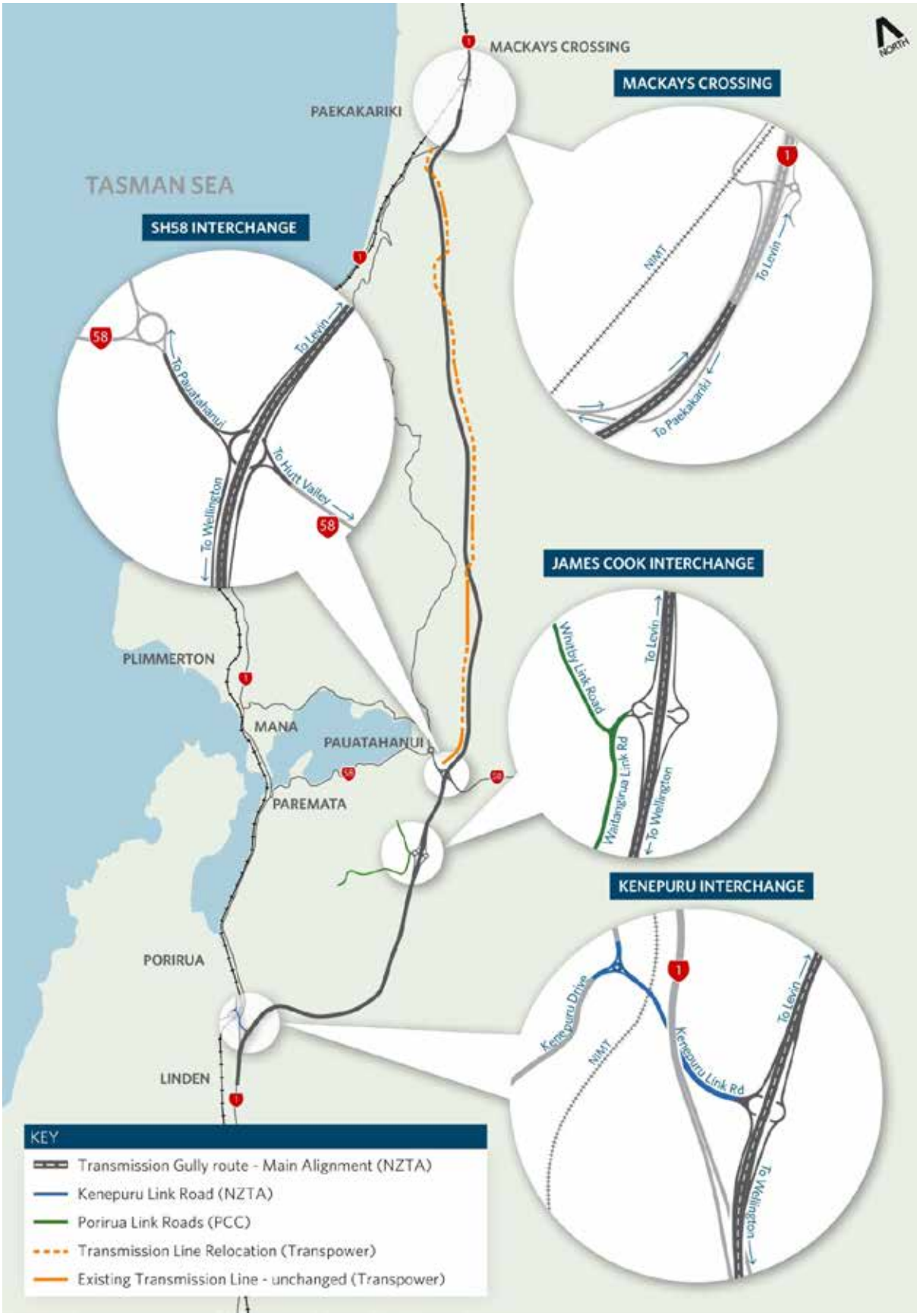


Figure 7-1: Transmission Gully Project

Key design features of the TGP main alignment include:

- Four lanes (two lanes in each direction with continuous median barrier separation);
- Rigid access control (to be gazetted motorway);
- Grade separated interchanges;
- Minimum horizontal and vertical design speeds of 100km/h and 110km/hr respectively;
- Maximum gradient of 8%; and
- Crawler lanes in some steep gradient sections to account for the significant speed differences between heavy and light vehicles.

The topography of the route is challenging, with the route alignment being very steep from Paekakariki to the Wainui Saddle and similarly at other parts of the route, particularly south of SH58. From north to south the route can be split into 9 project sections, refer to Figure 7-2 showing the nine sections, which each have different characteristics.

Key design features of the PCC link roads include:

- Two lanes (two lanes in each direction with continuous median barrier separation);
- Limited access road (direct access permitted);
- Minimum horizontal and vertical design speeds of 50km/hr;
- Maximum gradient of 10%.

The level of intelligent transport systems (ITS) proposed will increase the operational requirements for NZTA, particularly as it is proposed to retain ownership and responsibility of the existing ITS infrastructure along the alternative route for network management reasons.

NZTA's minimum ITS requirements for the recommended option include:

- Replacement weigh-in-motion site and traffic loop count sites
- HCV / Truck) Arrestor bed and associated ITS infrastructure
- Pan, Tilt and Zoom (PTZ) cameras at all interchanges and merges for traffic management purposes
- Continuous fibre-optic along the length of the project
- ITS controlled emergency access crossing points
- Street lighting (interchanges only)
- Variable messages signs (VMS) at all interchanges, key decision points and hazard locations (In Case of Emergency (ICE))

Possible additional operational infrastructure, subject to future decisions includes:

- Replacement weigh-station (final decision on location for Wellington northern corridor weigh-station and HCV service centre has yet to be made)
- Tolling infrastructure requirements (full span gantries and associated hardware)
- Continuous lighting of entire length (value-for-money decision)
- Continuous point-to-point camera surveillance (value-for-money decision by operator associated with real-time incident management)
- Ramp metering
- Full highway control (lane management), either just up the Te Puka Valley or along the entire route – full span gantries and associated hardware).

Figure 7-2: TGP Sections

1. MacKays Crossing: The route commences at MacKays Crossing, linking into the existing four lane overbridge. It leaves SH1 in the vicinity of the former Car Haulaways site at Paekakariki. At this point the terrain is flat, with some farming and lifestyle properties in the general vicinity

2. Wainui Saddle: The route ascends steeply from Paekakariki up the Te Puka Stream valley, which is a relatively small and deeply incised valley with steep slopes on both sides, to the Wainui Saddle. Access is via a farm track that also assists Transpower to maintain its 110 kV transmission line. The Wainui Saddle is the highest point of the alignment, at approximately 260 metres above sea level.

3. Horokiri Stream: The Wainui Saddle is also the headwaters of the eastern branch of the Horokiri Stream which flows southwards along a widening valley towards Battle Hill Farm Forest Park. The floor of the valley is currently being used for livestock (sheep and beef) farming.

4. Battle Hill: Here the terrain is still rolling but the steepness decreases and the widened floor of the valley is flat. As is typical along the route, the steep hill slopes contain a number of stream tributaries, the majority of them being ephemeral. There are a number of residential lifestyle blocks in the vicinity of the Battle Hill Farm Forest Park.

5. Golf Course: From Battle Hill the route descends through rolling farmland and residential lifestyle blocks and crosses the eastern end of the Pauatahanui Golf Course. At the northern end of this section the east and west branches of the Horokiri Stream meet before the combined stream flows into the Pauatahanui Inlet at Grays Road. Various tributaries to the Ration Stream cross this section of the TGP route before the Ration Stream also flows into the Pauatahanui Inlet at Grays Road (approximately 1km to the east of the Horokiri Stream).

6. SH58: At SH58 a major intersection is proposed, approximately 600 metres east of the Pauatahanui Bridge. The TGP alignment crosses over SH58 and the Pauatahanui Stream almost at right angles. The area is predominately flat and at the closest point the alignment is some 400 metres from the boundary of the coastal marine area at the headwaters of the Pauatahanui Inlet. There are also a number of residential lifestyle blocks in relatively close proximity. The proposed form of the interchanges is a large grade-separated roundabout.

7. James Cook: The route then ascends behind Whitby and continues through rolling terrain into the Belmont Regional Park. The TG route follows the east side of the Duck Creek valley before crossing the headwaters of Duck Creek. The PCC is proposing, to be developed as part of the TGP, to provide two link road connections into Eastern Porirua. James Cook Drive in **Whitby** would be extended and connected to a new road connection from **Warspite** Avenue in Waitangirua. The combined link roads would then connect to the TG main alignment via a grade-separated dumbbell interchange.

8. Cannons Creek: Between Duck Creek and Cannons Creek the alignment traverses an undulating plateau before crossing the deep valley of Cannons Creek. The land use is primarily farming, forestry and restoration planting, including large parts of the Belmont Regional Park. The route then passes farmland in the proximity of the Takapu Road electricity substation, and descends towards Porirua behind Ranui Heights.

9. Linden: The route then merges with the existing SH1 adjacent to Collins Avenue in Linden. There is also a link (the Kenepuru Link) provided to cross the existing motorway, the NIMT rail line and the Porirua Stream to meet Kenepuru Drive near the Kenepuru hospital. Land-use is more urban in this section than in other parts of the route.

During the EPA phase, there was significant discussion between NZTA and PCC over the provision of access to Whitby and Porirua East (as referenced in area 7 above) and the changes that could occur to the existing SH1 route once TGP is built (including discussions with KCDC about those sections in Kapiti).

As with many larger infrastructure projects there is a requirement that a number of services are relocated. The TGP requires the relocation of a number of Transpower's electricity transmission towers within Porirua City and Kapiti Coast District (between SH58 at Pauatahanui and SH1 at Paekakariki).

The NZTA has worked with Transpower since 2008 to establish how this aspect of the Project can be delivered and consented. Transpower has helpfully entered into various agreements with the NZTA which confirm that it is happy to work with the NZTA and that it will undertake the works needed to its assets as part of the Project. Those agreements currently cover in detail the investigation and consenting stages and in principle the subsequent stages up to and including construction.

8 Recommended Option – Assessment

The recommended option provides a high level of assurance of delivery when assessed against the four key performance criteria. The provision of an alternative strategic link, that will address safety, capacity, journey time reliability and enable and support regional and national economic development. Removal of freight and through traffic from the communities along the existing SH1 will allow better and easier access to transport (particularly pedestrian and, cycling modes, as well as rail and bus services.

The early signalling of an inland route, the predominantly green fields rural site, and the strategic purchase of key properties means that the certainty of delivery of the transportation outcomes being sought is high.

Gaining of the consents required for the project, plus widespread local and regional support from stakeholders and public means that efficient implementation of the project can occur. Ongoing reduction of risk through the project development has resulted in a high level of cost optimisation to-date along with a high level of project cost certainty.

This section assesses the performance of the recommended option against four key criteria:

- The Project Objectives
- Implementability Assessment
- Wider project impacts
- Cost Optimisation.

A summary of performance against the above criteria is given. The economic assessment of the recommended option is reported in Section 9.

8.1 Objectives

The TGP performs against the project objectives in the following manner:

Objective (ref. §4)	Performance
· **to provide an** alternative strategic link **for Wellington that improves regional network resilience and route security;**	An assessment of the seismic performance of the TGP against the existing SH1 has been completed; showing that full reinstatement of TG would be possible within 3 days to 2 weeks (limited access within 3 days) compared to 3-6 months for the coastal route.
· **to assist in remedying the** safety concerns **of, and projected** capacity and associated journey time and trip variability problems **on the existing SH1 by providing a safe and reliable route between Linden and MacKays Crossing in an environmentally sustainable manner;**	A minimum forty percent reduction in fatal and serious (combined) accidents per vehicle-kilometre travelled on TGP and the existing SH1 coastal route. TGP will operate with a mid-block LOS not less than LOS A at opening and LOS B for the forecast 2026 traffic volumes. TGP mid-block[5] LOS performance not less than LOS B at 150% of opening traffic volumes and LOS C at double the opening traffic volumes. A reduction of not-less-than 6 minutes for all journeys between Linden (SH1) and MacKays (SH1) for all periods, and a reduction of not-less-than 10 minutes for all journeys between SH58 (Pauatahanui roundabout) and MacKays for all periods.

[5] Where intersection performance is constrained by other factors ie. existing SH capacity this measure shall not apply.

Objective (ref. §4)	Performance
	Travel time variability at the 95% confidence interval of not-greater-than 30 seconds at opening, and 60 seconds at opening traffic volumes plus 60% traffic growth between MacKays and Linden, and 60% of those values between SH58 (Lanes Flat) and MacKays, for all periods.
· **to assist in enabling** wider national economic development **by providing a cost-optimised route that better provides for the through movement of freight and people; and**	A reduction of 6 minutes for all freight journeys between Linden (SH1) and MacKays (SH1) for all periods, and a reduction of 10 minutes for all freight journeys between SH58 (Pauatahanui roundabout) and MacKays for all periods. Freight travel time variability at the 95% confidence interval of not-more-than 30 seconds at opening and not-more-than 60 seconds (at opening plus 60% freight traffic numbers) between MacKays and Linden, and 60% of those values between SH58 (Pauatahanui roundabout) and MacKays, for all periods. Maximum freight travel time variability for twice the opening freight traffic volumes shall not exceed 120 seconds between MacKays and Linden, and 72 seconds between SH58 (Lanes Flat) and MacKays, for all periods.
· **to assist** integration of the land transport system **by enabling the SH1 to be developed into a safe multi-functional (including pedestrian and cycle friendly) alternative to the proposed strategic link.**	The daily traffic volumes on the existing SH1 between Linden and MacKays will reduce by between 14,000 and 20,000 vpd[6] in 2026. South of Paekakariki the residual traffic volume will be 3,100 vpd comprising only local traffic. Residual traffic volumes will be higher further south with 5,900 vpd to the south of Pukerua Bay, 20,500 vpd on Mana Esplanade and 44,200 vpd south of the Mungavin interchange. The significant reduction in traffic on the coastal route will improve accessibility, reduce severance and allow the corridor to function as an arterial delivering increased access to community facilities (schools, churches, shops, bus-stops, railway stations) and a resultant increase in users of non- motorised modes (pedestrian and cycling). Appropriate metrics to measure how successful the overall integration of the land transport system has been will be formulated as part of the project development process.

In addition to those objectives identified above, the Project will also result in a range of other direct and indirect benefits to the local area, region, and wider transport users as documented in Appendix A.

8.2 Implementability

8.2.1 Constructability

Constructability is potentially an issue for this project given the steep terrain, proximity to known earthquake fault zones, sensitive freshwater and marine receiving environments and potentially highly erodible material in places. This is similar to the coastal route, where oversteep batters, construction within a coastal marine area, along with live traffic management would be even more challenging.

Most of the associated risks have been reduced by way of consent conditions; however there are still consenting risks associated with the acceptance and certification by the consenting authorities, as well as engineering risks associated with the scale of earthworks required.

[6] vpd – vehicles per day

There are no novel or emerging technologies which represent project risk required to implement the recommended option; however provision of effective sediment and erosion control, and fish-passage in such steep terrain, and effective stream diversion and re-creation of stream habitat will be challenging.

Strong stakeholder support for the project, combined with the predominantly green-fields nature of the site with very limited traffic management requirements means very few constraints for a constructor, as opposed to the coastal route which had major opposition.

A number of consent conditions require early baseline ecological monitoring that have to be completed before construction can commence. These have the potential to delay the start of some construction activities if not completed before a construction contract is awarded. They include freshwater and marine water quality and ecology monitoring, bat monitoring plus fish-passage trials. In addition, consent conditions require the constructor to undertake stabilisation trials to confirm the effectiveness of their proposed erosion and sediment control measures.

Relocation and strengthening of a number of existing Transpower towers and relocation of the 110kV transmission lines is required and will to take up to 24 months to be completed. Close co-ordination with Transpower, their designers and contractor around co-ordinating some activities, such as the construction of access tracks and associated earthworks will be required in order to ensure that they are placed in locations that suit both parties.

A key driver for the programme will be the consideration of the movement of earthworks material around the Project (i.e. approximately 6.3 million cubic metres of cut and 5.8 million cubic metres of fill being required to construct the consented design). A key part of the earthworks construction are the consent conditions and how potential sedimentation effects on the harbour can be managed.

Although the construction methodology and approach adopted by the constructor may vary, those items identified above will be critical, and will influence value engineering and programming decisions.

The constructability and implementation of the project has been a major consideration in the refinement of the design and consenting of the project. Consideration has been given to the costs, environmental risks and effects, and route security trade-offs between earthworks and structures, including consideration of tunnelling options. Therefore, it is unlikely that there will be significant delays or disruptions to the programme due to consenting issues.

The Te Puka valley section of the Main Alignment is the most vulnerable to natural hazards, in particular earthquakes, and has the potential to reduce the security of the route. The geotechnical assessment identified risks associated with retaining walls on steep slopes in Te Puka and the vulnerability of bridges directly adjacent to steep slopes due to the risk of earthquake induced landslides.

8.2.2 Operability

Operational requirements for the existing State Highway network presently include:

- New Zealand Police Commercial Vehicles Investigation Unit (CVIU) weigh-station at Plimmerton (both directions)
- Variable Messages Signs (VMS) and other ITS infrastructure (including fibre-optic) plus traffic signals through Mana / Plimmerton
- VMS and other ITS infrastructure (including fibre-optic) plus traffic signals along the coastal section from Pukerua Bay north to Paekakariki
- Traffic signals – Whitford Brown Intersection
- Street lighting (urban sections and intersections)
- Weigh-in-motion and numerous traffic loop count sites.

The implications are that overall operating expenditure (OPEX) (not considering maintenance costs) will increase significantly (potentially double) due to the increased ITS requirements primarily. Highway lighting costs would be expected to reduce due to fewer and more efficient lighting fixtures.

It is expected that operational costs of tolling, if implemented, would be recovered under NZTA's existing toll recovery mechanisms and back-room operations.

Operational costs of traffic signals will be reduced to zero once revocation of the existing State Highway coastal route has occurred; however NZTA will still be assisting with funding local TA's operating costs for the street lighting and traffic signals. It is likely that there will be additional capital expenditure (CAPEX) requirements for NZTA for bridge replacements or seismic retro-fitting prior to revocation handover to the TA's.

Additional CAPEX could include minor safety improvement works required to address road safety audit issues relating to any change of traffic volumes and patterns resulting from the project.

8.2.3 Statutory Requirements

During the option selection phase of the WCP development, feedback from key stakeholders and the assessed cost, and scope of measures that would be required in order to satisfactorily mitigate the effects of a coastal route upgrade, meant that the previous cost of the coastal route had been significantly underestimated. Even with mitigation, NZTA's legal advisers were indicating that it still may not have been consentable, due to magnitude of the effects.

In contrast, the inland route already has a motorway designation in place, and although resource consents had not been secured, and the freshwater and marine receiving environments had high ecological values, obtaining of consents was not seen as anywhere near as difficult.

Apart from a few known exceptions, NZTA has been granted all necessary land NOR's and regional resource consents required to construct the project.

8.2.4 Property Impacts

Property constraints have had a very limited impact on the project design. An alternative inland route has been signalled for a many years and a TGP motorway designation included on District Plans since 2003 and hence property owners have been aware of the project.

Currently just over half of the designation by area has been acquired by the Crown for the purposes of road, with approximately a quarter of the remainder being in public ownership (PCC, GWRC or the Department of Conservation). In total, the number of property interests directly and indirectly affected by the inland TGP route is lower than the coastal route, due to the largely green-fields nature of the TGP route.

Utility owner assets and infrastructure impacts have and are likely to continue to influence the final design, and potentially programme of the construction of the inland route. Although the services are bulk gas, water and 110kv transmission lines, the green-fields nature of the route means that relocation and protection will be easier to manage than the much more numerous and complex services that would be encountered along the coastal route, particularly through Mana, Plimmerton and Paremata.

8.2.5 Asset Management

Throughout the development of options for the TGP, discussions have been held with the Regional Operations team within the NZTA to ensure consideration of future needs and associated cost implications are incorporated into the option assessment.

The recommended option is approximately 2% longer than the existing length of SH1 that it replaces. It is expected that the existing SH1 will be revoked and vested in the relevant TA. At this stage, no preliminary decision about revocation or otherwise of SH58 west of the TGP connection has been made. PCC have expressed a desire for this to become a local road to allow more multiple-modal use, including more cycle and pedestrian friendly uses.

The surface area of sealed pavement is considerably larger than the existing SH network, and the quantum of bridges and other structures (e.g. reinforced soil embankment retaining walls) will also increase.

Whilst pavement maintenance costs would typically be reduced as the result of it being a new piece of road this will need to be considered against the increase in the inspection and

maintenance of bridges, structures, side protection, stormwater and other facilities, plus increased landscape and ecological mitigation planting maintenance.

Pavement maintenance costs (reseal/ rehabilitation) are not fixed and are variable over time so they can be linked with cost indexing as opposed to a fixed annual cost, and represent a value-for-money opportunity.

The cost of slip clearance (both maintenance and operational incident and traffic management costs) is directly related to design decisions.

8.3 Wider Project Impacts

8.3.1 Environmental Impact

Environmental impacts have had a large influence on selecting the recommended option, due to the sensitive freshwater and marine receiving environment (Porirua Harbour). While the project corridor has been identified for over 30 years and protected on District Plans, the more detailed design has been focussed on avoidance and mitigation in terms of the RMA. This has led to design refinements during the SAR and AEE phases of the project to avoid and reduce direct impacts on streams, reduce earthwork volumes, provide improved erosion and sediment control opportunities and avoid, where possible, direct effects on native flora and fauna.

Other environment impacts that have been considered are the landscape and visual effects of the project, and noise and vibration, which have the potential to be significant for such a large roading project. These have been successfully balanced, mitigated and managed and the consent conditions and associated mitigation measures identified.

While there exists flexibility for a constructor, there are also consenting risks around interpretation, and negotiation with consent authority, and the certification of the numerous management plans that are required.

8.3.2 Social Impact

Social impacts have heavily influenced the choice of the recommended option, particularly the decision to construct an inland alternative bypass to the existing SH1 coastal route. The ability to consent an equivalent upgrade to the existing SH1 to address and mitigate social impact effects, and the public response at the Regional Land Transport (RLT) sub-committee Hearing on the Wellington Western corridor, all led to the decision to proceed with the consented alignment.

Due to the essentially 'green-fields' nature of the project, social impacts of the consented alignment are generally low, with little community severance across the project alignment. The exceptions are the social impacts on recreational users particularly for the two Regional Parks that are bisected (Battle Hill Farm Forest Park and Belmont Regional Park) and farm operations for both these two parks and also private farmers.

The much lower volumes of traffic along the existing SH1 route will create opportunities for the implementation of measures to encourage walking and cycling, more consistent with the local function of the route.

8.3.3 Joint Working

Opportunities exist to work with the PCC around the development of the link roads although any potential benefits of collaborative working would need to be carefully considered as the resource consent conditions are inextricably linked and need to ensure that neither the PCC nor the NZTA are disadvantaged.

The main alignment (particularly vertical) design has been future proofed to facilitate the PCC link roads connecting at the James Cook Interchange. Any change to this interchange will require involvement of PCC to ensure that the PCC link roads are not compromised, or that NZTA does not incur future additional costs, either for the main alignment, or as part funder of the PCC link roads. The optimum approach to dealing with this would be dependent upon the procurement model adopted and would be re-examined in the next phase of work.

The NZTA is currently working with Transpower around a possible alternative to the Transmission Gully relocation project that could result in reduced costs to NZTA, and better

operational and environmental outcomes for Transpower, in terms of reduced visual and landscape effects. Any cost savings will be passed onto NZTA, when measured against the TGP risk-adjusted Scheme Estimate. NZTA is managing this work closely to ensure that adoption of the Transpower alternative design does not negatively impact on the TGP programme.

8.4 Cost Optimisation

Cost optimisation and refinement has been a major part of the project development over the past four years, resulting in significant cost reductions which have contributed to the economic efficiency of the project.

As described earlier, the SAR Phase 1 of the project considered two alignments for the TGP route following exhaustive investigations and evaluations. Of these, an alignment which in some areas lay outside the previous designation was preferred. This alignment is estimated to cost up to [redacted] less than the best alignment that could be achieved within the previous designation. Following the SAR Phase 1, more investigation and specialist assessments were carried out as part of Phase 2 on the preferred alignment and additional cost savings were identified. These differences have been presented in Table 8-1 below.

Table 8-1: Change in TGP costs

[redacted]

8.4.1 Changes made during Phase I

In 2008 NZTA commenced a SAR including "Phase I Investigations - Investigations and Preliminary Design". The SAR was carried out between 2006 and 2008. The key objective was to identify the most advantageous route alignment which could then be further refined and used for assessment and consenting. The process involved multi-criteria analysis of 38 options and sub-options. Each one was assessed against the existing designation which was the baseline.

The Phase 1 process resulted in several important changes to the route alignment, the most significant being the decision to move the alignment from the east to the west slopes of the Te Puka and upper Horokiri valleys.

Road safety has been improved over previous designs. On sections of the route where steep grades will impact on truck speeds, crawler and auxiliary lanes have been provided. Improvements on earlier proposals include the removal of significant viaducts to increase the route's resilience to earthquake damage, revisions to road geometry to improve the alignment, particularly in terms of avoiding geological hazards such as active faults and historic landslides, and improved route security through changes to cut and fill slopes in line with the results of detailed geotechnical assessments.

Combining the James Cook and Warspite (Belmont Regional Park) interchanges into one was investigated early in the option development process. It was recognised that a combined interchange could provide similar transport functionality, and would benefit TGP's operability through reduced accident numbers. The Interchange connects to the industrial and commercially-zoned area of Waitangirua, as well as to James Cook Drive, and would provide the potential for renewal and intensification of the area.

Major cost saving areas included:

- Viaduct removed at Te Puka

[7] Risk-adjusted P50 Scheme Estimate Q2 2011 Dollars.

- Several structures removed along eastern valley through Battle Hill Farm and upper Horokiri stream valley
- Interchange removed from Belmont Regional Park
- Earthwork, structures, and alignment changes made during Phase 2.

Two Options were identified, developed and presented to NZTA and PCC. Option 2 was based around the SAR alignment utilising a 200 metre bridge crossing of Duck Creek, while Option 1 (an alignment to the west) eliminated the need for a significant bridge and reduced embankment heights. Consultation with affected parties and further assessment identified the eastern option (Option 1) as the preferred solution.

The benefits of Option 1 were the alignment was altered to achieve a best fit and minimise impacts on properties to provide better interface with existing topography. There was also a significant reduction in earthworks fill heights in vicinity of Duck Creek (reduced from 30 metres in height to approximately 10 metres) and the elimination of significant bridge structures which were replaced with a box culvert.

The road alignment was modified over approximately 5km through Horokiri and Battle Hill. The modified alignment introduced more winding elements that hug close to the existing land form, thereby creating opportunity for re-contouring the landform and integrating the road form into it. The new alignment also reduced the ecological impacts on the Horokiri Stream.

This change significantly reduces the effects on the lengths of stream diversion required and eliminates the physical impacts on the stream by removing bridge stream crossings and the number of cross culverts required. The earthworks cut volumes reduce by 725,000 cubic metres over this section of the project with no change to the proposed fill volumes.

Major cost saving areas:

- Significant reduction in earthwork volumes
- Removal of bridges for earth retaining structures.

Scheme Assessment

- Total earthworks cut is 7,900,000 cubic metres (cu.m)
- Total earthworks fill is 5,800,000cu.m
- Surplus cut material is 2,1000,000cu.m
- 2,300 metres of bridging
- 5.4km of stream diversions.

AEE Design

- Total earthworks cut is 6,100,000cu.m
- Total earthworks fill is 5,200,000cu.m
- Surplus cut material is 900,000cu.m
- 1,600 metres of bridging
- 5.9km of stream diversions.

NOR (Consented) Design

- Reduced global consenting risk related primarily to stream diversions, ecological mitigation, erosion and sediment control.

These modifications to the scheme design and associated project cost have resulted in the significant savings presented in Table 8-2 to the overall project costs.

Table 8-2: TGP Significant Areas of Savings

[redacted]

8.5 Do-Minimum Option

The do-minimum for the network has been considered extensively as part of the SAR and most recently the Transport Assessment for the AEE and represents a realistic future scenario for 2026, but without the TGP in place. This has been developed to provide a do-minimum against which the effects of the TGP can then be assessed and might exist should the TGP not be implemented.

This recognises that a number of other transportation projects are likely to be progressed and development will continue to occur in the period to 2026, irrespective of the TGP. Therefore, expected external changes to both land use and transport networks have been included in the modelling undertaken to produce a realistic do-minimum scenario.

This is a standard approach used for assessing the effects of a project from a transport planning perspective. It is important to note that this is not an assessment of the economic benefits of the TGP, for which the definition of the do-minimum may differ slightly.

The do-minimum includes the land use changes forecast by the GWRC which are also applied in the assessment of other transportation projects across the region.

Transport projects which have not yet been constructed (and have not been consented), but are expected to be completed in 2026 regardless of whether the TGP goes ahead are included in the do-minimum.

The projects principally include:

- Other RoNS projects;
- Petone (SH2) - Grenada (SH1) Link Road;
- SH58 Safety Improvement Upgrades; and
- Public Transport improvements (i.e. new rolling stock, twin tracking and electrification to Waikanae, integrated ticketing etc.) which are largely completed.

9 Economic Analysis

Economic assessment of the entire Wellington Northern RoNS package was undertaken as part of a business case study in late 2009 involving the development of a methodology to capture the benefits of each individual RoNS project (including TG) and then combine them to provide an overall project BCR for the package.

As a result of this analysis it was determined that the Wellington Northern RoNS package (as assessed in 2009) had a BCR of between 1.1 and 1.4. The BCR of 1.4 included wider economic/agglomeration benefits associated with the full package.

As a result of design refinement and risk mitigation and management, the cost of the project has continued to reduce in real terms. As the costs have reduced and further work has been undertaken to capture the benefits of the TGP, the project economics have also changed. Over the past four years the economic efficiency for the project has more than doubled as a result of changes in the EEM, cost reductions, increased benefits and the inclusion of a wider range of benefits (e.g. agglomeration).

The calculations for the TGP economic efficiency shown above assume a construction cycle that is contingent on the availability of funding from the NLTF. The RoNS programme originally anticipated a construction start date for TGP of 2015 however under current provisions there is considerable doubt of achieving this and a worst case start date is possibly around 2020.

On balance meeting the original RoNS programmed construction start of TGP via alternative funding/revenue sources has an overall positive, albeit small, economic benefit for the country.

Economic analysis of the TGP has evolved over time as the investigation into the route has progressed. The assessment of the Project has been undertaken from a national perspective following the guidelines set out in NZTA's Economic Evaluation Manual (EEM). The EEM sets out a method for capturing and calculating the set of costs and benefits that are relevant to the assessment of transport projects.

9.1 Wellington Northern RoNS Economic Assessment

The economic analysis for the TGP has been considered as part of the wider Wellington Northern RoNS package for the purposes of NZTA's Scheme Assessment Report Addendum (SARA) requirements.

Economic assessment of the entire Wellington Northern RoNS package was undertaken as part of a business case study in late 2009. This evaluation involved the development of a methodology to capture the benefits of each individual RoNS project (including TG) and then combine them to provide an overall project BCR for the package.

As a result of this analysis it was determined that the Wellington Northern RoNS package (as assessed in 2009) had a BCR of between 1.1 and 1.4. The BCR of 1.4 included wider economic/agglomeration benefits associated with the full package. It is important to note that some projects within the total corridor have a BCR below one while others have a BCR much greater than one. But in order to provide an Expressway from Levin to Wellington it would be difficult to achieve the RoNS objectives and recognise the wider economic/agglomeration benefits associated with the project without implementing the full package of works.

Beca were employed by NZTA to undertake a review of the economics for the Wellington Northern RoNS package and agreement was reached as to the assessment approach and economic analysis undertaken.

9.2 Assessment Profile

The project was assessed using the latest NZTA Planning Programming and Funding Manual (PPFM). An assessment profile of HHL has been determined for the project using the NZTA's funding allocation process as detailed below:

Strategic fit of the problem, issue or opportunity that is being addressed: **High**

The TGP is listed in the GPS as a RoNS and therefore is given a High strategic fit rating.

The project also has potential to provide a major contribution to national economic growth and productivity by improving travel time and reliability on key freight routes.

Effectiveness of the proposed solution: **High**

The project contributes to the NZTA's IRS in that it enables and supports a strategic component of the national transport system and will help give effect to the GPS.

The project will improve travel time, reliability and safety between the North Island and Wellington CBD and CentrePort.

Economic efficiency of the proposed solution: **Low** (BCR<2.0)

The BCR for the Wellington Northern RoNS project is estimated to be 1.1. This excludes wider economic and possible agglomeration benefits.

9.3 Characterisation of the Do-Minimum

During the SAR phase of the project, significant work was undertaken to look at the do-minimum network and look at the impact the TGP had on demands. As described earlier in Section 8.5, the Do-Minimum consisted of the agreed RLTS at the time which included a wide range of projects and land use assumptions that largely remain the same today as they did in 2008. The key Do-Minimum characteristics included:

- Duplication of and improvement to the Kapiti Railway line (NIMT) between Pukerua Bay and the extension to Waikanae – this project has since been completed and these benefits are being recognised.
- Kapiti Western Link Road – this has now been modified with the Wellington Northern Corridor RoNS SH1 M2PP Expressway Project utilising this corridor instead; however, the overall arrangement functions in a similar manner (i.e. expressway + local arterial).
- Reduction in peak time work based trips to and from Wellington CBD by 5% due to TDM measures (including car pooling and integrated ticketing) – this has been retained in current forecasts.
- Petone to Grenada link road – this remains a future scheme.
- Grade separation of the SH2/SH58 Haywards Intersection – this has been dropped for the current programme and forecast modelling.
- Local access and safety improvements for SH58 – these remain current, however the solutions have yet to be finalised.

At the time that the SAR was prepared there was no additional growth assumed for Kapiti as a result of the RoNS or PT improvements to the District. Although the level of growth and development that might occur in the Kapiti area remains uncertain, development is occurring and expected to increase significantly with the development of the RoNS package, therefore the SAR is likely to under predict the benefits of the TGP scheme.

The WTSM model was also used to look at changes in PT trips on the NIMT, which is predicted to increase significantly without the improvement of projects such as TGP.

9.4 Progression of the Economic Efficiency

As the investigations into TGP have moved through subsequent phases, understanding of the economic impact of the project has developed.

At the time that the SAR for TGP was completed, the RoNS had not been initiated and TGP was being considered as part of the Western Corridor package, but the project was considered in isolation. TGP now forms a critical part of the Wellington Northern RoNS project.

As identified earlier, the total Wellington RoNS BCR at the time of the business case in 2009 was between 1.1 and 1.4. There have been a large number of refinements to the TGP (including a substantial cost estimate reduction) and the level of assessment undertaken over this time, however, the benefit range identified is considered to be conservative due to the following factors:

- The demand modelling from WTSM assumes that the PT corridor has no capacity constraint and as a result there are significant increases in demand through to 2026; however, there are already capacity restrictions on the service and there is limited room for significant short term improvement until the duplication of the rail network between Pukerua Bay and Paekakariki.
- The Statistics New Zealand medium population and employment growth forecasts have been used for Porirua and Kapiti which do not take into account the significant infrastructure investment that has and will continue to occur as a result of the RoNS projects. However, both Porirua and KCDC have current investment plans predicated on high future population and employment growth, and if this eventuates will see reduced economic efficiency without the project, due to traffic related problems in the corridor, and therefore greater project benefits accruing than have been modelled.
- There have been no adjustments to the do-minimum network to address current safety and accessibility issues in location such as Paekakariki, Pukerua Bay and Mana. Such improvements would not only impact on network performance, they would also have a significant construction cost that would be of no value following the construction of TGP.
- As the costs have reduced and further work has been undertaken to capture the benefits of the TGP, the project economics have also changed over the past 10-20 years. Over the past four years the economic efficiency for the project has more than doubled as a result of changes in the EEM, cost reductions, increased benefits and the inclusion of a wider range of benefits (e.g. agglomeration).

9.5 Sensitivity Analysis

Table 9-1: TGP Sensitivity Testing

[redacted]

9.6 Cost/Benefit Variability

Various sensitivity tests have been carried out on the overall base BCR for the RoNS project. The sensitivity tests included factors such as; high population growth in the region based upon Statistics New Zealand projections with consistent growth in fuel prices, capping of benefits, changes in cost estimates and different programmes.

It should be noted that each of the sensitivity tests undertaken have been based upon the base overall RoNS BCR value that includes agglomeration benefits but excludes wider economic benefits such as employment. These sensitivity tests highlight the range in BCR's if different assumptions were adopted for the project, with a range between 1.0 and 1.4. Full details of these sensitivity tests have been documented in the 2009 Business Case.

An extensive list of sensitivity test have been undertaken for the project in isolation and this has highlighted that the variability is all greater than that reported in the 2009 Business Case and is comparable to the total corridor package.

9.7 Programme Impacts

The calculations for the TGP economic efficiency shown above assume a construction cycle that is contingent on the availability of funding from the NLTF. The anticipated availability of funding is dependent on both the future revenue gathered and the demands on the fund.

The RoNS programme originally anticipated a construction start date for TGP of 2015[8] however, the availability of funding to achieve this under current provisions places considerable doubt on achieving this and a worst case start date is possibly around 2020.

[8] All years stated are financial years commencing 1 July 20XX.

Under an alternative funding/revenue arrangement, such as raised FED/RUC or structured borrowing (including a PPP), it is feasible to return the programme to its anticipated schedule.

In addition to returning the programme to schedule, increased revenue/funding would remove cashflow limitations which limit the overall project delivery timeframe. A further benefit of PPP's as a delivery mechanism is that, through Debt/Equity funders interests in the project further programme efficiencies can be realised over and above an unconstrained programme.

Work has been undertaken to examine the impact that an "on-time" construction start and unconstrained cashflow programme would have on the economic efficiency of TGP. A five year construction programme was assumed as an unconstrained option to the six year time to build used in the business case.

With the construction period held constant (at five years), the construction start was brought forward to the beginning of 2015 (from 2016), assuming design and enabling works were all completed by the end of 2014. Under this scheme, benefits start a year earlier in 2019 and run for a year longer at 32 years. However, the corresponding uplift in the economic efficiency was smaller at 2% despite benefits starting earlier and lasting longer.

The 2% differential in uplift between the economic efficiency's for the 2016 and 2015 construction starts represents the combined trade-off between higher discounted construction costs and benefit streams that start earlier and last longer. The analysis indicates that shortening the construction period and delivering the project to programme have combined positive economic impacts on the performance of the TGP and the Wellington RoNS corridor as a whole. The analysis indicates that the increase in the discounted costs associated with an timely start are more than covered by value of gaining access to TGP's benefits earlier. On this basis, meeting the original RoNS programmed construction start of TGP via alternative funding/revenue sources has an overall positive, albeit small, economic benefit for the country.

10 Commercial Analysis

Work undertaken in assessing the commercial case for the project has concluded that a PPP is the recommended procurement model.

PPP is a viable procurement model in that the outcomes required from the TGP can be unambiguously captured in a performance based contract that provides the basis for private sector design, construction, financing, maintenance and operation.

Incentives can be put in place to encourage the contractor to deliver innovative design and construction techniques, especially with regards to improving operations and maintenance efficiencies, lifecycle optimisation and road user safety. Additionally, there will be opportunities for the NZTA, working in partnership with the contractor, to take the innovations and ideas delivered through the TGP and transfer them to the wider road network. By embracing the opportunities provided by this project, the NZTA can secure change in the effectiveness and efficiency of its approach to design, construction and operations.

The private sector has demonstrated strong interest in the Project. NZTA has the capability and resources to manage the PPP procurement process effectively.

The financial analysis and the review of available evidence from overseas is that the level of net financial gains that contractors would have to achieve to at least equal the PSC is achievable. The expectation, and requirement, is that a well-run procurement process to deliver the TGP through a PPP will produce bids that will "beat" the PSC.

10.1 Introduction

The HNO Group within the NZTA is responsible for over $1 billion of expenditure on maintenance, operation and capital improvement of the state highway network each year. This represents a considerable investment in roading infrastructure, which is vital to our national economy's support and development.

The level of NZTA's expenditure on the state highway network is such that we are a leader and shaper of the supply industry. We are very mindful of the impacts our actions have on the overall health and sustainability of the supply industry.

The LTMA section 25(1) requires the NZTA to have:

> *"procurement procedures that are designed to obtain the best value for money spent by approved organisations and persons, having regard to the purpose of this Act."*

The NZTA has consistently developed, implemented and monitored its procurement practices to promote the efficient consumption of resources to generate the maximum functional performance. The LTMA reinforces the NZTA's perspective on value-for-money, as we strive to continuously enhance our business outcomes. In response to this, the HNO Group has a well documented Portfolio Procurement Strategy[9] that:

- Signals to the supply industry how we intend to procure suppliers for the operation, maintenance and improvement of the state highway network.
- Helps our staff and the supply industry understand the available procurement options, and the decision-making processes that are applied in various scenarios.

The Portfolio Procurement Strategy (PoPS) documents the overall strategic approach to procurement for all activities undertaken by HNO, including the principles for decision making for specific activities.

All activities involving procurement have specific procurement strategies developed that are consistent with the PoPS and consider the specific characteristics of the particular activity or group of activities, alongside the strategic drivers of the NZTA.

[9] Portfolio Procurement Strategy, 2010, NZTA.

10.2 Purpose of this Section

The primary focus of this section is on the approach to procuring the TGP. It contains:

- A brief recap of the work undertaken prior to this Business Case on procurement options for the TGP.
- Commentary on the features of a public private procurement model and its benefits to the NZTA. This includes a discussion on the whether the TGP has the attributes to be a candidate for PPP procurement.
- A summary of the outcomes of the quantitative assessment of procurements options (this is presented in detail in Section 11).
- A summary of the discussions held with potential contractors, operators and financiers. These discussions were designed to provide high-level information on the TGP to the market participants and obtain their feedback on the project and their willingness to be involved in delivering the TGP.
- An outline of the outcomes that the NZTA would require from the TGP and the payment mechanism principles that would incentivise the contractor under a PPP to deliver the required outcomes.
- An outline of the contractual framework for a PPP.

10.3 Review of Previous Procurement Strategy Work

The suitability of various procurement models for the TGP have been analysed in detail in the past. Recent procurement assessment reports are the PPP Value for Money and Delivery Option Comparison Report and the Report on Procurement Strategy, Phases IV & V.

The analytical approach used in these reports and the key findings are outlined in Appendix J. In summary, these reports concluded that:

- Of the NZTA's traditional procurement approaches, D&C and competitive procurement were the most appropriate procurement approaches given the large scale, moderate risks/complexity of the TGP. Of these two approaches D&C is likely to be the preferred approach.
- When PPP was included in the analysis, it provided the best alignment with the project objectives, especially in terms of:
  - Certainty of meeting delivery times.
  - Certainty of delivery of economic outcomes.
  - Producing an outcome that is fit for purpose.
  - Ensuring compliance with project approval conditions.
  - Optimising whole-of-life outcomes.

The quantitative analysis included in the assessment concluded that PPP could produce greater cost savings that the traditional procurement approaches.

10.4 Public Private Partnership Procurement of the TGP

The following table provides a summary of key attributes or features of a PPP and the corresponding benefits for the NZTA.

PPP Attributes	Benefits to the NZTA
A PPP procurement process provides bidders with the opportunity to combine and make tradeoffs between construction and operation in innovative ways	NZTA will be presented with a range of solutions through the procurement process. It will be able to select a solution that provides it with the most appropriate combination of service quality, innovative thinking and cost on a whole of life basis.
The general approach to PPP contracting developed for New Zealand is focussed on requiring contractors to deliver outcomes to measurable standards. These outcomes and related standards cover both the construction phase (delivery of the completed asset (road) to the required standard) and the operating phase. Delivery of the outcomes to the required standards is driven by the performance-based payment mechanism. The contractor is repaid the capital it has used to finance the construction of the asset over the operating term of the PPP contract, together with its operating costs. This payment mechanism incorporates penalties for performance below the required standards.	The NZTA will only commence payments to the contractor once the TGP has been completed to the required standards. Any cost increases due to delay will be the contractor's risk. This would provide considerable incentive for completion of the TGP in time to ensure it is available for use in accordance with the required timetable. The NZTA will only pay the contractor for what it achieves relative to the required outcomes. This provides a strong incentive for the contractor to deliver at the required level of performance. The payment mechanism can also be designed to incorporate strong incentives for the contractor to deliver continuous and long term innovative solutions to the NZTA.
A PPP contract combines design, build and finance with a long term maintenance and operating contract. The two PPPs entered into by the Crown to date have operating periods of approximately 25 years.	The combination of design, build and finance with a 25 year maintenance and operating contract period will incentivise the contractor to deliver whole of life solutions in a cost effective manner to the NZTA. The TGP will be a new build. The Contractor will have responsibility for all operational and maintenance activities. Combining those factors into one service delivery contract provides significant scope and opportunity for whole of life optimisation of cost and services.
The contractor is allocated full financial risk for integrating design, construction, operation and maintenance of the TGP to achieve the required outcomes.	There will some be risks associated with the TPG that will be retrained by the NZTA. However, the objective will be to allocate risks to the contractor where it is commercially and financially sensible to do so. The nature of a PPP, with design, construction, financing and operations in a single contract provides significant scope for the NZTA to transfer risk to the contractor. A PPP will provide significantly more scope for whole of life risk transfer that is achievable under the NZTA's traditional procurement models.

PPP Attributes	Benefits to the NZTA
As noted earlier, the contractor finances the construction of the asset. A single periodic payment (e.g. monthly) is made to the contractor over the operating term of the PPP contract (i.e. the payments commence once the asset is commissioned and operating). This payment incorporates repayment of the financing of the asset and operating costs. This allows capital and operating payments to be linked to operational performance.	Linking of capital repayment and operating payments to operational performance will impose on the contractor the need for rigour upfront in project delivery. Having private sector capital at risk (as a consequence of funding the construction costs) provides a powerful incentive for the contractor to deliver in all aspects of the TGP and will incentivise the debt and equity providers in the consortium to maintain a high level of on-going review and control compared with other procurement models. This places additional pressure on the contractor to deliver services at the prescribed quality and quantity over the entire operating period. Furthermore, the PPP arrangements will provide financiers with the ability to replace the operator and the NZTA with the ability to step-in to the Project if a major default occurs. This will provide confidence in service delivery throughout the term of the PPP contract.
A PPP can provide new ideas on delivering assets and services.	The private sector partner will be expected to bring a fresh perspective that is not constrained by public sector processes and procedures and a focus on service delivery and achieving the required outcomes in the most efficient and effective way. In some respects this could characterised as the TGP providing a pathfinder role for the NZTA in the provision of services. The expectation is that the NZTA will be able to apply some these ideas and processes to other parts of the state highway networks and other projects.

The analysis in this table strongly suggests that a PPP procurement model will have a number of advantages. However, the benefits of PPP procurement to the NZTA do not of themselves argue for or against the TGP as a specific candidate for procurement through a PPP.

The suitability of the TGP for PPP procurement was considered by the NZTA in the PPP Value for Money and Delivery Option Comparison Report. A further qualitative assessment has been undertaken in this Business Case and is included in Appendix I

The conclusion of the qualitative revalidation in Appendix I is that the TGP is a viable candidate for PPP procurement. It has a number of the features that would enable the private sector to deliver value for money by bundling design, construction, financing and operation into a single, performance based contract. In particular, and consistent with the PPP features noted in the table above:

- The TGP is of significant scale. It will be attractive to a range of potential private sector participants and it will easily absorb the reasonably significant transaction costs that are part of a PPP transaction.
- Material risks inherent in the TGP can be adequately defined and allocated appropriately between the NZTA and the private sector contractor. An initial high-level risk allocation is included in Appendix L.

- There is scope for innovation, particularly given features such as the large number of structures and geotechnical challenges.
- It is feasible to express and quantify the outcomes the NZTA requires from the TGP so they can be incorporated into a mechanism for measuring the performance of the private sector contractor and setting the amounts it is paid for delivering the services.
- It is feasible to bundle the on-going management and maintenance of the TGP with the construction and financing into a long term (25 year) contract.

10.5 Quantitative Analysis: Financial Modelling

A financial model has been developed to compare the cost of the NZTA constructing, financing and operating the TGP itself (the public sector comparator (PSC)), using a traditional D&C procurement approach, to the cost if it were designed, constructed, financed and operated by the private sector (the proxy bid model (PBM)). The financial modelling is included in Section 11.

The construction and operating costs in the PBM do not include any efficiencies or cost reductions that the private sector might be able to achieve. Consequently, the PBM is higher than the PSC, reflecting that the private sector financing costs are higher than the public sector financing costs. This is to be expected.

The expectation, and requirement, is that the private sector will be able to equal or "beat" the PSC by providing construction, risk management and operating costs savings to at least offset the difference in financing costs between the public and private sectors.

The provisional estimates and analysis in Section 12 demonstrate that construction, and risk cost savings driven by private sector efficiencies can reduce the difference between the PBM and the PSC. Other factors may also come into play to enable the private sector to beat the PSC, such as different finance structures or costs and construction timeframes. These are not included in the analysis in Section 11.

10.6 Market Sounding

An initial marketing sounding has been undertaken with a selection of private sector constructors and financiers. This was used to provide high-level information on the TGP to interested parties and to gather information on issues and opportunities they identified with the Project, if structured as a PPP.

As the structure of a PPP for TGP is not fully formed, the information available to the private sector parties was limited. There is a risk of a strong optimism bias in the comments received.

A key parameter communicated to the participants was that a PPP for the TGP would be structured as an availability contract (the contractor would be paid for making the road "available"). The contractor would not be required to bear the risk of the volume of traffic using the road (i.e. payments would not be linked to the volume of traffic using the road).

The market participants included a cross-section of Australasian organisations (debt and equity investors, constructors and operators/maintainers) who are typically involved in similar PPP projects. Each participant received the same briefing, outlining the project need, potential project scope and services and a high-level timeline.

Participants were very enthusiastic about the project and are in the early stages of forming bidding consortia. However, they will require more detailed information on project scope, risk allocation, the NZTA's required outcomes, payment mechanism, timeline etc. before confirming their appetite to bid.

In general, the market sounding provided strong support for progressing the development of the project as an availability PPP. The concept of a roading availability PPP was well understood and attractive. All participants stated their interest is predicated on the project being structured as an availability PPP – there was no support for transfer of traffic volume risk to the private sector.

While both the TGP and the Huntly Bypass were supported, a number of participants supported Huntly Bypass being procured as a PPP before the TGP for the following reasons:

- Concern that the TGP may be too large to bid (and then construct) if other projects are underway or in market at the same time e.g. Christchurch rebuild.
- The large capital cost of the TGP may reduce the number of fully funded bids given the relatively small size of New Zealand's debt market, although there is likely to be sufficient liquidity to support two bids (ensuring non-exclusivity of banks is therefore important) and possibly three if international bidders bring their own relationship banks.
- The TGP has a slightly greater risk profile.

However, it was also acknowledged by several participants that the size and complexity of the TGP provided greater opportunity for innovation and creativity.

There were no major concerns expressed about the high level commercial principles suggested for the PPP. However, several parties stated their appetite for the project will be determined by the type of availability and performance criteria incorporated in the payment mechanism and the calibration of the penalty/incentive regime.

Several parties indicated current and thorough geotechnical information being made available to bidders was key to providing an accurately priced bid within the timelines.

The TGP is large by international standards and is certainly of sufficient size to warrant the investment required to develop and lodge a tender and, for the winning consortium, to mobilise the resources needed to deliver the contractual requirements. All parties expressed a view that tendering costs will be very high and welcomed any defrayment of these costs by the NZTA.

The limited number of New Zealand-based construction companies with the capacity and capability to construct a project of this size was noted as a potential constraining factor on participation in the tender process. However, all parties were certain NZTA would have two very capable bidders, and potentially three if the appropriate consortia formation occurs.

The tender process and timetable were not identified as constraints or issues. All parties welcomed the opportunity for further consultation during the EOI process.

10.6.1 Required Outcomes and Payment Mechanism

The outcomes required from the TGP under a PPP would be linked to the NZTA's high level outcome measures. These outcomes aim to contribute to government's overarching goal of growing the New Zealand economy to deliver greater prosperity, security and opportunities for all New Zealanders.

The government's long-term outcomes for the transport sector are:

- An efficient transport system that supports government's stated policy goal of achieving high levels of economic productivity, provides strong international connections for freight, business and tourism, and meets international obligations.
- A sustainable funding basis for transport infrastructure investments and use.
- A high quality transport system for Auckland, the nation's economic hub.
- An accessible and safe transport system that contributes positively to the nation's economic, social and environmental welfare.

In developing alignment between the strategic objectives of NZTA and the PPP, it is proposed to focus on four key result areas that balances the desire to be outcome led with managing the complexity of the availability / performance regime. The four areas of focus are:

- Throughput (travel time) – Focus design and operation on achieving and maintaining an optimal average speed throughout the concession period.
- Reliability – A focus on pinch points, e.g. on ramp merges, to ensure the design is optimised over time to minimise the effects of peak time traffic flows.

- Safety – Drive a safe system approach in design and by benchmarking against future trends to ensure continual improvement.
- Zero Harm – Everyone involved in construction and operations work returns home unharmed at the end of every working day.

These areas of focus would be linked into the mechanism used to pay the contractor for delivery of services. This payment mechanism would be based on the principle of only paying for service delivered. Service delivered would be judged against a range standards and performance measures.

An important feature of the performance standards is that they would not include any concept of payments being linked to traffic volumes – the contractor would not be required to bear the risks directly related to the volume of traffic using the road. Rather, as noted above, the performance standards would be related to the availability of the road for safe and timely journeys.

Worked completed to date on a suggested payment mechanism is included in Appendix K. This outlines the concept of the contractor being paid for delivering services and the payment being reduced (abated) where the services delivered are below the required performance standards. This work demonstrates that it will be feasible to design a payment mechanism that can incentivise a contractor to deliver services in accordance with the NZTA's desired outcomes.

10.7 PPP Contract

The Treasury's Standard Form PPP Contract[10] would provide the basis for the PPP contract for the TGP. This contract has been used for both Hobsonville Schools PPP and the Prison at Wiri PPP. In both of these projects the contract was adapted to a lesser or greater extent to meet the specific project requirements. This will also be the case for the TGP.

Adaption of the Standard Form Contract will be required for the TGP (refer to Appendix M for some examples of TGP specific contractual requirements). The very significant size of the construction component of the TGP, both in absolute terms and relative to the operating component, could raise some issues. However, the NZTA will benefit from the exposure the Standard Form Contract has had to the market through the two transactions completed to date. The PPP market participants and the Crown have an understanding of each other's position on a range of commercial and risk allocation issues of greater or lesser importance.

One critical point leading to some differences between the PPP market participants' expectations about contractual terms and conditions and the Treasury's requirements has been the "New Zealand specific" nature of the contract. The PPP market participants' expectations were based on Australian precedents (and, to a lesser extent, UK precedents). This were not always consistent with the focus of the New Zealand requirement for a well specified contract to support a focus on delivering outcomes.

No doubt the positions of the market and the Crown would be retested in the procurement of the TGP, particularly given offshore market participants' familiarity with roading PPPs. However, the NZTA will have a sound position to negotiate from.

[10] http://www.infrastructure.govt.nz/publications/draftpppstandardcontract

11 Financial Analysis

The financial assessment of the Project involved developing a Public Sector Comparator (PSC) to calculate the whole of life cost of the project if NZTA were to design, construct, finance, operate and maintain the project over a 25 year operations period. The PSC includes a risk adjustment to allow for those risks that are likely to be transferred to the private sector partner under a PPP contract and an adjustment for corporate taxation. The PSC establishes the affordability envelope for the Project.

The construction, operation and maintenance cost inputs in the PSC are used as a basis for developing a Proxy Bid model (PBM) to estimate the cost of private sector procurement of the Project. This is effectively the PSC with the addition of private sector debt and equity finance costs.

There is a [redacted] difference between the PSC and the PBM which is the additional cost of private sector finance. In order to provide NZTA with value for money and meet the affordability threshold, the private sector will need to identify total savings in construction and risk costs of approximately [redacted] %. These savings may arise as a result of efficiency or innovation during the design and construction process and are brought about by the additional rigour and due diligence present under PPP procurement.

11.1 Purpose of this Section

The purpose of this section is as follows:

- The reference project: this section identifies the capital expenditure and operating assumptions used in the PSC to define the reference project.
- Competitive neutrality: this section describes a tax adjustment made to the PSC to facilitate a like-with-like comparison between the PSC and PBM.
- Risk quantification: this section identifies the quantification of risks that would be borne by the NZTA under traditional procurement but would be transferred to the private sector contractor under a PPP.
- Calculation of the PSC: this section brings together the components of the PSC and presents the PSC results.
- PBM and financial benefits: introduces and quantifies the PBM and presents discussion on the potential financial benefits that could be provided by procuring the Project through a PPP.
- Reconciliation to the Scheme Estimate for the project: this section provides a reconciliation between the PSC and the scheme estimate for the project.
- Project revenues and cash flows: this section discusses the potential project revenues, if any, and the cash flows under traditional procurement, PPP procurement and if the NZTA were to borrow in its own right.
- Accounting treatment: this section illustrates the accounting implications for the NZTA of PPP procurement.

The whole-of-life cost of the project using traditional procurement is presented as the PSC. The PSC is compared to the estimated cost of the project under a PPP procurement model (presented as the PBM) to examine if it is possible for the private sector to equal or better the PSC through construction and operating cost efficiencies, or better risk management practices.

The calculation of the PSC uses a different methodology to the traditional NZTA Scheme Estimate. For example, the PSC includes allowances for inflation and is a Net Present Value (NPV) Number, where as the NZTA scheme estimate is a real number (excludes inflation and discounting). A reconciliation of the PSC and the NZTA Scheme Estimate is included in this chapter along with an explanation of the differences.

11.2 Definition of the PSC

The PSC is an estimate of the risk adjusted cost of the Project if it were to be designed, built, financed and operated by NZTA using traditional procurement methods. It has been developed taking into account:

- The outcomes required from the Project.
- The risks retained by the NZTA under traditional procurement but that would be transferred to the private sector under a PPP.

The PSC provides an estimate of the cost of the Project if it were to be built and operated by the NZTA to deliver the outcomes the NZTA requires from the Project. In this Business Case it has been used to provide a benchmark against which to compare the PBM (representing the cost to NZTA of the Project if it were procured through a PPP). If a decision is taken to procure the Project through a PPP, the PSC will be used as an input to determining the "affordability threshold". The affordability threshold will be the upper limit of the amount the NZTA is prepared to pay for delivery of the Project via a PPP (and may lock in a small proportion of quantitative value-for-money up front).

11.3 Components of the PSC

The PSC is comprised of three components:

- The "raw PSC" based on the "Reference Project".

  The Reference Project provides a baseline costing assuming the TGP is built and operated by NZTA. This includes all capital and operating costs associated with designing, building, maintaining and financing the TGP over the same period as the assumed term of the PPP Contract and to performance standards consistent with the outcomes for the TGP and excludes risk events. The timing of cash flows included in the PSC calculation reflects when the cash flows are incurred by the NZTA.

- Competitive neutrality adjustments

  A tax adjustment made to the PSC to allow a fair and equitable comparison between the PSC and the PBM. Tax is ultimately neutralised on a whole-of-government basis in any event, so this adjustment takes this into account.

- Transferred risk

  One of the important features of a PPP is the transfer of certain risks to the contractor. Risks that the contractor will have to manage will include such things as completing the building of the TGP within the cost estimate and within the required timeframes, achieving the required operational quality requirements etc. The value of transferred risks is included in the PSC to allow a like-with-like comparison with the PBM. Retained risk is the same under both scenarios so does not need to be considered in the analysis.

The following figure summarises the components of the PSC.

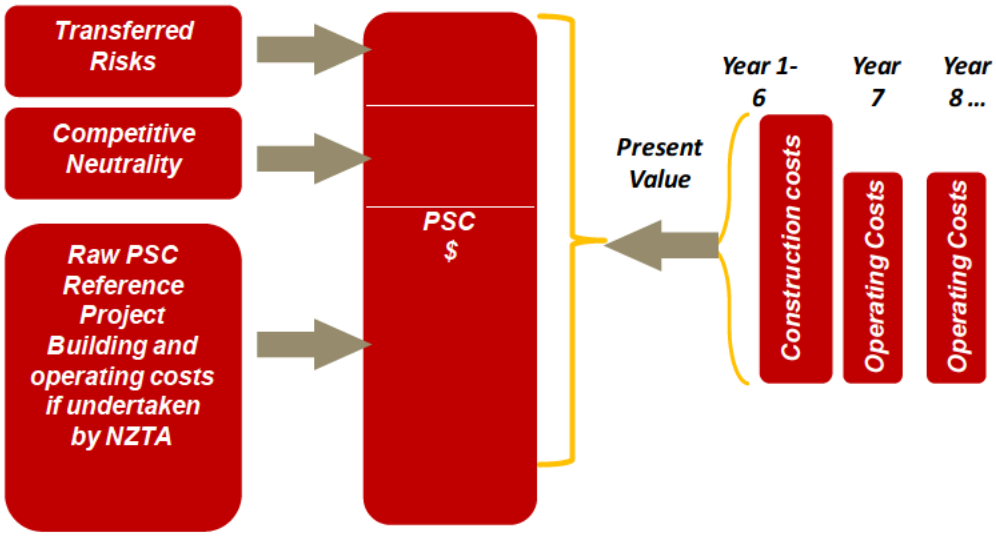


Figure 11-1: PSC Components

11.4 Design and Construction assumptions

The design and associated construction costs for the Project are based on the most recent Scheme Estimate and programme for the project. The Scheme Estimate was prepared in accordance with the Cost Estimating Manual (SM014). The table below summarises the key features of the design and construction assumptions used in the PSC.

Table 11-1: Design and Construction Assumptions

[redacted]

The base project estimate is at a P50 level, excluding risk events, but including contingencies associated with cost and quantity estimates. Risk events have been excluded from the base project estimate as the risk allowance (Transferred Risk) is added as a separate, specific adjustment to the PSC.

11.5 Operating and Maintenance Assumptions

Operating and maintenance costs (including lifecycle maintenance costs) have been developed based on estimated costs per km of highway and taking into account the number of bridges included in the Project.

[redacted]

The operating and lifecycle maintenance assumptions are included in the following table:

Table 11-2: Operating and Lifecycle Maintenance Cost Assumptions

[redacted]

11.6 Competitive Neutrality

Competitive neutrality does not include differences in performance or efficiencies that arise in a competitive market. It does not include differences in cost levels between the public and private sectors. The only competitive neutrality adjustment is for corporate tax.

The following table summarises the taxation adjustment made.

Table 11-3: Competitive Neutrality Adjustment - Details

Adjustment	Details
Corporate Taxation Consistent with previous PSC calculations following Treasury business case guidelines, corporate tax has been added to the PSC.	The tax amount included in the PSC is calculated as follows: • PPP SPV investor profits * 28% • +Debt investor margins * 28% • - Govt debt margins * 28%[12] This calculation estimates the total difference between the implied taxable amounts to debt and equity investors in the private sector and the implied taxable amount to investors in public sector debt.

Table 11-4: Competitive Neutrality Adjustments - Values

Competitive Neutrality Adjustment	$m (NPC)	$m (nominal)
Taxation on SPV profits	[redacted]	[redacted]
Taxation on investor debt margins		
Less taxation on government debt margins		
Corporate Taxation		

11.7 Risk Transfer

The project will involve a range of risks (such as unforeseen ground conditions, delays, cost overruns etc.). These risks are not captured in the construction or operating costs for the Reference Project included in the PSC. These risks may or may not crystallise into actual costs.

[12] Refer to the Public Sector Comparator – Assumptions and Results report contained in Appendix N for details of margins utilised for calculation purposes.

Under traditional procurement, a large number, but not all, of the project risks will be retained by the NZTA. Under PPP procurement the risks will be allocated between the NZTA and the private sector contractor to the party best able to effectively manage the potential for the risk to occur and best able to mitigate the cost if it does occur. This requires an optimal rather than maximum transfer of risk. Neither the NZTA nor the private sector contractor will be best placed to manage all of the risks.

All things being equal, the intent under a PPP is to pass as much responsibility as possible to the private sector contractor to manage construction and operation of the Project.

Transferring risk to the private sector contractor will come at a cost. The price the Contractor will charge to deliver the Project will include some allowance for the risks it is required to manage. The risk quantification exercise is an attempt to identify and quantify all of the material project risks. These risks will include risks to be retained by the NZTA and risks to be transferred to the contractor. The Transferred Risks are added to the PBM and also the PSC for comparative purposes. Retained risk is the same under both scenarios so does not need to be considered in the analysis.

Where a risk is classified as a Transferred Risk, the Contractor should be given a substantial degree of flexibility to determine the best method of controlling the costs associated with that risk. This creates a powerful incentive for the Contractor to manage the risk in the overall interests of the project, while delivering value for money to the NZTA. An efficient allocation of risks will allow the NZTA to obtain greatest value for money by harnessing the respective skills of all parties. However, if too much risk or the wrong risks are transferred to the contractor, the NZTA may pay more than if they were retained as the private sector may require a risk premium over and above the estimated cost of NZTA retaining the risk.

11.8 Risk Quantification

A detailed analysis of risk for the project has been undertaken. Further information on the risk approach is discussed in Section 12 (Project Risk Analysis), and the risks identified and analysed are included in Appendix G. The probability of each risk occurring and the financial impact of occurrence have been used as inputs into a risk model that simulates potential outcomes.

The table below summarises the overall results of the risk assessment process. The table provides a total estimated risk cost (including construction and operating phases) for the 85th percentile observation. For more information on the risk modelling, refer to the Public Sector Comparator Assumptions and Results paper included in Appendix N.

Table 11-5: Total Project Risk – Transferred and Retained[13]

	NPC ($m)	Nominal ($m)
Transferred construction and development risk	[redacted]	[redacted]
Transferred operating risk		
Sub Total Transferred Risk (estimated contribution)		
Retained construction and development risk		
Retained operating risk		
Sub Total Retained Risk (estimated contribution)[14]		
Total Project Risk		

[13] Refer to the Public Sector Comparator – Assumptions and Results report contained in Appendix N for further details of the risk modelling performed for the PSC.

[14] Following NIU guidance, retained risk values are not included in the PSC and the 85th percentile has been used for risk modelling outputs.

11.9 PSC Summary Results

The results of the PSC calculation are presented in the following table. The NPC[15] is the present value of the costs as at 1 January 2014[16]. The NPC has been calculated using a discount rate of 8.0%. The nominal costs are the total (undiscounted and inflated[17]) costs over the entire PPP Contract term.

Table 11-6: PSC Summary

Public Sector Comparator	NPC ($m)	Nominal ($m)
Operating costs	[redacted]	[redacted]
Construction costs		
Raw PSC		
Competitive neutrality		
Non risk adjusted PSC		
Transferred risk P85%		
Total PSC		

11.10 Proxy Bid Model and Financial Benefits

The PBM provides an indication of the possible cost of the Project if it were to be delivered through a PPP. The PBM is calculated by adding the following to the PSC:

- Private sector financing costs[19]. The financing costs used in the PBM are based on observations from recent New Zealand and Australian market transactions.
- Costs that the private sector contractor will incur in managing its operations and its obligations under the PPP contract.

The PBM does not include any allowance for efficiency gains. Please refer to Section 11 for the discussion on how efficiency gains might be achieved by the private sector and further testing of the impact on potential efficiency gains on the NPV of the PBM below.

Table 11-7 presents the NPC of the PBM and the difference between the NPC of the PSC and the PBM.

Table 11-7: Financial Benefits Comparison

	($m)
NPC of the PSC	[redacted]
NPC of the PBM	
Difference	
Difference as a percentage of the NPC of the PBM	

The difference between the PBM and the PSC is primarily a function of the difference between private sector and public sector cost of finance. It reflects that the Crown, given its sovereign credit rating and access to different financial markets, will be able to finance the Project at a lower cost than the private sector.

The difference between public sector and private sector financing costs is effectively reflected in the difference between the discount rate used to calculate the NPC of both the PSC and PBM ([redacted]%) and the private sector interest rates and cost of equity used to quantify the finance costs in the PBM.

[15] The present value of forecast costs.
[16] The discount date of 1 January 2014 has been used as it is the anticipated date for financial close (project start).
[17] All costs have been inflated at 3% per annum.
[18] $[redacted]m = $[redacted] base cost per Table 11.1 above + $[redacted]m inflation.
[19] The Proxy Bid model uses the construction and operating costs and related information from the PSC. Private sector financing parameters are added to the model and tax is calculated. The model is solved to generate a sufficient level of Unitary Payment annually to cover operating and maintenance costs, taxation, debt servicing and provide equity returns to shareholders while maintaining banking covenants.

In order to provide a cost effective solution to the NZTA, private sector contractors bidding for the PPP contract will need to bridge the gap between the PBM and the PSC through construction and operating cost efficiencies, or more efficient management of risk. By testing the cost structure and risk assumptions used to calculate the PBM, the implicit cost efficiencies and savings from more efficient management of risk that the private sector will need to achieve to provide value for money to NZTA have been identified.

The change in the difference between the PSC and the PBM using different cost and risk assumptions is shown in the following table:

Table 11-8: Sensitivity Testing of PBM Assumptions

Construction cost saving assumption %	Risk cost saving assumption[20] %	NPC of the PSC ($m)	NPC of the PBM ($m)	Difference between the PSC and PBM ($m)	Difference between the PSC and PBM (%)
0%	0%	[redacted]	[redacted]	[redacted]	[redacted]
5%	50%				
10%	50%				
15%	50%				

The NPC of the PBM is $[redacted] million higher than the NPC of the PSC. If the private sector can reduce the construction cost by [redacted]% (for example) and is able to manage the Transferred Risks such that only [redacted]% of the risks are priced into the contract then the gap between the PBM and PSC reduces to $[redacted] million. The analysis conducted in Section 11 from precedent PPP projects, indicates that these savings and efficiencies are achievable and therefore the cost savings modelled in the PBM are reasonable.

An examination of overseas PPP studies has been undertaken to understand how efficiencies might be achieved for the TGP through PPP procurement. The available evidence of PPPs delivered in Australia and the UK indicates that through the PPP process the cost efficiencies and additional upfront rigour and attention to risk mitigation required to meet or better the PSC are achievable. While overseas examples may not be directly comparable due to the differences in the New Zealand PPP contractual structure and market differences, this does not invalidate the lessons that can be taken from these examples.

Factors that support the contention that the private sector should be able to achieve efficiency savings at least at the levels required to bridge the gap between the PSC and the PBM include:

- A report prepared by Allen Consulting Group in (2009) found that in Australia, projects procured utilising PPP's have a cost advantage over traditional procurement that "can range from 30.8 percent when measured from project inception, to 11.4 percent when measured from contractual commitment to the final outcome"[21]. The report examined PPP projects with a contracted value of AUD4.9 billion and identified that the net cost over-run was only $58 million – not statistically different from zero. For $4.5 billion of traditional procurement projects, the net cost over-run amounted to $673 million or 15%.
- An earlier report[22] prepared by Allen Consulting Group for Infrastructure Partnerships Australia in 2007 reviewed a number of closed PPP transactions and traditional procurements. One of the observations was that there is scope for construction cost efficiencies within a PPP framework. This is a consequence of the private sector managing the cost and time risks and of significant amount of design work being completed before signing the contract, reducing the potential for scope changes after the contract is signed.

[20] High level analysis was performed over the probability of risks modelled in the PSC and included in the PBM. The analysis indicated that the reduction of the probability (but not the cost impact) for a small number of risks in areas where the private sector is expected to have an increased focus during the bid phase of the project would reduce the total modelled risk outcome by approximately [redacted]%.

[21] Allen Consulting. (2009) *Performance of PPPs and Traditional Procurement in Australia*. Report to Infrastructure Partnerships Australia.

[22] Allen Consulting Group, Duffield, CF and Raisbeck, P. (2007). Performance of PPPs and Traditional Procurement in Australia. Melbourne, Infrastructure Partnerships Australia.

- An authoritative study[23] of a representative basket of Australian PPPs and traditional procurements by the University of Melbourne in 2008 for the Australian National PPP Forum, which was expressly designed to address criticisms of pro-PPP bias levelled at earlier studies, found "PPPs delivered projects for a price that is far closer to the expected cost than if the Project was procured in the traditional manner."
- Research undertaken by HM Treasury[24] found that from a sample of 6,1[25] operational PPP's in the UK, 88% were completed on time or early, and with no construction cost overruns being borne by the public sector. Previous research had shown that 70% of non-PPP projects were delivered late and 73% ran over budget.
- A study by PwC of PPP projects in Australia completed in 2010, found that the PPP model delivers efficiencies by encouraging bidders to take a whole-of-life approach to evaluating costs and to optimise the trade-off between increased capital costs and lower maintenance/lifecycle costs. The study also found that the provision of equity capital and non-recourse debt finance, coupled with the transfer of risk to the private sector, results in financiers requiring a more rigorous analysis of project costs and risks through increase levels of due diligence. This has resulted in better management of delivery schedules, design changes and cost slippage which ultimately allows bidders to reduce the cost associated with uncertainty in the bid price.

The conclusion from the financial analysis and the review of available evidence from overseas is that the level of net financial gains that contractors would have to achieve to at least equal the PSC is achievable. The expectation, and requirement, is that a well-run procurement process to deliver the TGP through a PPP will produce bids that will equal or"beat" the PSC. Equally, contractors are considered likely to deliver benefits not possible under traditional procurement and these have not been included in the PSC, such as higher levels of service, superior network outcomes or replicable efficiency gains or innovation.

In addition to the financial benefits of a PPP specific to the TGP, it is possible that a PPP could act as a catalyst for change within NZTA. This could be measured in terms of NZTA achieving similar levels of efficiency gains as the Contractor through NZTA adopting learnings from the Contractor's whole-of-life approach.

Assuming that not all the operational or construction efficiencies achieved on the TGP could be replicated across the wider roading network, but that some of them could, a[redacted]% efficiency gain achieved across the NZTA operations would result in cost savings of the order of $[redacted] million per annum.

11.11 Reconciliation of the PSC to NZTA cost estimates

The Scheme Estimate for the project at a P50 level (excluding risk, including contingencies) has been used as a cost input into the PSC.

The P50 scheme estimate for the project is $[redacted] million (including contingency and risk).

A reconciliation between the Scheme Estimate and the PSC is provided in Appendix H. In general, the difference between the Scheme Estimate and the PSC is a result of the calculation methods used for the PSC, the inclusion of operating costs, competitive neutrality adjustments and inflation which are not included in the Scheme Estimate.

11.12 Project Revenues

Currently the project includes approximately 3.5km of new local roads, at an estimated P50 cost of [redacted] (including client managed costs, design and MSQA professional fees). Funding, development, construction and operation will be the responsibility the PCC and while they will seek financial assistance from NZTA for this work, part contribution from their rate-payers will assist in funding the PCC link roads. Development contributions may also assist in funding part of the link roads, but this is by no means certain. PCC have moved away from

[23] Report on the performance of PPP projects in Australia when compared with a representative sample of traditionally procured infrastructure projects, University of Melbourne, 17 December 2008.
[24] PFI: Meeting the investment challenge, HM Treasury, July 2003.
[25] This represents approximately 10% of all completed PPP's as at the date of the report.

having developers construct the link roads as part of the sub-divisions and this is likely to increase the call on national funding assistance.

There are no current third party contributions envisaged as part of the TGP. The opportunity for development contributions is limited as the proposed Motorway has no direct access and limited opportunity for non-state highway connections. A potential opportunity exists for a service centre to be constructed as part of the project given its length and somewhat remote location, although this is not included within the project scope, nor is it signalled as being necessary in terms of the applicable draft corridor management plan.

Toll revenue forecasts produced based on traffic modelling work undertaken for the SAR estimated that the revenue optimised maximum annual net toll revenue forecasts were [redacted] in 2016 and [redacted] in 2026 respectively. NZTA's alternative funding group determined the project would not meet the project advancement criteria set by NZTA. This preliminary work was based on no formal consultation or willingness-to-pay survey, and no detailed toll modelling work around variable or optimising revenue tariffs, or limiting diversion, leakage or toll infrastructure needs. Tolling of the TGP is therefore not within the current NZTA scope for the project.

11.13 Funding Requirement

The purpose of this section is to identify the estimated annual cash costs to NZTA of procuring the project using a PPP procurement model. These costs are compared to the annual cash costs of traditional procurement over the first ten years of the project.

Another alternative for funding the project is to utilise NZTA borrowing. The costs of this option have been quantified and are discussed in this section.

11.13.1 Costs of the project to NZTA

The cash costs of the project to NZTA under PPP procurement will consist of:

- Payments made to the contractor (the Unitary payment) over the term of the contract;
- Costs that NZTA will incur itself in relation to the PPP contract, in addition to the Unitary payment.

The Unitary Payment

The Unitary Payment is likely to be a fixed real amount, a component of which will be subject to indexation to allow for inflation. For the purposes of this business case, the inflation allowance has been applied to a proportion of the Unitary Payment to reflect that the costs that the Contractor will incur in providing operating services will be subject to inflation. A majority of costs relate to debt and equity repayment and servicing and are not subject to inflation and are not indexed.

An allowance for lifecycle maintenance costs, primarily consisting of resurfacing and pavement rehabilitation costs has been included in the cash flows when this cost is incurred by the contractor.

The annual Unitary Payment has been estimated for the Project using the PBM, adjusted to incorporate the level of efficiencies required to equate the PBM to the PSC. This is presented in the following figure, which shows the real Unitary Payment and the inflation component.

Figure 11-2: The Total Unitary Payment

[redacted]

The Unitary Payment has been calculated to provide sufficient revenue to the Contractor to allow the highway to be operated and maintained and to cover forecast debt and equity servicing requirements over the term of the PPP contract. A breakdown of the different components of the Unitary payment for the first ten years of operations is provided in the following table:

Table 11-9: Unitary Payment Breakdown

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cash operating costs	$m	$m	$m	$m	$m	$m	$m	$m	$m	$m
Operating and regular maintenance costs	[redacted]									
Working capital										
Lifecycle costs										
Total operating costs										
Funding costs										
Interest										
Return on equity										
Refinance fees										
Total finance costs										
Repayment of debt										
Repayment of equity										
Total debt and equity repayment										
Total funding costs										
Total Unitary payment										

[redacted]

Table 11-9 demonstrates that the majority of the cash costs relate to servicing debt and equity over the operations period. Return on equity payments remains fairly constant during the initial ten year period. Interest costs begin to reduce as principal payments reduce the outstanding debt balance. The initial spike in debt principal repayments reflects the impact of working capital and establishment of reserve accounts[27], which occurs in the first year of operations of the Project.

Costs incurred by NZTA

Preliminary estimates suggest that NZTA may spend up to $[redacted]m in total of additional costs in relation to project management, commercial, financial and legal advisers, under PPP procurement. This amount is additional to the cost of traditional procurement and is likely to be incurred during the periods prior to financial close.

11.13.2 Base interest rate risk

The costs in Table 11-9 are an estimate of the cash costs that may be incurred under a PPP contract. The actual costs may be different from those observed for a number of reasons, including different cost of capital and capital structures utilised by the Contractor and different base interest rates.

Base interest rate risk will most likely be a risk borne by NZTA. Interest rates are at or close to historical lows at present and the base interest rates utilised in the cost estimates reflect this. Should base interest rates increase from those used in the above estimates, the total Unitary Payment will increase, which will be a direct cost increase to NZTA. Table 11-10 shows the impact on the total value of the PBM from changes in base interest rates. These results indicate that NZTA will need to monitor the impact of changes in base interest rates on the affordability threshold.

Table 11-10: Impact to the PBM of changes in Base interest rates

Movement in interest rates (bps)	NPC of the PBM ($m)	Change in the PBM $m	Difference between the PSC and PBM (%)
-	[redacted]	[redacted]	[redacted]
100			
200			

11.13.3 The cost of the project under traditional procurement

The funding requirement under a traditional procurement approach (D&C) is significantly different to that of a PPP contract. A comparison of the two approaches to procurement is shown in the figure below for the construction period and entire operations period.

[27] The debt funders will require the Contractor to establish reserve accounts to, among other thing, reserve cash for debt servicing.

[redacted]

Figure 11-3: Annual payments under Traditional and PPP procurement methods

Figure 11-3 illustrates that while the annual average payment under PPP procurement is higher, there are no payments made until operations begin.

While the PPP project costs are greater, as referred to elsewhere in the Business Case, having private sector capital at risk, in a non-recourse manner within the PPP brings considerable benefits in incentivising the Contractor to deliver optimal whole-of-life performance and innovation. These benefits may potentially outweigh the added costs of the PPP.

11.14 Funding the project utilising NZTA debt

Financial forecasts have been produced for the option of NZTA borrowing in its own right to finance the Project. These assume that NZTA can finance the project using a weighted average cost of capital of 8% and that the (nominal) financing is repaid over the operations period. The annual cash cost in the first ten years of operations under this option is presented below and compared to the PPP option.

Table 11-11: Annual cost of structured finance- first ten years of operations

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total operating and maintenance costs	[redacted]									
Interest payments										
Principal payments										
Total Payments										
Total Unitary payment										
Difference										

The NZTA borrowing option will provide lower annual cash costs than under a PPP, reflecting the lower finance costs. However, the NZTA borrowing option is unlikely to involve the same level of risk transfer than can be achieved under PPP procurement.

11.15 Accounting Treatment

International Public Sector Accounting Standard (IPSAS) 32 Service Concession Arrangements: Grantor prescribes the accounting for service concession arrangements by public sector entities. The guidance in this standard is directly relevant to the accounting for PPP arrangements under the Treasury's PPP Standard Contract.

The accounting treatment of a PPP contract has two distinct phases, being Construction and Operations. During the Construction phase, as the Contractor is building the asset, NZTA will recognise both a Service Concession Asset (split between the road and fixtures and fittings) and a financial liability on a work-in-progress basis. During the operating phase:

- The service concession asset will be accounted for in accordance with NZTA's depreciation and revaluation policies.
- NZTA will need to separate the unitary payment made to the Contractor into its component parts. There will be at least three components:
  - Cost of service (charge to the income statement)
  - Finance cost (charge to the income statement)
  - Financial liability (reduction in the financial liability).

The implications for NZTA of the accounting guidance are demonstrated in the following table:

Table 11-12: Summary of Accounting Treatment Implications

Balance Sheet	***Assets*** Land (retained on balance sheet) Roading and related assets ***Liabilities*** Financial liability (written down during the service concession period)
Income Statement	***Income*** Nil ***Expenditure*** Cost of service provision by the contractor (recognised as the services are provided) Depreciation of service concession assets Loss on disposal of service concession assets (being fit-out periodically replaced by the contractor over the service concession period) Finance costs
Cash Flow Statement	***Operating Outflows*** That part of the unitary payment that relates to the services delivered. ***Investing Outflows*** That part of the unitary payment that relates to the lifecycle maintenance expenditure. ***Financing Outflows*** That part of the unitary payment that relates to the finance costs and the reduction in the financial liability.

12 Project Risk Analysis

NZTA has applied its risk management processes to the development of the project, including on-going qualitative and quantitative risk analyses.

The key project risk is the ability for NZTA to deliver the project in a timely manner within the existing NLTP funding envelope. Other project cost and programme risks include client initiated scope changes (in response to legislative, technical standards, network and third party requirements), and around the provision of a unencumbered site (property acquisition, third party enabling works etc).

Complex topography and geology, including the proximity of the route to known seismic hazards are all expected project risks that have been assessed and included within the risk contingency sums.

12.1 Risk Analysis Process

This section provides an overview of the risk analysis process undertaken. This included:

- A qualitative assessment considering reputational, stakeholder and environmental, as well as the cost and programme risks (and consideration of opportunities) which were then incorporated into the risk adjusted cost estimate and programme.
- A parallel, but integrated, qualitative and quantitative risk assessment and analysis process which has been maintained for the project, as required by NZTA for a project of this value. A monte-carlo analysis was produced for the SAR and updated at key milestones, including most recently for the preparation of the Detailed Business Case.
- The quantitative risk analysis being updated to capture the greater certainty and elimination of risks arising from the granting of the necessary consents for the project. This has resulted in a reduction of the global risk allowance for the project, resulting in an approximately 5% reduction in the P50 expected Scheme Estimate cost.
- Whilst early risk workshops did not consider any financial modelling risks around funding and operational and whole-of-life costs in any detail, the most recent workshop (attended by Treasury) considered all aspects of the project, including commercial risks.

12.2 Key Project Risks

The key project risk in terms of project benefit delivery delay, reputational and stakeholder risk (threat) is the ability of NZTA to fund the project within the existing NLTP funding envelope. This can be addressed by way of either structured borrowing against the Project, the programme or by way of PPP or other funding mechanism.

The top five key project risks (threats) as assessed and analysed in the quantitative analysis (cost and programme threats) which represents around [redacted] of all risk costs (in real dollar terms) are:

- Allowance by constructor for design creep (additional cost of specific design compared to scheme design).
- Claims by constructor against NZTA for client initiated scope changes.
- Scope creep by client (including responding to legislative, technical standards, network and third party requirements and pressures).
- Utility (services) owners relocation and protection work above contingency allowance (limited ability by client/constructor to influence third party price and programme) – noticeably Transpower but also Gas distribution lines and bulk water-main protection and relocation work.

- Labour cost premium (at tender box or financial close) due to a number of large construction project occurring concurrently (including NZTA RoNS projects nationally and regionally).

Lower magnitude risks for NZTA as client, include:

- Inability to acquire all the land necessary to construct the project within any accelerated timeframe, due to current minimum timeframes specified in legislation (Public Works Act, etc.), leading to delays or inefficiencies for the constructor (inability by NZTA to provide clean site for contractor).
- Consenting risks as a result of management plan approach and third party certification by regulatory authorities (including external peer review, dual certification and interpretation and potential arbitration/mediation.

12.3 Risk Quantification

Risk quantification has been analysed in terms of schedule risk (contingencies) around the quantity and rates and the global risk profile to understand the cost probability distribution. The base capital cost SE does not include any financial risk and is based on a single design and construct contract with a typical NZTA roading project risk sharing/transfer/retention profile.

At a P50 (Expected SE cost estimate) the combined risk allowance is assessed to be [redacted] of the base SE, (made up of [redacted] schedule risk and [redacted] global risk allowance), increasing to a combined [redacted] of base estimate at the P95.

This risk allowance has been reduced from the SAR cost estimate, as a result of the granting of consents for the project by the Board of Inquiry, which has provided increased certainty around consent conditions. Although a reference design and associated Design Estimate (DE) has not been produced, nor a parallel estimate produced, the consenting design is well developed and the construction risk allowances are considered to be close to DE magnitude.

12.4 Commercial and Financial Risk

There will be a number of commercial and financial risks that the NZTA would bear under a PPP procurement that it would not face under a under a D&C procurement. Also, there will a number of risks that are inherent in traditional procurement that would be more transparent and explicit under a PPP.

One of the critical factors that will affect risk under a PPP is the financing of the construction of the TGP with private sector debt and equity. Financing in any form is different to the "pay-go" funding model. There is also the added complexity with a PPP of the presence of private sector banks and equity investors. This is one of the advantages of a PPP (private sector capital places pressure on the contractor to perform efficiently) but the private sector financiers will also be particularly focussed on the comprehensive identification and allocation of risks.

Some of the key commercial and financial risks will include:

- Procurement risks:
  - The NZTA is fully familiar with procurement probity risks. However, the complexity of a PPP project means the bidding costs will be considerably more than under traditional procurement. This serves to emphasise the need for a well managed procurement process and a high standard of probity to minimise the risk of process challenge.
  - Notwithstanding the apparent interest in the TGP, there is always a risk of there being insufficient, serious interest in bidding. This risk would be faced with traditional procurement, but is heightened with a PPP procurement because of the number of parties needed in a consortium. As noted in Section 10, the market sounding indicated some nervousness among potential bidders about the TGP being the first roading PPP given its size.

- The procurement process may not be able to deliver bids within the NZTA's affordability threshold.

- Financing risks will distinguish a PPP procurement from traditional procurement:
  - Base interest rates will be set at financial close (following closely after signing of the PPP contract) for the term of the contract. However, it is very unlikely that the contractor (and its financiers) will be willing to bear the risks of changes in these interest rates beyond the short to medium term (five to seven years). The NZTA will most likely have to bear the risk of changes in interest rates beyond this period.
  - There are likely to be complexities around the ability or otherwise of the Contractor to increase the level of debt during the term of the contract. Similarly, there will be complex arrangements for establishing the payments to be made to the debt and equity providers if the contract is terminated before its expiry date. These issues may not necessarily impose additional costs on the NZTA but they are issues that have to be managed carefully to ensure that is not the case.

- There will be operating risks that will be similar between PPP and traditional procurement. For example, the NZTA will probably bear the costs of inflationary increases in the contractor's operating costs under a PPP. This is unlikely to be significantly different to traditional procurement.

Under a PPP, operating costs will tend to be fixed in real terms, with the exception of certain costs which the contractor will want to be reviewed periodically. For example the cost of bitumen might be a cost the contractor is not prepared to fix in real terms for the duration of the contract. The NZTA would bear the risk of real price increases under traditional procurement also.

As with traditional procurement, effective contracting is a primary (but not the only) means of mitigating risk under a PPP. The NZTA will have the benefit of Treasury's standard form contract and the "testing" it has had on the two PPP deals signed to date. Unlike traditional procurement, a PPP contract will be for a very long period, possibly 25 years. The contract must be able stand the test of time and provide protection to the NZTA for range of eventualities, not all of which can be foreseen now.

NZTA's on-going partnership with Treasury will continue during the procurement process utilising Treasury's experience and expertise in the development of the structural design of the necessary contracts.

13 Summary of Procurement Analysis

13.1 Introduction

The choice of a procurement approach for the TGP is a significant decision for a range of reasons, not least because of the opportunity to use an alternative to the NZTA's more traditional approaches.

Sections 10, 11 and 12 of this business case contain a qualitative and quantitative analysis of procurement options, with a particular focus on the application of a public private partnership procurement model. This analysis builds on earlier NZTA work on procurement approaches for the TGP that concluded that D&C was the preferred procurement approach, when only traditional procurement was considered but when PPP was added to the available approaches it, PPP, was the favoured approach because it could provide:

- Qualitatively, greater whole-of-life benefits to NZTA than traditional procurement.
- Quantitatively, greater cost savings than traditional procurement.
- The potential to advance the TGP and therefore earlier delivery of economic benefits.
- Reduced public sector interface risks versus conventional delivery.

13.2 Features of a PPP

A PPP for the TGP would have the following high-level features:

- It would involve an entity contracting with the NZTA to design, construct, finance, operate and maintain the TGP. All of these activities would be bundled into and governed by a single contract.
- The term of the contract would be for the construction period plus a long operating period in the order of 25 years. Both of the PPP contracts completed in New Zealand this year have a 25-year operating period.
- The NZTA would specify its requirements for the TGP in terms of the outcomes it wants to achieve from the road, not in terms of inputs. This would provide the contractor with flexibility and opportunity to innovate and make value for money choices and trade-offs without being overly constrained in the way it must construct, operate and maintain the road.
- Specifying requirements in terms of outcomes also provides a basis for a performance based mechanism for determining payments to be made to the contractor. A single periodic payment (e.g. monthly) would be made to the contractor over the operating term of the PPP contract (i.e. the payments commence once the asset is commissioned and operating). This payment would incorporate repayment of the financing of the asset and operating costs. This allows capital and operating payments to be linked to operational performance.
- This payment mechanism would be based on the principle of only paying for service delivered. Service delivered would be judged against a range standards and performance measures. These standards would be related to the NZTA's outcomes for the TGP, the availability of the road for safe and timely journeys. The payment would be reduced (abated) where the services delivered are below the required performance standards. This would incentivise the contractor to deliver services in accordance with the NZTA's desired outcomes.
- Construction, operating and financing risk will be transferred from the NZTA to the contractor where it makes commercial and financial sense to do so. The starting premise will be that the contractor will be better placed to manage risks unless it is demonstrable more cost effective for the NZTA to do so. Risk transfer is a major feature of a PPP.

13.3 Benefits of a PPP

Bundling design, construction, operations and maintenance into a single, long term contract, having private sector financiers exposed to the operating performance of the contractor for up to 25 years and having a well designed performance regime can deliver a range of benefits:

- NZTA will be presented with a range of solutions through the procurement process. It will be able to select a solution that provides it with the most appropriate combination of service quality, innovation and cost on a whole of life basis.
- The NZTA will only commence payments to the contractor once the TGP has been completed to the required standards. Any cost increases due to delay will be the contractor's risk. This would provide considerable incentive for completion of the TGP in time to ensure it is available for use in accordance with the required timetable.
- The NZTA will only pay the contractor for what it achieves relative to the required outcomes. This provides a strong incentive for the contractor to deliver at the required level of performance.
- The payment mechanism can also be designed to incorporate strong incentives for the contractor to deliver continuous and long term innovative solutions.
- The combination of design, build and finance with a 25 year maintenance and operating contract period provides incentives for the contractor to deliver whole of life solutions in a cost effective manner.
- There will some be risks associated with the TPG that will be retained by the NZTA. However, the nature of a PPP, with design, construction, financing and operations in a single contract provides significant scope for the transfer risk to the contractor. A PPP will provide significantly more scope for whole of life risk transfer than is achievable under the NZTA's traditional procurement models.
- Linking of capital repayment and operating payments to operational performance will impose on the contractor the need for rigour upfront in project delivery.
- Having private sector capital at risk (as a consequence of funding the construction costs) provides a powerful incentive for the contractor to deliver in all aspects and will incentivise the debt and equity providers in the consortium to maintain a high level of ongoing review and control compared with other procurement models. This places additional pressure on the contractor to deliver services at the prescribed quality and quantity over the entire operating period.
- The PPP arrangements will provide financiers with the ability to replace the operator and the NZTA with the ability to step-in the event of a major default. This will provide confidence in service delivery throughout the term of the PPP contract.
- The private sector partner will be expected to bring a fresh perspective to the delivery of the services that is not constrained by public sector processes and procedures and a focus on service delivery and achieving the required outcomes in the most efficient and effective way. In some respects this could characterised as the TGP providing a pathfinder role for the NZTA in the provision of services. The expectation is that the NZTA will be able to apply some these ideas and processes to other parts of the state highway networks and other projects.

13.4 The TGP as a PPP

A qualitative assessment has been undertaken of the appropriateness of the TGP as a specific candidate for PPP procurement. The analysis found that following features of the TGP are consistent with the attributes for a PPP project:

- The TGP is of significant scale. It will be attractive to a range of potential private sector participants and it will easily absorb the reasonably significant transaction costs that are part of a PPP transaction.
- Material risks inherent in the TGP can be adequately defined and allocated appropriately between the NZTA and the private sector contractor.
- There is scope for innovation, particularly given features such as the large number of structures.

- It is feasible to express and quantify the outcomes the NZTA requires from the TGP so they can be incorporated into a mechanism for measuring the performance of the private sector contractor and setting the amounts it is paid for delivering the services.
- It is feasible to bundle the on-going management and maintenance of the TGP with the construction and financing into a long term (25 year) contract.
- There is considerable market interest in delivering the TGP through a PPP. Discussions were held with constructors and financiers during the Business Case development process. While some parties noted the challenges with such a large project being the first roading PPP in New Zealand, there was general enthusiasm for the concept. Actual interest will depend on the details and specifics of the project but there was sufficient interest expressed to provide comfort that a PPP for the TGP will be welcomed by the market.

13.5 Financial Analysis

Financial analysis has been undertaken to compare the cost of the NZTA constructing, financing and operating the TGP itself (the public sector comparator (PSC)), using a traditional D&C procurement approach, to the cost if it were designed, constructed, financed and operated by the private sector (the proxy bid model (PBM)). The financial modelling is included in Section 11.

The construction and operating costs in the PBM do not include any efficiencies or cost reductions that the private sector might be able to achieve. Consequently, the PBM is higher than the PSC, reflecting that the private sector financing costs are higher than the public sector financing costs. This is to be expected.

The results of the financial analysis are presented in the following table. These are presented in net present value (net present cost – NPC) terms:

Table 13-1: Summary of Financial Results

	($m)
NPC of the PSC	[redacted]
NPC of the PBM	
Difference	
Difference as a percentage of the NPC of the PBM	

The expectation, and requirement, is that the private sector will be able to equal or "beat" the PSC by providing construction, risk management and operating costs savings to at least offset the difference in financing costs between the public and private sectors.

If the contractor can reduce the construction cost incorporated into the PSC and PBM by [redacted]% (for example) and is able to manage the Transferred Risks that have been explicitly quantified and incorporated into both the NPC and the PBM such that only [redacted]% of the risks are priced into the contract then the gap between the PBM and PSC reduces to $[redacted] million.

An examination of overseas PPP studies has been undertaken to understand how efficiencies might be achieved for the TGP through PPP procurement. The available evidence of PPPs delivered in Australia and the UK indicates that through the PPP process the cost efficiencies and additional upfront rigour and attention to risk mitigation required to meet or better the PSC are achievable. While overseas examples may not be directly comparable due to the differences in the New Zealand PPP contractual structure and market differences, this does not invalidate the lessons that can be taken from these examples.

13.6 Conclusion

Work has been undertaken as part of this Business Case to reassess the feasibility of a PPP for the TGP. Previous work on procurement of the TGP concluded that PPP was a feasible and preferred approach.

The assessment has taken into account that a PPP is a complex and significant commitment. It has a number of important features that are quite different to the NZTA's traditional procurement models. A PPP will involve a very long term contractual relationship with a private sector constructor, operator and, importantly, financiers. This brings a focus to risk allocation and financial and commercial issues that are not part of or not as transparent in the NZTA's more traditional procurement models.

The reassessment in this business case has reconfirmed PPP as a feasible procurement model for the TGP. Key factors supporting the feasibility of PPP are:

- It is a viable procurement model in that the outcomes required from the TGP can be unambiguously captured in a performance based contract that provides the basis for private sector design, construction, financing, maintenance and operation.
- Incentives can be put in place to encourage the contractor to deliver innovative design and construction techniques, especially with regards to improving operations and maintenance efficiencies, lifecycle optimisation and road user safety.
- The private sector has demonstrated strong interest in the Project.
- NZTA has the capability and resources to manage the PPP procurement process effectively.
- The financial analysis and the review of available evidence from overseas is that the level of net financial gains that a contractor would have to achieve for the whole-of-life cost of the TGP under a PPP to be at least equal to if not less than the whole-of-life cost if the NZTA were to construct, finance and operate using a traditional approach is achievable. The expectation, and requirement, is that a well run procurement process to deliver the TGP through a PPP will produce bids that will "beat" the cost under traditional procurement
- The PPP can be design to:
    - Bring whole of life innovations and improved investment certainty that would not necessarily be available under traditional procurement where there is a separation of D&C and operation and, importantly, the incentives on efficiency that will be driven by private sector financiers are not present.
    - Transfer to the contractor a range of whole-of-life risks that the NZTA would usually be responsible for under traditional procurement but which can be better managed by other parties.

The procurement process for a PPP is complex and time consuming. This reflects, in part, that it involves a very long term contract (25 years or more) and that the returns to the private sector financiers will be spread over most of the contract terms. All parties have an interest in ensuring that the contract will be enduring and provides for appropriate management of their respective risks and interests. The NZTA will have the benefit of the Treasury's standard form contract that has been tested in the two PPPs that have been completed to date. However, there will be specific features of the TGP that will need to be factored into the procurement process.

14 Reviews and Audits

The TGP project development has been subject to significant peer review over the years. The Board of Inquiry national consenting process scrutinised the project from a regional and national strategic, resource management and environmental perspective including comprehensive external resource management and environmental peer review and conferencing. The July 2012 State Services Commission's Gateway Review found the project to be fit-for-purpose with strong stakeholder support for the project, but considered that that the wider route security economic benefits may have been underestimated.

14.1 Peer Review

The TGP has been subject to significant peer review and scrutiny over the years. The most recent and public was that undertaken for the Board of Inquiry in which the entire project was scrutinised from a strategic, resource management and environmental perspective. The approval of the Project by the Board of Inquiry displays the robustness of the assessment undertaken, development of the design, and consideration of critical factors such as stakeholders, public, environmental conditions and the justification for the project.

Prior to the Board of Inquiry process the SAR went through a detailed external peer review process with cost (Bond Construction Management), economics (Beca) and safety (MWH) being the key areas of focus at that time.

Since this time the EPA process involved external peer review of all aspects of the Project, with a particular focus on resource management and environmental matters.

As the project has developed, costs and economics have continued to be peer reviewed at key milestones. The cost estimate has been peer-reviewed but a parallel estimate of the consenting design has not been completed.

14.2 Safety Audits

A series of independent feasibility and scheme Road Safety Audits were carried out on the proposed TGP concepts, options and scheme designs in accordance with NZTA best practice guidance. These audits were undertaken by a team consisting of four experienced safety auditors.

Firstly, a safety review was carried out on the 38 different viable options for the various sections of the route identified during the scheme assessment. Issues raised by the auditors formed part of the option assessment and evaluation decision making process.

A second scheme stage audit was then carried out following the evaluation process on the preferred / recommended alignment. This audit raised some serious and significant concerns, many of which were addressed and incorporated into the scheme design. Where the safety audit recommendations were not adopted because they generated a wider footprint which increased the earthworks quantities and land take required, dispensation was sought from NZTA's Scope and Standards Review Committee (SSRC).

The Committee considered various dispensations from design standards for the Project at a meeting held on 15 May 2008. The Committee approved all requested dispensations but with conditions or improvements to be considered as part of the future design and project development process.

Key design departures that NZTA's SSRC approved were:

- A relaxation of the current sight distance standards, such that the K value proposed for the crest curve at Wainui Saddle is now appropriate for a design speed of 110km/h. This now maintains good practice horizontal and vertical relationship between curves and negates the need for further lowering of the alignment at the saddle;

- A relaxation of safe stopping sight distances at locations where these are limited by horizontal curvature, median barriers, and/or guardrails. In many cases this allowed the design team to maintain the minimum road section width and minimised the required earthworks cut and land take requirements; and
- A reduced shoulder width where crawler lanes are proposed on the steepest sections of the route. The SSRC accepted a minimum of a 1 metre shoulder[28] where there are significant space constraints. This has reduced the overall earthworks footprint at Te Puka and on the approaches to Kenepuru Interchange.

Following the design changes recommended from the scheme stage safety audit and changes that were made as a result of the on-going technical assessments, a further road safety audit was carried out on the Main Alignment with a specific focus on the interchanges and link road connections.

The most serious concerns raised were associated with the steepness of the Kenepuru Link road approach to the intersection with Kenepuru Drive. The horizontal and vertical alignment was completely re-designed to provide a flatter approach to the intersection with Kenepuru Drive; delivering a substantial improvement over the original proposal. The revised alternative will also see a realignment of the existing SH1 which will improve its horizontal geometry.

[28] Deemed acceptable because cyclists, horses and related slow-moving traffic are banned from motorways.

15 Lessons Learnt and Post Project Monitoring

Lessons learnt from this project will be fed back into NZTA's project development and delivery lifecycle through a number of different mechanisms and levels of project and corporate management.

The benefits realisation assessment for Transmission Gully will allow lessons learnt and mitigation plans to be developed and fed back into the NZTA.

15.1 Lessons Learnt

Lessons learnt from this project will be fed back into NZTA's project development and delivery lifecycle through a number of different mechanisms and levels of project and corporate management. These include the RONS value assurance team, project management training workshops, Lessons Learnt Review (LLR) and Contract Management Review processes. Given the magnitude and public and political exposure of the project it is expected that a Level 4 SSC Gateway review would be undertaken, particularly if the project was funded by way of a PPP.

With the exception of the SSC Gateway review which would need to be funded out of the project budget, and to date has not specifically been included in the project estimate, all lessons learnt dissemination is included within existing NZTA administration budgets. Allocation for a Gateway review would be available particularly if the project goes to a PPP, with any NZTA resourcing being limited to development of the Principal's Requirements, Key Performance Indicators and handover condition surveys plus NZTA stakeholder liaison and consultation management.

15.2 Post Project Monitoring Approach and Schedule

There are a number of benefits that have been identified in Appendix A for the project that will need to be monitored as the project progresses through detailed design, construction and operation.

Although there is significant data collected in the Wellington Region, a more detailed TGP post construction monitoring regime will be developed and costed to assess whether the outcomes envisaged have been delivered. This benefits realisation assessment will then allow lessons learnt and mitigation plans to be developed and fed back into the NZTA.

PART B - Readiness and Assurance

16 Implementation Strategy

The proposed implementation programme is focussed on a collaborative procurement approach, aimed at a mid 2014 contract award.

Future stakeholder management will be multi-layered with both NZTA and the constructor interacting with key stakeholder and the general public alike.

16.1 Procurement Plans – Proposed Implementation Timescales

The below outlines the proposed implementation programme, focussed on an interactive engagement process that develops a collaborative style of procurement. The initial timings are aggressive, however the mid-2014 contract award is considered realistic.

Procurement Milestone	Approximate Date
Central Government approval of Business Case	Late October/ early November 2012
Stage II market testing	December 2012
Expression of Interest (EOI) to market	January 2013
Close of EOI	February 2013
Bidder interviews	February/March 2013
Announce shortlisted consortia	March 2013
Request for Proposal (RFP) to market	April/May 2013
Close of RFP	October 2013
Preferred Bidder announced	December 2013
Financial Close and Contract Award	Mid 2014

16.2 Future Stakeholder Management

Looking at future phases of the TGP, important considerations must be taken into account in certain areas of stakeholder management:

There may be groups of key stakeholders who will have a preference to deal with the Crown through its Agency directly rather than with an entity further removed from the Crown. Iwi groups, in particular, have such a preference and this is an important consideration that must be taken into account in the design of PPP arrangements with a PPP entity. Clearly the PPP entity would also need to honour and adhere to existing Memorandum of Understanding (MOU) arrangements that have been entered into with stakeholder groups.

The Board of Inquiry has laid down specific conditions in its final report and decision on the TGP pertaining to communications and public liaison during the construction phase which must be adhered to by the Requiring Authority. These conditions must be taken into account in the design of PPP arrangements with a PPP entity and clearly too, the PPP entity would need to honour and adhere to the conditions laid down.

17 Governance and Management

The governance structure under a PPP is still to be developed by the Agency and will be determined prior to proceeding to the RFP stage.

17.1 Governance Structure

The governance structure under a PPP is still to be developed by the Agency and will be determined prior to proceeding to the RFP stage, including involvement with Treasury and other key stakeholders, as part of the development and finalisation of the contractual, financial, and other arrangements.

18 Assurance

Formal construction funding acceptance (sign-off) will require NZTA Board approval. Under a traditional procurement model (D&C or a Competitive Alliance), all standard HNO and P&I value gate processes would apply, including risk and assurance committee, VAC, and P&I GM and HNO GM, prior to going to the Board.

Traditional independent road safety audits, structures design reviews, and internal and external roading, environmental including urban and landscape design reviews would need to be reviewed to ensure that the intent of a PPP approach to facilitating innovation and being outcomes focussed was not hindered but also maintaining assurance for the NZTA around the asset quality.

NZTA has documented policies and procedures on scope change with financial delegations set out in the NZTA *Instruments of Delegation* and will be adhered to during the delivery of the project with escalation to the appropriate scope committees as required to ensure that any initiated scope change is given full value-for-money consideration.

18.1 Acceptance

Formal construction funding acceptance (sign-off) of a project of this size will require NZTA Board approval. Under a traditional procurement model (D&C or a Competitive Alliance), all standard HNO and P&I value gate processes would apply, including risk and assurance committee, VAC, and P&I GM and HNO GM, prior to going to the Board.

During the consideration and development phase of PPP procurement model, NZTA have partnered with the Treasury to establish a PPP steering committee.

18.2 Peer Review

The NZTA has well documented processes and policies around the requirement for Independent road safety audits, structures design reviews, and internal and external roading, environmental including urban and landscape design reviews under a traditional procurement approach. Were a PPP to be selected, these would need to be reviewed to ensure that the intent of a PPP approach to facilitating innovation and being outcomes focussed was not hindered but also maintaining assurance for the NZTA around the asset quality.

18.3 Change Control

The HNO Group of NZTA has documented policies and procedures on scope change with financial delegations set out in the NZTA *Instruments of Delegation*. These change controls will be adhered to during the delivery of the project with escalation to the appropriate scope committees as required to ensure that any initiated scope change is given full value-for-money considerations, as any significant change in scope post-financial close is likely to have considerable and long-term NZTA portfolio implications.

18.4 Cost Management

As for scope, cost management policies are well documented within NZTA and within the financial delegations of the organisation. These would be adhered to with invoice certification against agreed contract budgets and deliverables undertaken by the NZTA before payment being made assuming a traditional design and construct procurement model. Development of a Total Outturn Cost (TOC) with appropriate KPI's would be required for any Alliance based model. For a PPP model, monthly Unitary Payments based on availability and any abatement adjustments will be paid upon certification by NZTA in accordance with the agreed payment model.

NZTA or its agent's role will be limited to exception reporting on delivery failure, and agreement with the operator that an abatement notice is applicable. NZTA will put in place suitable monitoring and reporting mechanisms to ensure that it's contracted performance deliverables are being achieved.

As part of ten PPP negotiations, NZTA would look to gain a share of any refinancing savings in relationship to positive interest rate movements following project commissioning.

KPI's will be in line with NZTA asset maintenance and operation deliverables, as well as any consent condition mitigation measures that apply i.e. ecological planting performance. KPI's will include crash rate monitoring, safe system delivery, lane availability, travel real-time monitoring and incident management.

18.5 Issues Management

Issues management will be undertaken at a number of levels, and via a number of channels. The Wellington (Johnsonville) Traffic Operations Centre (WTOC) will be tasked with day-to-day surveillance and monitoring of TG. Incident response will be the responsibility of the TG operator, with intervention by the WTOC only when human life is at risk or required response times have not been achieved (with associated payment abatement and cost recovery).

The operator will be required to provide a 24/7 incident reporting communications facility, with specified response times dependent on incident severity. Similarly scaled reporting to NZTA will be required, along with risk management, and continuous improvement mechanisms within the PI operational framework.

Standard NZTA structural, SCRIM and high-speed RAMM inspections, safe systems and road safety audit programmes are all expected to apply to TG. This will ensure that those areas of greatest risk to NZTA are independently inspected and monitored, in line with the required PI's for the highway.

NZTA would require a seamless operation of its network, with regard to the HPermit, Overweight, Over dimension and third party traffic management requirements (e.g. hikoi), and the PPP operator will be required to take full responsibility for those operational requirements.

NZTA intervention during the concession period would be very limited. Escalation triggers will apply where repeated PI failure and the abatement penalties fail to deliver the required contract performance. Initial escalation will be by way of the project PPP/NZTA governance board structure (Project Sponsor's representative), and the agreed dispute resolution mechanism. Unsatisfactory resolution would require rapid escalation up the NZTA management structure, as the financial implications of any failure to agree will very quickly exceed current delegations, and would have wider portfolio implications. Any decision around early termination of a PPP concession would have significant financial implications for NZTA, and is likely to require Treasury intervention.

18.6 Tolerances

Liquidated damages will be specified for late commissioning of the Project, including late delivery of any separable portion that may be specified, or agreed with the PPP. It is considered that incentives for early commissioning would not represent value-for-money, and that cost-of-money would provide sufficient incentive for a PPP to deliver early.

While the majority of PI's will be outcome focussed, there will be the need for a small number of output standards with zero tolerances specified for key design parameters e.g. lane widths, safe-stopping sight distances; however, the PPP would be able to present specific design departures to VAC for approval (either during contract negotiations or during the build) where value-for-money to NZTA can be demonstrated, either by way of cost savings, early delivery or improved performance (safe system approach).

Tolerance on agreed contract price will be subject to NZTA financial advisor and Treasury scrutiny as part of the overall financial due diligence. As indicated any client-initiated scope changes including quality, levels of service, aesthetics will attract a significant premium and will be best managed by NZTA taking a 'hands-off' approach.

18.7 Assurance Deliverables

Under a traditional D&C contract, NZTA will be engaging a client's representative and/or designers' representative to undertake random verification testing and a surveillance role during construction to provide assurance that specified levels of quality are being delivered.

Under a PPP procurement model, NZTA will rely on provision of specified levels of quality assurance and formal design, surveillance and MSQA for code and NZTA standards compliance certification, by the constructor. Issues to be dealt with by NZTA include comprehensive and sufficiently enduring professional indemnity and public liability insurance or suitable performance bond cover.

Pre-commissioning condition surveys in accordance with required KPI's and aligned with M&O asset management handover requirements, will be required to be undertaken and complied with prior to opening. NZTA will commission independent pre and post commissioning road safety audits that the PPP will need to address to the satisfaction of the client/Treasury PPP steering committee, before either permitting the highway or separable portion to be opened or suitable measures implemented that will effectively mitigate the road safety issues (with any payment abatement as appropriate).

APPENDICES

Appendix A –Project Investment Logic (Post-2007)

This appendix presents a summary of investment logic post the Transit New Zealand Boards decision post 2006 to focus on the provision of an alternative State Highway corridor to the existing coastal route. Note that a specific Investment Logic Map was not undertaken for this business case as the project predates the adoption of this investment technique.

Problem Definition: The problems with the existing SH1 corridor can be defined as:

- Congestion
- Accessibility
- Use of inappropriate routes
- Safety
- Severance
- Vulnerable road users
- Route security.

Benefit Definition: Addressing the above problems will result in the following benefits:

- Create an alternative and resilient transport corridor to and from Wellington;
- Reduce travel time, variability and congestion for motorists on SH1 and the existing coastal route;
- Improve accessibility and safety for all transport users; and
- Facilitate economic development within the Region and Nationally.

Strategic Response: The TGP will be consistent with the GPS and will deliver:

- Economic growth and productivity;
- Value for money; and
- Road safety.

At a Regional Level this response will:

- Provide a critical linkage as part of the Wellington Northern RoNS project;
- Develop a cost effective package of improvements; and
- Avoid or mitigate environmental and cultural effects.

Solution: The proposed solution will:

- Ensure appropriate alternative solutions have been considered.
- Be an alternative state highway linkage between MacKays Crossing and Linden;
- Provide an alternative State Highway corridor strategic connection between MacKays Crossing and Linden;
- Be designed to be sufficiently resilient to withstand a maximum 7.5 Magnitude local earthquake with a maximum complete (all lanes) closure time for all classes of vehicle of three days;
- Be the route of choice (efficiency and productivity) for all national and regional freight through-trips using the TGP rather than a local road.

Appendix B – Alternatives Assessment Summary

Strategic Investigations

The first strategic investigations into a new inland highway commenced in 1987 with the GATS which led to an EIR on the Region's western corridor. This study examined a number of options along both the inland and coastal routes. The EIR found that the inland route was more environmentally and socially acceptable than upgrading the coastal route, and also better than the "Do-Minimum Option" to leave SH1 as a single lane in each direction with some upgrades.

Designations (confirmed in 2002)

The GATS study and subsequent investigations by the Wellington Regional Council led to Transit New Zealand developing a preliminary design for the TGP. The main difference between the preliminary design and the inland route considered during the GATS study was the relocation of the southern interchange from Takapu Road to Linden.

NORs to designate the route were lodged in 1996. The notices were confirmed in 2002 by the Environment Court after the resolution of all appeals. No regional resource consents were applied for at that time.

Western Corridor Plan 2006

Options for progressing highway improvements along the western corridor were reviewed in 2004. The Western Corridor Transportation Study was carried out by GWRC and Transit New Zealand, with the assistance of the relevant territorial authorities. This multi-modal transportation study considered alternatives and options for the transportation corridor and the constitution of an overall package of transportation strategies between Peka Peka in the north and Ngauranga Gorge in the south.

The Summary of Draft Technical Report Stage 1 is attached in Appendix B which lists some of the scenarios considered as part of the Western Corridor Transportation Study.

The final relevant outcome was that the TGP formed a critical component of the adopted WCP, although not before some spirited debate at a regional level about the relative merits of upgrading the existing SH1 coastal route or building the TGP.

Following an extensive public hearings process, the WCP Hearings Subcommittee recommended the TGP as the preferred roading solution between Linden and MacKays Crossing, and the TGP was subsequently included in the final WCP.

Following the recommendations of the WCP Hearings Subcommittee, the Wellington Regional Transport Committee and the Transit NZ Board adopted the WCP in 2006.

Scheme Assessment (Alignment Alternatives)

An extensive option evaluation exercise was undertaken during the scheme assessment phase and this resulted in some fundamental alignment decisions that provide environmental (particularly ecological) benefits over the existing designated alignment. In particular, through the Te Puka and Horokiri valleys and Battle Hill, the road alignment was shifted to the west to reduce the impact on streams and terrestrial habitat. During the scheme assessment, the location of the interchange to connect to eastern Porirua (via the Porirua Link Roads) was also moved to enable an additional local road connection from Whitby (rather than just from Waitangirua).

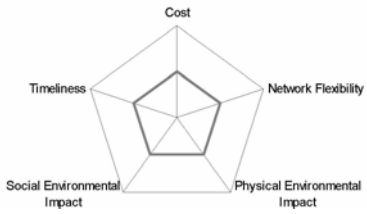
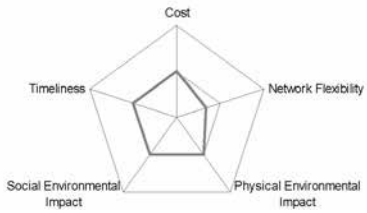
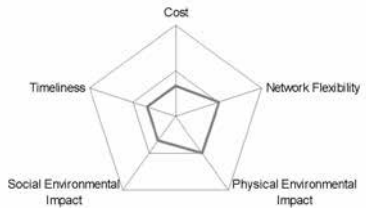
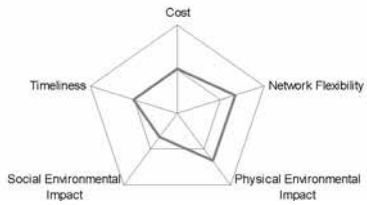
The Table B1below outlines the options considered for the nine different sections of the project at the Scheme Assessment phase, both "In-Designation" and "Unconstrained" and includes the multi-criteria assessment tool results.

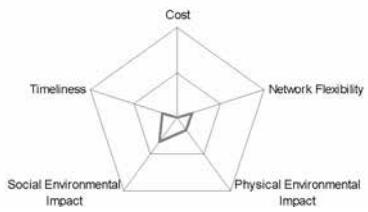
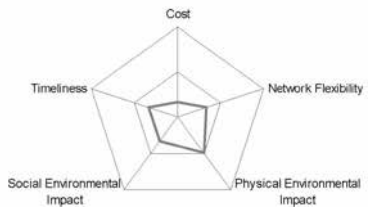
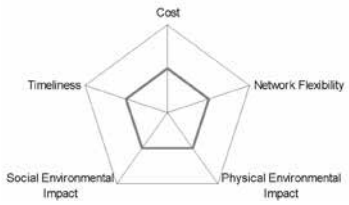
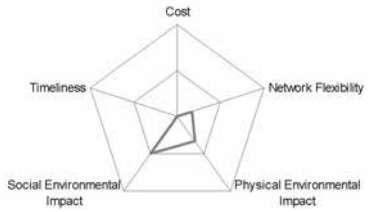
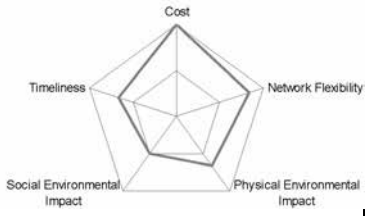
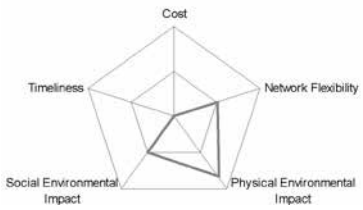
The multi-criteria tool assessed the following five key criteria:

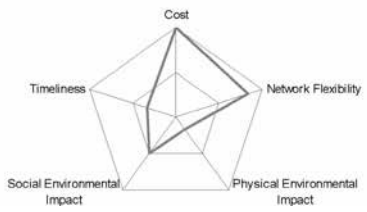
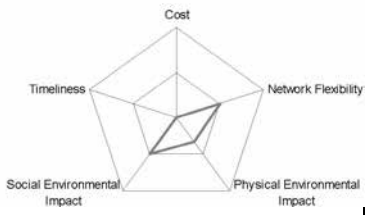
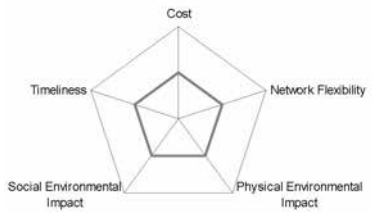
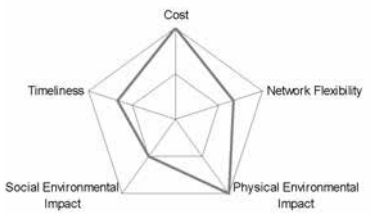
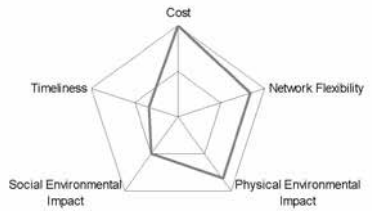
- Cost such as construction and operating/maintenance costs and current market value property costs;
- Timeliness which included the RMA process timeframes, the construction programme based on the extent of works, access, complexity, and a subjective assessment of the timing and potential for adjacent land use changes and economic opportunities;
- Social and environmental impacts which included an assessment of heritage and archaeological sites, an assessment of the social and community cohesion based on impact of traffic changes on urban areas, potential effects on existing residents by the proposed alignment and health and wellbeing (a subjective assessment of noise, fuel consumption, greenhouse gas emissions and additional pollutants on residential properties);
- Physical environmental impacts related to land stability, sites of geological interest, the exposure to sedimentation risk, changes in catchment run-off, severity of effects, and space availability to control run-off, and natural habitats and fauna (loss of fresh water and terrestrial habitat and the effect on ecological integrity); and
- Network flexibility which included traffic benefits, predicted accident savings, the integration with other transport modes, improvements to access and mobility, future-proofing and land transport integration which is to support regional growth.

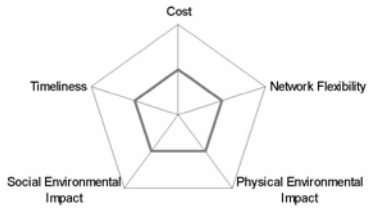
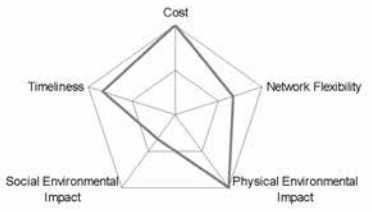
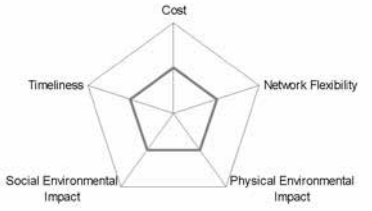
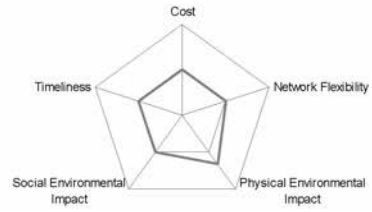
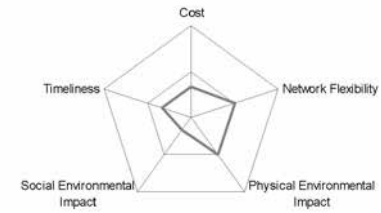
Table B1: Scheme Assessment Options Assessment Summary

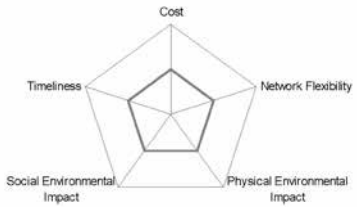
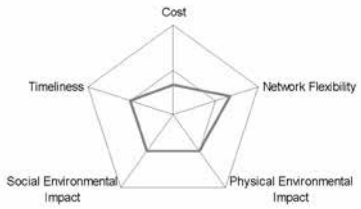
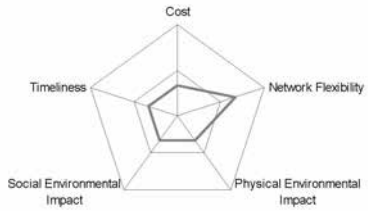
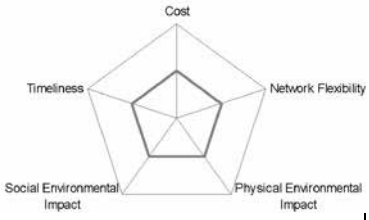
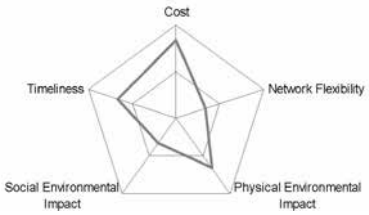
The nine sections are shown in the figure below:

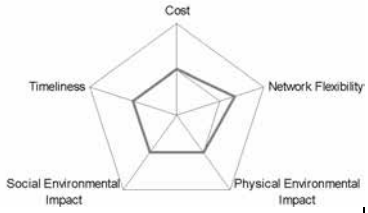
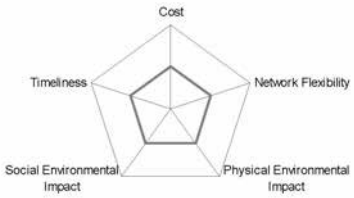
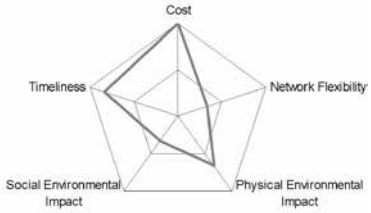
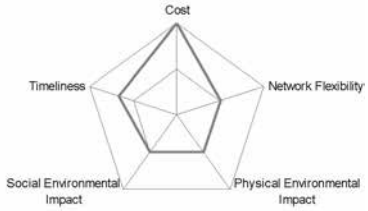
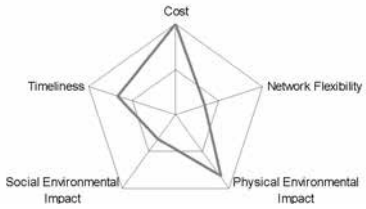
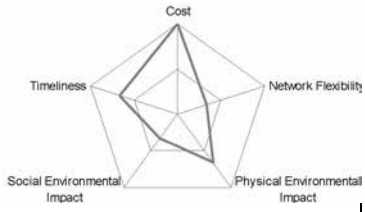
Section 1: MacKays Crossing		
Alignment 1 Connection 1 Base Alignment In-Designation Alignment	The alignment is mainly within the designation. It connects into the four lane section at MacKays Crossing, and then curves west of the existing state highway towards the NIMT railway line. The alignment crosses the existing SH1 on a bridge west of Car Haulaways, and continues south climbing up the Te Puka Stream valley. There are no changes to MacKays Crossing Interchange. North-facing entry and exit ramps are provided at the SH1/Paekakariki intersection (Connection Option 1). The existing SH1, to the east of Car Haulaways, is retained as a cul-de-sac to provide access to local properties.	
Alignment 1 Connection 2	This option has the same alignment as Alignment 1 Connection 1. The connection arrangement differs in that the southbound exit ramp at SH1/Paekakariki Interchange has been removed, and access south to Paekakariki is provided at MacKays Crossing (Connection Option 2). The existing SH1 would remain connected between MacKays and Car Haulaways, to provide the southbound connection to Paekakariki, and to provide local property access.	
Alignment 2 Connection 1	The alignment utilises the existing state highway as far as the curve to the east of Car Haulaways. It then diverges from SH1, and passes Car Haulaways on the south-eastern side, before swinging to the south to climb the Te Puka Stream valley. The existing MacKays Crossing Interchange remains unchanged, and there is a northbound on-ramp and a southbound off-ramp in the vicinity of Car Haulaways.	
Alignment 3 Connection 1 Unconstrained Alignment	The alignment of this option is similar to the previous option (Alignment 2), except that it turns through a greater arc on the curve to the east of Car Haulaways. The alignment passes through Car Haulaways before swinging south to climb the Te Puka Stream valley. The connection arrangement is the same as the previous option (Connection 1), with no changes to MacKays Crossing Interchange, and with north-facing on and off ramps in the vicinity of Car Haulaways.	

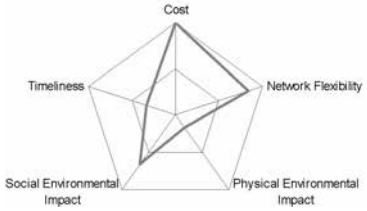
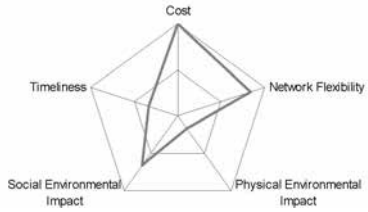
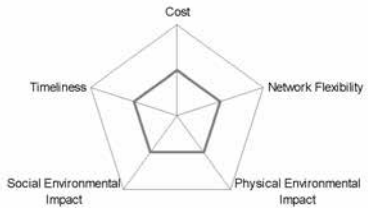
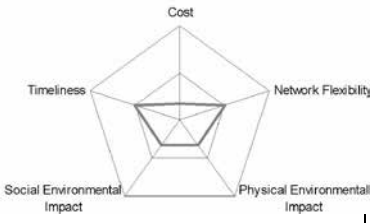
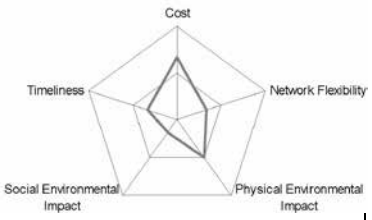
Alignment 4 Connection 1	The alignment diverges to the east of the existing state highway just to the south of MacKays Crossing. It then traverses an elevated terrace (currently in pasture and used as an airstrip), before turning to the west on the south side of Car Haulaways, and then turning south to climb the Te Puka Stream valley. The existing MacKays Crossing Interchange would be modified to provide connections to and from Paekakariki. North-facing on and off ramps (not shown on drawing) would connect into MacKays Crossing Interchange.	
Alignment 5 Connection 1	The alignment diverges to the west of the existing state highway just south of MacKays Crossing, and crosses low-lying horticultural land mid-way between the existing SH1 and the NIMT railway line. The alignment crosses the existing SH1 on a bridge at Car Haulaways, and swings to the south to climb the Te Puka Stream valley. Connections to and from Paekakariki would be via a modified MacKays Crossing Interchange, and the existing SH1 between MacKays Crossing and Car Haulaways would remain in place.	
Section 2: Wainui Saddle		
Alignment 1 - Cut Base Alignment In-Designation Alignment	The alignment is mainly within the designation. It crosses Te Puka Stream, and then follows the east side of the valley with a series of viaducts, earthworks and retaining walls. The alignment climbs on a steady 8.0% grade for approximately 3km to the summit, where it curves through an open cut approximately 30m deep.	
Alignment 1 – Tunnel	The horizontal alignment is the same as Alignment 1: Cut. It climbs on a steady 7.0% grade for approximately 3km to the summit, where it curves through twin 500m-long tunnels with approximately 35m cover over the centre line. The use of tunnels at the summit results in slightly flatter grades approaching the tunnels, and a different arrangement of viaducts, and earthworks with retaining walls, and with more use of half-bridges than the cut option.	
Alignment 2 – Cut Unconstrained Alignment	The alignment follows the west side of Te Puka Stream valley with a series of viaducts, and earthworks with some retaining walls. The alignment climbs on a steady 8.0% grade for approximately 3km to the summit, where it curves through an open cut approximately 30m deep.	
Alignment 2 – Tunnel	The alignment follows the west side of Te Puka Stream valley with a series of viaducts, and earthworks with some retaining walls. The alignment climbs for approximately 3km on a steady 6.5% grade to the summit, where it curves through twin 500m-long tunnels with approximately 40m of cover over the centre line. The use of tunnels at the summit results in slightly flatter grades approaching the tunnels, and a different arrangement of viaducts, and earthworks with retaining walls, than with the cut option.	

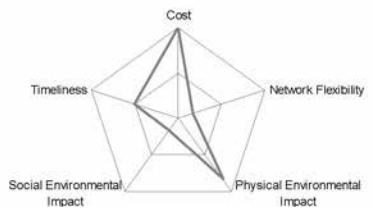
Alignment 3 - Cut	The alignment is split, with the southbound lanes following the east side of the Te Puka Stream valley, and the northbound lanes following the west side of the valley. Splitting the alignment results in generally smaller cuts and fills when compared with other options with both directions on one formation. Both northbound and southbound alignments are on steady 8.0% grades for approximately 3km to and from the summit, where they come together to curve through an open cut approximately 30m deep.	
Alignment 3 – Tunnel	The alignment is split, with the southbound lanes following the east side of the Te Puka Stream valley, and the northbound lanes following the west side of the valley. Splitting the alignment results in generally smaller cuts and fills than options that have both directions on one formation. The southbound alignment climbs on a steady grade of 7.0 % for approximately 3km to a tunnel at the summit, while the northbound alignment descends at 6.5% from a tunnel at a lower level than the northbound tunnel. The tunnels at the summit are 500m long with approximately 35m of cover over the centre line.	
Section 3: Horokiri Stream		
Alignment 1 Base Alignment In-Designation Alignment	The alignment is mainly within designation, and follows the east side of the valley, generally on cuts and fills with some retaining walls. A bridge is provided in one location to avoid fill-encroachment into ecologically-sensitive waterways. The alignment is near-straight, and falling towards the south. Grades are initially 5.5%, reducing to 2.5% towards the south.	
Alignment 2 Unconstrained Alignment	The alignment follows the west side of the valley, generally on cuts and fills with some retaining walls. The alignment is near-straight, and falling towards the south. Grades are initially 4.3%, becoming 5.3% towards the south. The route avoids encroachment into ecologically-sensitive areas without the need for any bridging.	
Alignment 3	The alignment is split, with the southbound lanes following the east side of the valley, and the northbound lanes following the west side of the valley. Splitting the alignment results in generally-smaller cuts and fills than other options that have both directions on one formation. The alignment is near-straight, and falling towards the south. The southbound carriageway has an initial grade of 5.5%, reducing to 2.5% towards the south. The northbound carriageway has a grade of 5.3%, reducing to 4.3% towards the north. A bridge is provided in one location along the southbound carriageway to avoid fill .encroachment into ecologically-sensitive waterways.	

Section 4: Battle Hill		
Alignment 1 Base Alignment In-Designation Alignment	The alignment is within the designation and located at the base of steep slopes to the east of Horokiri Stream and Battle Hill flats. The road passes over significant bridge structures and cuts and fills with some retaining walls. A number of the cut and fill slopes are significant in height. Numerous culverts are required to bridge the tributaries passing under the route. The alignment includes gentle horizontal curves, and initially falls gently to the south, before climbing again at the southern end of the route	
Alignment 2 Unconstrained Alignment	The alignment passes through the centre of Battle Hill flats. The formation typically consists of relatively minor cuts and fills. A few culverts are provided for waterways at the north end of the route. A bridge carries TGP over the Horokiri Stream at the south end of the section, and also provides access under the road for farm, forestry and recreational users. The alignment includes gentle horizontal curves, and initially falls gently to the south, before climbing again at the southern end of the route.	
Section 5: Golf Course		
Alignment 1 Base Alignment In-Designation Alignment	Apart from a small area at Station 2800, the alignment is within the designation, passing to the east of Pauatahanui Golf Course. The road is located in rolling farmland on generally modest cuts and fills. Horizontal and vertical alignments are gentle, with the road initially falling from north to south, before rising again at the southern end. Bridges are not required.	
Alignment 2 Unconstrained Alignment	The road passes to the east of the golf course as with Alignment 1. The road is located through rolling farmland on generally modest cuts and fills. Horizontal and vertical alignments are gentle, with the road initially rising for a short distance before falling from north to south. The road then rises again at the south end. Bridges are not required.	
Alignment 3	Alignment 3 is a straight, horizontal alignment passing through the middle of the Pauatahanui Golf Course. As with the other options, the road is located in rolling farmland on generally modest cuts and fills. The road is straight and the vertical alignment is gentle, with the road initially falling from north to south before rising again at the southern end. Bridges are not required.	

Section 6: SH58		
Alignment 1 Connection 1 Base Alignment	The route descends on a 3.6% gradient through rolling farmland, before crossing SH58. The road then passes over Pauatahanui flats, followed by a 6.5% climb up the slopes at the southern end of the section. The road is located in a variety of topographies on cuts, fills, bridges and culverts. Horizontal alignment is gently curving. A dumbbell-shaped, grade-separated interchange is provided at SH58. The main alignment is within the designation, except for part of the southbound on-ramp. The eastern roundabout is outside the designation, as is a short length of the western tie-in to SH58. Pauatahanui Stream passes under the route through a large twin-celled box culvert.	
Alignment 1 Connection 2 In-Designation Alignment Unconstrained Alignment	In this option, a large grade-separated circular roundabout is provided at the intersection with SH58. In every other aspect, the route is identical to Alignment 1. The portion of the roundabout to the east of the main route lies outside the designation, as does a short length of the western tie-in to SH58.	
Alignment 2 Connection 1	The alignment at the north end of the route is moved to the west, resulting in a straightening of the road. The net result is a reduction in cut heights. As with Alignment 1, a dumbbell-shaped, grade-separated interchange is provided at the intersection with SH58. The height of the embankment in the vicinity of SH58 is reduced by approximately 2 metres, resulting in an 8% grade climb at the south end of the section.	
Section 7: James Cook		
Alignment 1 Connection 1 Base Alignment	The main route passes through undulating countryside on cuts and fills, some of which are significant. A grade-separated connection is provided to James Cook Drive. The road initially rises at 8% from the north towards James Cook Drive. It falls over the next 800m, before gently rising again at the southern end. The main alignment is within the designation, with the exception of small areas in the vicinity of the interchange. There is no designation for the link-road from the interchange.	
Alignment 2	Horizontally, the alignment is similar to Alignment 1, and is mainly within designation. The vertical alignment has been lowered at the northern end, resulting in a lesser gradient of 6.5% in this location. Cuttings are deeper as a result. The Alignment does not provide an interchange or connections to James Cook Drive or Waitangirua.	

Alignment 2 Connection 1 In-Designation Alignment	In this option, a grade-separated, dumbbell-shaped interchange is added to Alignment 2. The vertical curvature has been reduced to allow the main route to pass beneath the interchange.	
Section 8: Warspite		
Alignment 1 Connection 1 Base Alignment	The main route is within the designation, although large areas of the interchange lie outside it. The road climbs from the north at a grade of 4%. After about 2 km, the road then falls towards the south at 3.4%. A grade-separated interchange connects Warspite Avenue to TGP. Major bridge structures carry TGP over the headwaters of Duck Creek and the deeply-incised Cannon's Creek gully. In other locations the highway is on cuts and fills.	
Alignment 2	The road is within the designation. A connection to Warspite Avenue is not provided with this option. The vertical alignment north of Duck Creek headwaters and to the south of Cannons Creek gully has been lowered significantly compared with Alignment 1. This significantly reduces the length of the major bridges and gradients are flatter. However, the depth of cuttings increases through this zone.	
Alignment 2 Connection 1 In-Designation Alignment	In this option, a grade-separated interchange is added to Alignment 2. All other aspects of the route are identical to Alignment 2. There is no designation for the connection to Warspite Avenue.	
Alignment 3 Unconstrained Alignment	The alignment is moved to the south-east at Cannon's Creek, resulting in an improved horizontal alignment. The up-grade from the south end of the section increases to 4.5%, before falling to the south at 3.0%. No connection is provided to Warspite Avenue. Cuts and fills remain significant. NOTE: This alignment was used for the Warspite section when the combined James Cook interchange was assessed.	
Alignment 4	The alignment moves further to the south-east than Alignment 3, to reduce the scale of bridging over Duck and Cannon's Creeks. Bridging is not, however, altered significantly by this change. Horizontal curve radii are less than those in Alignment 3, and gradients are flatter.	

Section 7 & 8: James Cook and Warspite		
Alignment 3 Connection 1 Unconstrained Alignment	The same grade-separated, dumbbell-shaped interchange as used in Section 7: Alignment 2, Connection Option 1, with an additional connection provided to Waitangirua. In every other respect this option is identical to that shown in Section 7. There is no designation for the connection to Waitangirua. Refer to Section 8: Alignment 3 for continuation of this Alignment.	
Alignment 3 Connection 2	The dumbbell-shaped interchange arrangement in Alignment 3, Connection Option 1 is replaced with a large circular roundabout. Two overbridges are required to carry the roundabout over the main highway route. In every other respect this option is identical to Alignment 3, Connection Option 1. Refer to Section 8: Alignment 3 for continuation of this Alignment.	
Section 9: Linden		
Alignment 1 Connection 1 Base Alignment In-Designation Alignment Unconstrained Alignment	The main route alignment and the interchange lie within the designation, as does part of the link to Kenepuru Drive. There is no designation for the Kenepuru Drive link west of SH1. The road continues from Cannon's Creek to Linden over a series of cuts and fills, generally of significant scale. A grade-separated interchange with a large roundabout provides for all movements between the existing SH1, TGP and Kenepuru Drive. The gradient approaching the interchange from the north is approximately 3.7%, reducing to become a slight up-grade at the merge with SH1. The southbound merge with, and northbound diverge from, the existing SH1 both extend to around 1 km south of Collins Avenue Bridge. As a result, both carriageways will be widened over Collins Avenue. The northbound connection from the existing SH1 to TGP crosses over SH1 via a skewed bridge.	
Alignment 1 Connection 2	The main alignment remains unchanged. The large roundabout in Connection 1 is replaced with free-flowing connections between TGP, the existing SH1 and Kenepuru Drive. No connection is provided from Kenepuru Drive to SH1 southbound. An additional highly-skewed bridge over SH1 carries a northbound off-ramp over SH1 and onto the Kenepuru link. The bridges over SH1 and the NIMT Railway at Kenepuru are also wider, to accommodate an additional lane from the TGP northbound off-ramp.	
Alignment 1 Connection 3	Alignment 1, Connection 2 is modified with the removal of connectivity with Kenepuru Drive for northbound traffic. The additional bridge structure over SH1 is no longer required, and the bridges over SH1 and the NIMT railway on the Kenepuru link return to two lanes. All other aspects of the alignment and connections remain the same as in Alignment 1, Connection 2.	

Alignment 1	No connection is provided to Kenepuru in this option. The main TGP alignment remains as for Alignment 1	
Alignment 2 Connection 1	No connection is provided to Kenepuru in this option. The ramp configuration is similar to Alignment 1, Connection 3 with free flowing north-facing connectivity between TGP and the existing SH1. This requires extensive retaining walls parallel to SH1 and a highly-skewed northbound overbridge. A small area of the southbound off-ramp lies outside the designation.	

Note: The Unconstrained Alignment is a combined James Cook and Warspite Interchange. Refer to Section 7 and 8 James Cook and Warspite for details.

The preferred options for each section were chosen for both an "In-Designation" and "Unconstrained" scheme as shown in the two tables below based on a multi-criteria analysis

In-Designation Alignment		
Section	Favoured Option	Comments
1: MacKays Crossing	Alignment 1 Connection 2	Two similar In-Designation options were considered. The road alignment is the same for both, but connectivity to the existing SH1 differs. Connection 1 has two south-facing ramps, while Connection 2 has a northbound on-ramp only. The southbound off-ramp in Connection 1 terminates at a roundabout on SH1, and there were safety concerns in terms of HCVs negotiating the roundabout. Connection 2 with southbound traffic leaving SH1 at MacKays Crossing to access Paekakariki or the coastal route was therefore Unconstrained. Connection 2 results in a slight decrease in level of service due to southbound coastal route traffic having to give way to northbound traffic joining TGP. Passenger transport connectivity along the coast is also slightly reduced. However it is considered that network flexibility is little different to that provided by Connection 1, and could be regarded as neutral. There is also a cost saving by virtue of the southbound off-ramp being removed. While the alignment affects a small part of the MacKays Crossing wetland, it has the advantage of avoiding a known landslide area and a Queen Elizabeth Park covenant.
2: Wainui Saddle	Alignment 1 Cut	The only alignment falling In-Designation is Alignment 1. Two options featuring this alignment were considered - one with a deep cutting at the Wainui Saddle summit, and the other with a tunnel running beneath the Saddle. While the tunnel option reduces landscape and ecological effects at the summit, and provides a marginal reduction in the approach gradient, it has some significant disadvantages in terms of additional cost and additional time to construct. Traffic safety is also reduced because of a curved horizontal alignment through the tunnel. There would be on-going operational costs for lighting and ventilation, and the tunnel crosses a fault line, resulting in lower route security than for a cutting. The tunnel alignment requires a different configuration of viaducts adjacent to the Te Puka stream, and there is an additional loss of stream habitat compared with the cut option. The cut option was consequently favoured.

In-Designation Alignment		
Section	Favoured Option	Comments
3: Horokiri Stream	Alignment 1	This is the only In-Designation option.
4: Battle Hill	Alignment 1	This is the only In-Designation option.
5: Golf Course	Alignment 1	This is the only In-Designation option.
6: SH 58	Alignment 1 Connection 2	Two In-Designation options are considered. The road alignment is the same for both, but there are two options for the connection to SH 58. Connection 1 is comprised of a dumbbell-shaped interchange, while Connection 2 has a large roundabout. Connection 2 is more expensive because it requires two bridges, but the large roundabout provides better circulatory flow and can be signalised to improve flows in the future. Connection 1 is considered inferior with regard to safety, and it is considered more difficult to provide a connection to properties northeast of the roundabout.
7: James Cook	Alignment 2 Connection 1	Two alignment options and one connection were considered, although the connection form differs between the two alignments. Both alignment options have similar horizontal alignments, but Alignment 2 is lower at the northern end to reduce the gradient. The diamond interchange proposed for Alignment 1 is replaced by a dumbbell-shaped interchange for Alignment 2. This is considered to provide a safer arrangement and greater capacity. Hence, Network Flexibility is assessed as being higher for this option. Alignment 2 also provides the opportunity for adding the connection at a future date, if this is deemed necessary.
8: Warspite	Alignment 2 Connection 1	Alignments 1 and 2 are both in-designation, with different forms of connections to the link to Warspite Avenue. Alignment 2 is significantly lower, reducing the length of major bridges over Duck and Cannon's Creeks. The shorter bridges mean Alignment 2 is significantly cheaper than Alignment 1, and would be quicker to complete.
9: Linden	Alignment 1 Connection 1	The designation at Linden is such that the main alignment in Alignment 1 is within the designation while a small area of Alignment 2 lies outside. Alignment 1, Connection1 provides greater connectivity and better overall network performance than other options. It is noted that the steep grade on Kenepuru Link could have safety implications, and care will need to be taken in its design. The option has high landscape impact, but this is common to all options.

Unconstrained Alignment		
Section	Favoured Option	Comments
1: MacKays Crossing	Alignment 3 Connection 1	Alignment 3 with a connection at MacKays Crossing (Connection 1) was assessed as being the best of the five alignments. It provides better Network Flexibility, by virtue of the free flow connection improving safety, by removing the conflict for vehicles travelling to Paekakariki. It is also slightly advantageous for passenger transport trips using the Coastal Route. It has less Physical Environmental Impact than the other options as it avoids the MacKays wetland, and reduced earthworks means it is less visually intrusive. The alignment also requires fewer service relocations, and it avoids a known landslide area. While the alignment has a slightly worse Social Environmental Impact than other options because of noise impacts on properties, and some severance and accessibility issues for houses south-east of the alignment, as well as a circuitous connection to Paekakariki, it was favoured over other alignments.
2: Wainui Saddle	Alignment 2 Cut	Alignment 2 was favoured over other alignments. It has less Physical Environmental Impact because it avoids tributaries to Te Puka Stream and the Akatarawa forest on the east side of the gully. It is also a straighter alignment, with attendant safety benefits. Two options featuring this alignment were considered - one with a deep cutting at the Wainui Saddle summit, and the other with a tunnel running beneath the Saddle. While the tunnel option reduces landscape effects at the summit and provides a marginal reduction in approach gradient, it has some significant disadvantages in terms of additional cost and additional time to construct. Traffic safety is also reduced because of the tunnel's curvature, and there will be on-going operational costs for lighting and ventilation. The tunnel is close to a fault line, and a viaduct adjacent to the Te Puka Stream crosses a fault, resulting in lower route security than the cutting option. In contrast, the cut option has significantly fewer structures and a much reduced cost. It also crosses a fault on earthworks as opposed to a viaduct, resulting in improved route security.
3: Horokiri Stream	Alignment 2	Alignment 2 was assessed as being significantly better than Alignment 1 and better than Alignment 3. It is much less expensive than Alignment 1, and can be constructed more quickly. It has better Network Flexibility because cuttings and soil nailing are reduced, and the Physical Environmental Impacts are significantly less because it avoids Horokiri Stream and its important eastern tributaries. The two separate carriageways in Alignment 3 provide redundancy in the event of an earthquake or a storm event, and this alignment was assessed as having better Network Flexibility. Otherwise, the attributes of Alignment 3 are similar or inferior to Alignment 2.
4: Battle Hill	Alignment 2	Of the two alignments assessed, Alignment 2 was considered superior in most respects. It is significantly cheaper, having only one bridge structure, much less earthworks, and significantly fewer retaining walls. The reduced earthworks improve route security, and the Physical Environmental Impacts are much less because of the reduced footprint. The alignment avoids crossing the important eastern tributaries of the Horokiri Stream, as well as visual scarring of the prominent eastern slope. It is noted that severance of the Battle Hill Farm Forest Park is an important issue to address, possibly by way of a land-swap.
5: Golf Course	Alignment 2	Of the three alignments considered, Alignment 2 was assessed as being the best. It avoids the removal of native and exotic vegetation as required for Alignment 1. Alignment 3 would be more expensive and would probably result in loss of the golf course, as well as more services relocation work.
6: SH 58	Alignment 1 Connection 2	Two In-Designation options were considered. The road alignment is the same for both, but there are two options for the connection to SH 58. Connection 1 is comprised of a dumbbell-shaped interchange, while Connection 2 has a large roundabout interchange. While Connection 2 is more expensive because it requires two bridges, the large roundabout provides better circulatory flows and could be signalised to improve flows in the future. Connection 1 is considered inferior with regard to safety, and it is considered more difficult to provide a connection to the development north-east of the roundabout. It was however recognised that further work on the interchange form will be required in subsequent stages of the project.

Unconstrained Alignment		
Section	Favoured Option	Comments
7: James Cook	Alignment 3 Connection 1	Combining the James Cook and Warspite interchanges provides similar transportation functionality as for two separate connections at James Cook and Warspite. Reducing the number of connections was seen as beneficial to the operation of TGP by reducing accidents. The combined interchange also connects to the industrially and commercially zoned area of Waitangirua, and would provide the potential for renewal and intensification of this area. The combined connection also has the potential to provide improved ecological, environmental and landscape outcomes. Alignment 3, Connection 1 is favoured as it is significantly cheaper than the other two by virtue of reduced earthworks and much shorter bridges at Duck and Cannon's Creeks. While construction of the interchange is considered to have potentially greater Physical Environmental Impacts as it requires extensive earthworks in the Duck Creek catchment, which drains into the Pauatahanui Inlet, this is offset by reduced cuts and fills, and lower impact on the landscape of the TGP route. Of the two interchange forms, Connection 1 - with a dumbbell-shaped interchange - was favoured over Connection 2, because a large circular roundabout is considered to have an inferior safety performance. It is however recognised that further work on the interchange form will be required in subsequent stages of the project.
8: Warspite	Alignment 2	Alignment 2 is favoured as it is within designation, minimises earthworks, and has much shorter bridges at Duck and Cannon's Creeks. These provide the alignment with significant cost advantages. It can be constructed in a shorter time than other options, and landscape effects are reduced by the omission of Warspite Interchange. It is noted that pedestrian access within Belmont Regional Park and across TGP, together with the management of the Waitangirua farm, need to be taken into account.
9: Linden	Alignment 1 Connection 1	Alignment 1, Connection1 provides connectivity in all directions, and has a better overall network performance than other options. It is noted that the steep grade on Kenepuru Link could have safety implications, and care will need to be taken in its design. The option also has high landscape impact, although this is common to all options. It was recommended that the northbound diverge on SH1 connecting to TGP should have TGP diverging to the right and SH1 to the left.

Following the Options Assessment workshop (March 2008), the Unconstrained alignment in each section of the project was refined to address:

- Safety audit comments.
- The latest geotechnical assessments.
- Improvements identified during the alignment evaluation and workshop process; and
- Refinements to connect each section alignment to the neighbouring section alignment.

Following the option assessment undertaken for the SAR the Unconstrained Alignment was chosen as the preferred alignment. The alignment unconstrained by the designation is preferred because it provides advantages in terms of route security, has less impact on environmentally important streams and Pauatahanui Inlet, is less intrusive on the landscape and is significantly cheaper than the best in-designation alignment.

In December 2008 the NZTA Board confirmed the preferred alignment (i.e. the Unconstrained Alignment) to be a more robust, cost effective and environmentally responsive proposal compared with the existing designations. On that basis, the NZTA continued more detailed investigations (Phase 2 investigations) into the preferred alignment and carried out further public consultation and more direct consultation with property owners and other interested parties.

Detailed investigations into preferred alignment

Following the SAR, the NZTA undertook Phase 2 of the investigations into the TGP, which has involved more detailed investigations into the preferred alignment.

The Phase 2 investigations commenced in early 2009 and included the various engineering, environmental and planning investigations that led to the development of the technical reports that are appended to the AEE. The Phase 2 investigations also included workshopping of issues by the various technical experts to ensure that an appropriate balance was achieved between different factors.

During the public consultation in July / August 2008, seven specific items were identified in submissions that the NZTA considered required further investigation and/or refinement before lodgement of the notices of requirement and resource consent applications for the Project. These seven items were:

Parks and Reserves / farming operations

At Battle Hill Farm Forest Park, the potential impact of the Preferred Alignment on the viability of the existing farming operation needed to be considered. The Project team and GWRC met to discuss the Battle Hill Management Plan and agreed an approach to ensure that the Project can be effectively integrated into the operational management of the park. The agreed approach was to consider land exchange within the park that is required for the Project with areas of Crown owned land adjacent to Battle Hill (including the former Toomey property which was purchased specifically for that purpose) to avoid adversely affecting the Park's farming operation;

Access to existing properties at SH58

Access to a number of existing properties on a private road / right of way off SH58 adjacent to the SH58 interchange was proposed to be directly onto the interchange roundabout, which was raised as a significant safety concern by the safety auditors. In discussion with the affected land owners, the need was identified for further design work to ensure that access to the properties could be provided safely. The SH58 Interchange has been subtly re-designed to enable adjacent properties to have access (via their existing private road and the existing SH58 carriageway) onto the realigned SH58 carriageway east of the interchange roundabout, rather than directly onto it;

Whitby and Waitangirua link roads

Discussions with land owners, tenants and with PCC identified opportunities to enhance the proposed design to provide better integration with the existing land boundaries as well as a more favourable solution for proposed developments in the area. A number of land owners, particularly at the western end of the Waitangirua Link Road, offered alternate solutions which needed further consideration. As part of the urban design workshops and consultation on the Waitangirua Link Road, the proposed intersection with Warspite Avenue was changed from a roundabout to a signalised intersection;

Two alternative alignment options were investigated for the Whitby Link Road. One option was through the Silverwood property and the other was through Whitby Coastal Estates land. These alternatives were considered with regard to the alignment's proximity to and potential impacts on Duck Creek. The Whitby Coastal Estates option was selected as it avoids earthworks encroachment into the stream. It also reduces the cut volumes, and height of cuts in poorer quality material.

Kenepuru link road

A submission requested that the proposed Kenepuru Interchange be changed to include links directly from the interchange onto the existing SH1 heading north towards Mungavin.

Options were investigated during the scheme assessment phase as to whether access was provided to Porirua City via a Kenepuru link, or via SH1 and Mungavin Interchange. Traffic modelling showed that although the concept via SH1 performed well, it attracted less traffic than the concepts that provide a link to Kenepuru Drive. It would, as well, place greater demand on the Mungavin Interchange, which already has capacity constraints. This was consequently not favoured as highly as other options that provided a direct Kenepuru link.

Pull-off and vehicle inspection areas

Submissions asked whether it would be possible to include a Rest Area at the top of the Wainui Saddle to give people a viewing opportunity and the use of Portaloos. They also ask that signage advising of road gradients and the location of truck run-off areas are provided.

Brake check and truck rest areas are provided both north and southbound at Wainui Saddle. They have been designed for heavy vehicle use but would be available for other vehicles to access. NZTA does not intend to provide a formal viewing area with the appropriate roadside signage. However, an un-manned kiosk with information boards could be provided.

Austroads guides recommend appropriate containment facilities are provided on highways with steep grades. The NZTA has incorporated an arrester bed and truck run-off areas into the design and will include the appropriate advisory signage, as mentioned by the submitter, into the final design.

Property impacts at Paekakariki

Of the five options presented at Paekakariki three proposed the main alignment to be offset from the existing state highway which could then be utilised as a local link. These options were not considered as favourably as the preferred option better utilised the existing highway, could be integrated into the landscape, and minimised encroachment into adjacent properties.

The TGP route within this section is wider than the existing highway. It provides five lanes of sealed road, which for most part, is elevated above the existing ground. This would provide greater resilience if there is a significant event on the highway compared with alternatives at ground level. I consider that the proposed option provides for better route resilience and the provision of a local link would not offer more security.

The local road connections suggested would require additional land from the Sang Sue property (a Market Garden). This would especially be the case at the southern end where an intersection would be required to manage the conflicting vehicle movements generated by the on / off ramps, access under Bridge No. 2, and to the Market Gardens. Both of the options suggested in the submission would also require land to be taken from the MacKays Crossing wetland (site K106).

Bulk water mains

The position of KCDC's new water supply bore has yet to be finalised and as such the NZTA has included sufficient land within the designation to allow for a range of possible locations whilst maintaining access. Boundary adjustments and easements where required can be made on final confirmation of the water bore location.

Access to the proposed water supply bore and facilities would be from under Bridge No.2 and along a new constructed track which also provides access to several nearby properties.

These seven specific items have been further investigated and have all now either been fully resolved or have a clear path to resolution during the detailed design phase of the Project.

In addition to resolving the seven specific items described above, the Preferred Alignment has been continually refined throughout 2009 and 2010 on the basis of further, more detailed environmental and engineering investigations. The refinements have sought to reach the most appropriate balance between different, sometimes competing or conflicting factors such as the Project objectives, environmental effects and stakeholder views. Many relatively minor alignment changes were made to the design.

Summary

Consideration of alternatives and the preferred scheme have been endorsed by the Board of Inquiry process and the associated updated designation and consents.

Appendix C – Capital Cost Estimates – Scheme Estimate

Item	Description	
A	Nett project property cost	[redacted]
	Investigation and reporting: - consultancy fees - the NZTA-managed costs	
B	Total investigation and reporting	
	Design and project documentation: - consultancy fees - the NZTA-managed costs	
C	Total design and project documentation	
	Construction *MSQA* - consultancy fees - the NZTA-managed costs - consent monitoring fees *Sub-total base MSQA* *Physical works*	
1	Environmental compliance	
2	Earthworks	
3	Ground improvements	
4	Drainage	
5	Pavement and surfacing	
6	Bridges	
7	Retaining walls	
8	Traffic services	
9	Service relocations	
10	Landscaping	
11	Traffic management and temporary works	
12	Mitigation Costs	
13	Preliminary and general	
14	Extraordinary construction costs	
	E/O for SH58 Interchange	
	E/O for James Cook Interchange	
	E/O for Kenepuru Interchange	
	E/O for Whitby Link	
	E/O for Waitangirua Link	
	E/O for Kenepuru Link	
	Sub-total base physical works	
D	Total construction	
E	Project base estimate (A+C+D)	
F	Contingency (~~Assessed~~/Analysed)	
G	Project expected estimate	
Project property cost expected estimate Investigation and reporting expected estimate Design and project documentation expected estimate Construction expected estimate		
H	Funding risk (~~Assessed~~/Analysed)	
I	95th percentile Project Estimate	
Project property cost 95th percentile estimate Investigation and reporting 95th percentile estimate Design and project documentation 95th percentile estimate Construction 95th percentile estimate		

Date of estimate: 26/07/12 risk updated 14/08/12	Cost index (Qtr/Year) Q2/2011
Estimate prepared by MacDonald International	Signed
Estimate internal peer review by	Signed
Estimate external peer review by	Signed
Estimate accepted by the NZTA	Signed

Note: (1) These estimates are exclusive of escalation and GST.
(2) Investigation and reporting project phase estimates are included at the request of NZTA.

Appendix D – Maintenance Cost Estimates

The maintenance cost per year on the TGP that have been included in the maintenance and operational costs in the economic evaluations, have been calculated at [redacted] per km over the 27km route, while resurfacing has been assumed to be required on an [redacted] year cycle at a cost of [redacted]^2 at [redacted] for chip seal and [redacted] at [redacted] for asphalt.

This equates to an annual cost of approximately [redacted], a resurfacing cost of [redacted], and [redacted] pavement rehabilitation [redacted].

Appendix E – Consenting Strategy

With the exception of a few known exceptions, NZTA has been granted all necessary land (NOR's) and regional resource consents required to construct the project.

A total of six different NOR's (four for the main TGP alignment and two for the Kenepuru state highway link road) designations have been confirmed, along with a total of 16 resource consents being granted, with an associated 1,643 conditions attached.

A number of consent conditions require early baseline ecological monitoring that has to be completed before construction can commence. These have the potential to delay the start of some construction activities if not completed before a construction contract is awarded. They include freshwater and marine water quality and ecology monitoring, bat monitoring plus fish-passage trials,

Known additional planning approvals that are required, in addition to any specific additional consents or alterations that a constructor may elect to seek, include:

- Historic Places Trust (HPT) Authorities
- Transpower resource consents for their relocation work
- Contaminated land consents required under the recently implemented National Environmental Standards (NES) for contaminated land
- A resource consent to provide fish passage for an existing SH1 culvert at Paekakariki (part of the ecological mitigation package required by consent conditions).

Appendix F – Property Strategy

The current property acquisition strategy has all property interests required for the project completed by 30th June 2015, and seeks to deliver a 'clean' site to the constructor. Early property acquisition of key properties is needed in order to secure access for construction for the Transpower relocation work. [redacted]

As part of the consent conditions, NZTA is required to provide certainty of tenure (in perpetuity) of the land required for retirement and revegetation required for ecological mitigation, and this will require appropriate legal mechanisms to be registered against the titles.

Where there is land currently owned by other Crown agencies, or TA's, NZTA is working through the necessary purchase agreements under the applicable pieces of legislation, including a Deed of Grant with NZ Railways Corporation for a crossing of the NIMT at Kenepuru.

In terms of the disposal of Crown land that has been acquired for the purposes of road but is not required for the project, this will be disposed of in two stages.

Once a constructor is on-board and the area of land required for construction has been determined, any land not required would be disposed using the standard disposal procedures contained within the Public Works Act (PWA). Following commissioning, any land not required for long-term mitigation or operation of the highway would be identified, surveyed and sub-divided and disposed of under the PWA.

Appendix G – Risks included in the PSC

Risk #	Risk category	Risk Description	Risk Allocation		
			Contractor	NZTA	Shared
Site risks					
	Ground conditions	Planned erosion and sediment control measures prove insufficient resulting in damage to streams during construction which requires greater rehabilitation. Includes the effects on the Pauatahanui inlet of storm damage during construction that exceed capacity of measures taken (and insured losses).	ü		
	Ground conditions	Slope instability during construction in cuts and fills leads to redesign and additional costs in normal weather,	ü		
	Site contamination	Failure to identify contamination which is actually present, resulting in: additional characterisation, shut-down of construction in the area, and remedial action not currently planned or foreseen.	ü		
	Land purchase	Inability to secure land requiring change in design (or purchasing takes longer to acquire using the PWA).		ü	
	Change in site requirements	The Porirua Gun Club, there may be a requirement to relocate adjacent to existing site or at a new location. - Includes access structure under Transmission Gully.		ü	
	Consent conditions	Achieving consented conditions. 2. Drainage treatment scope is greater than assessed requiring more land [d24.1] Sign off of two other consents	ü		
Design risks					
	Scope creep	Scope creep beyond contingency plans. Scope creep occurs during design or construction phases in excess of that allowed for in the estimate.	ü		

Risk #	Risk category	Risk Description	Risk Allocation		
			Contractor	NZTA	Shared
	Design solution	Design opportunities may exist as the cheapest conforming solutions have not been proposed in the current design (e.g. cheaper bridge solutions identified in tender phase).	ü		
	Design solution - Transpower	There is an opportunity to reduce the Transpower tower relocation cost and a risk of the inability to meet NZTA project timeframe or to obtain consents for alternative route delays TG construction start.		ü	
	Change in design	There is a risk that there may be a requirement to include an additional Vehicle Underpass north of SH58 (Welsh).		ü	
	Consent conditions	There is opposition to granting of Transpower's resource consents or Heritage Protection Authorities or contaminated land consents causes a delay in design.		ü	
	Fitness for purpose	The SPV does not make sufficiently robust specifications which result in an increase in costs to the constructor to achieve the outcomes required from the project.	ü		
	Design creep	The SPV adds to the concept design during construction which causes increases in price which cannot be managed through value engineering.	ü		
	Design delays	There is a lack of Bridge Engineers available for construction phase resulting design holding up construction. Note that there are 29 bridges along the route.	ü		
Construction risks					
	Labour shortage	There is a shortage of skilled labour as a result of other projects occurring at the same time, which requires a premium to be paid to obtain labour.	ü		
	Materials shortage	There is a shortage of materials as a result of other projects occurring at the same time, which requires a premium to be paid to obtain materials.	ü		
	Plant shortage	There is a shortage of plant as a result of other projects occurring at the same time, which requires a premium to be paid to obtain plant.	ü		

Risk #	Risk category	Risk Description	Risk Allocation		
			Contractor	NZTA	Shared
	Material cost	The amount of suitable material on site for sub-base and base course may not be sufficient and imported material may have to be used.	ü		
	Geotechnical information	Limited geotechnical information in vicinity of structures or ground improvements may result in additional costs or change in form of structure, or change in cut/fill slopes - additional stabilisation (both design/construction).	ü		
	Protest action	There may be protest action or other unpredicted social events which disrupts construction progress.	ü		
	Adverse Weather on contractors programme and production	Adverse Weather on contractors programme and production. The site may be subject to adverse weather during construction. - a. Precipitation - b. Wind/cyclone - c. Flood	ü		
	Prime contractor faces financial distress	Prime contractor faces financial distress which results in the possible cessation of service, forced change in ownership and/or possible corporate failure causing financial loss to private party. Cost in re-tendering and delay during process.	ü		
	Force Majeure	A force majeure event during construction leads to damage or delays in construction progress (e.g. an earthquake).			ü
	Industrial Action	Industrial action during construction impacts on the ability of the constructor to continue construction.	ü		
	Site access	Site access isn't granted, and there is a need to redesign access to the site which causes delays in construction progress.	ü		

Risk #	Risk category	Risk Description	Risk Allocation		
			Contractor	NZTA	Shared
	Environmental management of earthworks to avoid consent issues	Compliance with consent requirements more onerous than expected resulting in additional cost and delay to meet requirements.	ü		
	Consents during the construction phase	Requirement to obtain new consents during construction phase as a result of not having obtained during the design phase (e.g. cut batter is greater than anticipated to get to more land).	ü		
	Road Safety Audit	Safety issues identified by Road Safety Audit team, result in an increase in construction and design costs to meet compliance standards.	ü		
Operations and Maintenance risks					
	Operational Costs	The risk that the operating costs of the highway are not in accordance with plans or forecasts (e.g. Increased utilities volume, traffic management costs etc.). Accident response	ü		
	Safety Management, including Accidents	A death or serious injury to users as a result of: - Poor safety management; - Poorly developed/implemented H&S procedures; - Inadequate temporary/permanent access/crossings; - accidents - Emergency service routes disrupted; or - Safety audit findings disputed / not completed. Occurrence of human fatalities or casualties (e.g. as a result of unsafe condition of existing assets), traffic congestion & emergency route blockage. Costs from: ACC levies, structural repair work being required, and reputational damage.	ü		
	Design risk- operational impacts	The stability of slope and erosion is not adequately designed for, which increases operating costs. Known risks with landscape for blowing out bridges and culverts. The design does not cope with the changes to flows resulting in damage or loss of stream.	ü		

Risk #	Risk category	Risk Description	Risk Allocation		
			Contractor	NZTA	Shared
	Stream diversions result in on-going maintenance requirements	Stream diversions result in higher than anticipated on-going maintenance requirements.	ü		
	Failure of mitigation (planting).	Failure of mitigation (planting) to achieve certain targets which are part of consent conditions, resulting in greater planting requirement.	ü		
	Force Majeure events during operations	Force Majeure events during operations (e.g. an earthquake).			ü
	Provider insolvency	There is a risk that an operations or maintenance contractor may fail financially or may fail to provide contracted services to specification requiring replacement of the contractor. The failure may result in service unavailability, in each case, a need to make alternate arrangements for service delivery with corresponding cost consequences.	ü		
	Poor Pavement Design	There is a risk that poor pavement design and construction results in increased maintenance costs, meaning that the asset is not available for use as intended as the cost of maintenance is greater than anticipated.	ü		
	Ground conditions	There may be on-going settlement of structures or cuts during post the defects liability period.	ü		
	Non Road specific change legislation, regulations or specifications (e.g. Employment law)	There is a risk that changes in operating standards, legislation, regulations require alterations involving costs and potential temporary closure. This includes technical obsolescence. (e.g. labour law, environmental, health and safety)	ü		
	Specific change in operating standards, legislation, regulations or specifications	Risk that changes in operating standards, legislation, regulations require alterations involving costs and potential temporary closure. This includes technical obsolescence		ü	

Appendix H – Reconciliation of the PSC to the NZTA scheme estimate

The following table provides a reconciliation from the PSC to the NZTA estimate and an explanation of the each of the items.

Table I:1: PSC reconciliation to NZTA estimate

	Public Sector Comparator	Transmission Gully ($m)
	Total NPC of the PSC (as per above) above	[redacted]
I.	Convert to the NPC value to a nominal value	
II.	Less operating costs	
III.	Less risk adjustments	
IV.	Less competitive neutrality adjustments	
V.	Less inflation	
VI.	Less contingency	
VII.	Remove additional costs not included in original estimate	
	Sub total	
VIII.	Add design and investigation sunk costs	
IX.	Add property costs	
X.	Add original contingency and risk estimate	
	Project Expected Estimate (P50)	

The following adjustments are required to the PSC in order to reconcile back to the NZTA scheme estimate:

i. The PSC is has been subject to both escalation to reflect inflation and discounting to reflect the time value of money. The first step in reconciling to the NZTA scheme estimate is to remove the impact of discounting, by presenting the PSC as a nominal value.

ii. Operating costs are included in the PSC to calculate the whole-of-life cost of the project over a 25 year operating period. These costs are not included in the NZTA scheme estimate and therefore they are required to be removed.

iii. The risk adjustments included in the PSC are different to those included in the NZTA scheme estimate because they only include transferred risk. They must be removed and added back as per the NZTA risk estimate (refer to (ix) below).

iv. Competitive neutrality adjustments are specific to the PSC and are not included in the NZTA scheme estimate. Therefore they have been removed as part of the reconciliation.

v. Inflation is added to all costs inputs in the PSC (construction, risk and operating cost inputs) at the rate of [redacted]% per annum. The NZTA scheme estimate does not include inflation and therefore it has been removed.

vi. The contingency included in the PSC included in the PSC is included in the total risk value in the NZTA scheme estimate. Therefore it is removed and added back in (ix) below.

vii. Interest costs are not included in the NZTA scheme estimate.

viii. Certain costs included in the original scheme estimate have been spent at the time of compiling the PSC. These costs have not been included in the PSC and need to be added back to the PSC to reconcile back to the NZTA scheme estimate.

ix. Certain costs have been spent to date and are therefore not included in the PSC.

x. Property costs are not included in the PSC as they are a cost to NZTA.

As part of the original scheme estimate, NZTA included a contingency and risk estimate (at the P50 level). This has been included as separate contingency (P50) and risk (P85) values in the PSC. These numbers must therefore be added back to the PSC (as they were removed above) in order to reconcile back to the original NZTA scheme estimate.

Appendix I – PPP Criteria

The TGP has been re-assessed to confirm it is an appropriate candidate for a PPP. This has involved an assessment of the high-level suitability of the TGP for a PPP against "hurdle" criteria. This is presented below.

Project Size

The estimated nominal (undiscounted) cost of constructing the TGP is approximately $[ ] million. The estimated nominal (undiscounted) operating costs over the 25 year contract period are $[ ] billion. This is a very sizeable project by New Zealand standards.

The market sounding process has identified that the TGP is of the size to make it attractive. However, there were also signals that the significant size of the project may influence the number of fully funded bids, depending on how the procurements deals with issues such as bank exclusivity. This will be an issue to consider in the design of the procurement approach.

Contract Duration

The term of the operating component of the contract could be for up to 25 years. The TGP itself will have a long life, longer than the contract term. While there will be resurfacing, refurbishment and life cycle maintenance during the operation term, there would not be a rebuild of the facility required during the operating period.

There are some disadvantages with a long term contract. In particular, a long term contract would reduce the NZTA's ability to easily respond to major changes in circumstances. This loss of flexibility needs to be considered against the value for money that could be provided by the PPP model. In particular, given the long life of the TGP a long term contract would assist in optimising whole of life costs.

The loss of flexibility associated with a longer term contract would be mitigated to some extent by the change mechanisms likely to be included in the PPP Contract. These should allow the NZTA to make changes to the TGP requirements but with a consequential cost impact. There is also likely to be provision in the PPP Contract for value testing of reviewable services costs at regular intervals throughout the contract term.

Timetable

Letting a PPP contract is time consuming. Negotiation of a PPP contract can take longer to complete than a conventional design and build contract, although the NZTA would have the benefit of two pathfinder PPPs that have dealt with a number of contentious issues with the Treasury's standard form contract.

There is nothing specific about the TGP that has negative consequences for a PPP procurement.

New Build vs. Refurbishment

The TGP would be a new build, with a number of structures required. There will be constraints around alignments. However, there should be opportunities for innovative solutions that will provide value for money for the NZTA. It would contribute to achieving whole of life optimisation.

Ability to Transfer Risk

A core benefit of the PPP model is the transfer of risks to the contractor that it is able to manage and price. The contractor would be required to accept the risks associated with constructing the TGP and ensuring it is in service within the required timeframe. There is nothing to suggest that these risks are unusual or would result in significant cost to the NZTA.

The Contractor would be required to manage the risk of delivering operating and maintenance services to the standards needed to deliver the required outcomes for the TGP. Again, the assessment of the TGP Team is that there is nothing unusual in this that would be difficult for the Contractor to accept.

The following two factors would assist with Effective risk transfer:

- There should be relatively clear boundaries around the scope of activities and services to be provided by the Contractor. The interfaces between the TGP and other roads and associated services and the impact of this on the payment mechanism would require care consideration but is not expected to be unsolvable.
- There would be many interfaces with the NZTA. However, there would be little need for direct NZTA involvement in the operation of the TGP.

In addition, the payment mechanism for the TGP would incentivise good risk management. The combination of charges and abatement would encourage the Contractor to manage risks to achieve performance standards and avoid financial penalties.

Location Issues

The TGP would be the first PPP procurement of a road in New Zealand. It would be a pathfinder project for the NZTA. However, there is now a growing body of experience with PPPs in New Zealand. There is also considerable international experience with roading PPPs, although not all will have the same level of focus on outcomes as would be the case with the TGP.

The design of the PPP for the TGP, including the development of project documentation and the design of the procurement process, can draw on and be tested against the two New Zealand PPPs and the experience from overseas jurisdictions. In this way, the best can be taken from the overseas experience and is be tailored for New Zealand circumstances in general and for the NZTA in particular.

Ease of Bundling Contracts

Bundling service contracts into a single, long term contract is a prerequisite to achieving value for money. The approach adopted for the TGP should be to specify the outcomes it requires and provide the Contractor with a degree of freedom to design and deliver the road and required services. In effect, this would involve comprehensive bundling of the design, construction and operation of the TGP. Operation would include complete responsibility for maintenance, operation and lifecycle expenditure.

Bundling all aspects of the operation of the TGP with design, construction and financing is critical to achieving optimised whole of life costs and appropriate quality of service. It also reflects that the TGP would lend itself to the contractor having end-to-end control of the processes required to design, build and operate the TGP.

Private finance would place a high degree of pressure on the contractor to perform. The level of debt in the capital structure in particular will ensure that both debt and equity investors will be keenly interested in the Contractor, through the TGP operator, meeting the performance standards and not incurring abatements to the Unitary Payment that might put debt servicing payments at risk.

Measurable Outcomes

Setting objective performance measures that are directly related to the required outcomes from the TGP would be critical to establishing the contractual relationship between the NZTA and the contractor and setting the level of performance that the contractor must achieve.

Key performance indicators would be required to assess the Contractor's performance and quantify payments to be made for the services delivered. These measures would be designed to be effective in providing a quantifiable assessment of the contractor's progress in achieving the outcomes required from the TGP.

Performance Based Contract

A general principle underpinning PPPs is that the Contractor is only paid for the services delivered. Full delivery results in full payment. Services delivered below the required standards result in a reduced payment.

This principle should be incorporated into the PPP Contract for the TGP and would be a key component of the payment mechanism. KPIs would need to be developed that provide the basis for measuring achievement of required standards and for determining the reduction in the payment to the Contractor where the standards have not been met.

Scope for Innovation

Innovation will be encouraged where outcomes are specified clearly and input based constraints are minimised.

Accessing private sector innovation that can be transferred to and successfully implemented in the NZTA's network would be a reason for procuring the TGP through a PPP. The approach of specifying the outcomes required from the TGP, and minimising constraints so that the contractor has maximum flexibility to design and deliver solutions, would provide the contractor with every opportunity to produce innovative ways of designing and operating the TGP.

Market Appetite

The market sounding process has indicated that the private sector is capable of delivering the TGP and the required outcomes.

Appendix J – Previous Analysis of Procurement Approaches

PPP Value for Money and Delivery Option Comparison Report, March 2011

The NZTA engaged Everything Infrastructure (EI) to assist in determining if PPP would provide better value for money, better whole-of-life outcomes and better enable project delivery within a constrained funding environment compared to NZTA's traditional procurement models.

EI used a staged process to assess the procurement models. The activities and outputs of each stage were assessed in workshops with the following participants:

- Key NZTA and central Government stakeholders
- NZTA project team leaders and PPP and policy representatives
- Treasury representatives
- Ministry of Transport representatives
- Everything Infrastructure.

The first stage of the process involved applying the following delivery model diagram to identify the appropriate procurement models for the TGP.

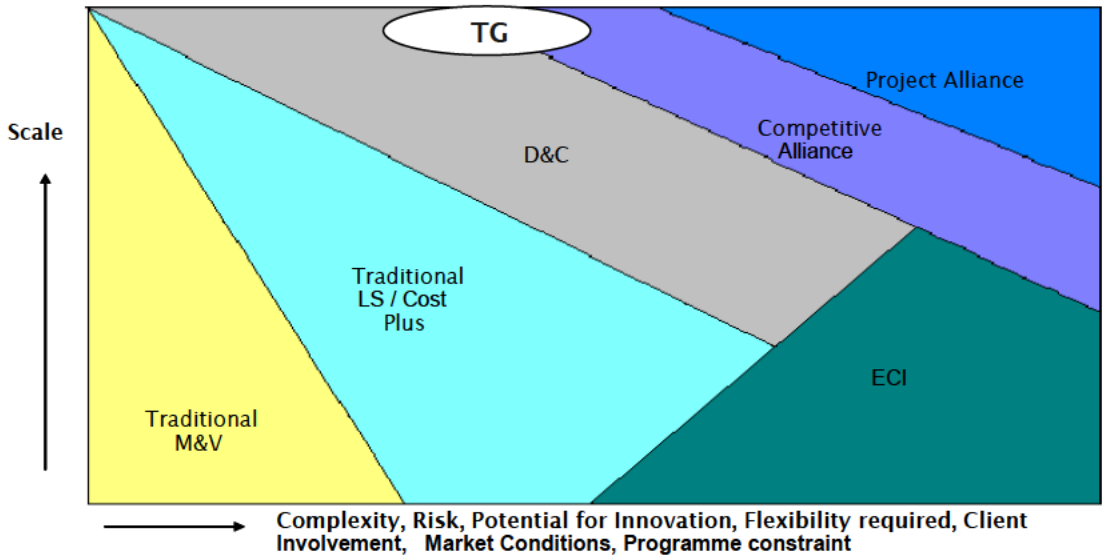


Figure 18-1: NZTA Delivery Model Assessment Diagram

The TGP will be a large scale project but is expected to be "moderate" in terms of complexity/risk in the context of the NZTA's project portfolio. Its "moderate" assessment in relation to complexity and risk reflects the significant planning and due diligence completed to date. The combination of these attributes led to design and construct (D&C) and Competitive Alliance being shortlisted as the appropriate procurement models.

The two shortlisted procurement models were assessed using NZTA's more complex Microsoft Excel-based Delivery Model Selection Matrix tool. This evaluates procurement models using the following ten project criteria, weighted by importance:

- Project scale
- Complexity and scope for innovation
- Programme/time constraints

- Risk profile
- Number and type of stakeholders
- Market conditions, e.g. local and international capability to undertake the project
- Client involvement, control, capability and availability
- Focus on non-cost success, e.g. compliance with environmental requirements and community expectations
- Tangible demonstration of value for money
- Flexibility to deal with change

The conclusion of the overall score and ranking from this exercise was that D&C was the preferred procurement model, with Competitive Alliance a close second.

The D&C and Competitive Alliance models were then compared to the PPP procurement model.

Qualitative Analysis of D&C/Competitive Alliance versus PPP

The qualitative analysis weighted the project objectives according to an estimate of their relative importance:

- 10% for Compliance with regulations, law, designations, consents.
- 40% for Fitness for Purpose – given the emphasis on achieving planned economic outcomes and technical performance targets while encouraging innovation and alignment with long-term strategies.
- 10% for On Time Delivery – given the moderate importance of meeting the project timeline for construction.
- 15% for Governance – given that this is a strategically desirable outcome but not fundamental to success.
- 25% for Stakeholder management – given the importance of meeting stakeholder expectations.

Optimising whole-of-life cost in the context of the capital budget and capital availability was an important objective. However, as this applied only to quantum and certainty of cost, it was assessed in the quantitative analysis.

The qualitative analysis found that the PPP model provided the best alignment with the project objectives, especially in terms of:

- Certainty of meeting delivery times.
- Certainty of delivery of economic outcomes.
- Producing an outcome that is fit for purpose.
- Ensuring compliance with project approval conditions.
- Optimising whole-of-life outcomes.

The D&C model demonstrated reasonable alignment, particularly in:

- Optimising NZTA's management effort during construction.
- Certainty of delivery of economic outcomes.

The Competitive Alliance model had the least alignment but was expected to have greater certainty in the delivery of community and Iwi expectations.

Quantitative Analysis of D&C versus PPP

Analysis was undertaken to quantify the net present cost (NPC) differences between D&C and PPP. This involved:

- Developing the raw (non-risk adjusted) cost for design and construction and the assumed 25 year assessment period.
- Incorporating the risk ranges and probabilities of occurrence for design, construction and maintenance risks.
- Modelling the risk adjusted net present costs for the project's total design, construction and operation.

Financing costs were not included in the quantitative analysis.

The results of the quantitative analysis were provided in terms of the total outturn cost savings:

- At the P50 level, PPP had a 3% cost advantage over the D&C model and a 10% advantage over the Alliance model.
- At the P90 level, PPP had a 4% cost advantage over the D&C model and a 16% advantage over the Alliance model.

Overall Conclusion

The EI report concluded that both the qualitative and quantitative assessments favoured a PPP procurement model. The basis for this conclusion was:

- Qualitatively, greater whole-of-life benefits to NZTA.
- Quantitatively, greater cost savings on the P90 basis.
- Potential to advance project and therefore for earlier delivery of economic benefits.
- Reduced public sector interface risks versus conventional delivery.

Report on Procurement Strategy, Phases IV & V, June 2012

Subsequent to the EI report, the NZTA undertook additional procurement analysis, culminating in the Report on Procurement Strategy in June 2012. This report had four stages:

1. Options development.
2. Procurement model shortlisting.
3. Assessment of number of contracts.
4. Determining the Recommended Approach.

Options Development

The report assessed three procurement models contained in the NZTA Procurement Manual (July 2009): Traditional, D&C, and Alliance. PPP was also included in the initial list of procurement models. However, it was not analysed or assessed. The report stated that:

> *"The PPP model will not be considered further in this strategy until the Government's appetite and/ or the models suitability for the NZ market is confirmed."*

Procurement model shortlisting

The procurement models were assessed against the NZTA Delivery Model Selection Matrix. The conclusion of the assessment was that D&C was the preferred procurement model, followed by Competitive Alliance and Traditional.

However, limitations in terms of Matrix's lack of financial categories for projects in excess of $100 million, lack of sub-criteria for a number of categories and risk of separating detailed design led to additional testing. The procurement model selection matrix was revised to incorporate increased granularity for the key areas of concern.

The outcome of the revised modelling found the D&C and Alliance models being virtually tied as the preferred model, with Traditional scoring significantly lower.

Number of Contracts

Consideration was given to the number of contracts to be used to procure the TGP. An option of two separate contracts on a North/South geographical basis was reviewed. It was concluded that stated section length and estimated contract values required further consideration before a final decision on number of contracts could be made.

The procurement of different functional packages (e.g. separate contracts for earthmoving, structures and pavement) was also considered and discounted because of the potential this had to increase construction management risks.

The option of including the maintenance contract with the construction contract was also reviewed and discounted as:

- Large project construction contractors do not necessarily provide maintenance services as part of their offering
- Network operations could be affected
- Whole-of-life quality issues for at risk elements (structures and batters) can be managed through an extended defects liability period.

Recommended Approach

Further assessment of the Project Alliance, Competitive Alliance and D&C models was carried out in a workshop with the NZTA and industry advisors with the objective of determining a recommended procurement model.

The workshop participants further refined the Revised Procurement Model Selection Matrix and determined:

- Project characteristics and risk profile suit D&C or Competitive Alliance, with marginal advantage to D&C
- One contract would be better value due to additional costs of two contracts.

The final selection of D&C or Competitive Alliance as the preferred procurement model was noted as being dependent on:

- NZTA's ability to define and transfer geotechnical risk
- Ability of NZTA to support the significant resource and staffing requirements of a Competitive Alliance
- Local and Australian market demand for a D&C contract
- Cash flow and market activity at time of procurement.

Appendix K – Payment Mechanism and Performance Regime

Under a PPP, the NZTA would make monthly payments to the contractor, for the term of the PPP contract, for delivering services. These payments would only commence once the TGP is completed and available for use.

The monthly payment is referred to as the Monthly Unitary Payment and is typically comprised of:

- A "Unitary Charge". This is the payment required by the contractor to cover all of its costs, including capital servicing costs.
- Pass through costs, if any. These are costs that are the responsibility of the NZTA but which are incurred by the contractor on the NZTA's behalf.
- Deductions (abatements) where the contractor's performance has been below agreed standards. It is proposed that the PPP payment mechanism will be consistent with New Zealand precedents and include deductions from the Unitary Charge in three categories: Unavailability Deductions and Service Performance Deductions and Reporting Deductions.

In addition to the Unitary Payment the NZTA might also consider awarding discretionary innovation payments (outside of the Unitary Charge) for a programme of work to be developed and agreed on appointment. This would be designed to assist the NZTA achieve its wider network goals.

Availability Regime

The NZTA would only make payments to the contractor once the road and the required services, exactly as specified in the tender documents and the PPP contract, are made available by the contractor.

On acceptance into service (date on which the assets and services are delivered in accordance with the Contract), the entire Unitary Charge becomes payable monthly by the NZTA but is at risk if the road becomes unavailable i.e. the payment is reduced if the road is not available, as defined.

The availability of a specific section of road is determined through the Availability Criteria that apply to that particular section of road (different sections may have different criteria). Three Availability Criteria are proposed:

- Free-flow travel time
- Lane availability from planned events
- Lane availability from unplanned events.

Ratchet mechanisms can be used to create additional financial incentives for the contractor to rectify continuing poor service or lane unavailability. These can be structured as follows:

- Ceiling Ratchet – If the road section is unavailable for more than a number of predetermined days in the contract period, then a Ceiling Ratchet will increase the rate of each subsequent availability deduction for the road. This would result in increasingly larger deductions so incentivising the contractor to rectify the cause of the unavailability.
- Repetitive Failure Ratchet – The deduction increases when the service failure has occurred in previous consecutive contract periods. This would result in increasingly larger deductions so incentivising the contractor to rectify the cause of repetitive unavailability.

Free Flow Travel Time

The aim of the availability measure is to drive good design and maintenance so to maintain a desired free-flow service level. A measure by road section would be overly complex to monitor and measure and therefore it is proposed this is a global availability measure covering the whole asset and would be based on making deductions where free-flow travel time (by vehicle type, i.e. Car/HCV) is below an agreed threshold.

Lane availability from Planned/Unplanned Events

The aim of these Availability measures is to minimise total delay and to provide a reliable customer experience through:

- Minimising total delay from planned/unplanned events
- Minimising the impact of planned/unplanned events.

A lane availability approach based around the time of day of a proposed planned activity and the temporary traffic management posted speed during the activity could be used. Timing of activity is used as a measure of reducing the impact of planned events, while the sign-posted speed element of temporary traffic management is used to incentivise (in design and operation) effective maintenance planning to minimise disruption during a planned activity. Penalties would vary by road section based on the criticality of the section to network performance.

Full closures of a road section would have knock on implications for the availability of the whole road leading to possibly substantial penalties.

Availability for unplanned events would be managed on a similar framework, although in the event of an unplanned incident a grace period could be offered where the road will not be deemed unavailable. The road could also not be deemed unavailable where an approved authority (such as the police) has closed the road.

Performance Regime

Performance deductions provide a further means of incentivising the contractor to provide services in accordance with the Outcome Specifications.

The payment and performance regime could reflect the fact that some of the services are more important than others (e.g. safety). As a result, some PI's will be given a higher weighting than other Performance Indicators to reflect their relevant performance and would therefore attract higher penalties for poor performance and less tolerance around rectification.

The Performance measures are set out below.

Safe Travel

A safety outcome will initially be driven through the completion test requiring the road to achieve a KiwiRAP safety rating of 4-Stars. However, the NZTA would require a regime of continual performance improvement in operation and maintenance of the corridor to ensure any emerging issues around safety are addressed by the contractor.

Two measures are proposed to drive a safety outcome through performance.

- Ratio of observed Fatal and Serious crashes versus NZTA's average for a road of the same type
- Observed crashes per million vehicle kilometres travelled (MVKT) versus NZTA's average for a road of the same type.

A measure of good performance (which would not lead to performance penalties or bonuses) would be to exceed the NZTA's average by an agreed threshold with average (at NZTA's performance level) or worse performance being penalised.

Reliable Journeys

Related to the Availability Payment for clearing incidents promptly it is proposed to place a performance measure around incident response times to ensure effective operation of the asset. These would be set by road section and time of day to balance operational need with affordability with a penalty incurred by the contractor for exceeding the maximum.

Throughput – Freeflow Travel Time

The measure desires to maintain the throughput established by the Completion Tests by seeking to drive good network management to reduce the impact of asset quality on vehicle throughput and performance. The measure would require the road to deliver above agreed free-flow travel time thresholds by vehicle type.

Throughput – Total Junction Performance

A significant contributor to maintaining throughput of the road is the operation of interchanges. They are also the points on the network which are likely to require operational changes as a result of demand pattern changes through time. Therefore, it is desirable that the contractor not only maintains an interest in the maintenance of the asset but also in the manner in which it operates during the concession life. A common measure of interchange performance is maximum degree of saturation. A performance penalty regime could be used where interchange performance exceeds an agreed maximum degree of saturation.

Environmental Compliance

The aim of this KPI is to ensure that the contractor undertakes its maintenance activities in a responsible manner (compliance during construction is dealt with within the conditions of contract).

Penalties would be received for non-compliance based on the severity of the event with prosecutions being considered as breaches of contract.

Zero Harm

A penalty based approach for exceeding the Total Injury Frequency Rate both during construction (a one off penalty) and during operation (an annual penalty). Ratchets would apply based on the level of exceedence of agreed thresholds.

Satisfied Customers

As a measure of overall customer satisfaction, the contractor will be incentivised to demonstrate that customers are satisfied with the level of service they are receiving from the contractor with regard to accessibility of the organisation, response times for dealing with the customers issue and satisfaction with the outcome. This could be achieved through sampling customer interactions and agreeing a benchmark performance against which penalties are incurred. Specific areas of focus of customer service which are of particular value to the NZTA (e.g. ride quality, graffiti, litter etc.) would be identified explicitly within the survey framework and Penalty regime.

Informed Customers

This measure aims to incentivise the contractor to engage with its users on planned and unplanned events to ensure that users have sufficient information to make informed travel choices. The measure would be assessed through achieving an agreed benchmark from an annual user survey.

Connected Communities

The aim of this KPI is to maintain minimum levels of accessibility/travel time by walking/cycling between key destinations crossing corridor. A framework similar to that used for planned/unplanned events above could be used.

Incentive Payments: Network Innovation Payments

The concept of Network Innovation payments provides a means of incentivising the contractor to assist the NZTA in achieving its wider goals for the Network outside of the proposed corridor. The Network Incentive pool would be known in advance of tender but would be outside of the PPP Model in that it would not be contestable or form part of the unitary charge.

The network incentive could then be taken forward by the NZTA with the contractor (subject to satisfactory performance against the unitary payment mechanism) on an agreed programme

basis using a mix of rate based payments to develop and deliver projects and outcome payments based on the outcomes achieved from the programme.

Examples of such outcomes could be:

- Increased network vehicle occupancy.
- Increased network freight efficiency.
- Total network safety targets.

Other Contractual Mechanisms

In addition to the Availability and Performance regime, certain outcome aspects of the projects can be captured through:

- Works and operational completion tests
- Performance penalty points
- Contractual requirements.

Works completion tests are the means by which an assessment is made, on conclusion of construction, on whether the outcome requirements of the project through the construction phase have been made and before the road is opened and the first Unitary Payment is made.

Works completion tests proposed include:

- Achieve a KiwiRAP rating of 4-Star – to drive a safety in design approach
- Achieve a Greenroads rating of "EverGreen" – to achieve sustainability outcomes
- Achieve free-flow travel times for Car/HCVs at a predetermined level on opening.

Performance points can accumulate over time and lead to a number of different consequences, in addition to the deductions levied against the Unitary Charge. These can include:

- Enhanced monitoring;
- Formal warnings to the PPP Company and service provider;
- Requirement for the PPP Company to provide a plan to rectify shortcomings in the service;
- Requirement for the PPP Company to replace service provider and/or NZTA step in; and, in extreme cases
- Contract Termination for breach of contract.

Appendix L – Potential Risk Allocation

The Treasury's Standard Form PPP Contract sets out the allocation of risk between the Crown and the PPP contractor across the project lifecycle, including financing and handback. The following table provides an outline of potential risk allocation for the TGP:

Risk Category	NZTA	PPP	Shared
Design risk		ü	
Construction and development risk		ü	
Property risk	ü		
Transition and implementation risk		ü	
Availability and performance risk		ü	
Operating risk		ü	
Variability of revenue risk	ü		
Termination risks			ü
Technology and obsolescence risks		ü	
Residual value risks		ü	
Financing risks			ü
Legislative risks			ü

Appendix M – Examples of TGP Specific Contractual Requirements

Specific contractual mechanisms and requirements to be considered for the TGP would include:

Outcome	Output	Comment
Asset condition	Remaining service life of asset	The PPP Contract would specify a complete asset survey would be undertaken by an independent party [3] years prior to contract completion. Any deficiencies against the asset conditions specified in the Contract would result in retention of payment to the PPP to fund the rectification of these shortcomings. A further survey could then be done [12] months before contract to ensure asset conditions have been met, if not then the final year or payment will be retained for rectification.
Compliance with environmental requirements during construction	Meet environmental obligations	Contract would specify that prosecution for failure to comply with environmental consents would lead to termination of contract with financial penalties and penalty points amassed for lesser breaches. A persistent breach of this condition (as demonstrated by amassed penalties) can then lead to Contract termination.
Skilled workforce	Minimum 20% lift in skill development over project life	PPP would need to maintain in place programs to provide for skill development.

Appendix N – Public Sector Comparator Assumptions and Results