

## 2. Background to the Project

### Overview

The Project has a long history with the concept of an inland alternative route for SH1 being discussed over many decades. A number of strategic studies and investigations have concluded that an inland alternative for SH1 between Wellington City and the Kapiti Coast is preferable to an upgrade of the existing SH1 as it will provide greater benefits in terms of route security, travel time savings and safety. It will also substantially reduce the levels of severance currently experienced by communities along existing SH1. The Kenepuru Link Road and the Porirua Link Roads will improve accessibility to western and eastern Porirua, respectively.

The Project is a key component of a number of national, regional and local transport strategies, policies and plans.

### 2.1 Introduction

This chapter provides background to the Project and sets out the following aspects:

- the development of the Project (Section 2.2);
- the national, regional and local strategic context of the Project (Section 2.3);
- the benefits of the Project (Section 2.4); and
- the NZTA and PCC's objectives (Section 2.5).

### 2.2 Development of the Project

The need for an inland State highway between Wellington City and the Kapiti Coast, in some form, has been discussed for a long time. References to investigations into an inland highway date back at least as far as articles in the Evening Post newspaper in June 1919<sup>16</sup>, and there is a persistent 'urban myth' (which the NZTA is unable to confirm or debunk), that the US Army offered to build an inland route during or soon after World War 2. The NZTA does not have records of any of these early considerations of an inland route.

Since the mid-1980s a number of studies have been undertaken examining the future of SH1 between Wellington City and the Kapiti Coast.

The key events in the development of the NZTA Project are shown in Figure 2.1.

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16. Evening Post, Volume XCVII, Issue 131, 5 June 1919, page 3 and Issue 133, 7 June 1919, p4.

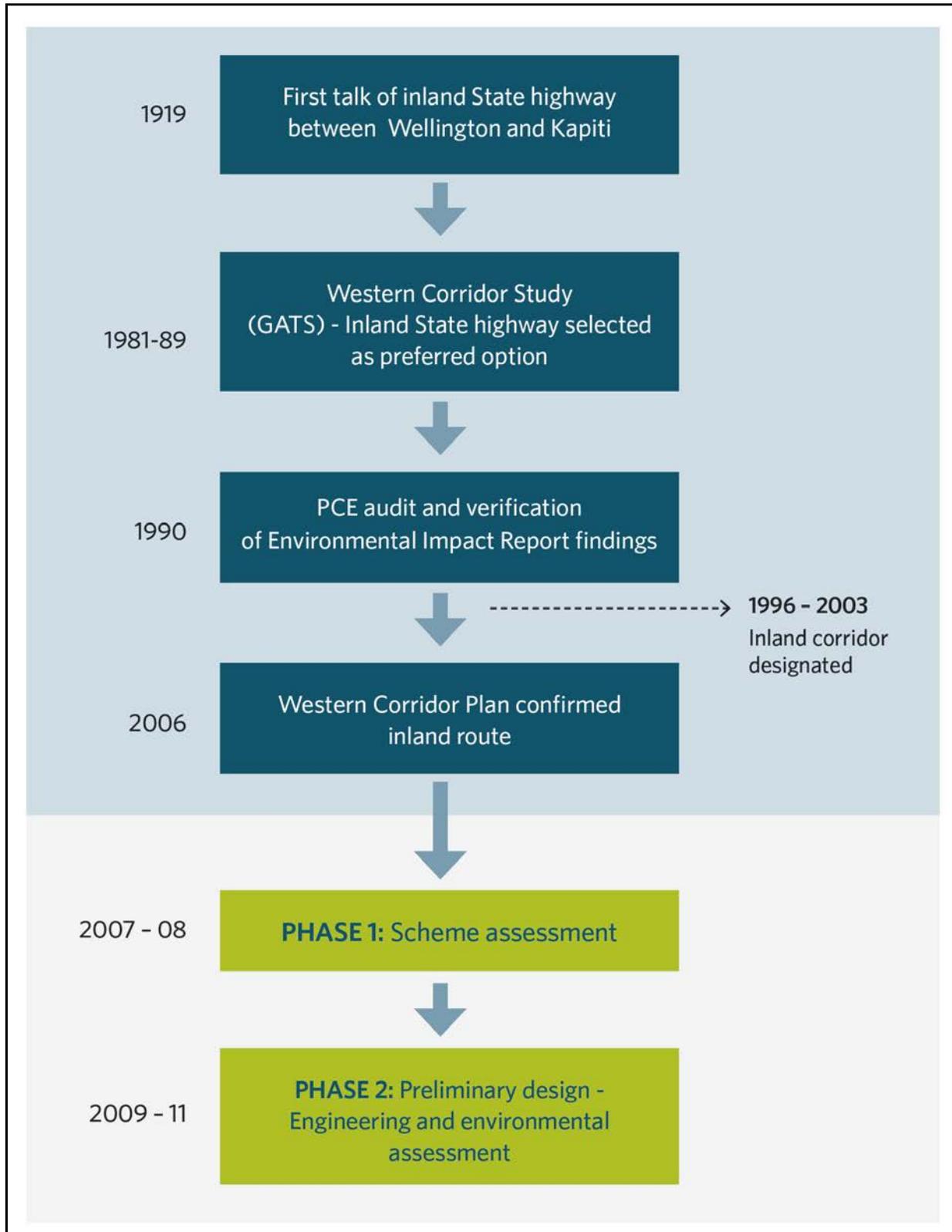


Figure 2.1: Key events in the development of the Project

### 2.2.1 Western Corridor Study (Southern Section) and Greater Wellington Area Land Use and Transportation Strategic Review (1981 – 89)

In 1981 the Ministry of Works and Development and the Ministry of Transport commenced a study of options to address increasing congestion on State Highway 1 between Wellington City and the Kapiti Coast, known as the Western Corridor Study (Southern Section). The findings of the study, released in 1986<sup>17</sup>, rejected an inland alternative route for SH1 in favour of major upgrades to the existing coastal route. This finding met with strong public opposition, particularly from coastal communities who called for an inland alternative to be more thoroughly investigated. Largely as a result of this the Greater Wellington Area Transportation Strategic (GATS) review undertaken in 1987 was the first serious review of an alternative inland route for SH1 between Wellington City and the Kapiti Coast. The purpose of the GATS review was to examine the region's transport network and essentially arose from<sup>18</sup>:

*The National Roads Board's reluctance to make firm commitments on the future development of State Highway 1 north of Paremata in the light of the controversial findings of the Ministry of Works and Development 'Western Corridor Study (Southern Section)' prepared in July 1986, and strong local pressure for a new Inland Route to be developed through Transmission Gully.*

Part of this 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 review led to the preparation of an Environmental Impact Report (EIR) which considered the impacts of options to address capacity issues. The GATS review also examined public transport improvements as an alternative to road options but concluded that public transport improvements alone would not be sufficient to address the capacity issues. The broad road options assessed were:

- do minimum (i.e. this is the existing SH1 with grade separation employed at Newlands and Porirua); or
- upgrade existing SH1 (i.e. the Coastal Route); or
- construct a new inland route between Wellington City and the Kapiti Coast (i.e. the Transmission Gully Project).

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 found that the inland route was more environmentally and socially acceptable than upgrading the coastal route and also better than the "Do Minimum option". The favoured inland route was from MacKays Crossing in the north, connecting to SH1 at Grenada North in the south.

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. The main

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17. Ministry of Works and Development and Ministry of Transport. Western Corridor Study (Southern Section) report. 1986.

18. Wellington Regional Council, Boyden Evans and Boffa Miskell Partners. Environmental impact report: Future State highway 1 route. Wellington Regional Council. 1989.

reservations the PCE had related to the selection of a road construction option, as opposed to greater investment in public transport. The PCE stated that while she<sup>19</sup>:

*wishes to be 'practical', she also does not wish to encourage further dependence on a mode of travel that damages the environment, nor an increase in the use of this mode for long distance daily commuting.*

Key recommendations of the PCE report were to consult with the public to reduce uncertainty and to finalise the alignment of the inland route and lodge the designations. One of the key recommendations of the PCE report was that the proposed alignment at the southern end of the Transmission Gully Project route should be reconsidered in view of the likely negative impacts of the proposed Takapu Valley connection on residents of the valley. It was recommended that the alignment be finalised and designations for the route be lodged in order to provide certainty for communities along the route.

### 2.2.2 Designation of the Inland Route (1996 – 2003)

Further investigations were undertaken and the necessary notices of requirement were lodged by the then Transit NZ in April 1996. Resource consents required under Wellington regional plans were not applied for at the time. The notices were heard by Commissioners during April and May 1997. The Commissioners recommended that the notices be confirmed, subject to conditions which Transit NZ's decision accepted largely without modification. Several parties appealed the decision on the notices and these appeals were all resolved by January 2003. The designations were then included in the relevant district plans. These designations are the existing Transmission Gully designations in Wellington City, Porirua City, Upper Hutt City and Kapiti Coast district plans (as listed in Table 1.3 of this report).

As part of the designation process for the Inland Route consideration was given as to where the new route between the Kapiti Coast and Wellington City would tie-in with existing SH1. Alternative locations for the northern tie-in at MacKays Crossing were not considered. A number of alternative locations for the southern tie-in were considered.

As explained above, the route identified in the 1989 GATS review ran down Takapu Valley and would have tied-in at Grenada North (south of where the existing Tawa Interchange is located). Following the PCE's audit of the EIR the location of the southern tie-in was reconsidered in view of the likely negative impacts of the proposed Takapu Valley connection on residents of the valley.

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19. Office of the Parliamentary Commissioner for the Environment 'Audit of the "Future State Highway Number One Route" Environmental Impact Report', March 1990.

As part of the investigations for the NoRs a working party was formed to consider options for the southern connection. Four main options were considered<sup>20</sup>:

- Option A: From the top of the Takapu Valley to south Ranui Heights (Linden);
- Option B: Down Takapu Valley to south of the existing Tawa Interchange;
- Option C: Down the eastern side of Takapu Valley and continuing from Grenada to Petone; and
- Option D: From Cannons Creek down the Korokoro Valley to Petone.

These southern alignment options are shown in Figure 2.2.

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20. An alternative alignment from north of SH58 through Belmont connecting with SH2 just south of the Kennedy Good Bridge was also investigated as part of this package of work but this is not relevant to this Project or AEE report. It should also be noted that the numbering of options (i.e. A, B, C and D) differs from that used in the original investigation reports as this has been simplified for the purposes of this AEE report.

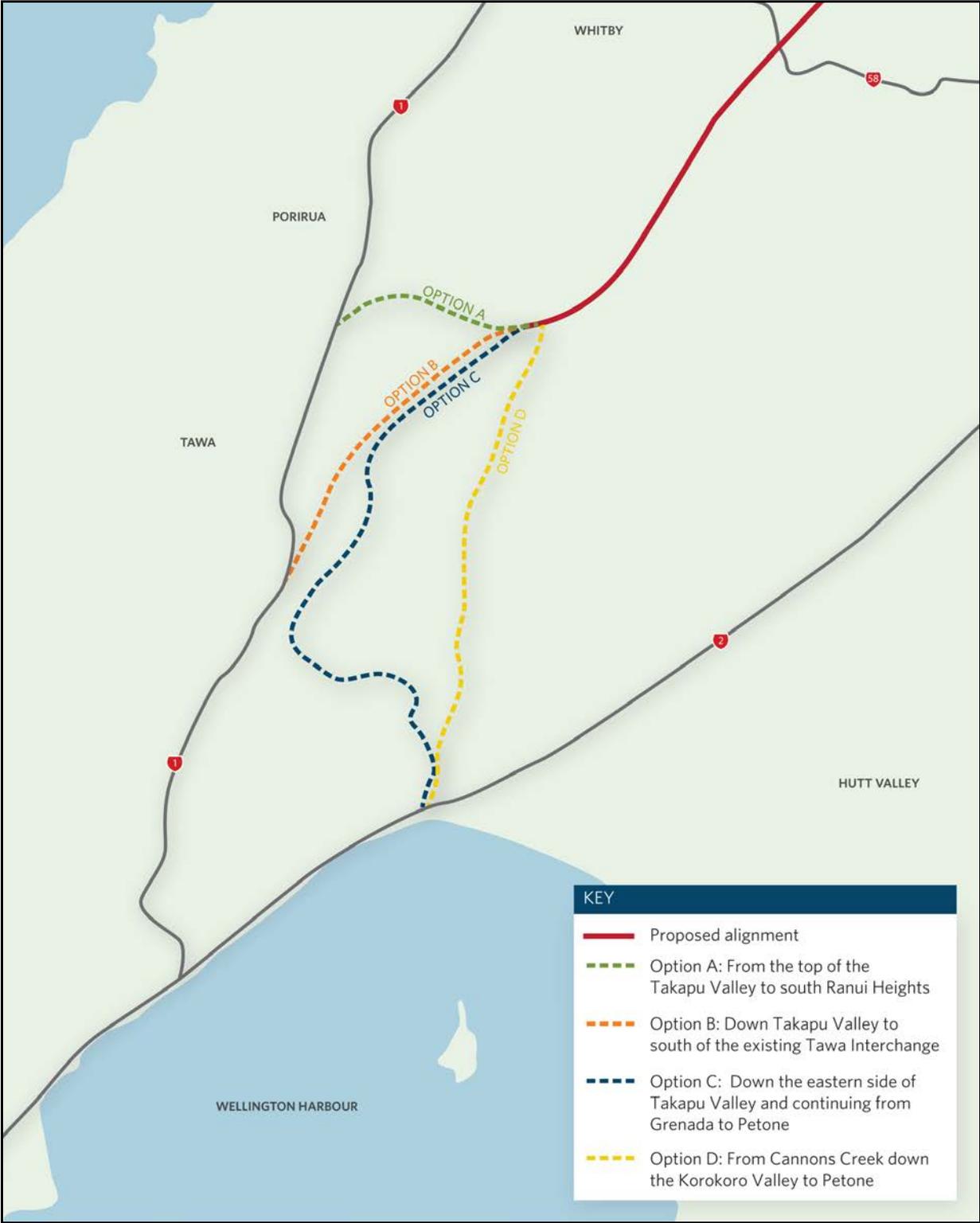


Figure 2.2: Southern connection options considered

The key findings of the evaluation<sup>21</sup> were:

- Options A and B would both provide a significant reduction in traffic on SH1;
- Option C would not provide increased relief to SH1 and would not attract extra regional traffic to the Inland Route north of Grenada; and
- Option D would likely have higher environmental impacts than any of the other options.

As a result of the first evaluation, options A and B were selected for further investigation. The ultimate conclusion of this investigation was that *there was no obvious choice between Option A (with a link to Kenepuru Drive) and Option B.*

On the basis of this finding, and previous investigations, Option A was selected as the preferred solution for the southern connection because:

- it would have fewer property impacts compared to the Takapu Valley route;
- it would likely have fewer adverse ecological impacts compared to the Takapu Valley route; and
- it would allow for the Kenepuru Link Road, which would provide increased accessibility to western Porirua and Tawa.

Consequently, an inland route from Linden to MacKays Crossing (including a Kenepuru Link Road) was designated.

### 2.2.3 Western Corridor Study (2004 – 06)

In 2004 GWRC, in conjunction with the then Transit NZ commissioned the Western Corridor Study (WCS) as a key input into a review of the Regional Land Transport Strategy. The Western Corridor<sup>22</sup> is one of four transport corridors in the region with the other three being: Hutt; Ngauranga to Airport; and Wairarapa. Similar to the earlier GATS review, this study found that “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”<sup>23</sup>. The broad options considered for the Western Corridor roading solution were either an upgrade of the existing SH1 or construction of an alternative inland route.

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21. State Highway 1 Inland Route: Review of the Southern Section: Report 3, Works Consultancy Services, 1991.

22. The Western Corridor refers to a transport corridor that generally follows the line of State Highway 1 and the North Island Main Trunk Railway from Otaki to Ngauranga along the western side of the Wellington region.

23. Western Corridor Plan, 2007.

The initial conclusion of the WCS was that upgrading the existing SH1 would be the best option. The consultant team, in a report to the Project Steering Group in 2005, preferred upgrading the existing SH1 as part of the entire package of transport-related proposals<sup>24</sup>. This report was reviewed by an external consultant team, who found there was considerable uncertainty over gaining the consents necessary for such an upgrade - particularly in relation to social and environmental effects.

After a call for submissions, the WCS was put before a Hearings Sub-committee. The Hearings Sub-committee made the following comments<sup>25</sup>:

*“The Sub-committee found that the Western Corridor faces a series of serious reliability, resilience and congestion problems that are impacting negatively on the region, and on the main arterial transport link between Auckland, the Capital, and the South Island.*

*All modelling and the experience of affected communities suggests that these problems are likely to increase over the next 20 years even under conservative forecasts of population and economic growth. Commuters in the Region already show strong usage of public transport. Although further modal shift from private motor vehicles to public passenger transport is desirable, this, in itself, will not replace the need for substantial upgrade of the roading infrastructure in the Western Corridor.*

and:

*The Sub-committee finds that, in the longer term, the status of the current SH1 alignment from Mackays Crossing to Linden should be reduced to meeting local traffic needs and providing a scenic route in which lower speeds and traffic volumes will prevail after the opening of TGM. The new environment would facilitate safe cycling along the route.*

and:

*The Sub-committee is of the view that many of the safety upgrades the Project Team suggest are required on the Coastal Route will be unnecessary if TGM proceeds. The reality is that affected communities and other submitters want TGM and want the current Coastal Route to be effectively a combination of a local road serving coastal communities and those wishing to use the coastal amenities of the Region. Under that scenario, the Coastal Route will effectively become a scenic route in which lower speeds and volumes will prevail. TGM will provide for those interested in fast highway and freight movement. In those circumstances, the grade separations and other proposals for the Coastal Route would be surplus to need on such a modified local and*

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24. The initial recommendation of the WCS and the Project Steering Group favouring an upgrade of the Coastal Route was based on an initial costing of the coastal upgrade of about 60% less than the final estimate. As such, it was based on incomplete information. While the initial lower cost of the Coastal Route upgrade led to it initially being recommended, Transmission Gully was always recognised as being able to provide a superior road design with less environmental and social effects than the Coastal Route.

25. Proposed Western Corridor Plan: Hearings Sub-committee’s Report, 2006. p. 1 - 4. All references to ‘TGM’ in this report effectively refer to the Main Alignment.

*scenic route. As such the costs for safety improvements along the Coastal Route during the construction and later operation of TGM should be significantly lower.”*

Following submissions and a public hearing on the WCS the original recommendation was revised and the inland route selected as the preferred option because:

- an inland route would provide greater resilience to natural hazards;
- overall, an inland route would likely have fewer adverse social and environmental impacts as compared to an upgrade of the Coastal Route; and
- upgrading the Coastal Route would increase the severance currently experienced by coastal communities along existing SH1 and would not allow for community aspirations for the Coastal Route to better provide for local vehicles and pedestrians and cyclists.

Consequently, an inland route was included as a high priority project in the final Western Corridor Plan (WCP), which was released in 2006. The WCP includes a number of recommended actions across a number of different modes to address the issues identified in the Western Corridor. Key components of the WCP are the improvements to passenger rail services and the implementation of travel demand management (TDM) initiatives. A significant upgrade of the Wellington Rail Network has been undertaken over the last three years which included many of the components outlined in the WCP<sup>26</sup>.

#### 2.2.4 Work from 2007 - now

The scheme assessment (Phase 1) of the Project's development, undertaken throughout 2007 and 2008, involved a new evaluation of the inland corridor. This involved undertaking more detailed on-site investigations than was possible when the NoRs for the existing designations were prepared. The scheme assessment considered a number of alternative alignments for the inland route, both within the existing designations and unconstrained by the existing designations. The evaluation concluded that a much improved alignment lay outside the existing designation boundaries in many places. The selected preferred alignment offered a number of benefits over the designated alignment, including:

- reduced geotechnical risks, resulting in improved route security;
- reduced ecological impacts and better opportunities for ecological mitigation;
- lower cost; and
- improved connections to the eastern Porirua road network.

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26. The Wellington Regional Rail Programme involves a package of improvement measures to the Wellington rail network, including the upgrade of the power supply systems and signals and new trains (electric multiple units known as Matangi trains). Specifically on the Kapiti (Western Corridor) Line this includes the extension of electrification and double tracking to Waikanae and the upgrade of a number of railway stations on the line. As of mid-2011, this upgrade work has been substantially completed. The net result will be a significant improvement to the level of service for rail passengers using the Kapiti Line, and indeed the wider Wellington rail network.

A draft scheme assessment report (SAR) was issued in May 2008. During Phase 2 of the Project's development the Preferred Alignment was refined to its current form (and for which designations and resource consents are now being sought).

The development of the Project through Phases 1 and 2 is discussed in further detail in Part E of this report.

## 2.3 Strategic context of the Project

On 19 March 2009, the RoNS programme was announced by the Government. The Government has identified seven RoNS, including the Wellington Northern Corridor (Levin to Wellington) RoNS. The Government has stated that the development of these roads will help grow the national economy by improving productivity in New Zealand's largest cities and surrounding regions. These key routes require significant development to reduce congestion, improve safety and support economic growth<sup>27</sup>.

The Wellington RoNS is approximately 110km in length and extends from north of Levin to the Wellington International Airport, as shown in Figure 2.3.

The objectives of the Wellington RoNS are<sup>28</sup>:

- to enhance inter regional and national economic growth and productivity;
- 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 the Wellington International Airport; and
- to improve the safety of travel on State highways.

Implementation of the Wellington RoNS programme will be ongoing over the next ten years with various sections of the route at different stages of development.

On 15 December 2009, the Minister of Transport announced that Transmission Gully (i.e. the Main Alignment) was the preferred option for the section of the Wellington RoNS between Linden and MacKays Crossing.

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27. Government Policy Statement on Land Transport Funding 2009/10 – 2018/19, 2010, p.9.

28. Wellington Northern Corridor – Project Summary Statement, 2009, p.4.

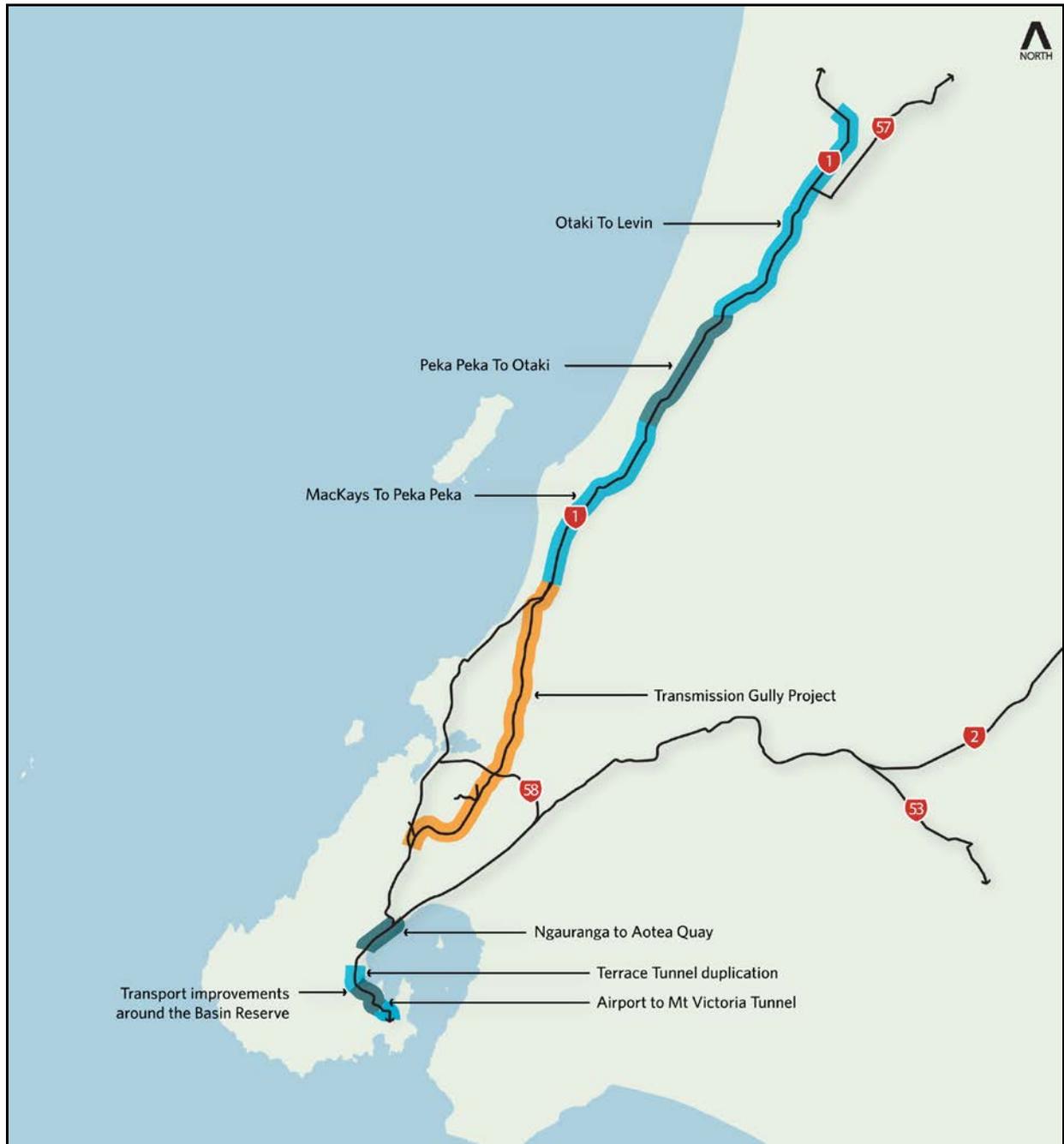


Figure 2.3: The Project within the context of the Wellington RoNS

### 2.3.1 National context

At a national level the Project fits within a number of strategic initiatives including:

- the Government Policy Statement on Land Transport Funding 2009/10 – 2018/19 (GPS)<sup>29</sup>;

29. On 26 July 2011 the Minister of Transport announced the release of the Government Policy Statement on Land Transport Funding 2012/13 – 2021/22. This will not come into force until 1 July 2012.

- the National Infrastructure Plan 2011 (NIP); and
- the New Zealand Transport Strategy 2008 (NZTS).

The GPS came into effect on 1 July 2009. It details the Government's desired outcomes and funding priorities for the use of the National Land Transport Fund (NLTF) to support activities in the land transport sector. It covers the financial period to 2014/15 and provides indicative figures for the period 2015 – 2019.

The short to medium term impacts expected to be achieved through the use of the NLTF are:

- improvements in the provision of infrastructure and services that enhance transport efficiency and lower the cost of transportation through:
  - improvements in journey time reliability;
  - easing of severe congestion;
  - more efficient freight supply chains;
  - better use of existing transport capacity;
- better access to markets, employment and areas that contribute to economic growth;
- a secure and resilient transport network;
- reductions in deaths and serious injuries as a result of road crashes;
- more transport choices, particularly for those with limited access to a car, where appropriate;
- reductions in adverse environmental effects from land transport; and
- contributions to positive health outcomes.

The GPS is also complemented by the NIP, the second version of which was released in July 2011. The NIP aims to achieve the government's vision that:<sup>30</sup>

*"New Zealand's infrastructure is resilient and coordinated and contributes to economic growth and increased quality of life."*

The NIP outlines the government's infrastructure priorities and describes the planned investment to address these. The GPS and the NIP both identify the RoNS programme as being a priority.

The Project also sits within the context of the NZTS. The NZTS was developed in 2002 and updated in 2008. It guides New Zealand's transport policy at all levels. The vision of the NZTS is that in 2040:<sup>31</sup>

*"People and freight in New Zealand have access to an affordable, integrated, safe, responsive and sustainable transport system".*

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30. National Infrastructure Plan 2011, p.11.

31. New Zealand Transport Strategy 2008, p.5.

The objectives of the NZTS are:

- ensuring environmental sustainability;
- assisting economic development;
- assisting safety and personal security;
- improving access and mobility; and
- protecting and promoting public health.

The GPS states that<sup>32</sup>:

*“The government in general terms supports the overall intent of the NZTS, but considers that moving too quickly on modal shift will have a negative impact on environmental and economic efficiency.”*

### 2.3.2 Regional context

The Project is proposed within the context of a number of inter-related regional transport strategic initiatives, including:

- the Western Corridor Plan 2006 (WCP);
- the Wellington Regional Land Transport Strategy 2010 – 2040 (RLTS); and
- the Wellington Regional Strategy 2007 (WRS).

The RLTS and the WCP both identify the Project as a high strategic priority for the region.

The WCP also contains a number of recommended actions around Transmission Gully (i.e. the Main Alignment), including that it be built as a toll road, that the existing SH1 be developed as a scenic route once Transmission Gully is open and that an east-west connection between Transmission Gully and SH2 be developed. As discussed previously, no decision has been made on whether the Main Alignment will be tolled. Similarly, the future status of the existing coastal route between Linden and MacKays Crossing, and SH58 between Paremata and Pauatahanui is being worked through with the respective territorial authorities. Furthermore, while the Project has been designed to take into account any possible future upgraded east-west connection using SH58, which is currently under investigation, there has been no commitment by the NZTA to upgrade this link and it is not part of this Project.

The RLTS was adopted by GWRC in September 2010. It is a statutory document prepared under the Land Transport Management Act 2003. It is the strategic transport document that guides the development of the region’s land transport system.

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32. Government Policy Statement on Land Transport Funding 2009/10 – 2018/19, 2010, p.11.

The vision of the RLTS is:<sup>33</sup>

*“To deliver an integrated land transport network that supports the region’s people and prosperity in a way that is economically, environmentally and socially sustainable.”*

The objectives of the RLTS are to:

- assist economic and regional development;
- assist safety and personal security;
- improve access, mobility and reliability;
- protect and promote public health;
- ensure environmental sustainability; and
- ensure that the Regional Land Transport Programme is affordable for the regional community.

The RLTS identifies the Transmission Gully Project as the preferred solution to addressing safety and performance issues associated with existing SH1 between Linden and MacKays Crossing.

In 2007 the nine local authorities of the Wellington region, collaboratively developed the WRS. The WRS has a principal aim of making the region internationally competitive, in terms of being a region with great lifestyle and job opportunities, supported by a strong economy.

The WRS identifies three focus areas for sustainable growth. They are:

- **Leadership and partnership** – Key players working together to deliver the region’s sustainable growth.
- **Grow the region’s economy, especially its exports** – Export more and become less reliant on trade within New Zealand.
- **Good regional form** – Building on the physical arrangement of our communities and how they link, and strengthening our city and town centres, matching transport decisions and land use, creating quality urban design, creating strong open spaces and recreation amenities, and providing good housing choice – essentially, making the Wellington region a great place to live, with a good quality of life.

A key aspect of the WRS is the provision of high quality, efficient transport routes to support the objectives around economic growth and good regional form. The WRS notes the importance of the Project in terms of improving the performance and resilience of the region’s State highway network. It also notes the value of the Project in terms of improving the east – west connections across the region. The benefit of improved accessibility for various areas and the potential that this creates for changes in land use is also highlighted in the Strategy.

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33. Wellington Regional Land Transport Strategy 2010 – 2040, 2010, p.2.

### 2.3.3 Context of the Porirua Link Roads

The context for the Porirua Link Roads is different to that of the Main Alignment and the Kenepuru Link Road. The Porirua Link Roads are being promoted by PCC to encourage use of the Main Alignment rather than the existing SH1 and SH58 routes and thus reduce the adverse community and environmental impacts of traffic flows on those roads. Additionally, PCC wishes to improve connectivity within eastern Porirua suburbs and support an integrated approach to regional and local land transport and development, with a particular emphasis on the development and revitalisation of Waitangirua Village Centre.

The Project is recognised in a number of district documents. For example, the PCDP notes that the Project is one of the most significant resource management issues for Porirua City. The Porirua Development Framework 2009 (PDF) was developed on the basis that the *"location and form of potential future development areas reflects an assumption that [Transmission Gully] will be built"*<sup>34</sup>. Implicit in all of these assumptions is that there will be good local road connections to Transmission Gully.

The Porirua Link Roads will facilitate access to eastern Porirua, as anticipated by the various village plans developed for this area within the context of the PDF. Of particular relevance to the Porirua Link Roads and the overall Project are the existing village plans for Cannons Creek/Waitangirua, Plimmerton, Whitby and Pukerua Bay. These village plans have been developed with the local communities and take into account both local and City-wide needs and the opportunities that the Porirua Link Roads, and the wider Project, will provide. The same will apply to those plans still in development for Paremata/Mana and Pauatahanui.

For Waitangirua the benefits include improved accessibility to other centres in the region and the opportunities for development that this can provide. For coastal communities on or close to existing SH1, such as Plimmerton and Pukerua Bay, the key benefits are a reduction in traffic volumes along the existing SH1 and the opportunities for improved local connections that this provides.

## 2.4 Benefits of the Project

The Project will provide a number of benefits. These include:

- improved **route security and resilience** of the Wellington region's State highway network;
- improved **safety** performance as compared to the existing SH1 between Linden and MacKays Crossing;
- reduced **travel times** and improved travel time reliability along key routes and increased accessibility across many parts of the region's road network;
- reduced severance for existing SH1 coastal **communities**;
- **economic development** as a result of travel time savings and improved trip time reliability; and
- improved **access** to eastern and western Porirua.

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34. Porirua Development Framework, 2009, p.6.

### 2.4.1 Route security and resilience benefits

The Project will improve the security and resilience of the region's State highway network in two main ways:

- the Main Alignment will provide increased resilience to natural hazards, as compared to the existing SH1 between Linden and MacKays Crossing; and
- the Main Alignment will provide an alternative route to the existing SH1 between Linden and MacKays Crossing.

The movement of people and goods within the Wellington region, and movement northwards in and out of the region, is heavily dependent on State highways 1 and 2 and two similarly located railway lines. Being located at the bottom of the North Island, and hence not accessible by land from the south, means that the region is extremely reliant on these northern transport connections. Of these, SH1 is the main transport route, with an annual average daily traffic volume (2010) of approximately 42,800 vehicles per day<sup>35</sup>.

Existing SH1 between Linden and MacKays Crossing is vulnerable to several threats which collectively reduce the security of this route. These threats are:

- large earthquakes causing:
  - faulting;
  - structural and/or slope failure;
  - liquefaction and/or lateral spreading;
- high rainfall events causing flooding and/or slope failure;
- tsunami and coastal storm surges;
- road traffic crashes causing delays;
- collateral damage (e.g. train accident affecting SH1); and
- operating restrictions due to maintenance works.

Figure 2.4 shows a section of existing SH1 along the coastal route which has a very high susceptibility to slope failure in earthquake events.

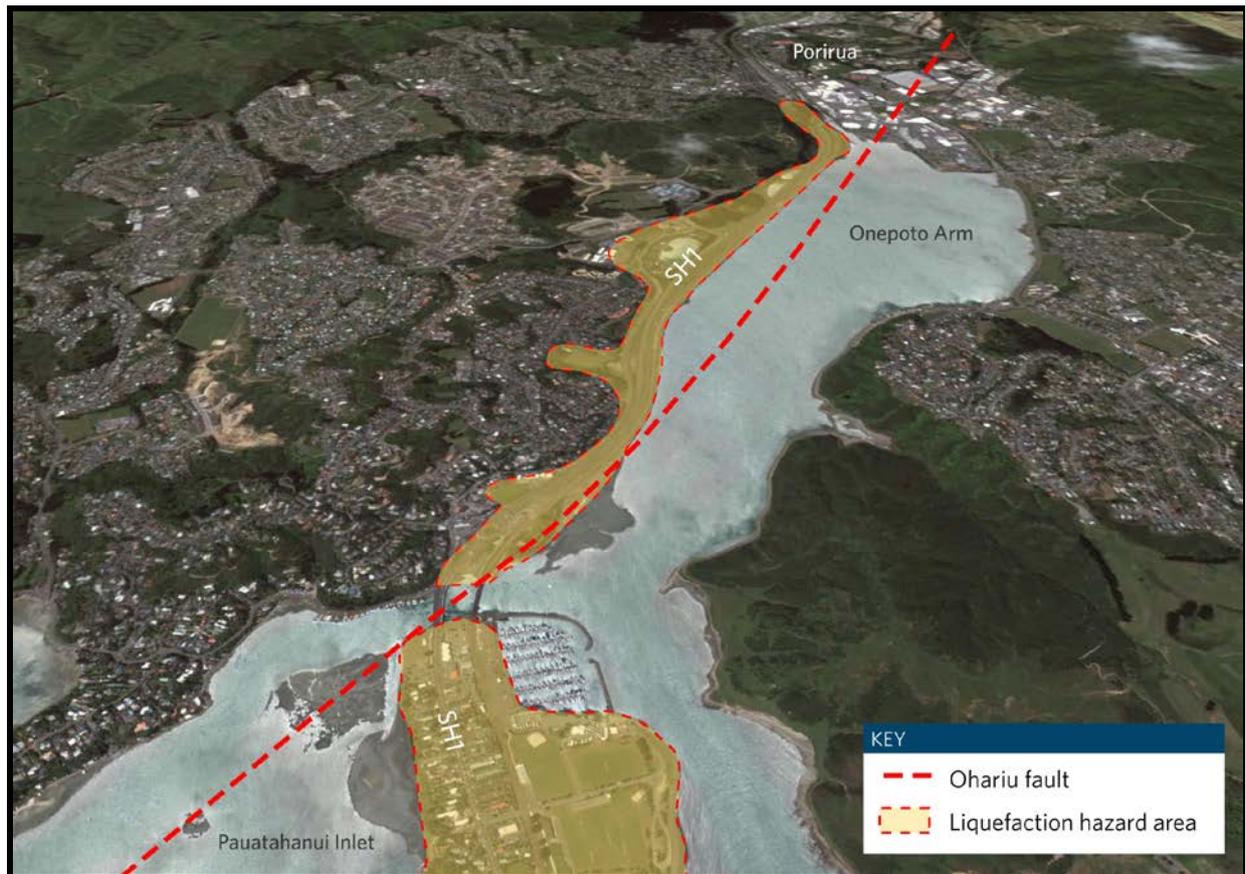
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35. Measured at SH1 (Tawa College), figures taken from the State Highway Traffic Data Booklet 2006 – 2010.



**Figure 2.4: Aerial view of a coastal section of existing SH1 between Paekakariki and Pukerua Bay**

As well as slope failure, a large earthquake would also be expected to cause significant liquefaction. For existing SH1 between Linden and MacKays Crossing the area which presents the highest risk from liquefaction and lateral spreading (and consequent ground damage) is between Porirua and Plimmerton, as shown in Figure 2.5. A large portion of this liquefaction hazard area is reclaimed land.



**Figure 2.5: Liquefaction hazard area along existing SH1 between Linden and MacKays Crossing**

Liquefaction (and associated lateral ground spreading) can cause severe damage to roads as experienced in the 1931 Napier earthquake (Figure 2.6).

In addition to the threats posed by earthquakes, the existing SH1 is also vulnerable to severe weather events such as high rainfall events and/or coastal storm surges. Existing SH1 is also vulnerable to flooding, slips and debris flow as a result of high rainfall events. At least one culvert at Paekakariki is particularly susceptible to blockage by gravel and debris. Eight potential debris-flow sites have been identified on SH1 in the Paekakariki area, and it is predicted that major flows at these sites could close SH1 for several days. The threat to the existing SH1 from severe weather events and storm surges is also likely to increase into the future due to climate change, particularly for those sections exposed to the open coast and hence vulnerable to sea level rise.

Finally, even small incidents can currently cause major traffic disruption during peak travel times. The existing SH1 is at or near capacity during peak periods and the clearing of traffic incidents can be impaired by congestion, thereby exacerbating delays.



**Figure 2.6: Damage to road from liquefaction and lateral spreading during the 1931 Napier earthquake**

#### **2.4.1.1 Resilience to major earthquakes**

It is generally recognised that Wellington will be temporarily inaccessible by land after a large earthquake, as both State Highways 1 and 2 and the adjacent railway lines are vulnerable.

As noted earlier, a number of sections along existing SH1 north of Wellington have been identified as being potentially vulnerable in the event of a major earthquake because of ground conditions, their proximity to a faultline, the steepness and stability of the adjacent topography and their liquefaction potential. In the event of a large earthquake, the section between Paekakariki and Pukerua Bay would likely be affected by one or more significant landslides. Major landslides would likely also occur at a number of other locations along existing SH1 between Linden and MacKays Crossing. Such landslides mean that SH1 would be closed for at least six months following such an event. The Paekakariki to Pukerua Bay section of existing SH1 would also be vulnerable to a tsunami after a major earthquake in the region.

The area between Paremata Bridge and Porirua could also experience liquefaction-induced lateral spreading towards Porirua Harbour. This would likely cause severe damage to SH1, probably similar to that experienced during the 1931 Napier earthquake (shown in Figure 2.6).

In addition to the damage to SH1 from ground shaking, slope failure and liquefaction, failure of the following structures is also expected:

- the Pukerua Bay Hill retaining walls; and
- the Paremata Harbour bridge (southbound).

### Summary of post- earthquake availability

Being in the same regional geological hazard context as the existing SH1 means that the Project will not be able to completely avoid the earthquake risk to the State highway network. However, it does provide an opportunity to substantially reduce the risks posed to the region's network from a major earthquake event.

As was shown recently in the Canterbury earthquakes (September 2010 and February 2011), a critical factor in the recovery from a major earthquake is the restoration of transport links. For the Wellington region this will be extremely critical, given the lack of land transport access to the City from the south. Essentially, the shorter the closure period, the more quick and effective the recovery response will be. Closure periods for the existing SH1 and the proposed Main Alignment have been estimated for the two most likely major earthquake events in the region, being:

- a Wellington Fault event; and
- an Ohariu Fault event.

The characteristics of both events are shown in Table 2.1.

**Table 2.1: Characteristics of most likely major earthquake event in the Wellington region**

Event	Richter magnitude <sup>36</sup>	Rupture displacement	Recurrence interval	Probability of occurrence in next 50 years
Wellington Fault	7.5	Horizontal: 4-6m Vertical: 1m	600 years	8%
Ohariu Fault	7.5	Horizontal: 3-4m Vertical: 0.7-1m	2,200 years	2.5%

Estimated closure periods for these two events have taken in account the geological risks and the predicted performance of both existing SH1 and the proposed Main Alignment. Full assessment results

36. The Richter magnitude scale is an open-ended logarithmic scale for expressing the magnitude of a seismic disturbance (as an earthquake) in terms of the energy dissipated in it with 1.5 indicating the smallest earthquake that can be felt, 4.5 an earthquake causing slight damage, and 8.5 a very devastating earthquake (Merriam-Webster Dictionary).

are presented in the aforementioned route security report but Table 2.2 provides a summary of the key findings.

**Table 2.2: Comparison of estimated closure periods after a major earthquake event for proposed Main Alignment and existing SH1**

Route	Ohariu Fault event		Wellington Fault event	
	Existing SH1	Main Alignment	Existing SH1	Main Alignment
<b>MacKays Crossing - Battle Hill</b>	-	2 weeks – 3 months	-	2 weeks – 3 months
<b>Battle Hill - Linden</b>	-	3 days – 2 weeks	-	3 days – 2 weeks
<b>MacKays Crossing - Pukerua Bay</b>	Over 6 months	-	3 – 6 months	-
<b>Pukerua Bay - Linden</b>	3 – 6 months	-	3 – 6 months	-
<b>Overall closure period</b>	<b>Over 6 months</b>	<b>2 weeks – 3 months</b>	<b>3 – 6 months</b>	<b>2 weeks – 3 months</b>

The results show that for both major earthquake events, the Main Alignment will result in significantly shorter closure period. Reduced closure periods will allow for a more rapid response by emergency vehicles and improved access to regional hospital facilities following a major natural disaster. It will also improve the region's ability to recover, reducing quickly the lost productivity time for the region and the country.

Although the effects of a major earthquake have been assessed, more moderate, but also more frequent events also need consideration. In moderate earthquake events, existing SH1 will be prone to significant closure and outage (of several days to weeks) due to landslides, particularly along the coastal cliffs with steep slopes.

Following the same severity of earthquake event, the Main Alignment is expected to experience only small failures which are unlikely to close the route altogether and it is expected that it will remain open and at least limited access will continue to be available.

The other main geological hazard to the State highway network along the Western Corridor is from tsunamis (whether generated by a major earthquake in the region or otherwise).

Small and medium tsunamis (up to 5m run up) could inundate and damage both existing SH1 and the railway adjacent to the coast, due to debris deposition, and possibly local scouring and pavement damage. A larger tsunami (greater than 5m run up) would cause major scouring, erosion and deposition of debris on the coastal highway, danger to traffic and probably loss of life. Data from the Kapiti area indicates tsunami events of this size have a return period of between 400 and 650 years<sup>37</sup>.

37. Cochran, U. What evidence for paleotsunami triggered by local earthquakes in the Wellington Region of New Zealand. Proceedings of Petropavlovsk-Kamchatsky Tsunami Workshop, Moscow, September 2002, pp. 9-16; and Kapiti Coast District Council. Kapiti Coast Erosion Draft Management Strategy: Chapter 4- Tsunami Risk (prepared for KDC by J Goff, GeoEnvironmental Consultants). 2004.

Relocation of SH1 inland (i.e. the Main Alignment) will eliminate the tsunami risk posed to the network between Linden and MacKays Crossing<sup>38</sup>.

#### 2.4.1.2 Resilience to severe weather events and other events

As well as the Main Alignment having a greater level of resilience than the existing SH1 against geological hazards, it will also reduce the risk posed by other natural hazards (such as flooding) and events such as road crashes. Currently there is no viable alternative State highway route between Linden and MacKays Crossing. Together with the existing SH1, the Project will introduce increased route security into Wellington's State highway network by providing an alternative route. Significant traffic delays result where there is no alternative access route, whether due to a natural event or otherwise. By having an alternative access option available, traffic can be diverted to other parts of the network, rather than stopped, for the duration of the closure.

#### 2.4.2 Safety benefits

Some sections of the existing SH1 between Linden and MacKays Crossing have higher than expected crash severity, while other sections have substantial numbers of intersection related crashes. Overall, existing SH1 between Linden and MacKays Crossings has one of the highest rates of fatal/serious crashes per kilometre in the country.<sup>39</sup>

The Project is expected to significantly improve this safety performance by providing an improved vertical and horizontal alignment on the new road, as compared to existing SH1. The Project will provide a State highway to an expressway standard with grade separated intersections (i.e. interchanges) and continuous median barrier separation for northbound and southbound traffic. The road safety performance which can be achieved for the Project is greater than would be possible through retrofitting of the existing SH1.

The Project will also deliver a safer traffic environment along the existing SH1 due to the significant reductions in traffic volumes predicted. A large volume of through traffic will be removed from urban areas and coastal settlements along SH1. While the final treatment of the existing SH1 has yet to be determined, it is likely that one or more of the following options will be possible:

- traffic calming mechanisms;
- reduced operating speeds;
- intersection improvements;
- improved pedestrian access; and
- improved cycle networks.

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38. It would also mean that no part of the State highway network in the region was exposed to the open coast (noting that in Wellington City parts of the network are on the coastline but are all within Wellington Harbour).

39. KiwiRAP, New Zealand Road Assessment Programme, 2008.

Overall, the Project will improve safety for road users and for communities along the existing SH1.

### 2.4.3 Travel time benefits

The current level of service (LOS) along the existing SH1 section is poor, particularly during commuter and holiday peak periods. This results in substantial delays and queues, both for through traffic on SH1 at the urban communities of Paremata, Mana, Plimmerton and Pukerua Bay and for side road traffic entering SH1. This is predicted to worsen significantly into the future, as the volume of traffic increases.

The Project will result in significant travel time reductions for journeys between Linden and MacKays Crossing as well as for journeys involving part of the Main Alignment route and / or the Kenepuru Link Road or the Porirua Link Roads. The time predicted savings vary depending on the origin and destination of the journey and the time of day the journey is made. Table 2.3 shows the predicted time savings for a number of key journeys at peak times<sup>40</sup>.

**Table 2.3: Travel time reductions resulting from the Project at peak times**

Journey	Travel time reductions as a result of the Project	
	Minutes	Percentage
Morning (AM) peak		
MacKays Crossing to Linden	9.6	36%
MacKays Crossing to SH2 (Haywards)	10.3	36%
Paraparaumu to Waitangirua	9.6	33%
Whitby to Wellington	3.0	9%
SH58 East to Kenepuru Hospital	4.6	22%
Evening (PM) peak		
Linden to MacKays Crossing	18.5	52%
SH2 (Haywards) to MacKays Crossing	10.5	35%
Waitangirua to Paraparaumu	14.1	42%
Wellington to Whitby	2.7	9%
Kenepuru Hospital to SH58 East	4.0	19%

In addition to reducing travel times for a number of key journeys, the Project will also result in a very substantial reduction in travel time variability.<sup>41</sup> Currently, travel time variability on existing SH1 between Linden and MacKays Crossing is five minutes in the morning (AM) peak and nine minutes in the evening (PM) peak. The Project will virtually eliminate this, with variability predicted to be reduced to less than 15 seconds for both peaks.

The Kenepuru Link Road and the Porirua Link Roads will increase the accessibility of western and eastern Porirua, respectively. These link roads will provide more efficient connection to the State highway

40. Peak times are discussed more fully in **Technical Report 4**, but the AM peak is 7am to 8am while the PM is 5pm to 6pm.

41. Travel time variability is the difference between trip times for the same journey and is given as the standard deviation from the average travel time. A low value indicates that road users can expect more consistent journey times for any given trip made at any given time of the day.

network for these areas of Porirua, allowing improved access to SH1, SH58 and SH2. This will provide faster access from Porirua to Wellington City, the Hutt Valley and the Kapiti Coast. This is reflected in travel time reductions for these journeys. A full assessment of the traffic and transport effects of the Project is provided in Chapter 13 of this report.

#### 2.4.4 Community benefits

The Project will provide benefits for surrounding communities. For the coastal communities, it will enable the existing SH1 route between Linden and MacKays Crossing to become more accessible to local residents through reducing traffic volumes, improving access and creating the opportunity to provide for safer walking, cycling and public transport along the existing route.

The reduction in traffic volumes will also help to reduce severance of the communities along the existing SH1, for example in Paremata, Mana, Plimmerton and Pukerua Bay. Similarly, traffic reductions through Pauatahanui village will reduce the severance experienced by this community. In these areas it is very difficult for pedestrians, as well as vehicles, to cross roads with high traffic volumes, resulting in severance and restricted accessibility to residential areas, community facilities and schools.

The Project will also bring benefits to the communities located near the Main Alignment. As noted above, the Kenepuru Link Road and the Porirua Link Roads will increase the accessibility of western and eastern Porirua, providing more efficient connection to the State highway network and allowing improved access from Porirua to Wellington City, the Hutt Valley and the Kapiti Coast. This would enable access to employment, shops, recreation, social support and health services for these communities.

The Waitangirua Link Road will reinforce the role of the Waitangirua Village Centre as a focus for activity in this community, while the Whitby Link Road will improve accessibility to Whitby. Construction of the Kenepuru Link Road will improve connectivity between eastern and western Porirua by providing relief to the existing Mungavin bridge and interchange.

A full assessment of the social impacts of the Project is provided in Chapter 27 of this report.

#### 2.4.5 Economic development benefits

The Project will provide a number of economic benefits. It will better enable SH1 to deliver its national and strategic functions of providing a safe, integrated, efficient and responsive route for the movement of goods and people. This will increase efficiency for all road users (including inter and intra-regional freight movement) through travel time savings, reduced congestion and improvements to travel time reliability (as shown by the substantial reduction in travel time variability). In addition to travel time savings, private and fleet operating costs will be reduced by more efficient fuel use and shorter trip distances.

Access to areas such as parts of the Hutt Valley and eastern Porirua will also be enhanced. Improved levels of accessibility could create opportunities for land use development, although it is recognised that this is controlled by the land use provisions in district plans. Construction of the Kenepuru Link Road will provide a more direct connection into Porirua town centre, as well as Broken Hill and Elsdon

industrial estates from Wellington, the Hutt Valley and centres further north. Opportunities for land use development will also be created along the existing SH1 route.

## 2.5 NZTA and PCC objectives

The NZTA and PCC each have specific objectives for their individual projects (i.e. the NZTA Project and the PCC Project), which together make up the Transmission Gully Project.

### 2.5.1 NZTA objectives

The NZTA's objectives for the NZTA Project are:

- to provide an alternative strategic link for Wellington that improves regional network security;
- to assist in remedying the safety concerns of, and projected capacity problems on, the existing State Highway 1 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
- to assist integration of the land transport system by enabling the existing State Highway 1 to be developed into a safe multi-functional alternative to the proposed strategic link.

### 2.5.2 PCC objectives

PCC's objectives for the PCC 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 Transmission Gully for regional and inter-regional trips as opposed to the existing State Highway 1 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 Transmission Gully for regional and inter-regional trips, as opposed to roads directly adjacent to the Pauatahanui and Onepoto Inlets 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; and
- to support the development and revitalisation of Waitangirua Village Centre as a focus for activity within the community by improving connectivity.