NZ TRANSPORT AGENCY
WAKA KOTAHI

Roads of national significance

1 Wellington Northern Corridor

Peka Peka to Otaki Expressway

# Scheme Assessment Report Addendum

January 2012

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NZ Transport Agency
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**Quality Assurance Statement**

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**Revision Schedule**

| Rev. No | Date | Description | Prepared by | Reviewed by | Approved by |
|---|---|---|---|---|---|
| 1 | September 2011 | Draft Report | Sam Thornton | Tony Coulman | David Dunlop |
| 2 | January 2012 | Updated following review and comment | Sam Thornton | Gareth McKay | Tony Coulman |

# Contents

**List of Abbreviations**

| | |
|---|---|
| AADT | Average Annual Daily Traffic |
| AEE | Assessment of Environmental Effects |
| AEP | Annual Exceedance Probability |
| ANZSIC | Australia and New Zealand Standard for Industrial Classification |
| CAS | Crash Analysis System |
| CBD | Central Business District |
| EPA | Environmental Protection Agency |
| GNS | Geological and Nuclear Sciences |
| GWRC | Greater Wellington Regional Council |
| HCV | Heavy Commercial Vehicle |
| HPT | Historic Places Trust |
| IPCC | International Panel on Climate Change |
| LTMA | Land Transport Management Act 2003 |
| KCDC | Kapiti Coast District Council |
| M2PP | MacKays to Peka Peak Expressway |
| MEC | Modified Employment Count |
| MfE | Ministry for the Environment |
| MSL | Mean Sea Level |
| MWH | Montgomery Watson Harza Consultants |
| NB | Northbound |
| NIMT | North Island Main Trunk Railway |
| NIWA | National Institute of Water and Atmospheric Research |
| NO2NL | North Otaki to North Levin Expressway |
| NZS | New Zealand Standard |
| NZTA | NZ Transport Agency |
| Opus | Opus International Consultants |
| PCU | Passenger Car Unit |
| PP2O | Peka Peka to Otaki Expressway |
| PPF | Protected Premises and Facilities |
| RFP | Regional Freshwater Plan |
| RL | Reduced Level |
| RLTS | Regional Land Transport Strategy |
| RMA | Resource Management Act 1991 |
| RoNS | Roads of National Significance |
| SARA | Scheme Assessment Report Addendum |
| SAR | Scheme Assessment Report |
| SB | Southbound |
| SH1 | State Highway One |
| SKM | Sinclair Knight Merz Consultants |
| ULDF | Urban and Landscape Design Framework |
| URS | URS New Zealand Ltd |
| WTSM | Wellington Transport Strategy Model |

# 1 Executive Summary

## 1.1 Report Purpose

This Scheme Assessment Report Addendum summarises the findings from further investigations focused around enhancing outcomes for the Peka Peka to North Otaki (PP2O) Expressway. PP2O forms part of the Wellington Northern Corridor Road of National Significance.

## 1.2 Project Overview & Background

The Wellington Northern Corridor runs from Wellington Airport to Levin and completing it will assist regional and national economic growth. The PP2O project is one of eight sections of the Wellington Northern Corridor, its location is illustrated in Figure 1-1.

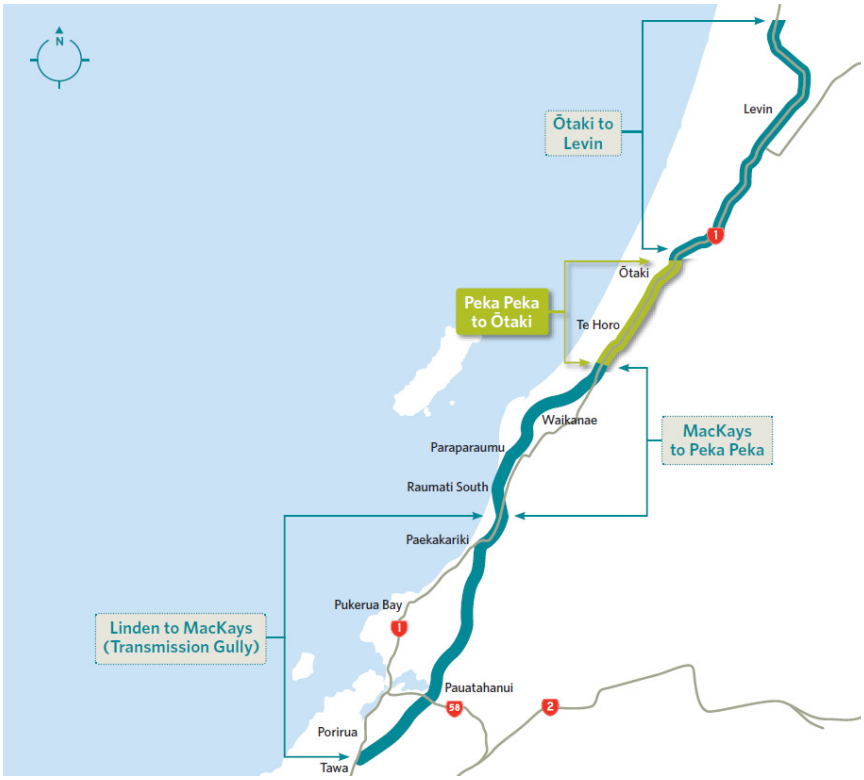



**Figure 1-1: Northern section of Wellington Northern Corridor Road of National Significance**

The PP2O project is identified as part of the first phase of projects to be constructed from the Wellington Northern Corridor. This Scheme Assessment Report Addendum decribes the process to find a preferred scheme option. The NZTA board will then use this information to decide upon the preferred option before proceeding with Resource Management Act applications for the expressway.

The PP2O scheme includes a 4-lane expressway from the northern extent of the Peka Peka interchange ramps (being developed by the MacKays to Peka Peka (M2PP) project), through to an interface with the existing State Highway 1 (SH1) near Taylors Road, a distance of approximately 13.5km. A half interchange (with local road bridge) will be provided north and south of Otaki, together with further local road bridge connections at Rahui Road, and Te Horo.

A new section of local arterial will be constructed south of Mary Crest (as the expressway alignment will sit on the location of the existing SH1) and the project scope allows for removal of the passing lanes on the existing SH1 together with tie-in works to the expressway. Any further enhancements to the existing SH1, together

with provision of a parallel walking and cycling facility (including the clip-on across the Otaki River Bridge), will be addressed as part of the SH1 revocation process.

Earlier scheme assessment reports and addendums (2002/03) have considered a range of alternative corridors, and following public consultation in 2003 and 2009 the NZTA Board adopted a preferred central corridor in December 2009. A further independent review of this process has been documented in a separate Route Options Review Report to draw all of the corridor option consideration into a single document.

The focus of this investigation and scheme assessment has been to identify options that improve on the 2009 expressway scheme and that deliver an integrated scheme that responds to current and planned urban design, environmental, cultural, land use, and community issues, including the Otaki Vision Statement.

## 1.3 Problem Description

The PP2O Project is close to the northern edge of the Wellington Corridor RoNS and is currently subject to significant traffic congestion during peak periods, particularly at weekends and public holidays, which impact on route efficiency.

The route is also currently subject to significant road traffic safety concerns (it has a high number of serious/fatal crashes, and is assessed as medium/medium-high under the KiwiRAP system), and contributes to severance between east and west communities due to high traffic volumes along the existing transport corridor. Delivery of the PP2O project will provide significant benefits in terms of improved route efficiency, safety, the opportunity to reduce community severance through the provision of safe grade separated connections which separate local and regional traffic, and a reduction in traffic (including significant through traffic) in urban areas.

## 1.4 Project Objectives

The overall project objectives can be summarised within the following statement:

*"To provide a modern 4-lane expressway that will support economic development by providing a strategic arterial route to improve trip reliability and efficiency through the Wellington region. The project will provide legible connections to Otaki township, and provide for community connections across the corridor. The expressway is to be integrated with the Otaki Vision and opportunities to enhance urban and landscape outcomes, are to be explored."*

The full project specific objectives are listed in Section 2.2 of the report. Sitting above the project objectives are a set of Wellington Northern Corridor RoNS wide RMA objectives which have been defined as follows:

- 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, and to improve the journey time reliability of travel to the section of SH1 between Levin and the Wellington Airport; and
- To improve the safety of travel on state highways.

The extent of the PP2O Project is illustrated in Figure 1- below.

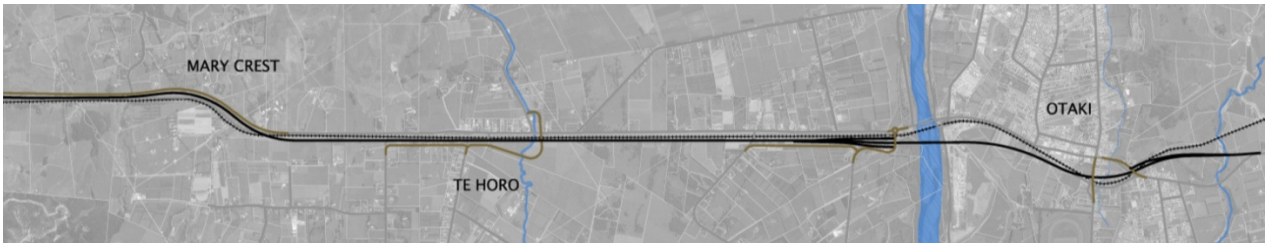



**Figure 1-2: Extent of PP2O Project**

## 1.5 Strategic Context

SH1 between Levin and Wellington Airport is one of seven RoNS which have been given top priority by the Government. The identification and development of the sevens RoNS, including the Wellington Northern Corridor, is a cornerstone of the Government's strategy to unlock economic growth potential.

The NZTA's Statement of Intent for 2011-2014 (SOI) reflects the government's priorities as set out in the Government's Policy Statement on Land Transport Funding (GPS), National Infrastructure Plan (NIP) Safer Journeys initiative and the Wellington Regional Land Transport Strategy. Within the SOI the planning for and delivery of the RoNS is the top strategic priority. As part of the Wellington Northern Corridor RoNS the SOI commits the NZTA to commencing a tender process for PP2O in the 2013/14 financial year.

Development of the PP2O scheme has also recognised the existing KCDC Otaki Vision and known developments such as the proposed Riverside 'clean tech' development and the expansion plans for Paraparaumu Airport.

## 1.6 Travel Demand Management (TDM)

The project provides improved walking and cycle facilities both across and along the corridor which should help to encourage the use of more sustainable travel modes. The reduction of traffic on the existing SH1 corridor will not only make walking and cycling a more attractive and enjoyable experience, it will also facilitate access to and from the Otaki Railway Station and improve bus operation along this corridor (using either the existing SH1 or the expressway for long distance trips). The project has also safeguarded for the duplication of the rail corridor and associated station requirements in Otaki.

Transport modelling using the Wellington Transport Strategy Model and the project specific model provides little evidence to suggest that the provision of the expressway will result in greater use of private motor vehicles within the project area, therefore having little or no impact on travel demand management targets to increase the use of trips made by sustainable modes.

## 1.7 Key Issues

The key environmental, social, cultural, and engineering aspects that have been considered in the scheme option development and assessment include:

- The requirement for a designation for both road and railway purposes, resource consents and Historic Places Act authority;
- Significant ecological bush remnant habitats identified in the vicinity of Mary Crest, together with localised bush remnants along the corridor;
- The need for high standards of stormwater treatment, in line with KCDC and NZTA's current best practice;
- The need for provision of adequate waterway capacity and hydraulic modelling at the key waterway crossings to maintain, or enhance existing flood regimes, specifically at the Waitohu Stream, Otaki River, and Mangaone Stream, together with retention of existing throttle controls on the Mangapouri Stream;
- Key social/amenity impacts relating to the Pare O Matangi Reserve, operational noise, potential visual effects, local road connectivity (particularly for access across and parallel to the expressway) and cycle/walking connectivity;
- Business viability within Otaki and the need to develop interchange configurations that provide efficient and intuitive access to and through Otaki, recognising Otaki as a destination in itself;
- Cultural values and sites along, or adjacent to the route, particularly to the north of Otaki and in the vicinity of Mary Crest and Te Horo Pa;
- Mitigation/treatment for the presence of heritage sites and buildings including the Otaki Railway Station;
- Recognition of the Otaki Vision and opportunities for integration with this;
- The need for quality architectural and urban design solutions for the key local road bridge connections to achieve aesthetically pleasing outcomes;

- Key engineering risks relating to poor ground conditions in peat areas south of Mary Crest, assumptions around the extent of material re-use, extent of bridge piling, and the extent of stormwater and flood mitigation controls; and
- A desire to optimise the expressway footprint and form to reduce effects on productive land, improve sustainability of the outcome by optimising the cut-fill balance, and to provide value for money.

## 1.8 Options Assessed

A wide range of options have been identified and assessed to respond to the key issues and objectives identified above. This included an initial scoping phase in mid-late 2010, a public consultation process in February 2011, and further option assessment and scheme development with stakeholder input following receipt of this feedback. The key options considered comprise the following:

### Expressway Connectivity

Six connectivity scenarios were developed, agreed at a stakeholder workshop, and then assessed by the team. The range of options included the original 2009 scheme, as well as options with a single point full interchange at Otaki, through to split interchanges surrounding Otaki. Following a Multi Criteria Assessment (MCAT) process two options were identified to be taken forward to public consultation in February 2011.

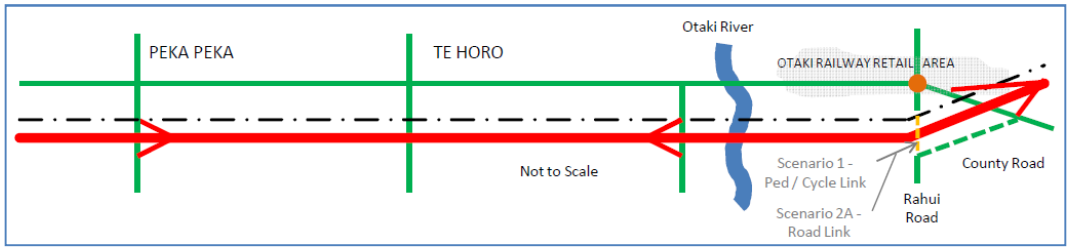



**Figure 1-3: Connectivity Scenarios taken to Consultation**

The scenario illustrated if Figure 1-3 provides a split interchange to the north and south of Otaki with either a pedestrian/cycle link, or road link at Rahui Road. These connectivity scenarios were shortlisted because they provided the best balance between improved transport outcomes, social, environmental and economic value. The provision of a split interchange on either side of Otaki also provides legible and intuitive access to and from the township while supporting the aim for future growth to be focused within the Otaki township.

In addition to the improved access to and from Otaki to the expressway, a further key benefit of the above scenarios is the removal of southbound expressway access off County Road (as included in the 2009 proposal). This reduces detour lengths for southbound visitors departing Otaki and significantly reduces County Road traffic volumes relative to the earlier 2009 proposal.

### Interchanges

**North Otaki Interchange**

Three alternative configurations were assessed for a north facing expressway access on the north side of Otaki. These included options that provided a conventional half diamond interchange (with relocated entrance to Otaki), a free flow interchange connection into the existing SH1 at the Mill Road roundabout (with the local arterial diverted via County Road), and a staggered interchange option that retained the current entranceway into Otaki.

The staggered interchange option was assessed as the clearly preferred option, and was assessed to provide the better overall transportation and social-environmental outcomes while providing the best value for money. This option received strong support from key stakeholders and in the 2011 public consultation feedback (80% support indicated), and is the recommended scheme option for North Otaki (see Figure 1-4).


**Figure 1-4: Recommended North Otaki Interchange Option**

### South Otaki Interchange

Three alternative options were assessed for providing south facing expressway access on the south side of Otaki, combined with a local link to Otaki Gorge Road. These included an option on the northern side of the Otaki River that was discounted on flood and value for money grounds, a conventional half diamond positioned at Otaki Gorge Road (requiring a loop access back to the existing SH1), and a half diamond with local overbridge located to the north of the existing Otaki Gorge Road access (providing a direct roundabout connection into the existing SH1).

A half diamond interchange with direct connection to the existing SH1 clearly provided the best economic, environmental and social outcomes, while transport outcomes were comparable for both options. This is primarily due to the fact that the option better utilises the topography to reduce visual and land effects and was assessed to provide a more legibile and better gateway for access to and from Otaki. Value engineering resulted in cutting the expressway into the ground at this location, resulting in reduced effects and an approximate saving of $8M over other options. This option received strong support from key stakeholders and the public in the 2011 public consultation feedback (87% support indicated), and is the recommended scheme option for South Otaki (refer to Figure 1-5).

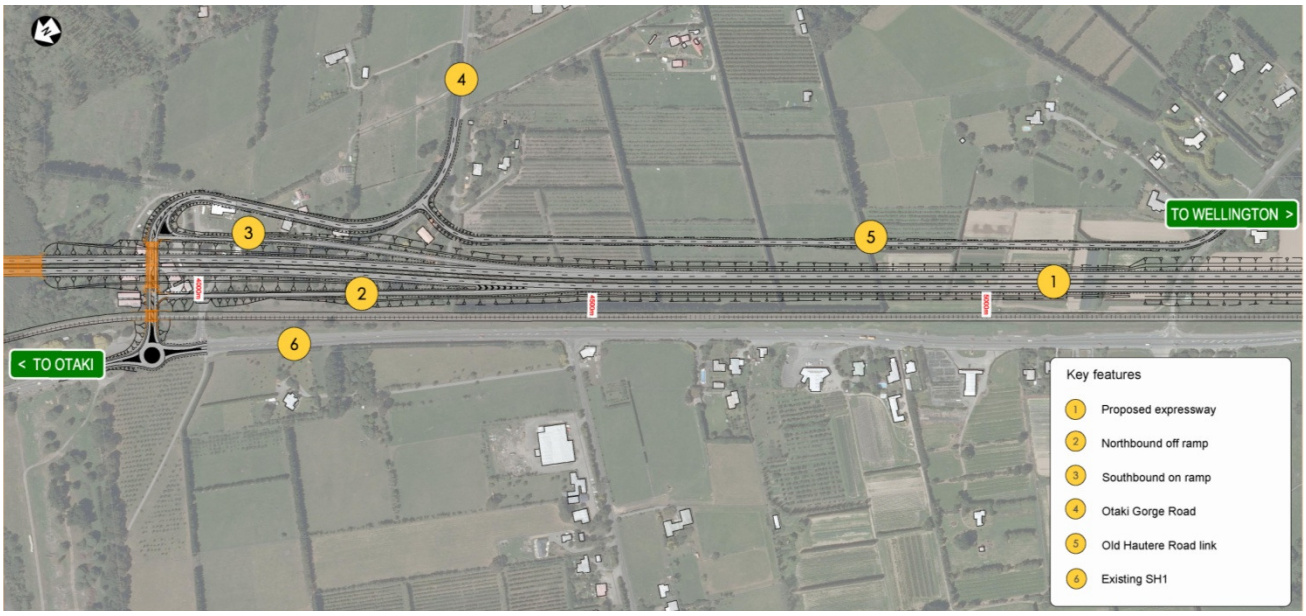



**Figure 1-5: Recommended South Otaki Interchange Option**

## Cross Corridor Connections

### Rahui Road Cross Corridor Connection

The 2011 consultation process and stakeholder feedback identified a strong community desire to retain two east-west link across the expressway at Otaki. Numerous alternative configurations were considered for maintaining these two east-west connections. These included elevated expressway proposals and submerged Rahui Road options, all of which were discounted on the grounds of technical complexity or highly significant effects.

With the recommended North Otaki Interchange providing a local bridge connection (known locally as the 'Ramp') between the Waitohu Plateau and town centre, the logical locations for a second link include Rahui or Waerenga Road. Four key options were assessed in more detail, including: a pedestrian/cycle bridge at Rahui Road, a road bridge at Rahui Road, a road bridge connecting to Waerenga Road, and an elevated expressway over an at-grade link to Waerenga Road.

A road, pedestrian and cycle bridge connection across Rahui Rd has been identified as the recommended option for maintaining two points of east-west connectivity. Improvements to the rail and expressway relationship, refined flood assessments, and changes to the eastern approach geometry allow for a reduced structure height and approach grades. This option was assessed as providing the best overall outcome in that it retains the current desire lines, has the least visual impact and is economically justified when compared to other road connection options, and provides more benefits and functionality than a pedestrian/cycle bridge at this location. This outcome has received positive support to date from key stakeholders.

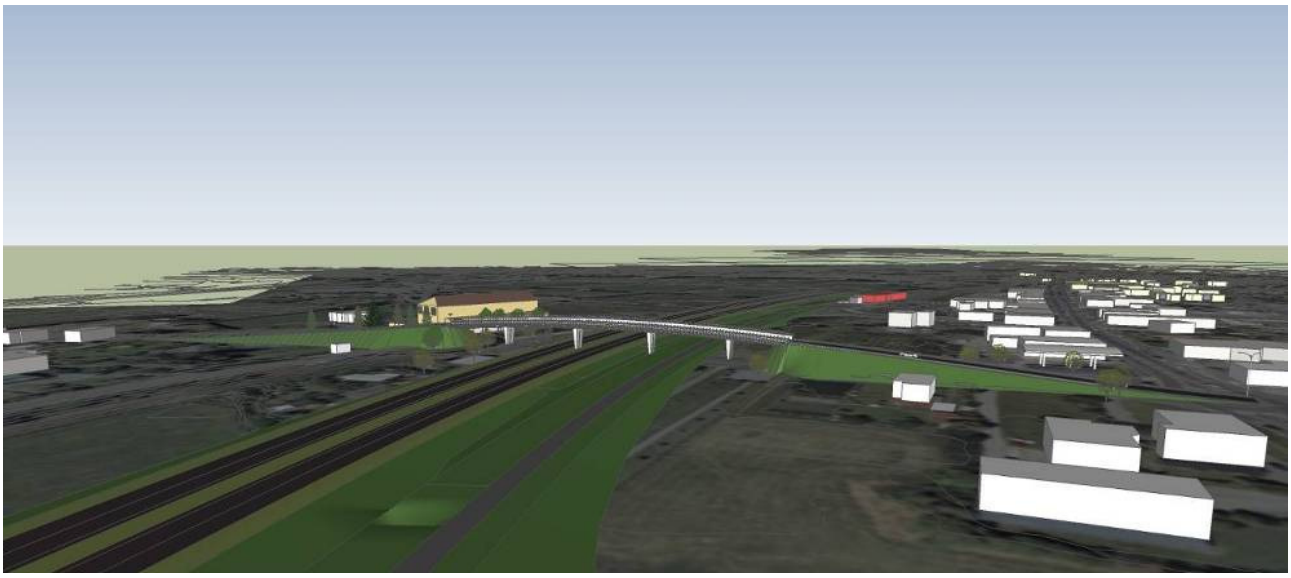


**Figure 1-6: Recommended Rahui Road Scheme Option**

### Old Hautere Road Connection

Three alternative configurations have been assessed for the treatment of the existing Old Hautere Road connection to SH1. These included a cul-de-sac, an at-grade link back to Otaki Gorge Road, and a grade separated connection over the existing rail corridor to the existing SH1.

Inclusion of an at-grade link to the south Otaki interchange and Otaki Gorge Road (refer to Figure 1-5) has been identified as the preferred option (similar to the 2009 scheme), and is economically justified over a cul-de-sac proposal. While this option provides slightly less connectivity than a grade separated crossing it delivers significantly better value for money, only marginally reduced connectivity benefits, and reduces the localised visual/landscape and property effects of introducing a grade separated structure.

### Te Horo Cross Corridor Connection

Numerous options have been considered for providing a connection between east and west Te Horo, with six alternatives taken through an Multi Criteria Assessment screening process. All options exclude any direct connection to the expressway, but provide for differing locations for a local road bridge, or subway across the corridor.

Feedback from the 2011 consultation process, including KCDC and Otaki Community Board (OCB) feedback, showed overwhelming support for an option that provides a local road bridge connection just to the north of Te Horo Beach Road (Proposal B in the brochure). The main rationale for this has been to address visual and proximity effects of the grade separated infrastructure from residences and businesses at Te Horo.

While the Multi Criteria Assessment process indicated an enhanced outcome with a proposal located to the south of the settlement (improved pedestrian/cycle connections), it is recognised that Proposal B has local support, reduced impact on residential dwellings, and shifts the grade separated structure to the north of the main settlement. The options are relatively cost neutral and on this basis, and the fact that flood management can be addressed, it is recommended that Proposal B (refer Figure 1-7) is adopted.


**Figure 1-7: Recommended Te Horo Cross-corridor Connection Option**

## Alignment Optimisation

### Mary Crest Alignment

Through the 2011 consultation and scheme assessment process areas of ecological and cultural/heritage significance were identified in the vicinity of Mary Crest. As a result, alternative locations were investigated for crossing the rail and local road corridor near Mary Crest. Three options were identified and assessed including the 2009 scheme alignment, an eastern option that crossed the railway south of the existing SH1 curves at Mary Crest, and an improved western alignment that avoided significant 200-300 year old bush remnants.

When considering ecological, heritage, social, property and cost factors a preference was identified for the improved western alignment in that it significantly reduces ecological and cultural/heritage impacts relative to the 2009 scheme, avoids a significant fill embankment that would be associated with an eastern option that crosses the rail corridor further to the south, limits impact on properties to the east of the current rail/SH1 corridor, and is more consistent with previous options presented for the corridor. This modified western alignment is recommended and has received positive responses from technical stakeholders (KCDC, GWRC, KiwiRail, HPT) and Iwi to-date (refer to Figure 1-8)

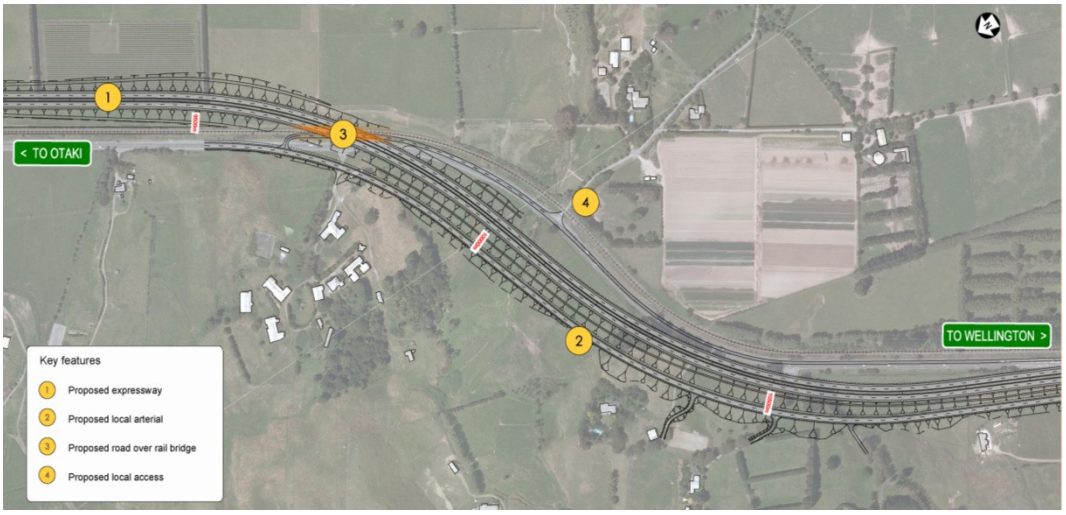



**Figure 1-8: Recommended Mary Crest Scheme Option**

**Optimisation of Earthworks Requirements**

Further value engineering during the scheme phase has optimised the expressway corridor placement relative to the railway (hence reducing land and bush remnant effects), and explored opportunities to reduce the extent of earthworks by refining the alignment, achieving an appropriate balance between barrier and clear zone provision, together with realising opportunities to better utilise areas of suitable material. A comparison to the 2011 scoping phase design (which was based on only minor improvements to the 2009 scheme) demonstrates a reduction in the fill shortfall from approximately 400,000m$^3$ to 50,000m$^3$, resulting in an approximately $10M reduction in cost over the scoping phase estimate.

## 1.9 Other Investigation Findings

### Existing SH1 and Walking/Cycling

An urban design and landscape framework has been developed to ensure that broader urban design considerations, including desire lines for non motorised users are identified and catered for. Pedestrian and cycle links are proposed at all locations in which local roads cross over the expressway, including Otaki North interchange, Rahui Road, Otaki South Interchange (Otaki Gorge Road and Old Hautere Link), and Te Horo.

The project has assumed that an off road parallel shared path and cycleway for vulnerable/recreational users will also be developed in conjunction with the project. Assessment and stakeholder meetings have concluded that the facility should be provided within the existing SH1 corridor, and not the expressway corridor, given that this is where people want to move to and from. There remains some uncertainty as to whether this should be located on the east or west side of the road. Feedback from stakeholders provides greater support for a facility on the western side, however there are a number of design, safety and value for money issues that need to be addressed.

For the purposes of this SARA it has been identified that a facility can be provided within the Existing SH1 Road corridor and it has been agreed that the project being undertaken to look at the revocation of SH1 should look at the final form of this facility in more detail.

### Potential Northbound Off-ramp Access South of Te Horo

Through the 2011 consultation several business groups identified a desire for northbound access off the expressway between Peka Peka and Te Horo with an aim to increase accessibility and traffic passing businesses south of Otaki Gorge. KCDC were supportive of this provided direct access is not provided to Te Horo as a means to manage growth pressures.

Options for a northbound (NB) off-ramp have been assessed and viable locations have been identified just north of Te Hapua Road (south of Mary Crest), or at the Peka Peka interchange. Options to the north of here were considered, but were eliminated on the grounds they would introduce significant new grade separated infrastructure, or impact significantly on identified ecological areas at Mary Crest. Assessment has highlighted that the presence of a ramp at Te Hapua Road does not provide a significant increase in trips along the Existing SH1 (estimated at only 10 more vehicles per hour in the PM peak), and results in additional ecological and property impacts. Greater benefits, with potentially lower environmental effects could be achieved with a NB off-ramp at Peka Peka, however this needs to be balanced with desires to manage growth pressures at this location and is being considered by the M2PP Project. For the purposes of PP2O it is recommended that no north bound off-ramp is located at Te Hapua Road.

## 1.10 Consultation

Consultation to-date has informed and influenced the option development and has included key stakeholder involvement (KCDC, Greater Wellington Regional Council, KiwiRail, Historic Places Trust, Iwi, OCB, Emergency Services), and community feedback on issues and options during February 2011. Initial liaison and site walkovers have also been completed with Raukawa and Nga Hapu o Otaki to enable an appreciation of local cultural values. The comments received through consultation to-date has helped shape the project and influence the design (eg. Te Horo cross corridor connection). Further consultation processes will be needed to inform the community of the scheme assessment outcomes and then to consult on mitigation measures as they are developed during the AEE phase.

## 1.11 Scheme Costs

A scheme estimate and quantified risk assessment have been completed for the preferred PP2O scheme, together with an independent parallel estimate. The expected and 95%ile estimates are $252M and $278M respectively (inclusive of property).

This estimate includes the outcomes of various basis of design and value engineering inputs. These culminated in a value for money challenge workshop and Value for Money Statement prepared for the Value Assurance Committee.

The BCR for the Wellington Northern Corridor (including agglomeration and wider economic benefits) is over 1. It is noted that without the inclusion of this project and other parts of the Wellington Northern RoNS package, the agglomeration benefits and GPS outcomes sought for this corridor may not be achieved. The funding allocation profile for PP2O has been assessed as High, High, Low.

## 1.12 Recommendations

It is recommended that the options described above are adopted as the scheme proposal for the PP2O project and that the following aspects should be considered further to provide input into the preliminary design and AEE phase:

- Take the refined options and decisions back to the public in a newsletter outlining decisions made and the process going forward;
- Undertake specific landowner consultation to ensure those newly effected or those no longer effected understand the preferred project and the decisions made, while also finalising specific private property access arrangements; and
- Progress further environmental and social/cultural assessments (including a CIA) to further inform the development of mitigation measures, and the preliminary design prior to lodging an application with the EPA.

# 2 Introduction

## 2.1 Report Purpose

The NZ Transport Agency (NZTA) commissioned Opus International Consultants (Opus) to carry out the Secondary Investigation and Scheme Assessment Report Addendum (SARA) phase for the Peka Peka to Otaki Expressway Project. This SARA builds on earlier Scheme Assessment Reports (2002 & 2003) and is focussed on identifying improvements to the form and function of the expressway and local network connections for the preferred route option adopted by the NZTA Board in December 2009.

This investigation phase has included a two stage process involving:

(a) Scoping – Investigation, identification, development and evaluation of connection options to achieve the project objectives.

(b) SARA – Further development and comparison of options following consultation to determine the preferred option and to clearly define the project scope.

In order to identify and develop an integrated solution for PP2O these investigations have developed and assessed options in light of current best practice requirements, together with consideration of the following requirements outlined for further investigation by the NZTA Board at its December 2009 meeting:

- The form and location of the interchanges providing access to Otaki and Te Horo are reviewed, in light of the submissions received in the October 2009 public engagement;
- The requirement for signage to indicate destinations off of the State Highway is reviewed;
- The design should allow for future double tracking of the North Island Main Trunk Railway line through Otaki;
- The alignment is reassessed against current planning requirements prior to preparation the of Notice of Requirement applications; and
- The NZTA should work with Kapiti Coast District Council, the Otaki Community Board and the community in general, with a view to integrating the expressway with the proposals set out in the Otaki Community Vision document.

## 2.2 Project Definition and Objectives

The Roads of National Significance (RoNS) are 'lead infrastructure' projects – that is, they enable economic growth rather than simply responding to it. The focus is on moving people and freight between and within New Zealand's five largest population centres more safely and efficiently. The Peka Peka to Otaki Expressway (PP2O or proposed expressway) is just one segment of the proposed roading improvements along the Wellington Northern Corridor RoNS and will contribute to providing improved efficiency to encourage regional and national economic development.

As a concise statement the key project requirements and objectives can be summarised as follows:

*"To provide a modern 4-lane expressway that will support economic development by providing a strategic arterial route to improve trip reliability and efficiency through the Wellington region, whilst providing legible connections to Otaki township, and providing for community connections across the corridor. The expressway is to be integrated with the Otaki Vision and opportunities to enhance urban and landscape outcomes are to be explored."*

The scope of the project includes investigation of a new four lane expressway between Taylors Road (north of Otaki) through to a connection with the proposed MacKays to Peka Peka Expressway (M2PP) in the south (the Peka Peka interchange forms part of the M2PP project scope). Delivery of the scope includes investigation of all associated elements of the project including local road connections, interface with the existing SH1 (new local arterial), railway realignment and associated environmental, urban and landscape design considerations.

A high level set of Wellington Northern Corridor RoNS wide Resource Management Act 1991 (RMA) objectives have been defined as summarised in the following table:

| GPS | Wellington Northern RoNS | Peka Peka to Ōtaki |
|---|---|---|
| **Support economic growth** | To enhance inter-regional and national economic growth and productivity.<br><br>To improve access to Wellington's CBD, key industrial and employment centres, port, airport and hospital. | By: Providing a significantly improved transport link as an integral part of the Levin to Wellington Airport RoNS.<br><br>By: Achieving a state highway to expressway standards that connects with the Mackays to Peka Peka and Ōtaki to Levin sections of the Levin to Wellington Airport RoNS; and<br>Efficiently serving the Ōtaki township, its future development and the wider Ōtaki area. |
| **Reduce congestion** | To provide relief from severe congestion on the state highway and local road networks.<br><br>To improve the journey time reliability of travel on the section of SH1 between Levin and the Wellington airport. | By: Aligning traffic types and movements with the most appropriate route by separating through traffic from local traffic. |
| **Improve safety** | To improve the safety of travel on state highways. | By: Separating regional and local traffic, limiting access to the expressway and providing local grade separated access across the expressway at Te Horo. |

**Figure 2-1: Wellington Northern RoNS Objectives and link to PP2O**

The key project specific objectives for the Peka Peka to Otaki project are:

- To build a modern, high standard four-lane highway between Peka Peka Rd and Taylor's Rd bypassing Otaki Village, and including a new four lane bridge over the Otaki River;
- To provide high quality connections to the realigned SH1 at Otaki Village and maintain connections to local roads at Otaki Gorge, Te Horo and Gear Rd/School Rd
- To achieve high standards of design and construction;
- To provide a reliable and resilient route offering superior ride comfort, convenience and journey time savings;
- Contribute to the economic growth and productivity and significantly improve transport links to the lower North Island;
- To enhance the urban and rural landscape, where practicable, using urban design principles and environmental best practice;
- To mitigate, where practicable, the social and environmental impact of construction;
- To provide connectivity to local road networks and provide a safe experience for vulnerable road users e.g. cyclists and walkers; and
- To ensure efficient, local and stage-able interfaces with the adjacent RoNS projects to the North and South.

The priorities for the development stage of the Kapiti Expressway are to:

- Achieve an early start and early delivery as part of the Government's infrastructure package;
- Develop an integrated solution that achieves an appropriate balance between the functional performance requirements of local and State Highway traffic;
- Achieve a balance between the initial capital investment and long term maintenance by whole of life costs analysis and value engineering techniques;
- Secure statutory approvals as early as possible in the project on conditions that are acceptable to the NZTA and that minimise construction constraints whilst maximising operability of the expressway;
- Consider the social, land use and environmental impacts of the project in the context of the aspirations of territorial authorities; and
- Identify and progress opportunities for early physical works that deliver benefits and which are assessed by value for money criteria.

## 2.3 Study Area

As illustrated in Figure 2-2 the PP2O expressway project runs from the northern end of the proposed Peka Peka interchange (being investigated by the M2PP Alliance) through to Taylors Road on the northern side of Otaki a distance of approximately 13km.


**Figure 2-2: PP2O Overview Plan**

The key cross corridor local connections intersected by the route (starting in the south) include School Road/Te Horo Beach Road, Old Hautere Road, Otaki Gorge Road, Otaki River Access, Rahui Road/Mill Road and the existing SH1 rail bridge at North Otaki.

## 2.4 Strategic Context

### Roads of National Significance

State Highway 1 (SH1) between Levin and Wellington Airport is one of seven RoNS which have been given top priority by the Government. The identification and development of the sevens RoNS, including the Wellington Northern Corridor, is a cornerstone of the Government's strategy to unlock economic growth potential. The following is an extract from the NZTA website (www.nzta.govt.nz):

> *"As a small, sparsely populated country distant from world markets, New Zealand relies on a robust transport network to move people, goods and services safely and efficiently.*
>
> *Infrastructure development is one of the Government's key planks for economic growth. A key departure from road planning in the past is that the RoNS projects represent a 'lead infrastructure' approach. This means the Government is investing in infrastructure now to encourage future economic growth rather than wait until the strain on the network becomes a handbrake on progress.*
>
> *Around 92 per cent (by weight) of all freight within New Zealand is moved by road. An efficient freight industry with access to cost effective transport is vital to the competitiveness of New Zealand businesses.*
>
> *Industries that are critical to New Zealand's economy such as dairy processing, forestry and tourism are the key beneficiaries of better roads. With less time and money spent transporting goods, more investment can be made in productive assets and increasing wages which continue to fuel economic expansion.*
>
> *The RoNS projects deliver much more than faster, safer, lower cost freight links. Perhaps to an even greater degree these roading improvements will deliver agglomeration benefits to businesses. Agglomeration refers to the benefits businesses gain when they are located near each other or when the costs of interaction between them is reduced resulting in increased productivity. For example, through improved transport links businesses will gain access to a wider talent pool, specialist suppliers, knowledge and skills."*

Investment in the RoNS is expected to significantly improve access within and through New Zealand's largest cities and improve critical parts of our national freight and tourism routes.

Key economic impacts the Government expects to achieve through investment in New Zealand's transport system in the next three years are:

- 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; and
- A secure and resilient transport network.

The NZTA's Statement of Intent for 2011-2014 (SOI) reflects the Government's priorities as set out in the Government's Policy Statement on Land Transport Funding (GPS), National Infrastructure Plan (NIP) Safer Journeys initiative and the Wellington Regional Land Transport Strategy. Within the SOI the planning for and delivery of the RoNS is the top strategic priority. As part of the Wellington Northern Corridor RoNS the SOI commits the NZTA to commencing a tender process for PP2O in the 2013/14 financial year. In the development of the PP20 project the project team has considered each of the key strategic priorities staetd in the SOI:

- Planning for and delivery of Roads of National Significance (RoNS);
- Improving the Road Safety System;
- Improving Customer Service and Reduce Compliance Costs;
- Improving Effectiveness of Public Transport; and
- Improving the Efficiency of Freight Movements

In conjunction with this we are also aware of the key focus for NZTA on providing Value for Money and this key component of our investigations is discussed further in Appendix J.

While pursuing the Government's economic growth and productivity priorities, NZTA is also required to deliver on the purpose and objectives of the Land Transport Management Act 2003.

PP2O is close to the northern edge of the Wellington Northern Corridor road of national significance. The local area, regional functions to the north and the country nationally have much to gain from the potential benefits the project provides.

SH1 through the Kapiti District is the major route in and out of Wellington and for the lower North Island, linking the centres of Palmerston North, Wanganui and Levin with Wellington. The importance of an efficient highway corridor through this District has been highlighted in previous studies. Both the MacKays to Peka Peka, and Peka Peka to Otaki sections of SH1 are in the first phase of projects within the Wellington Northern RoNS project.

Each of the seven RoNS routes has had a project summary statement prepared for it. For the Wellington Northern Corridor the project summary describes the Peka Peka to Otaki Project as follows:

"The objectives of the projects in this section are to ease congestion and improve journey time reliability in Otaki as well as improve safety. The construction of a bypass, at a 100kph standard, will improve local accessibility and reduce journey time variability for local and through-traffic. This will improve the efficiency of freight and people movements between Wellington and the north, and will assist in facilitating economic productivity and growth in the area as well as improving safety".

## National Policy and Legislation

The relevant national policy and legislation for this project are as follows:

- Land Transport Management Act 2003 (Statutory);
- Government Policy Statement on Land Transport Funding 2009/10 – 2018/19 (Statutory);
- National Land Transport Programme 2009-2012 (Statutory);
- NZ Transport Strategy (Non-Statutory); and
- Transit Planning Policy Manual 2007 (Non-Statutory)
- Resource Management Act (Statutory)

- Historic places Act (Statutory)
- NZ Transport Agency Statement of Intent 2010-2013 (Non-Statutory)
- Government Roading Powers Act.
- Civil Defence Emergency Act.
- Freshwater Fisheries Regulations.

The relationship between the different pieces of national transport legislation listed above is outlined in Figure 2-3.

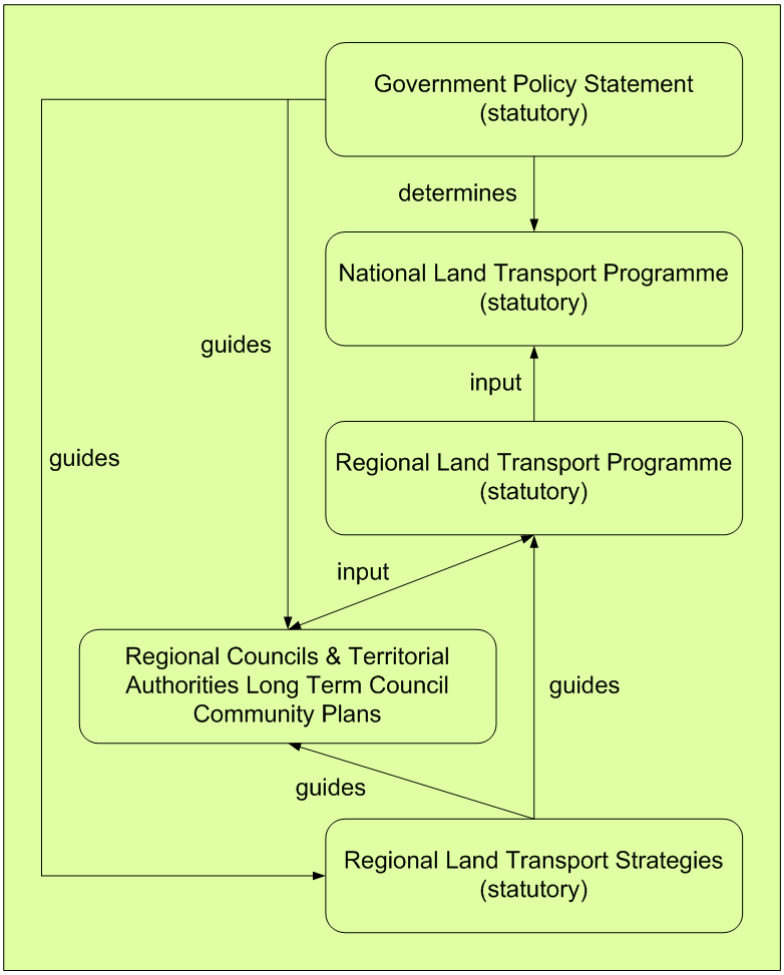



**Figure 2-3 Relationships between National Policy and Legislation**

## Regional and District Policy and Legislation

- Greater Wellington Regional Policy Statement (Statutory);
- Wellington Regional Land Transport Strategy 2007-2016 (Statutory);
- Regional Land Transport Programme 2009-2012 (Statutory);
- Wellington Regional Strategy 2007 (Non-Statutory);
- Greater Wellington 10-year Plan, 2009-19 (Non-Statutory);
- Greater Wellington Regional Cycling Plan, 2008 (Non-Statutory);
- Kapiti Coast District Plan, 1999 (Statutory – currently under review);
- Kapiti Coast District Long Term Council Community Plan (LTCCP) – "Choosing Futures", 2009, including 2011 amendments (Non-Statutory);
- Kapiti Coast District: Choosing Futures Development Management Strategy, 2007 (Non-Statutory);

- Kapiti Coast District Towards a Sustainable Transport System, 2008 (Non-Statutory); and
- Kapiti Coast District Cycleways, Walkways & Bridleways Strategy, 2004 (Non-Statutory).
- Western Corridor Plan, 2006 (non Statutory)

## Local Policy

The Greater Otaki Vision document was developed in 2004 and is a non-statutory outcome of Kapiti Coast District LTCCP "Choosing Futures". It sets out the community's vision for Greater Otaki, and aspects relevant to this project include:

Passenger Transport: That Greater Otaki has:

- Mobility services for the elderly and disabled providing access to health and social services to the north and south;
- Improved access for all the community; and
- Has an extensive network of cycleways and walkways.

Otaki Railway: Sub-regional retail function with specialist shops and railway station is developed in a way that:

- Looks at the entire area;
- Includes the Railway Station and other heritage buildings as major features;
- Provides safe access to adequate long-term parking;
- Improves the look of the streets and keeps the character of the area;
- Provides better pedestrian and cycling access from Rahui Road to Arthur Street and a possible separate road access.

Industrial Area: The Riverbank Road industrial area becomes a major commercial/industrial development and employment area of district wide significance, and is a leader in its image and products produced:

- Strongly linking the industrial area to the Railway and Main Street, so it is not a 'backwater' but is seen as part of the whole Otaki economy;
- Providing for links through the area to the river and developing a 'user friendly environment' with improved footpaths and cycling;
- Making more of the proximity of the area to State Highway 1 and to rail;
- Connect with cycleways/walkways into the residential area but avoid road connections.

Access and Road Safety: That Greater Otaki is a safe place to travel about whether cycling, walking or in a vehicle, and is a place that:

- Recognises the importance of working together on community education about road safety;
- Promotes a pedestrian and cycle friendly town;
- Has increased the number of cycle lanes and cycleway link network across the District;
- Has slowed the traffic through Main Street; and
- Considers the road safety element in all future developments and Greater Otaki Projects.

Managing Growth for Local Benefit: That there is an increased focus on the existing Otaki urban areas as places for the location of future population and employment growth, provided this happens in a way that:

- Respects the character of the town;
- Consolidates development within existing zoned residential areas; and
- Makes efficient use of town services.

## 2.5 Associated Projects

### MacKays to Peka Peka Expressway

The proposed MacKays to Peka Peka (M2PP) Expressway project connects into the southern end of the proposed Peka Peka to Otaki Expressway. The M2PP project includes construction of the Peka Peka interchange and local connection to Hadfield Road.

The M2PP project is part of the Wellington Northern Corridor, which is another of the identified RoNS projects in the Wellington area. The M2PP project will create a 13.5km four lane expressway through Paraparaumu and Waikanae, along with associated interchanges and a new four lane bridge over the Waikanae River. It has been envisioned that the construction of this and the PP2O project may overlap with one another.

The connection between the two proposed projects is particularly important as the Peka Peka interchange in the M2PP project will service northbound vehicles wanting to enter the PP2O expressway and southbound vehicles wanting to exit the expressway. The interchange will also provide a link with the proposed local road servicing properties severed by the proposed new expressway on the western side of the alignment.

The interface between the two projects has been taken to the north of Peka Peka interchange ramps (on the basis of north facing ramps at this location).

### North Otaki to Levin Expressway

The North of Otaki to North of Levin (NO2NL) Expressway project would connect into the northern end of the proposed PP2O expressway, with the border between the two projects located approximately at Taylor's Road on the northern side of Otaki. Once NO2NL is built it is envisaged that local traffic will use a parallel local arterial or service road.

The NO2NL project is also a RoNS project that forms part of the Wellington Northern Corridor. The NO2NL project covers approximately 32km from Taylor's Road north of Otaki, to south of the Manawatu River (Whirokine) bridge, south of Foxton. The route encompasses a bypass of Levin and several possible stream and rail crossings.

Given the latest timeframe for NO2NL, the PP2O project will provide for a transition back to the existing SH1 (two lanes) in the vicinity of Taylors Road. An interface at this location retains maximum flexibility for a range of NO2NL options.

### KiwiRail Upgrades

KiwiRail has recently undertaken over $550million worth of improvements to its network within the Wellington Region. A significant amount of money has been spent on double tracking and electrification of the North Island Main Trunk (NIMT) railway from MacKay's crossing to Waikanae. KiwiRail is also improving the stations at various stops along the line in preparation for the new rolling stock that is scheduled to arrive in 2011/12.

KiwiRail have recently upgraded the NIMT alignment north of Otaki, including the construction of a new bridge over the Waitohu Stream. Any new design for the railway north of Otaki will match into this altered alignment.

As part of a strategy to reduce journey times between Wellington and the north KiwiRail are also actively investigating existing speed/rail curvature deficiencies along the corridor with an aim to remove constraints. Key speed constraints exist immediately north of Otaki Railway Station, at the Otaki River bridge (north and south of river) and to the south in the vicinity of Mary Crest.

### Forest Lakes Safety Improvements

The Forest Lakes Safety Improvements are located at the northern extent of the PP20 project encompassing SH1 between Pukehou Rail Bridge and the Waitohu Stream Bridge. The project is still at

feasibility/investigation stage but it is likely to incorporate a wire rope median barrier, widening of the highway and intersection improvements at Taylor's Road and Forrest Lakes Road. A high level RoNS corridor study from Taylors Road to Pukehou Rail Bridge has been completed. It identified a preferred expressway corridor for further investigation along the existing SH corridor and concluded that the Forest Lakes Safety Improvements can be implemented prior to the construction of the expressway in 2017. These findings will be further assessed as part of the NO2NL project.

The PP2O project will consider the safety improvements and provide for an interim tie in solution ahead of the later North Otaki to Levin project.

### SH1 Revocation

The PP2O scope includes investigation of the necessary direct mitigation and tie-in works for the expressway project. These include interchange and local road connection interfaces with the existing SH1 and removal of existing passing lanes. A new section of local arterial is also to be provided south of Mary Crest where the expressway will sit on top of the existing SH1.

A separate investigation will be undertaken to identify what further works may be required as part of the existing SH1 handover to KCDC. This investigation will provide input into the existing SH1 revocation process and will encompass further consideration of a proposed off-road walking, cycling and equestrian path along the local arterial corridor. An understanding of the extent of works, or the process to be entered into (between NZTA and KCDC) will be required prior to entering the Environmental Protection Agency (EPA)/Board of Inquiry (BOI) process.

### Others

Ongoing investigations into improvements through the Otaki Town Centre have also been undertaken. These investigations have centred on ways to improve traffic flow through the town centre, and have looked at treatments such as parking restrictions and signalised pedestrian crossings. The proposed improvements are documented in the Otaki Traffic and Transportation Report.

## 2.6 Previous Investigations

### Strategy and Scheme Assessment Reports by Meritec (1998 – 2003)

In 1998, Transit NZ (now the NZ Transport Agency) commissioned Meritec to determine the most appropriate route and development options for SH1 between Himitangi and Waikanae. The Strategic Study report was presented in September 2000 and recommended a four lane highway in the existing transport corridor between Levin and Waikanae. The study also recommended that the proposed strategy was publicised and presented to the Kapiti Coast District Council, Horowhenua District Council, community boards and other interested parties before confirmation of the strategy.

In 2002, and as part of the same contract, Meritec completed a Scheme Assessment Report (SAR) for the section between North Otaki and Peka Peka Road. The report was presented as two parts comprising the Otaki Bypass and Te Horo expressway. Six route options and combinations of sub-options were presented.

In 2003, following consultation and further investigation into an alternative route for the Otaki Bypass (Te Waka Road route), the Transit NZ Board adopted an Eastern alignment for both parts of the project. The Board chose not to designate the route at that time due to funding constraints.

### Kapiti SH1 Strategic Study by Opus International (2008 – 2009)

Between July 2008 and August 2009, and under the direction of the NZTA Wellington Regional Team, Opus revisited the alignment adopted by the Transit NZ Board in 2003 as part of a Strategic Study of the Kapiti Coast.

Modifications were made to remove the proposed interchange at Te Horo to limit growth pressures and to alter the on/off ramps around Otaki. Public engagement for this section was combined with the consultation on options for the MacKays to Peka Peak section, and in December 2009 the NZTA Board reaffirmed the Eastern alignment for the Te Horo expressway and an Eastern Bypass of Otaki.

# 3 Problem Description

## 3.1 Traffic Characteristics

The main problem with the existing SH1, through the PP2O project area, is the severe congestion caused at peak periods, especially at weekends and over public holidays. Whilst normal journey times at other periods are within acceptable limits for the speed environment, the route experiences a degradation of levels of service when traffic volumes are high. The congestion at peak times has not allowed efficient access to local roads on the Kapiti Coast where an effective, parallel local road network does not exist at present.

Implementation of PP2O provides an opportunity for traffic congestion relief and the separation of regional and local traffic by providing an effective local road alternative.

## 3.2 Journey Time Reliability and Route Efficiency

The congestion discussed above does not allow for the smooth flow of traffic. This affects the reliability of journey times. As an illustration of the scale of the existing problem the average travel time along SH1 between Otaki (Waerenga Road) and Manakau, a distance of approximately 6.5 km, was recorded by Opus International Consultants on the Friday and Monday of Labour Weekend (24-27 October) 2008[1]. Data was collected between Waerenga Road and Manakau to ensure the survey captured, in its entirety, any delay associated with a queue on SH1 as traffic approaches Otaki. The survey was completed between 3pm and 8pm on Friday and between 12pm and 6pm on Monday to coincide with the peak travel times for the long weekend. The results are shown in Figure 3-1.

There were only minor variations in the average speed on both days, with the exception of southbound traffic on Monday where significant delays and queuing were experienced. The recorded travel times for both directions on Friday and Monday northbound are typical journey times, whereas the Monday southbound travel times coincide with the expected peak caused by people from the Wellington region returning home after being away for the long weekend. A similar delay was not experienced on the Friday in the northbound direction, but this could be due to a wider spread of travel times with some people choosing to travel throughout the day on Friday and others on Saturday.

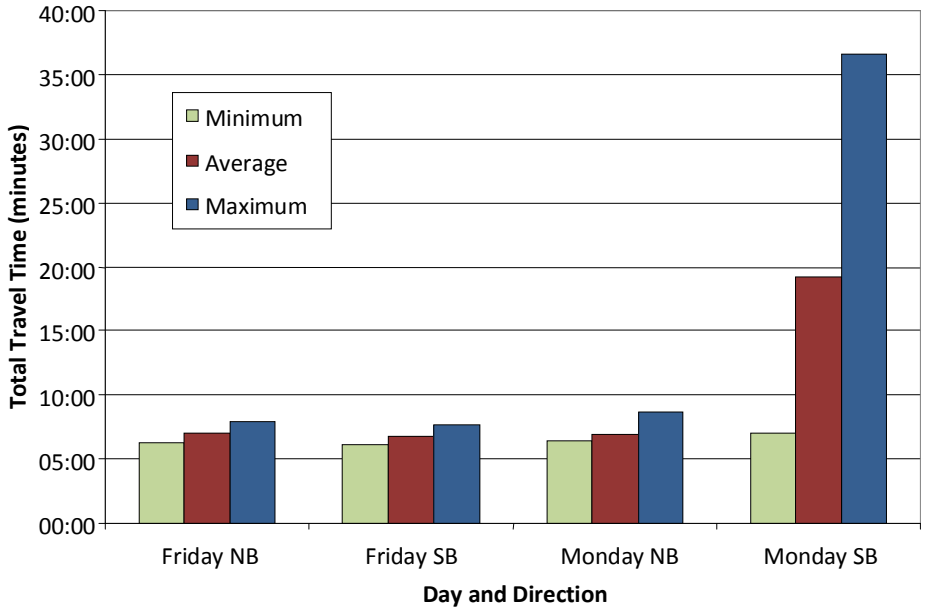



**Figure 3-1: SH1 Travel Time Otaki to Manakau (2008)**

[1] Otaki Traffic and Transportation Report, Opus International Consultants, November 2009

This lack of reliability will affect local and regional private traffic as well as efficient regional freight movements through Otaki.

## 3.3 Road Safety

The need to enhance safety for motorists travelling on the Peka Peka to Otaki route is a prime consideration for NZTA. The existing SH1 has seen a high number of crashes due to the lack of traffic separation and the number of local accesses on to the highway.

There have been 16 serious or fatal crashes on the existing SH1 through the project area between 1 January 2006 and 31 December 2010. The majority of these (11) are midblock rather than intersection related. The highest concentration of crashes has occurred in the 50kph zone through Otaki although these have generally been non-injury and low speed as you would expect in a developed area.

Of the three fatal crashes, all have occurred in the 100kph sections of the SH. One involved a vehicle turning out of a side road; one involved a vehicle crossing the centreline on a fine day and the other involved a cyclist being hit.

Further details are provided in Section 5.3. The key opportunity for the PP2O project is to provide an expressway route with median separation, no local accesses onto the expressway and a reduction in conflict between local and through traffic on the existing SH1.

## 3.4 Route Security

In the event of a serious accident or emergency on SH1, generally there are alternative routes which could be utilised. However, the Otaki River Bridge is the only bridge across the Otaki River. In the event of a serious earthquake or flooding event resulting in the Otaki River Bridge being unusable, the detour length for vehicles is significant. In this case, motorists would have to travel via SH2 through the Wairarapa.

## 3.5 Population Growth and Development Controls

The Kapiti Coast District is experiencing high growth and is one of the fastest growing districts in the Wellington Region and lower North Island. In just five years from 2001 to 2006, the population increased by nearly 10% to 46,000.

There are areas of planned development in the Otaki area which, if progressed, would place even greater demand on the use of SH1 as a commuter route. There is also increasing intensification of rural activity, particularly horticulture and viticulture industries.

The Otaki Vision document is an outcome of the KCDC Long Term Council Community Plan, also known as 'Choosing Futures'.

Section 5 of the Otaki Vision document focuses on managing growth for local benefit. It seeks an increased focus on the existing Otaki urban areas as places for the location of future Kapiti Coast District population and employment growth, provided that it happens in a way that:

- Takes a sustainable development approach;
- Respects the character of the town;
- Consolidates development within existing zoned residential areas;
- Makes efficient use of towns services;
- Encourages sustainability through grey water and rain water systems, and pollution minimisation; and
- Clearly creates work opportunities for the community.

It proposes that there is no new urban development at Te Horo Beach and the previously proposed Te Horo future urban growth area is removed, in preference to a focus on Otaki. Appropriate consideration of

interchange locations and form will be important in supporting these goals. Local population growth is discussed further in Section 4.3.

## 3.6 Amenity and Social Effects, including Walking and Cycling

SH1 currently fulfils a range of functions within the study area. These functions are often competing in nature. SH1 is the main highway link between Wellington and Auckland. Therefore it carries a high volume of through traffic and many trucks. However, within the study area it is also the only link connecting each of the communities and therefore also plays an important role providing local access.

Within Otaki there are a variety of shops and cafes located along SH1 with on street parking and pedestrian crossing facilities. The high turnover rate of the on-street parking, turning movements (to/from intersections and accesses), and high pedestrian crossing demand in Otaki results in significant delays to through traffic. The high volume of through traffic, and in particular trucks, also results in poor amenity for pedestrians and people shopping in Otaki.

Within the study area very few facilities for non-motorised users (pedestrians and cyclists) are provided along SH1. The lack of facilities, combined with truck and traffic volumes and high vehicle speeds, makes travelling along the existing SH1 undesirable for most non-motorised road users. Additionally, the distance between most destinations are too great for walking or cycling to be a viable mode of transport for many people. However, serious road cyclists are observed riding along SH1, particularly on weekends. With the construction of an expressway opportunities can be explored for improvements along the existing SH1 corridor or an alternative route along the expressway which caters to these cyclists' needs.

# 4 Site Description

This section describes the community and environment in which this project is located. It is intended to build on the material within the original SAR and also look to highlight any changes in environment, legislation or policy since the original SAR was produced. Significnat changes since the 2002 SAR investigation are highlighted at the end of each section.

## 4.1 Site Description

The project area is located along the Kapiti Coast, approximately 40km north of Wellington (see location map, Figure 4-1). The route stretches for 13km from Peka Peka Road in the south to Taylor's Road in the north. The project area comprises a mix of land uses including rural, residential, industrial, commercial and horticultural. The area surrounding Otaki township is predominantly rural, with the Otaki economy relying largely on the farming communities.


**Figure 4-1: Location Plan**

The route passes through two townships; Te Horo, a small community of approximately 640 people, and Otaki, a larger town of approximately 5,600. Otaki is the northernmost urban centre of the Kapiti Coast and Wellington Region.

The Kapiti Coast is currently experiencing high growth and is one of the fastest growing districts in the lower North Island. Planned development in the Otaki area will place greater demand on the existing road network,

and particularly on SH1 as a commuter route to Wellington. Additionally, there is increasing intensification of rural and horticultural activities.

The proposed route traverses relatively flat terrain, crossing the Waitohu Stream, Otaki River, and the Mangaone Stream.

SH1 and the adjacent NIMT rail corridor currently sever Te Horo and Otaki. At-grade SH1 connections provide east-west connections across the SH traffic flow.

## 4.2 Existing Transport Network

The key transport spine through the project area runs north – south centrally between the coast to the west and the hills to the west. The spine includes SH1 and the North Island Main Trunk Line (NIMT). Local east-west connections join this key transport spine throughout the project area.

The existing transport network is described in more detail in the sections below.

### Traffic Network

As discussed the key Traffic Network comprises a variety of east-west connections to SH1. The majority of these connections are centred on the urban centre of Otaki and Te Horo to a lesser extent. Some of the key east-west connections include School Road/Te Horo Beach Road, Old Hautere Road, Otaki Gorge Road, Otaki River Access, Rahui Road/Mill Road and the existing SH1 rail bridge at North Otaki. There are no significant north-south connections between these different communities and links, SH1 currently provides this north-south connection.

SH1 currently has priority over all except one intersection (the Otaki Roundabout) along the route. This roundabout, in conjunction with the pedestrian movements and the side friction in the railway retail precinct cause significant congestion issues, particularly during busy periods.

### Passenger Transport

Currently, bus route 290 provides service within Otaki then along SH1 to Paraparaumu Station. There are five buses per day in each direction between Otaki and Paraparaumu and an additional three buses per day, in each direction, serving only the Otaki area. Route No. 290 runs from Paraparaumu to Otaki Beach. The route followed is: SH1 to Rahui Road, Freemans Road, Te Manuao Road, SH1 to Mill Road, Aotataki Street, Riverbank Road, Rangiuru Road, Marine Parade, Koromiko Street, Ngaio Street, Tasman Road, Main Street, Mill Road, SH1 to Paraparaumu.

The Otaki Train Station is the only stop on the NIMT in the project area and is located near the centre of the Otaki Railway Retail Area. The Capital Connection train stops at Otaki Station, providing services to Wellington in the morning, and returning to Otaki in the evening. It is understood there is some desire to extend the regular service from Waikanae (where the current electrification work will finish) to Otaki. Should this occur, provision of adequate park and ride facilities and bus access to Otaki railway station will need to be considered. In addition, the station services freight trains.

### Pedestrian and Cycling Links

Observations of pedestrians crossing side streets and SH1 were made when carrying out traffic counts in July 2010.

Table 4-1 shows the locations along the route where pedestrians were observed crossing SH1[2]. Counts were undertaken in the AM Peak (7am – 9am), Interpeak (11am – 1pm) and PM Peak (4pm – 6pm). The busiest period for pedestrians was during the Inter Peak (IP) when a total of 170 pedestrians were counted crossing

[2] Locations where no pedestrians were counted crossing were: Peka Peka Rd, Hadfield Rd, Te Horo Beach Rd, Te Waka Rd Te Kowhai Rd, Te Hapua Rd, Addington Rd, Otaki Gorge Rd and Taylors Rd

SH1. It should be noted that these observations were made during winter on a weekday, and pedestrian numbers could be higher on weekends and during the summer.

**Table 4-1: Pedestrian Counts**

| Location | AM | IP | PM | TOTAL |
|---|---|---|---|---|
| School Road | 0 | 2 | 3 | 5 |
| Old Hautere Road | 0 | 0 | 1 | 1 |
| Riverbank Road | 1 | 3 | 2 | 6 |
| Waerenga Road | 4 | 28 | 22 | 54 |
| Arthur Street | 14 | 133 | 61 | 208 |
| Mill/Rahui Roads | 1 | 3 | 2 | 6 |
| Country Road | 41 | 9 | 23 | 73 |
| Te Manuao Road | 6 | 0 | 0 | 6 |
| Waitohu Valley Road | 4 | 1 | 1 | 6 |
| TOTAL | 71 | 179 | 115 | 365 |

The busiest locations for pedestrians crossing were within Otaki, which is to be expected. A total of 208 pedestrians were counted crossing SH1 at Arthur Street. This is in the heart of the Otaki Railway Retail Area and is the only point when SH1 passes through Otaki where a controlled pedestrian crossing, in the form of a zebra crossing, allows pedestrians to cross safely. The next busiest location was at the junction with County Road where 73 pedestrians were counted crossing SH1. This is a residential area just north of Otaki town where a median refuge is provided to allow pedestrians to safely cross one lane of SH1 at a time.

No cyclists were observed on SH1 during the counts.

## 4.3 Social / Community

### Population Growth

In the 2006 Census 46,200 people were recorded as living in the Kapiti Coast District. This is an increase of 8.8% since the 2001 census. The average population growth in New Zealand for the same time period was 7.8%. The historic population growth in the Kapiti Coast District is shown in Figure 4-2.

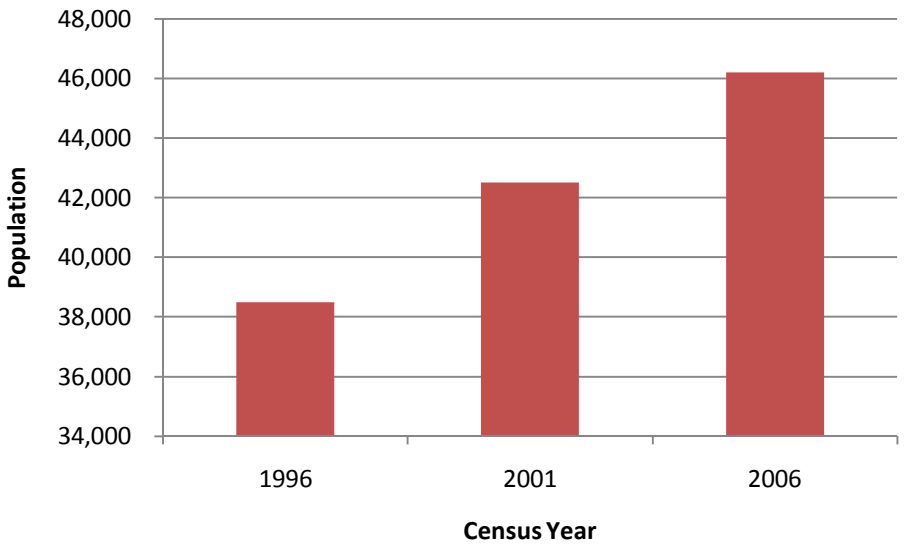



**Figure 4-2: Kapiti Coast District Population Growth**

Figure 4-3 shows the projected growth for the Kapiti Coast District. The forecast was prepared in 2001. Growth in the period 2001 to 2006 is consistent with the high growth scenario. The chart shows a medium growth projection in population of more than 30% in the coming 20 years.

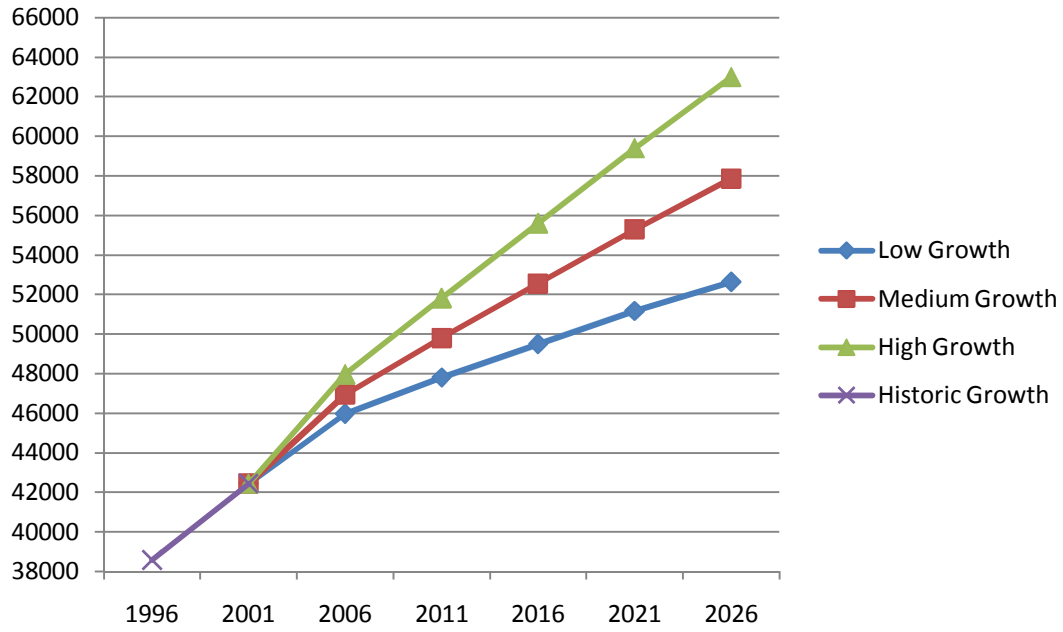



**Figure 4-3: Projected Population Growth for Kapiti Coast District**

The Wellington Region has an ageing population. The median age increased from 32 in 1996 to 34 and then 35 in 2001 and 2006 respectively. Whilst this trend is observed throughout the region, it is particularly pronounced in Kapiti Coast District where the proportion of the population aged 44 or less has decreased by 5.3% in the last ten years. The median age in Kapiti Coast District has increased from 40 to 44 in the same period.

Figure 4-4 shows the proportion of the 2006 populations of districts in Wellington of a particular age. It shows that of the four districts presented, Kapiti Coast District has the highest proportion of its population over the age of 44.

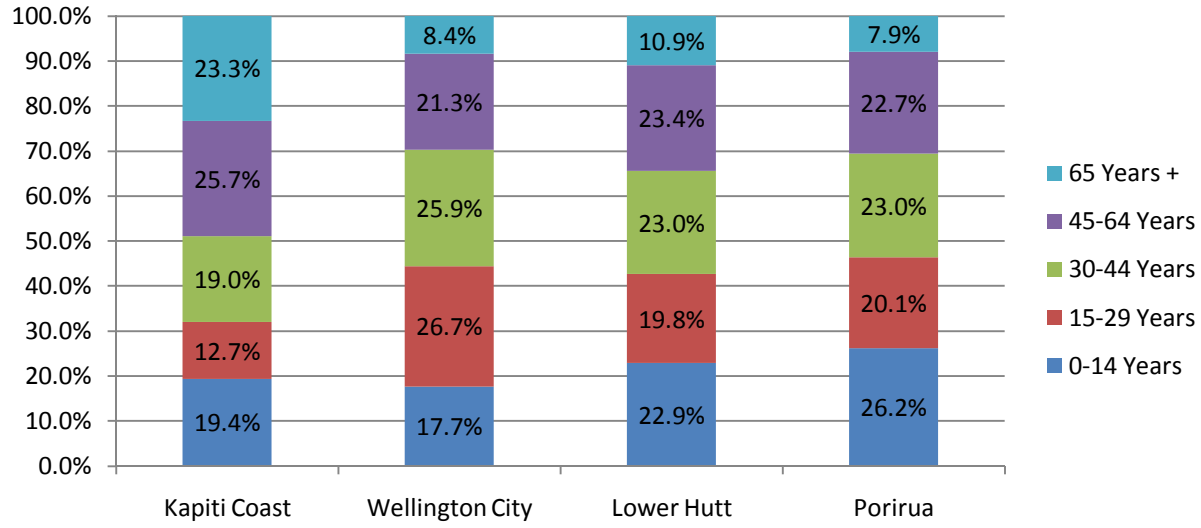



**Figure 4-4: Age of Usually Resident Population (2006 Census)**

If the Kapiti Coast District population continues to age, it may be difficult to significantly increase the proportion of trips that are made using active travel. The age of the Kapiti Coast District population also means that it will be difficult to address peak hour congestion by encouraging greater take-up of a move towards active travel. Workers over the age of 45 are often well paid and able to afford comfortable cars and parking charges. It is unlikely that large number of workers over the age of 45 will begin travelling using active modes, particularly after a lifetime of car use. If the Kapiti Coast District population continues to age then it is likely that there wil be an increased reliance on passenger transport due to medical reasons preventing the use of private motor vehicles.

Those of retirement age are even less likely to begin using active forms of transport and often travel outside peak hours.

## Employment

The unemployment rate in the Kapiti Coast District in the 2006 census was 4.8% for people aged 15 and over, compared with 5.1% for all of New Zealand.

The most common occupation group in Kapiti Coast District is 'professionals', which is also the most common grouping in New Zealand.

For people aged 15 and over, the median income in Kapiti Coast District is $23,000, compared with $24,400 for New Zealand as a whole.

**Table 4-2: Kapiti Population Statistics**

| Year | Population older than 15 | Proportion of Working Age with Income From | | |
|---|---|---|---|---|
| | | Wages, Salary, Commissions, Bonuses etc | Self-employed or Business | Total Employed |
| 1996 | 30,318 | 44% | 17% | 61% |
| 2001 | 33,552 | 45% | 16% | 61% |
| 2006 | 35,493 | 37% | 14% | 51% |

## Schools

The following discussion is illustrated in more detail in the Urban and Landscape Design Framework (ULDF), refer to Appendix M.

With respect to institutional and community land uses, education activities are well represented in the Otaki region. There are eight primary and secondary schools that fall within close proximity to the proposed PP2O route. It appears that none of these schools will be physically affected by PP2O, however, the wider impacts associated with accessibility, connectivity, safety etc. may impact on, or benefit the schools and need to be considered. These schools are a mixture of state and independent schools. In total there are approximately 1300 students attending schools within the general project area. The eight schools are identified in Table 4-3.

**Table 4-3: Schools within Proximity of the Project Area**

| School | Type | Gender | Decile | Roll | Address | Enrolment Scheme |
|---|---|---|---|---|---|---|
| Te Horo Primary | Full Primary State: Not integrated | Co-Ed | 9 | 111 | School Road, Te Horo | No |
| Otaki College | Secondary State: Not integrated | Co-Ed | 4 | 533 | Mill Road, Otaki | No |
| Otaki School | Contributing State: Not integrated | Co-Ed | 3 | 192 | Mill Road, Otaki | No |
| Waitohu Primary | Contributing State: | Co-Ed | 4 | 259 | Te Manuao Road, Otaki | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Not integrated | | | | | |
| Otaki Health Camp School | Special School State: Not integrated | Co-Ed | 1 | N/A | Health Camp Road, Otaki | - |
| St Peter Chanel School (Otaki) | Full Primary State: Integrated | Co-Ed | 3 | 43 | Convent Road, Otaki | No |
| Te Kura-a-iwi o Whakatupuranga Rua Mano | Composite (Year 1-15) State: Not integrated | Co-Ed | 3 | 92 | 143 Tasman Road, Otaki | No |
| Te Kura Kaupapa Maori o Te Rito | Composite (Year 1-15) State: Not integrated | Co-Ed | 3 | 82 | Te Rauparaha Street, Otaki | No |

In addition to the eight schools, Te Wananga-O-Raukawa (a Maori University) is also located within the general project area at 144 Tasman Road.

The approximate distances between the schools, Te Wananga-O-Raukawa and the proposed PP2O route are shown in Table 4-4.

**Table 4-4: Approximate distances to Proposed Expressway Route**

| School | Approximate distance to PP2O route |
|---|---|
| Te Horo Primary | 1.0 km |
| Otaki College | 0.4 km |
| Otaki School | 1.3 km |
| Waitohu Primary | 0.3 km |
| Otaki Health Camp School | 3.9 km |
| St Peter Chanel School (Otaki) | 2.0 km |
| Te Kura-a-iwi o Whakatupuranga Rua Mano | 2.4 km |
| Te Kura Kaupapa Maori o Te Rito | 2.3 km |
| Te Wananga-O-Raukawa | 2.4 km |

The geographic area that the schools draw their students from is likely to be relatively large due to the distances between communities and the concentration of schools in townships. As such, students may utilise various methods to get to school including walking, cycling, public transport, and private cars.

Due to the potential severance that an expressway may cause and the presence of residential areas and schools on both sides of the proposed route, accessibility and road safety will be of key concern to the schools.

Opportunities for consideration with the PP2O expressway include provision of appropriate connectivity for vehicles, walking and cycling as well as the potential benefit of a grade separated crossing at Te Horo.

**School Bus Routes**

In the study area there is one school bus route; it services Te Horo Primary School. The project team is currently liaising with the school to gain a better understanding the potential impacts of this project on the bus routing. If, depending upon student demand, the current bus route operates to or from Old Hauture Road via SH1 the bus routing will need to be revised once the expressway is constructed. The grade separation across SH1 and the elimination of the at grade railway crossings will result in benefits for all other aspects of the school bus service to Te Horo School.

## Community Facilities

There are numerous community facilities within the wider area along the PP2O route as identified in the ULDF in Appendix M. As with the schools identified above, the majority of these facilities are located within the

Otaki Township and will not be directly affected by PP2O. However, accessibility, connectivity, safety etc. are all factors that have been considered in developing options for the PP20 expressway.

**Cemeteries**

There are three cemeteries located within the Otaki township. Otaki Cemetery is located on Anzac Road and there are two smaller cemeteries on Convent Road and Te Rauparaha Street. Otaki Cemetery is located approximately 1.1km from the PP2O alignment and the two smaller cemeteries are approximately 2km from the proposed alignment.

**Libraries**

The Otaki Library and Service Centre is located in the in the centre of Otaki Town Centre. The proposed PP2O route is approximately 2km to the east.

**Swimming Pool**

The Otaki Pool is located in Haruatai Park near the middle of the Otaki Town Centre. This is approximately 700m from the PP2O route.

**Race Courses**

The Otaki Racecourse is used daily for training and frequently hosts meets. The racecourse is located just to the east of SH1 and will be approximately 300m from the PP2O route. A key consideration for the Otaki Racecourse is to provide for access across the expressway corridor for horse floats and traffic to cater for the demands on race days. There are two smaller racecourses that are still operational and/or used for training. They are located on Te Hapua Road and Addington Road to the south of Otaki. Both of these facilities are on the western side of SH1, with Te Hapua being approximately 1km from the PP2O corridor, and Addington Road being approximately 500m from the corridor.

**Parks/Reserves**

There are several parks within the Otaki Region. The Otaki Domain is near the centre of Otaki and provides playing fields and courts. Haruatai Park is located slightly to the northeast of the Domain and contains more playing fields, courts, and the Otaki Pool.

Pare O Matangi Reserve is located directly to the east of SH1 near the rail overbridge directly north of Otaki. The Pare O Matangi Reserve does not hold reserve status in the district plan, but is a green space of importance to the community. The Pare O Matangi Reserve is likely to change significantly as a result of the expressway. The reserve in its current form will be lost under the footprint of the new road.

As identified in the ULDF (Appendix M) there are opportunities to provide new reserve spaces to the east or west of the expressway which will be explored as part of the evolving landscape design development for the project.

**Churches**

There are numerous churches in the Otaki area. The majority are located along Mill Road/Main Street or on Convent Road/Te Rauparaha Street. These churches all fall approximately 1km from the proposed PP2O route. The Highway Baptist Church is located on the corner of SH1 and Te Manuao Road, approximately 150m from the proposed alignment. In Te Horo there is a church on School Road near the community hall and fire station.

**Community Halls**

The Otaki Memorial Hall is located on Main Street in Otaki. The Te Horo Hall is located on School Road near the fire station. This is approximately 400m from the proposed PP2O alignment.

**Medical**

The Otaki Medical Centre is located at 2 Aotaki Street. This is approximately 2km from the proposed PP2O alignment.

**Museums**

There are two museums in the wider project area. The Otaki Museum is located on Main Street, Otaki. The Hyde Park Museum is located on the corner of SH1 and Te Horo Beach Road.

**Police Station**

There is only one police station within the wider project area. This is located in Otaki on the corner of Iti and Matene Streets. The station is located approximately 2km from the proposed PP2O alignment.

**Fire Station**

The Otaki Volunteer Fire Station is located on Mill Road near the centre of the Otaki Township. This is approximately 2km from the proposed PP2O route. The Te Horo Fire Station is located on School Road near the community hall and it is manned by the Rural Fire Force. The fire station is located approximately 400m from the proposed PP2O route.

**Ambulance Station**

The Otaki Ambulance Station is located near the Otaki retail precinct on Dunstan Street. This places it within approximately 150m of the proposed PP2O alignment.

**Emergency Services Access**

Police and emergency services require good accessibility and connectivity in order to service the local area. PP2O has the potential to impact on these factors, however ongoing engagement with emergency services will ensure that issues such as emergency access requirements are considered. This is particularly relevant for the sections of expressway between north Otaki and South Otaki. In order to facilitate access to this section of the expressway, it is proposed that a paved area of median which allows for the wire rope barrier to be dropped and emergency service vehicles to switch lanes is identified at the end of the approach tappers for each interchange.

Te Horo Rural Fire Service have also requested emergency access to and from the expressway in the Te Horo area. It has been agreed that a restricted link from Gear Road to the expressway should be provided with a paved central median and a removable wire rope barrier to allow north bound access.

**Residential Areas**

Otaki's residential areas fall on both sides of the proposed expressway corridor. To the east of SH1 the residential area lies between Waitohu Valley Road to the north, Rahui Road to the south, and the cul-de-saves of Ludlam Way, Speranza Avenue, and Brandon Street to the east.

To the west of SH1 the residential area is mostly densely settled around Otaki. There is also an area extending westward to the coast and then along Otaki Beach.

At Te Horo, the main residential area is along School Road, there are also numerous lifestyle and larger rural blocks in the area. The remainder of the route has lower densities of population.

**Marae**

Raukawa Marae (Mill Road) and Katihiku Marae, Te Pou o Taimui Marae and Pukekaraka Marae (Convent Road) all are in the vicinity of the Otaki Town Centre.

## 4.4 Business / Economic

Otaki is the primary settlement along the alignment where economic effects may be experienced by the proposed expressway.

There are two main retail areas within Otaki: the area along the current SH1 alignment (the 'Railway Retail Area') and the area on Main Street some 1.8km north-west of SH1 (the Otaki Main Street Retail Area'). These areas are shown below in Figure 4-5.

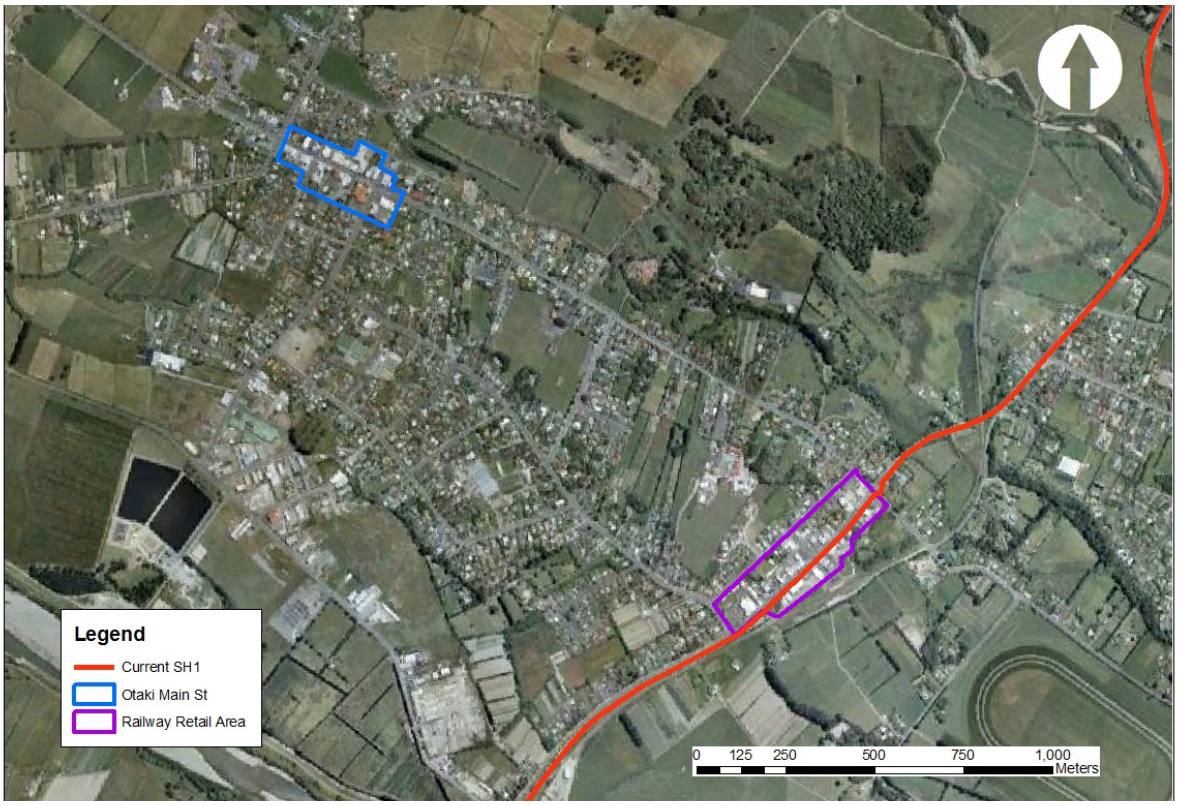



**Figure 4-5: Retail Areas within Otaki**

### Existing Business/Retail Activities

There are approximately 265 workers (MECs or Modified Employment Count, from Statistics NZ's Business Frame) employed in Otaki's Railway Road Retail Area working in 43 businesses. The largest employer is the New World supermarket in the Otaki Town Centre (nearly 100 MECs), while other businesses in the Railway Retail Area are smaller, averaging less than 5 MECs each, spread across a range of core retail, hospitality and household and health service businesses. There are a further 327 workers in the Town Centre, in 75 businesses.

Customer origin information has been collected using a sample of approximately 450 pedestrians and shoppers over a weekday and weekend period. This information confirmed that the majority of people in both Otaki Town and the Railway Retail area were from Otaki (approximately 45%, while other parts of Kapiti made up the next group at 17%). Based on this analysis, the Railway Retail Area sources a higher proportion of its custom from travellers using SH1 of approximately 65% (due to the presence of its discount/outlet stores, and location on SH1), and the Main Street area has a higher proportion from locals (57%). The actual origin of customers will be confirmed in a more detailed assessment to be completed for the AEE phase.

The emergence of outlet stores within the Railway Retail Area at Otaki has been a recent phenomenon, with most having opened since the 2002 Scheme Assessment Report was undertaken. The location of these outlet

retailers in Otaki does not appear to have stimulated any significant growth in other retail activity in the town. Changes in business numbers and employment since 2002 have been in line with business life cycles commonly observed in most retail areas[3]. The Otaki retail environment is relatively stable, with an increase of less than 10 retail and household service stores between 2002 and 2009 (Statistics NZ Business Frame).

At this stage it appears that there may be limited or no representation in many retail types in the two centres within Otaki (e.g. appliances, music, sports goods, jeweller), and residents are likely to head south to Paraparaumu or Wellington, or north to Levin for a large part of their retail needs.

Ease and legibility of access to and from the expressway to the Railway Retail Area will be a key consideration for option development and assessment.

**Changes since 2002 SAR:** Emergence of discount/outlet stores in Otaki Railway Retail Area and the Riverside 'clean tech' development.

## 4.5 Landscape and Urban Design

The landscape and urban design assessment for the project area is provided in the '*Specialist Report – Landscape and Visual*' included within Appendix BB, the '*Specialist Report – Urban Design*,' included within Appendix AA, and in further detail in the '*Urban and Landscape Design Framework*' (ULDF) included within Appendix M.

### Landform

The proposed expressway travels between the eastern foothills, and the coast, and follows a route that travels through varying environments (residential, commercial, rural, horticultural, and recreation areas) and topography.

The landform of the project area is defined by a number of strong natural features including the coastal edge, the coastal plain, the eastern foothills, and the local rivers and streams.

The floodplain around the Otaki River predominantly consists of premium flat, fertile soils which foster farming, market gardening and horticulture; all are of economic significance to the area.

### Vegetation

As a generalisation, intense agriculture has resulted in a relatively open landscape with scattered mature exotic trees, numerous shelterbelts and hedges and bands of willow common to the river and stream banks.

Indigenous vegetation is largely confined to a few small remnants, though these scattered stands of native vegetation are more common and distinctive in the Otaki Gorge Road/Old Hautere Road/Te Horo area. The proposed expressway alignment passes through stands of native mature trees and wetland in a few discrete localities along the alignment. Many of these sites are of local significance e.g. Cottles Bush. Two areas of swamp forest have also been identified near Mary Crest.

### Connectivity

State Highway 1 and the adjacent North Island Main Trunk (NIMT) rail corridor sever Te Horo and Otaki. This is particularly an issue in Otaki as there is only one main local road east-west connection (Mill Rd/Rahui Rd) providing access across the corridor. Important east-west connections across these corridors are shown in

[3] A count of business numbers from Statistics NZ's Business Frame shows that at an ANZSIC level (detailed business classification coding) there has been very little change in any individual category.

Figure4-6. The thickness of the lines represents the importance of the link. These connections need to be considered when developing options.

It is important that cross-corridor connections are legible, safe, and efficient, so that communities can still function successfully, even though local facilities and residents may be split on either side of the corridor.

The ULDF further discusses the full range of movement networks including non-motorised users of the corridor.


**Figure 4-6: Severance and Community Connectivity**

## Current and Future Land Use

The majority of the Project is currently zoned as rural, with urban activities mainly confined to Otaki and to a much lesser extent, Te Horo. The urban boundaries of Otaki are the Otaki River to the south and Waitohu Stream and Waitohu Valley Road to the north. The KCDC Otaki Vision Document outlines a desire to grow the urban centre within these containment lines.

The area surrounding Otaki is predominantly of rural character, with the economy of Otaki relying largely on the farming and horticultural communities. Following the Otaki Vision Document, the desire is for rural areas to grow with horticultural and agricultural business, rather than more residences or lifestyle developments.

On the southern edge of Otaki along the northern bank of the Otaki River, is an industrial zone, including aggregate extraction and precast concrete works. This area around Riverbank Road is the subject of a very recent KCDC plan change and is now a designated growth area with a focus on 'clean tech' industries.

There is also a proposed Otaki Lake Development, which includes the development of a lake and amenities to the north of Stresscrete, on the northern bank of the Otaki River. The proposed alignment of the expressway currently runs along the western side of the Otaki Lake area, so consideration will need to be given to how local access to the area would be achieved.

KCDC's current and future land use plans have need to be taken into consideration in the design of the expressway alignment and its interchanges- refer Figure 4-7 below.


**Figure 4-7: Current and Future Land Use**

**Changes since 2002 SAR:** Designation of Riverbank Road 'clean tech' growth area.

## 4.6 Stormwater

### Existing Physical Environment

The existing physical environment is rural for most of the route, with flat land to the west, and steep country to the east and south of Mary Crest. Waterway flow is from east to west, towards the sea. The smaller waterways are defined to the east but some lose definition as they flow to the flat land to the west (possibly subject to infiltration or artificially diverted to farm drainage channels).

The existing SH1 and rail embankment alter the natural drainage patterns. In isolated places the culverts under the rail act as a restriction, which reduces the downstream flooding risk e.g. Mangapouri Stream.

The southern two fifths of the road may be subject to debris flows, due to the small and steep nature of the catchment to the east.

The topography along the route is generally flat. The middle third of the alignment has limited locations where stormwater can be discharged to. This may result in the need for wider swales and attenuation ponds to protect the relatively small waterways.

**Catchments**

As described in Section 4.7 there are three main catchments that the alignment cuts through. These are associated with the waterways which they are named after:

- Waitohu Stream;
- Otaki River; and
- Mangaone Stream.

There are a further eight catchments in the range of 100ha to 500ha, and over ten catchments smaller than 100ha. There will be waterways (and waterway crossings and potential discharge points) associated with each of these catchments. These catchments are illustrated in the scheme plans within Volume 4 of the SARA

### Existing Regulatory/Legislative Environment

While there are no physical changes to the environment that have been identified since earlier assessments (2002 SAR), there have been significant changes to best practice expectations with respect to stormwater management.

NZTA's expectations for stormwater management have been set out in the NZTA Stormwater Treatment Standard for State Highway Infrastructure (2010). This document highlights the need to treat road runoff and to mitigate against the effects of increased downstream flooding risk and stream erosion.

KCDC's expectations have increased and are evolving. They include high expectations for mitigating flood risk as well as integration of stormwater and landscape features. KCDC have on previous projects expressed a desire for small bridges in place of culverts. Following discussions with the project ecology team it has been decided that there are no water crossings, apart from the Waitohu Steam and Otaki River, that have sufficient significance to warrant the use of a bridge in place of a culvert. The key outcomes of stormwater-focused meetings held with KCDC on 26 August 2010, 6 April and 15 June 2011 are outlined below:

- KCDC agreed that the general approach would be to: treat runoff from all new impervious areas, with no retrofit of existing roads, in general;
- KCDC are considering whether the NZTA stormwater standards meet their expectations for stormwater treatment. They consider that some catchments may warrant a higher standard of treatment than provided by the NZTA guideline, but have not provided supporting evidence at this stage;
- KCDC advised that acceptable approaches for peak flow attenuation are attenuate to pre-development levels or establish a case that effects are no more than minor;
- KCDC does not generally favour multi cell culverts on its road network due to the perceived maintenance requirement.
- The Mangapouri Stream is throttled by a culvert under the railway (possibly to 10 or 20 year flow). KCDC are keen to retain this throttle. Any new or re-configured throttle should have an easement over it to allow KCDC access for maintenance purposes.

GWRC's expectations have remained relatively constant. However their erosion and sediment control requirements are expected to be updated before resource consent is granted for this project.

**Changes since 2002 SAR:** Changes to best practice approach and to the regulatory and legislative environment.

## 4.7 Hydrology

### Otaki River

The Otaki River drains a 335km$^2$ catchment (at the existing State Highway 1 Bridge) extending back to the main divide of the Tararua Ranges. It is a major river which responds very rapidly to weather systems impacting on the mountain range. After exiting from the foothills of the Tararua Range, the river flows westwards across a coastal plain to the sea over a distance of about 9km. The township of Otaki lies on the true right (north) bank on the coastal plain.

The Otaki River incorporates a stopbank system along the true right (north) bank providing a 1% annual exceedance probability (AEP) standard of flood protection to the township of Otaki. The northern (right bank) approach embankment to the NIMT railway line bridge across the river ties into the upstream section of stopbank and has been strengthened to form part of the primary flood defence system for the Otaki Township. The stopbank continues along the right bank downstream of the existing SH1 Bridge. Super-

design floods (floods larger than the design standard) would overtop the stopbank system along the right bank upstream of the existing NIMT railway line and SH1 bridge crossings.

Natural high ground (in the form of a river terrace) confines flood flows in the river along the true left (south) bank. The Otaki River is hydraulically very steep so flood levels at the site of the proposed expressway crossing are significantly higher than at the site of the existing SH1 road bridge. The proposed expressway crossing is located approximately in line with GWRC's surveyed river cross-section 380 seen in Figure 4-8. Design flood levels for the bridge crossing are therefore based on calibrated hydraulic model predictions of flood levels at this particular cross-section from existing information provided by GWRC and on modelled projections with the new bridge in place.


**Figure 4-8: GWRC surveyed river cross-sections on Otaki River near expressway crossing**

The existing SH1 road bridge has a shorter total span length than the existing NIMT rail bridge and causes an elevated backwater effect upstream. It is recommended therefore that the minimum total span length for the proposed expressway bridge crossing should be approximately the same as the downstream rail bridge.

The proposed bridge crossing will be located sufficiently far upstream of the existing NIMT rail bridge to not cause any significant hydraulic interference (induced by wake vortices off the piers) and additional scour effects on the downstream piers of the rail bridge. However it would be desirable to roughly align the piers of the proposed new expressway bridge with the piers of the existing rail bridge if possible.

The current 0.2% AEP flood of 2130m$^3$/s for the Otaki River closely approximates the 1% AEP flood adjusted for the effects of possible future climate change to 2090 (based on the latest MfE Guidelines for a mid-range average temperature increase). For this flood flow, the predicted upper bound flood level at GWRC's cross-section 380 is ≈ RL 15.7m (MSL Wellington 1953 Datum). Bridge pier head losses could add up to 0.1m for this flood level depending on the pier geometry and number of piers.

The Chrystal's Bend extended stopbank upstream of the existing SH1 bridge protecting Otaki Township is relatively new. The design crest profile of this stopbank has been set based on current climate conditions (1% AEP design flood standard) but the stopbank cross-section profile has been defined to permit additional

raising in the future to take account of the effects of possible future climate change. There is no guarantee that the stopbank will be raised in the future so that the design of the bridge crossing needs to take account of both existing and raised stopbank situations. Consideration must also be given to super-design floods which would overtop and potentially cause breaching of the stopbank.

A minimum freeboard allowance of 1.2m is also appropriate to provide debris clearance given the heavily forested nature of the upstream catchment and the potential for debris raft formation on the piers of the expressway bridge. This would give a minimum soffit level of RL 17.1m for the proposed bridge crossing.

## Flood Hazard for Otaki River Floodplain

The proposed expressway crosses the Otaki River floodplain to the north of the existing Otaki River crossing. The floodplain incorporates known secondary flow paths for residual flows from the river, sourced either from stopbank overtopping or from flow through a stopbank breach. The proposed expressway will intersect these secondary flow paths and require it to be elevated above the floodplain.

GWRC and KCDC have produced a combined flood hazard map showing the effects of flood inundation from a 1% AEP flood in the river with some residual overflow plus the effects of a 1% AEP rainfall storm on the stormwater system servicing Otaki Township (these events are not necessarily coincident events). An extract from this combined map is shown Figure 4-9.

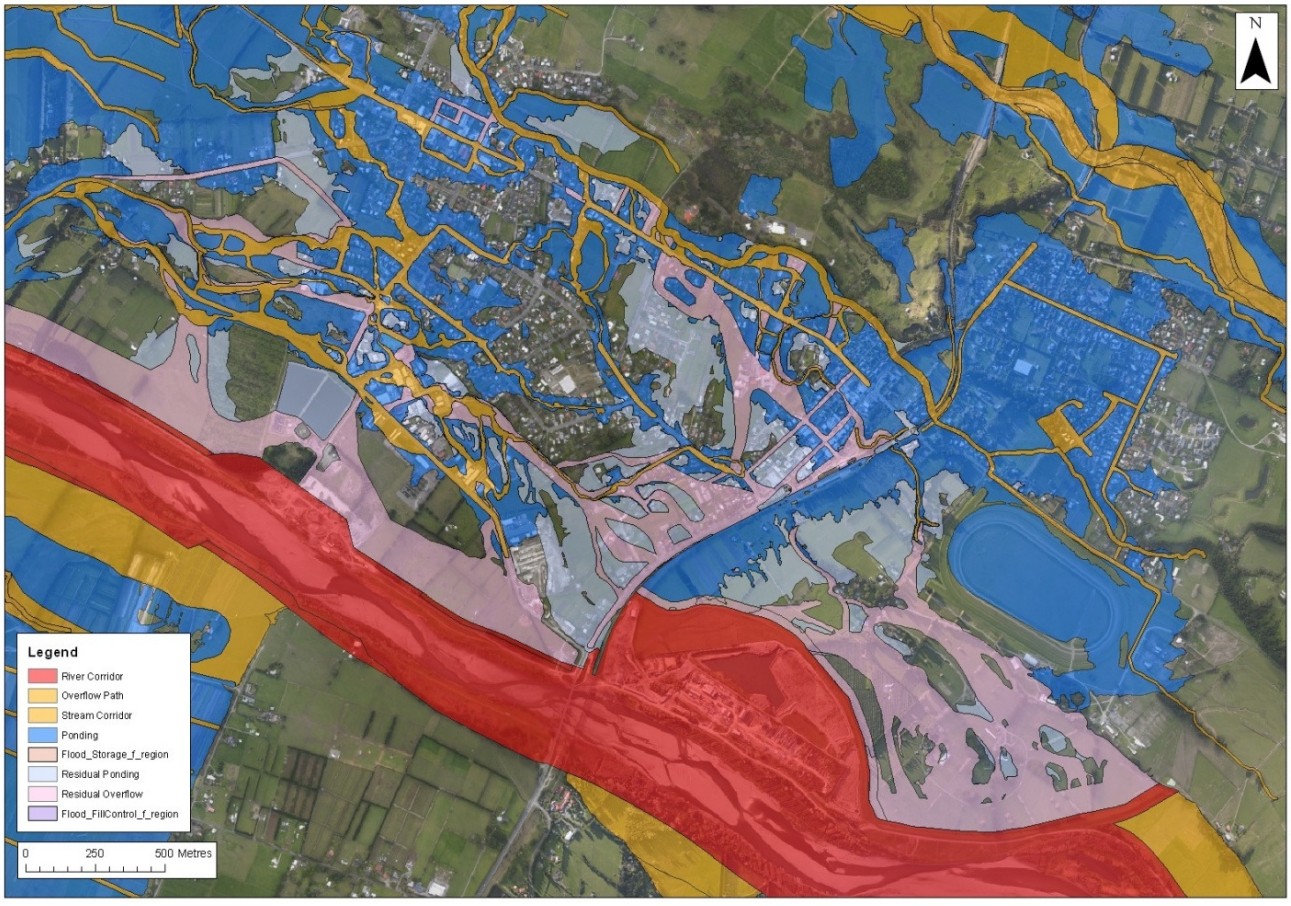



**Figure 4-9 : Extract from combined flood hazard map for effects of 1% AEP flood in Otaki River and 1% AEP rainfall storm on Otaki River floodplain (from GWRC and KCDC)**

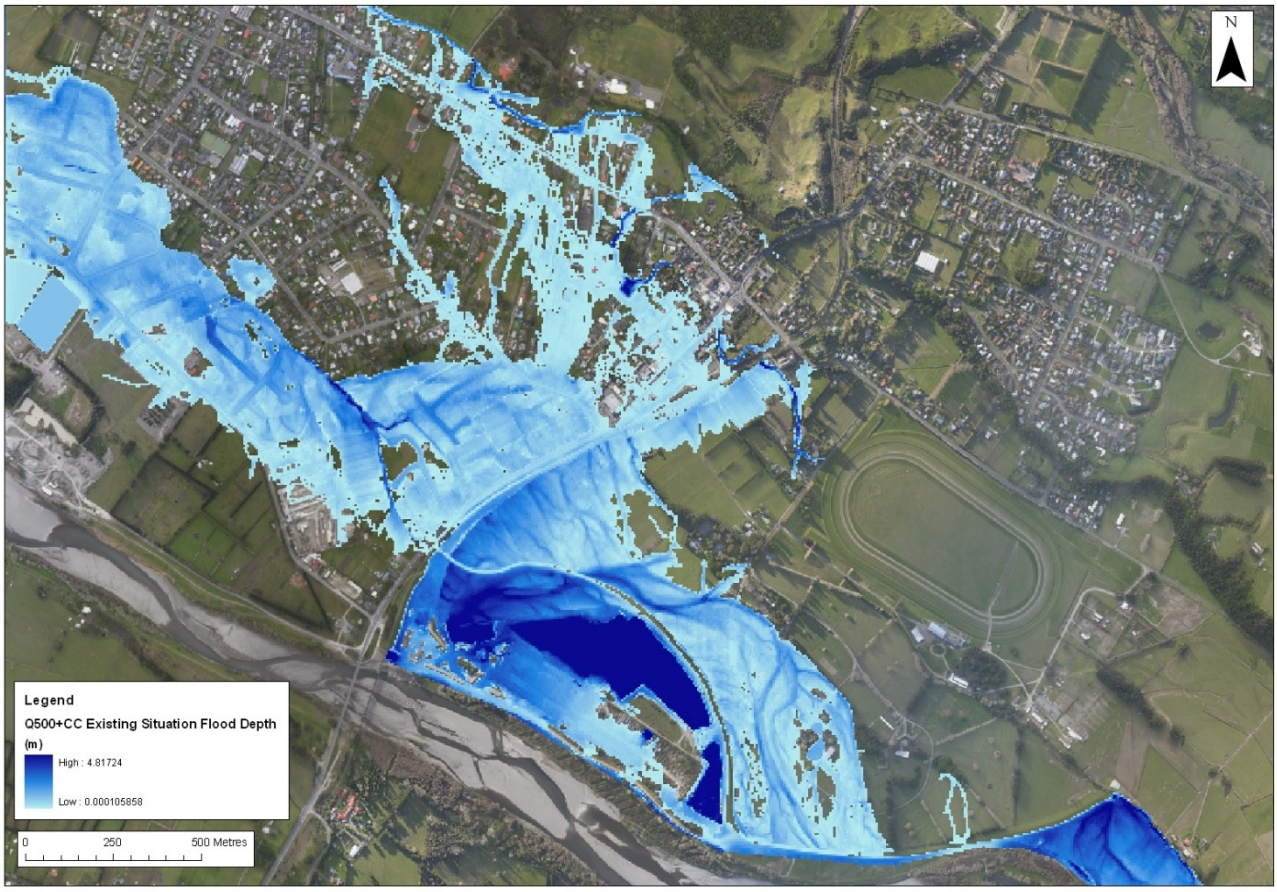



**Figure 4-10: Extent of flood inundation on Otaki River floodplain in existing situation for 0.2%AEP flood adjusted for effects of future climate change with stopbank overtopping**

The current 0.2% AEP flood adopted as the design standard for the river and floodplain crossings and the 0.2% AEP flood adjusted for the effects of possible future climate change to 2090 would both overtop the existing Chrystal's Bend extended stopbank. Figure 4-10 shows the extent of flood plain inundation in the existing situation for the latter flood. This indicates the occurrence of stopbank overtopping along much of the length of the Chrystal's Bend extended stopbank. Overall there are strong similarities with the flood inundation pattern for residual overflow in Figure 4-9 indicated by the pink and light blue shaded areas.

The alignment of the proposed expressway has not been superimposed on either of the flood hazard maps in Figure 4-9 and Figure 4-10. The expressway clearly needs to be elevated in order to remain flood free up to a specified design standard.

The expressway represents a major opportunity to reduce the existing flood risk to a large part of Otaki Township by elevating the road. However the effect of elevating the expressway would be to partially block off the secondary flow paths across the floodplain shown in Figure 4-10 and to cause ponding to occur upstream of the road embankment. The extent of this ponding and the extent of mitigation can be determined by computational hydraulic modelling. Ponding could be partially mitigated by the installation of culverts underneath the expressway. The opportunity to reduce the flood risk to Otaki Township by this means is discussed more fully in Appendix C.

## Mangapouri Stream

A component of the stormwater-induced flood inundation shown in Figure 4-9 includes the Mangapouri Stream which passes underneath SH1 and the NIMT railway line just to the north of the existing SH1/Rahui Road roundabout (along the northern edge of the Otaki River floodplain).

The capacity of the Mangapouri Stream downstream of the existing SH1 culvert through Otaki Township is severely restricted. Consequently the culvert under the NIMT railway line has been deliberately designed to act as a throttle in conjunction with the County Road culvert immediately upstream to limit downstream flood flows to about 8m$^3$/s (≈ 7-8% AEP flood). This causes storm runoff to pond upstream in the basin bounded by SH1, Rahui Road and the high ground to the north of Rahui Road as illustrated by the flood inundation map for the 1% AEP flood adjusted for possible future climate change effects to 2090 in Figure 4-11.

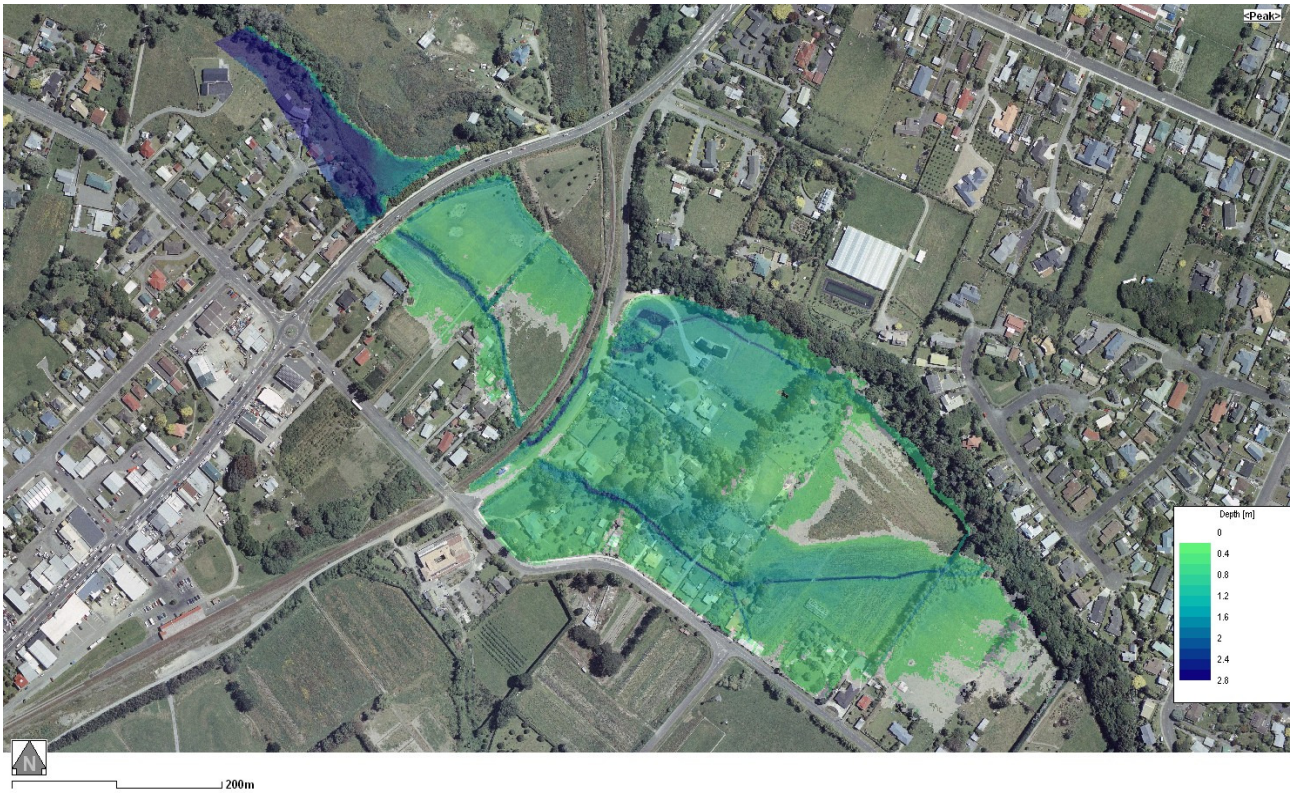



**Figure 4-11: Inundation map for existing situation for 1% AEP flood adjusted for possible future climate change effects to 2090**

Table 4-5 summarises estimated flood level and discharge estimates for the County Road/NIMT railway/SH1 culvert system on the Mangapouri Stream for floods of varying frequencies. The level of SH1 is about 13.74m (MSL Wellington datum) so that none of the floods listed in the table would overtop this road.

**Table 4-5: Flood Level Estimates for Mangapouri Stream at existing County Road, NIMT railway and SH1 culverts**

| Case | Peak Flood Level (m MSL Wellington datum) | | | Peak Flood Discharge (m3/s) | |
|---|---|---|---|---|---|
| | u/s County Rd culvert | u/s railway line culvert | u/s SH1 culvert | upstream flow | downstream flow |
| 10% AEP flood for current climate | 14.38 | 14.02 | 12.78 | 7.4 | 3.74 |
| 5% AEP flood for current climate | 14.44 | 14.42 | 13.05 | 8.6 | 4.34 |
| 1% AEP flood for current climate | 14.70 | 14.68 | 13.30 | 11.5 | 4.70 |
| 1% AEP flood for climate change to 2090 | 14.85 | 14.85 | 13.45 | 13.5 | 4.91 |
| 0.5% AEP flood for climate change to 2090 | 14.96 | 14.96 | 13.53 | 14.9 | 5.06 |
| 0.2% AEP flood for climate change to 2090 | 15.13 | 15.13 | 13.63 | 16.7 | 5.26 |

The alignment of the proposed expressway passes between SH1 and County Road with the NIMT railway line being shifted westwards to accommodate the expressway. The throttling function of the existing railway line culvert will need to be transferred to the culvert under the expressway. The flood level estimates in for the NIMT railway line culvert therefore provide an indicative guide to ponding levels upstream of the proposed expressway for the listed floods

Even without the expressway, the presence of a ponding area upstream of the NIMT railway line is a significant issue for existing properties along the northern side of Rahui Road. The issue remains with the proposed expressway situation and is complicated by the presence of a local link along Rahui Road and across the expressway. A Rahui Road underpass link (local road over) option could exacerbate ponding levels even more as the elevation of Rahui Road to achieve the required clearance over the expressway would block off the secondary overflow path to the south unless adequate provision is made for this flow path. A Rahui Road overpass link (local road under) option could fill with floodwaters above a certain flood threshold and become impassable for a period of time until pumped out. The threshold for filling with floodwaters could be raised by vertical adjustments to the alignment of County Road and the construction of a stopbank between the stream and Rahui Road. However, this would still not prevent the underpass from becoming submerged in extreme storm events.

## Waitohu Stream

The Waitohu Stream lies to the north of the Otaki Township and the Otaki River. The Waitohu Stream and its tributaries drain a 53 $km^2$ catchment on the steeply sloping western side of the Tararua Ranges. After the stream flows out of the foothills, it meanders across the coastal plain for a distance of about 7 km before exiting into the sea north of Otaki Beach Village. The average channel slope of 13.3% makes the stream extremely steep hydraulically.

The slope of the stream reduces significantly at about the location of the existing SH1 Bridge causing this location and downstream to be a zone of lateral channel instability and sediment aggradation. For river management purposes, GWRC have established a fairly wide design alignment for the river downstream of the SH1 Bridge to allow for possible further changes in channel alignment occurring in response to channel migration during extreme flood events. This is shown in Figure 4-12.

The proposed expressway crosses the zone of lateral channel instability and sediment aggradation downstream of the existing SH1 Bridge. The expressway bridge crossing needs to have a minimum span length of 75m to accommodate this zone and GWRC's design alignment for the stream. This is considerably longer than the span of the existing SH1 Bridge, but will mitigate against bank instability risks and long term operational maintenance costs.

The piles of the expressway bridge crossing need to be located outside of the existing main flow channel of the stream as much as possible. This would imply a bridge with three spans of 25m each.

The recommended design flood level for the 1%AEP flood (with a 5% AEP coincident flood in the downstream tributaries) adjusted for possible future climate change effects to 2090 is RL 25.75m (MSL Wellington Datum). The magnitude of this design flood level is extremely sensitive to the expressway alignment due to the steepness of the stream. If the alignment was to shift from the present alignment, the design flood level would change accordingly.

A design freeboard of 1.2m is appropriate to allow for uncertainty in future stream bed levels and the potential for woody debris to be caught up on the piles (due to the forested catchment upstream) and causing elevated flood levels.


**Figure 4-12: GWRC's design alignment and buffer zone for Waitohu Stream downstream of existing SH1 Bridge**

The other issue of significance for the expressway crossing of the Waitohu Stream is the very extensive extent of flood inundation on the north side of the stream channel for the design 1% AEP flood adjusted for the effects of possible future climate change to 2090. This is illustrated in Figure 4-13. The extent of inundation is approximately 0.9 km in width along the proposed expressway route. The expressway will need to be elevated above the floodplain over this width. The effect of the elevated expressway embankment will need to be mitigated by the appropriate location of culverts.

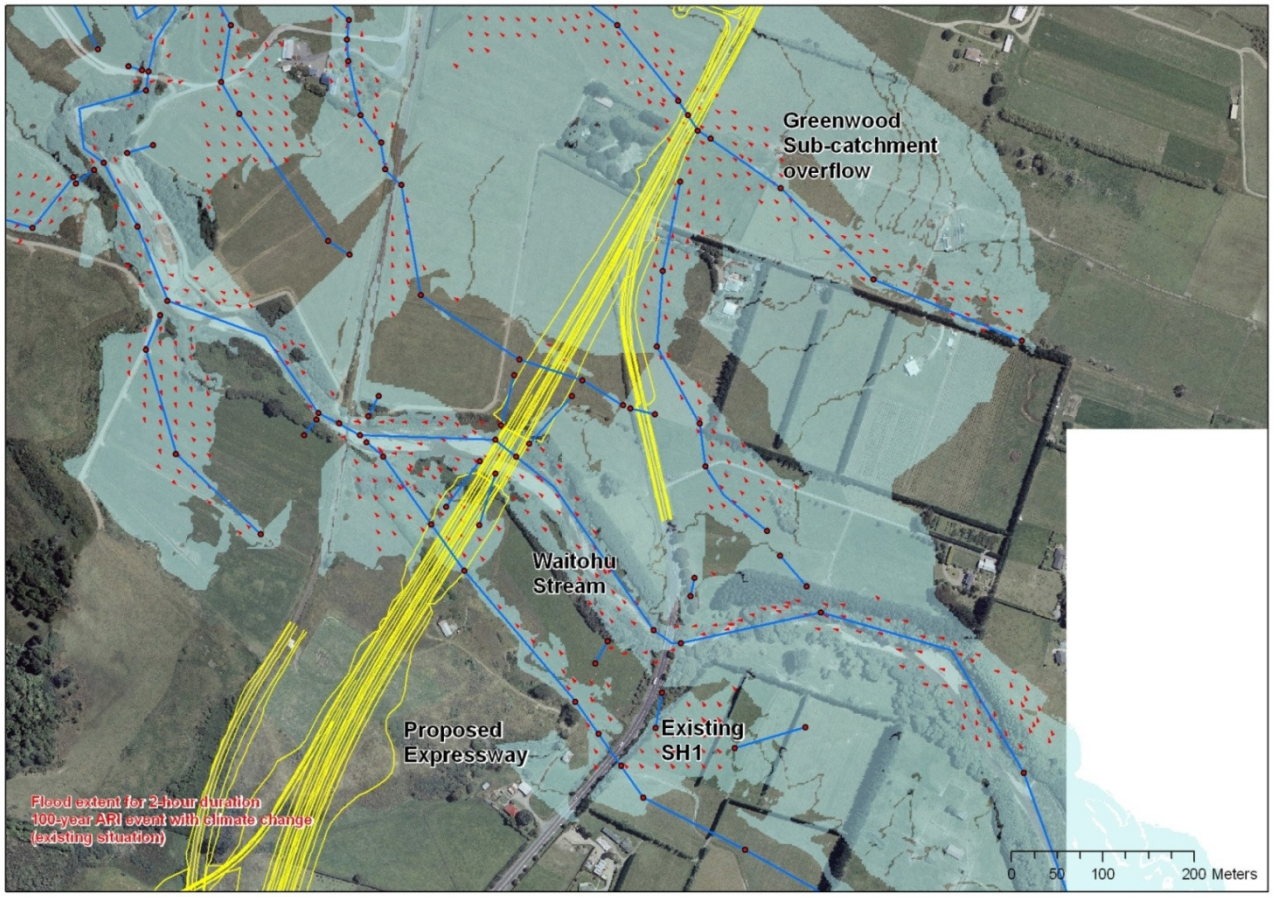



**Figure 4-13: Extent of flood inundation for flood induced by 2 hour duration 1% AEP rainstorm in vicinity of existing SH1 bridge crossing of Waitohu Stream (current situation excluding proposed expressway)**

## Mangaone Stream

The Mangaone Stream drains a 38.6km$^2$ catchment (at the existing SH1 bridge) in the lower foothills of the Tararua Ranges. After exiting from the foothills, the stream crosses the coastal plain over a distance of about 7km before exiting into the sea. SH1 and the NIMT railway line cross the stream at Te Horo about 3.5km to the south of the Otaki River.

The alignment of the proposed expressway shows it running roughly parallel with and to the east of SH1 and the NIMT railway line as both transport links traverse the coastal plain. The expressway therefore crosses the Mangaone Stream as it flows across the coastal plain on the upstream side of SH1 and the NIMT railway line. The crossing point is a known flooding hotspot with SH1 having been overtopped by floodwaters in the vicinity of the Mangaone Stream culvert in recent years. The stream has been the subject of detailed flood hazard assessment by MWH New Zealand for GWRC in 2002[4]. The floodplain exhibits a couple of secondary flow paths parallel with the stream which are also intercepted by SH1 and the NIMT railway line as seen in Figure 4-14.

[4] GWRC (2002), "Mangaone Stream Flood Hazard Assessment – Hydraulic Modelling Report", produced by MWH for Greater Wellington Regional Council, Wellington Regional Council Publication #WRC/FPSA-T-02/27, Final, June 2002.

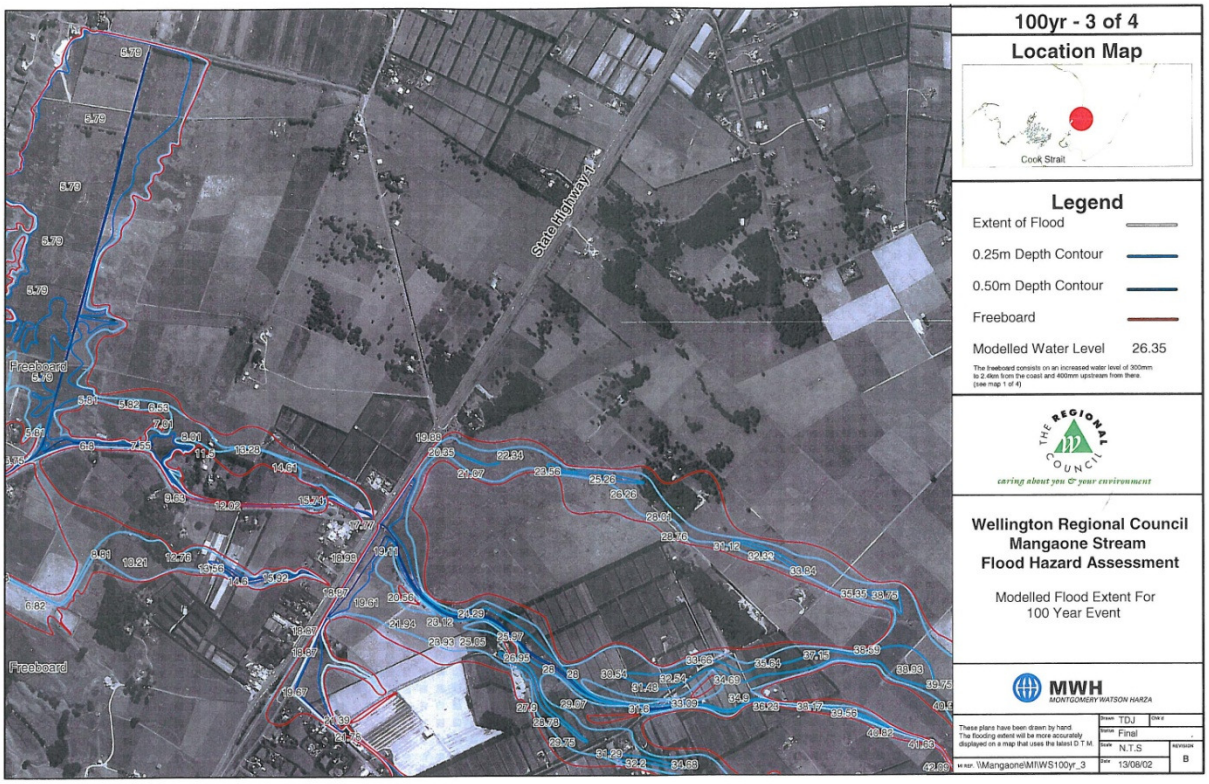



**Figure 4-14: Modelled flood levels and extent for 1% AEP flood from GWRC (2002)**

Figure 4-15 shows the approximate extent of flood inundation upstream and downstream of the NIMT railway/SH1 culvert system on the Mangaone Stream for the 1% AEP flood adjusted for the effects of possible future climate change to 2090. Ponding occurs upstream of the railway line, between the railway line and SH1 and around the School Road/Gear Road intersection. The extent of inundation downstream of SH1 is indicative only with arrows indicating the continuation of overland flow paths. The inundation area to the north of the stream below the SH1 culvert is a dedicated overland flow path known as the Lucinsky Overflow.

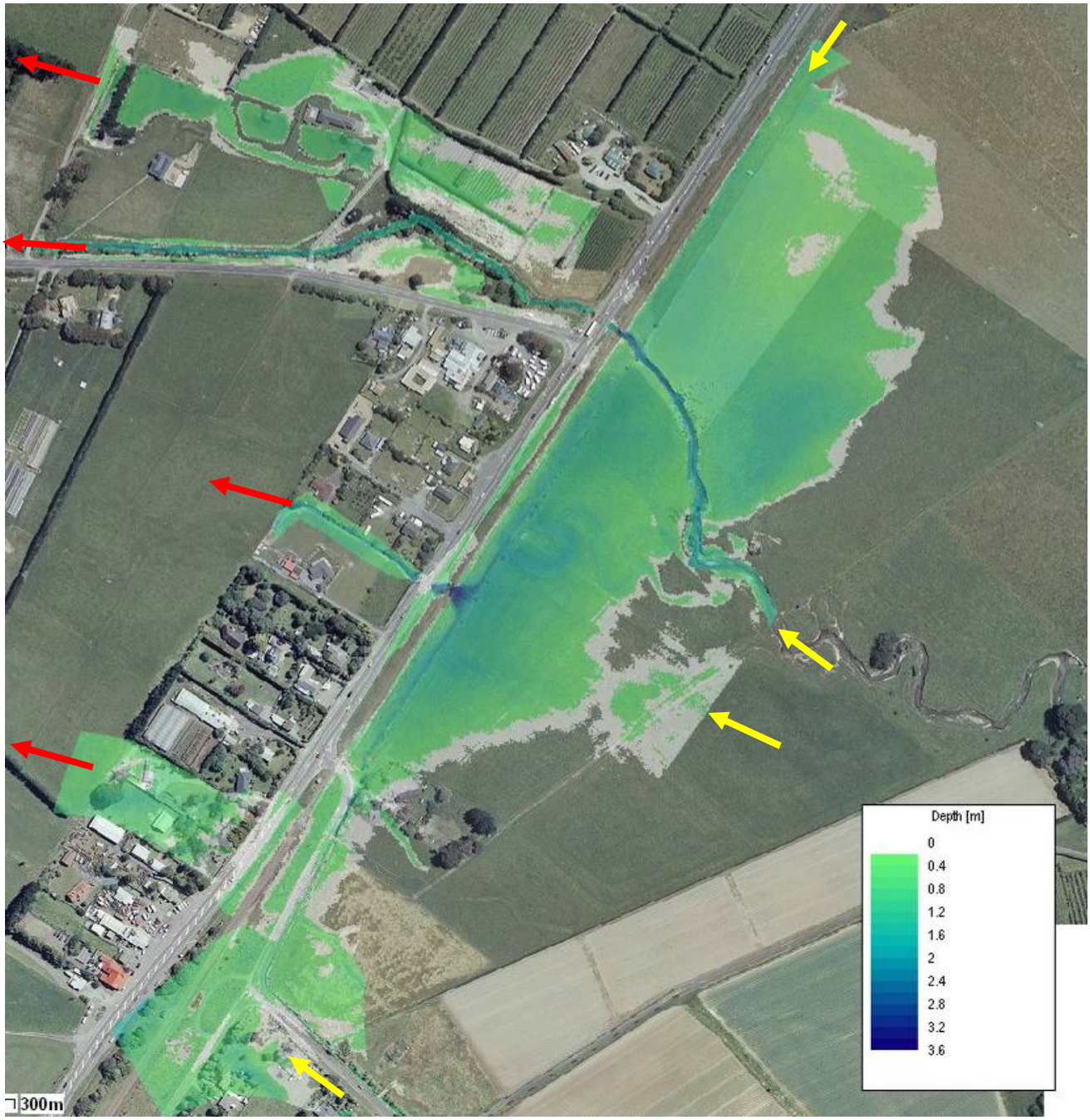



**Figure 4-15: Flood inundation map for existing situation for 1% AEP flood adjusted for possible climate change effects to 2090 (upstream boundaries shown in yellow, downstream boundaries shown in red)**

The proposed expressway will need to be elevated above the coastal plain where it crosses the Mangaone Stream to remain flood-free up to a specified design standard. The ponding that currently occurs upstream of SH1 will be transferred to upstream of the new expressway. It may be possible to reduce the extent of ponding upstream of the expressway with appropriate sizing of the primary and secondary waterways under it but care will need to be exercised to ensure that the flood hazard is not transferred downstream. It may also be necessary to mitigate any increased ponding along School Road due to the proposed expressway.

The situation is further complicated by the need to provide an east/west local link road connecting Gear/School Road with Te Horo Beach Road. The proposed connection involves two additional crossings of the Mangaone Stream with both the eastern and western approach embankments located through known overland flow paths. This would require the provision of relatively wide culverts to maintain the continuity of these flow paths.

The local link road extension of the relocated Gear Road will need to be slightly elevated above the floodplain to achieve a minimum level of service from a flood perspective. However this level of service could be less than that adopted for the proposed expressway because of the lower frequency of usage and available alternative in such an infrequent event.

Preliminary computational hydraulic modelling has been undertaken as part of the SARA / AEE process to better refine flood level predictions and the extent of mitigation required. This is described in detail in Appendix C.

The magnitude of the design 1% AEP flood adjusted for climate change effects to 2090 (estimated to be approximately 80.2$m^3$/s at the proposed expressway crossing of the stream and floodplain) means that the various waterway or overland flow path crossings for the proposed situation would need to be either large multi-cell culverts or small bridges depending on the required elevation and span. Culverts are permitted to be surcharged with an allowable minimum freeboard of 0.5m to road level (in this case assumed to be to the edge of the road rather than the centreline). The freeboard requirement for a small bridge would be more onerous because of the need to provide clearance against woody debris snagging on the structure. . However the breakout of flood flows across the upstream floodplain means that this risk might be partially mitigated by the potential for woody debris flushed out of the upper catchment to be deposited along the margins of the overland flow paths.

## 4.8 Environment / Ecology

The terrestrial Ecology Assessment has been based on the following:

- A review of existing background information relating to the project and the project corridor including: Project plans, existing ecological reports, aerial photographs and the Kapiti Coast District Plan.
- Walkthrough surveys undertaken in January and July 2011.

The aquatic ecology assessment has used existing information on the ecology of rivers and streams in the area extracted from reports written by the Greater Wellington Regional Council, and from data extracted from the New Zealand Freshwater Fisheries Database. An initial site visit was undertaken in October 2010. Fieldwork was conducted at five of the seven identified waterways in mid March 2011. The five waterways surveyed are: Waitohu River , Mangapouri Stream, Otaki River, Mangaone Stream, and Settlement Rd Stream. At that time two of the waterways (Gear Rd Stream and a stream near Te Hapua Rd) had largely dried up.

Key considerations for the scheme development are the identification and development of mitigation measures at waterways and any practicable opportunity to minimise affects.

### Terrestrial Habitat

The 2009 scheme alignment passes through up to seven stands of native mature trees. In some cases these are features of local significance including Cottles Bush, the bush to the south of Old Hautere Road. Other habitat features include riparian vegetation at the water bodies along the alignment and wetland habitat (see freshwater habitat below).

A key wetland area which is listed in the KCDC Heritage Register (Ref: K134 – Unnamed wetland), and assessed as being of local significance is a wetland located adjacent to the railway in Otaki (just to the north of the existing SH1 'ramp' rail overbridge), and will be completely lost to the Project footprint.

Significant bush remnant areas along the alignment corridor are:

- An area of indigenous forest on the Steven's property;
- Hautere Bush F (KCDC Ref: K038) and Cottle's Bush (KCDC Ref: K037);
- Mature native trees situated between Hautere Bush F and Cottle's Bush;
- Mature native trees adjacent to Cottle's Bush; and
- An area of indigenous forest in two stands and associated areas of wetland at Mary Crest. This area is considered to be of regional significance because it is an underrepresented habitat, is

species rich and contains large specimen trees and a range of vegetation types including swamp forest.

## Freshwater Habitat

The Greater Wellington Regional Council Regional Freshwater Plan (RFP) identifies the Waitohu Stream, Mangaone Stream and Otaki River as watercourses with nationally threatened indigenous fish recorded in the catchment. Waitohu Stream has Brown Mudfish recorded, the Mangone Stream has Shortjawed Kokopu, Koaro and Banded Kokopu recorded, and the Otaki River has Shortjawed Kokopu, Giant Kokopu, Banded Kokopu and Koaro recorded. Parts of the Otaki River are also identified in Appendix 4 of the RFP as important trout habitat.

Freshwater ecologist Alistair Suren completed an initial field examination of all waterways in the project area on 3 September 2010. The key findings are summarised below.

**Waterways**

There are three waterways specified in Greater Wellington's Regional Freshwater Plan that are in the project area – Otaki River, Waitohu Stream and Mangaone Stream.

The initial site visit revealed the existence of seven waterways that may be affected by the proposed expressway. Working from north to south these are as follows:

- Waitohu Stream;
- Mangapouri Stream;
- The Otaki River;
- The Mangaone Stream; and
- A small drain near Gear Rd.
- A stream running past Settlement Road and under SH1; and
- A small stream running under SH1 near Te Hapua.

A description of the first five waterways is summarised in Table 4-6.

**Table 4-6: Description of Waterways**

| Waterway Name | Type | Width | Formation | Riparian Vegetation | Species | |
|---|---|---|---|---|---|---|
| | | | | | Invertebrates | Fish |
| Waitohu Stream | River | 9-10 m | Dominated by a mixture of boulders and large cobbles | Willows, pine trees and pasture grasses | Diverse assemblage of invertebrates | Likely to have a diverse native fish fauna |
| Mangapouri Stream | Soft bottomed stream | 1-2 m | | Native planting has been done in a corridor above SH1 adjacent to Pare o Matangi Reserve | Relatively species-poor fauna, dominated by pollution tolerant organisms such as amphipods and snails | |
| The Otaki River | River | 20 m+ | Dominated by boulders and cobbles | Dominant vegetation: mixture of exotic trees (e.g. willows), grasses | Characteristic of a of river in good ecological condition, contains a diverse assemblage | Likely to support a very diverse fish fauna |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | including mayflies and caddisflies | |
| Mangaone Stream | Stream | 1-3 m | Deeply incised channel, bouldery and cobble substrate | Above the State Highway: pasture Below the State Highway: mixture of pasture grasses, as well as isolated willow and exotic shrubs. | Very diverse, including sensitive mayflies and caddisflies | This river is also likely to support a diverse fish fauna |
| Gear Road drain | ditch | < 1 m | Dominated by clay and silt, although some gravel exists | Flows through farmland and pasture. Banks relatively bare of vegetation. | Only a few tolerant snails were observed in this stream | It is unlikely to support significant fish populations, although short-fin or long-fin eels may be present in low numbers |

Where appropriate requirements for fish passage will be incorporated into waterway crossings.

**Wetlands**

Although the presence of numerous wetlands is indicated on topographic maps, the field inspection undertaken by Alistair Suren showed that most of these have now been converted into farmland. Exceptions were:

- A small, possibly perennial pond on the western side of the State Highway between Te Hapu Road and Gear Road which was highly modified, with only remnant growths of sedges in parts of the wetlands. Stock have full access to this pond, so it is likely that its ecological condition would be relatively low; and
- A wetland adjacent to the point where SH1 crosses the NIMT north of Mill Road (as described under terrestrial ecology).

**Changes since 2002 SAR:** A complete review has been undertaken of the existing environment including field visits to ensure sites of significance have been identified. The significance and quality of the bush remnants at Mary Crest (assessed as being an area of potential regional significance with Totara and Kahikatea tree specimens up to 200-300 years old) has been identified as an area of significance, however as a result of alternative alignment investigations, the proposed alignment now avoids this bush and wetland area.

## 4.9 Heritage and Archaeology

Opus heritage and archaeology specialist Cathryn Barr reviewed historic reports and records on the project area. This review allowed for identification of known archaeological sites, identified heritage features or buildings, and the identification of areas of potential heritage risk. The criteria used to assess the effects of options with regard to heritage resource were Part II of the Resource Management Act (1991) and the provisions of the Historic Places Act (1993). Site visits were undertaken in 2006 (as part of the NZAA Upgrade Project) and in November 2010 in order to relocate recorded archaeological sites and to scope the likely heritage and archaeological effects.

Information on the Maori and European history of the Otaki/Waikanae district is provided in a report prepared as part of the draft Assessment of Environmental Effects for the project in 2003 (O'Keefe, 2003) and this is not repeated in detail here. It is important to note however that the Otaki District has long been important as a coastal settlement and as a transport link between Te Whanganui a Tawa/Wellington and areas to the north. Information on the heritage values of the area is provided in a report prepared as part of the draft Assessment of Environmental Effects for the project in 2003 (Bowman, 2003). A summary from the O'Keefe report is detailed here to provide context to statements as to archaeological and heritage significance of the project area.

### Historic Background

**Natural development of area**

The topography of this district has had a strong influence on the location of early settlement, the location of early roads and the railway line. The dominant physical features are obviously the coastal edge, the Otaki River, and the inland range of hills. The land between the hills and the sea is predominantly sand dunes, formed over successive dune building phases. Within the dunes today are examples of remnant wetlands, which in the pre-European period would have been significant sources of food and raw materials.

**Maori occupation**

Several Iwi groups have links with the Peka Peka/Otaki area. Muaupoko are reported to have lived along the Kapiti Coast for many years prior to the 1820s. Between 1821 and 1822 Te Rauparaha, a chief of Ngati Toa from Kawhia district, left the Tainui district and with supporters from Ngati Raukawa and Te Ati Awa, and settled in Kapiti.

Pressure on land resources and several disputes meant that over the following years there were a number of battles fought along the Coast, including the battle of Horowhenua along the banks of the Otaki River in 1834. Land grievances reached a head in October 1839 with the battle of Kuititangata, fought at the Waikanae Estuary between Te Ati Awa and Ngati Raukawa.

The missionary Henry Williams was involved in assisting peace negotiations on Kapiti Island in November of 1839, and this marked both the end of inter-tribal conflicts on the Kapiti Coast, and the beginning of established missionary stations in the district[5].

**European occupation**

With peace the Kapiti Coast became not only a key area for crops and agriculture to support the growing population in Wellington, but the main transport route to the north, initially a coach route and then in 1886 the Wellington – Manawatu Railway line. The railway line through this area was initially constructed by a private company, the Wellington – Manawatu Railway Company, following withdrawal of funding by central government[6]. In constructing the railway line, it was a requirement on the Wellington – Manawatu Railway Company that a station was established every 10 miles and as a result the company surveyors laid out

[5] http://horowhenua.kete.net.nz *An historic day in Horowhenua, 27 October 1839*
[6] Kerr 2001: 11- 12

villages, roads and small farms around each station[7]. Within the project area stations were located at Te Horo and Otaki.

## Potential Impact of Project on Archaeological Resources

### Archaeological

Details of the method by which known archaeological sites in the project area were determined has been assessed.

Existing archaeological work within the Otaki area has been limited, and therefore while there is an understanding of a long and significant use of the land in this area, this is not necessarily reflected in the archaeological record. The following are locations within the project area that are considered to be of high archaeological potential:

- River terrace and dunes north of Otaki township; and
- Dune belt south of Te Horo.

Table 4-7 sets out the known archaeological sites in the project area.

**Table 4-7: Known archaeological sites in the vicinity of the Project Area**

| Reference | Details | Proximity to Project Area | Source |
|---|---|---|---|
| R25/14 | Pit site | Within project area-north of Te Hapua Road | O'Keefe |
| Unrecorded | Otaki Railway Station | Within project area | O'Keefe |
| Unrecorded | Unrecorded pit site | Within project area-north of Te Hapua Road | O'Keefe |
| R25/5 | Shell midden | Outside project area – located on dune ridge immediately to the north of Te Hapua Road | O'Keefe |
| R25/7 | Shell midden | | O'Keefe |
| R25/8 | Site of a partially completed waka | Just outside the footprint of the proposed alignment south of Te Hapua Road | O'Keefe |

### Heritage Buildings

A review of built heritage carried out for the project in 2003 identified that of the listed buildings within the Kapiti Coast District Plan, a total of 10 were identified on or nearby the proposed route (Bowman, 2003). These are listed in Table 4-8. Of the ten buildings identified by Bowman, two are expected to be potentially directly affected. These are shown in **bold text** in Table 4-8.

**Table 4-8: Listed Heritage Structures**

| District Plan Reference | Location/Legal Description | Name | NZHPT Register Reference |
|---|---|---|---|
| **B1** | **Arthur St, Otaki (SO 13765 Railway land)** | **Otaki Railway Station** | **4099** |
| B4 | 3 Main Highway (SH1) (Lot 2 DP 26621) | Cottage – Brown Sugar Café | 4093 |
| B7 | 35 Rahui Road, Otaki (Lots 1, 4 DP 4014 Pt Matitikura ML 258 / 349) | Rahui Milk Treatment Station | 4102 |
| B8 | 35 Rahui Road, Otaki ((Lots 1, 4 DP 4014 Pt Matitikura ML 258 / 349) | Rahui Factory Social Hall | 4101 |
| B42 | 64 Old Hautere Road, Te Horo (Pt Lot 2 DP 60575 Lot 1 DP 74253) | Remains of camp for depression workers. Includes store, cairns | N/A |
| B47 | 91 Main Highway (SH1) Otaki (Pt Plan A/2425 Lot 7 DP 15445) | Old house built around 1880 heart rimu and kauri | N/A |
| B53 | 290 Main Highway (SH1) Otaki (Lot 2 DP 46091) | Old House (1898) originally used as home for homeless and | N/A |

[7] Grouden 2009: 7

| | | | |
|---|---|---|---|
| | | deprived children | |
| **B54** | **990 State Highway 1, Te Horo (Ngakaroro Pt 3 D1 No 6 Blk II Kaitawa SD ML 1526** | **Once Te Horo Railway Station. Relocated to this site.** | **N/A** |
| B60 | Centennial Reserve, Main Road, Otaki (Lots 1 – 4 DP 12402) | Court House | N/A |
| B86 | 266 Main Road (SH1) Otaki (Lot 2 DP 30732) | Victorian Cottage built 1888 | N/A |

In addition to the listed buildings identified by Bowman, several other buildings with heritage values were identified that may be impacted by the proposal. These sites are shown on the Issues and Constraints Map (Figure 4-17 in section 4.14) and are:

- Former railway workers hut and kilns associated with the potter Mirek Smisek. These are at the same site as the re-located Te Horo Railway Station listed above; and
- Pre-1900 villa located just north of Otaki Railway Station.

## 4.10 Cultural

This history of the Kapiti Coast is steeped in Maori and European history. The original iwi inhabitants on the Kapiti Coast were Ngai Tara, Ngati Apa, Rangitane Muaupoko and Kahungunu tribes.

A timeline with some of the key features of the history of the Kapiti coast is included in Section 3.7 of the ULDF.

### Sites of Significance

There are various sites of cultural significance along the proposed expressway route, including:

- Pare-O-Matangi Reserve – area used by Chief Matangi and late settled by a Hauhau community;
- Te Manuao – east of SH1 that was a former clearing and kainga of Ngati Raukawa;
- Karu-o-te-Whena – a clearing to Ngati Turanga to the west of SH1 near Te Waka Road;
- Te Horo Pa – south of Mary Crest (just to the west of the Mary Crest bush remnants);
- Te Waka – cultivation area where Te Atiawa rangatira were killed, also west of SH1;
- Makahuri – cultivation area and known burial ground near Mary Crest;
- Te Matenga-o-te Tupe – vicinity of Te Horo Beach Road;
- Apa – a former cultivation and clearing in the bush; and
- Pare-o-Te-Puoho – a clearing east of Hautere.

The majority of these sites are shown on the Issues and Constraints Map, Figure 4-17 in section 4.14.

Further research along with a cultural impact assessment and archaeological assessment are provided in Appendix V.

## 4.11 Air Quality

### Available Air Quality Monitoring Data

There is limited information on air quality within the region. In order to address this lack of information, a short-term air quality monitoring programme has been commenced, however this is not expected to be completed until late January 2012. NZTA has also been conducting short-term nitrogen dioxide ($NO_2$) monitoring at Otaki at the corner of Mill Road and SH 1. Monitoring at this location commenced in March 2010 and will continue until January 2012. On 3 August 2011 URS began monitoring $NO_2$ at three locations, Rahui Rd in Otaki, 7 Gear Road in Te Horo and at the Beca operated Paraparaumu monitoring station on Raumati Road.

Additionally, there is an absence of publically available meteorological data for the Otaki region, therefore a weather station was installed at Te Horo, halfway between Peka Peka and Otaki. The weather station was commissioned in March 2011 to July 2011 at 7 Gear Road. The weather station measured wind speed and direction, temperature, humidity and rainfall. Due to the short duration of monitoring conducted at this location and the requirement that a minimum of one full year of meteorological data is used to assess air emissions, URS has also reviewed and used meteorological data collected at Levin and Paraparaumu. The Levin monitoring site is located approximately 21 km to the north of Otaki and Paraparaumu is 23 km to the south.

**Changes since 2002 SAR:** Assessments for the AEE will need to be consistent with the Ministry for the Environments Good Practice Guide on Assessing Discharges to Air from Land Transport, and the draft NZTA document, Standard for Producing Air Quality Assessments for State Highway Projects. These documents did not exist at the time the 2002 SAR was prepared.

## 4.12 Noise

Noise specialists from URS conducted a site visit in September 2010 to gain an understanding of the existing acoustics environment, topography and an overview of the nearby Protected Premises and Facilities (PPFs)[8]. The noise assessment by Malcolm Hunt Associates (2002) prepared for the previous Scheme Assessment Report has also been reviewed, together with the current preferred alignment.

### Current Noise Environment

The previous study found that most areas near the existing state highway have moderate noise exposure, which is also consistent with current traffic data and observations made during the site visit and during ambient noise surveys conducted (using noise loggers) by URS during February 2011 to quantify existing noise exposure from road traffic and rail. There are numerous Protected Premises and Facilities (PPFs) close to and accessed directly from the current SH1, with particular concentrations in Otaki and Te Horo. As the traffic volumes progressively increase, the noise environment for these PPFs close to the existing road is gradually deteriorating. While there are likely to have been isolated houses built, there appears to have been no significant new development close to the existing road or proposed alignment since the 2002 assessment.

### Sensitive Receptors

As noted above, there are numerous protected premises and facilities (PPFs) close to and accessed directly from the current SH1, with particular concentrations in Otaki and Te Horo. Noise effects can be expected both during the construction phase of the project (associated with construction machinery), and during the use and operation of the expressway (road traffic noise), however the NZ standards provide for recognised approaches to mitigation.

There are PPFs near to the proposed new alignment, but these are generally single PPFs further from the alignment. The existing road-traffic noise levels at those PPFs further from the current SH1 are proportionately lower than the levels discussed in the 2002 assessment which were measured nearer to SH1.

The assessment standard used by the NZTA for road-traffic noise changed in 2010 to NZS 6806. The new Standard promotes integrated design to achieve the Best Practicable Option, which should result in better outcomes for all stakeholders.

Further details on existing ambient noise levels are described in Section 10 and Appendix Y.

[8] NZS 6806:2010 (Acoustics – Road-traffic noise – New and altered roads) defines a PPF as a building used for a noise-sensitive activities such as residential buildings, marae, overnight medical care and teaching facilities.

**Rail Noise**

Rail noise measurements have also been undertaken to determine train characteristics. The chosen location of these measurements was at Taylors Road, north of Otaki. Measurements were taken approximately 16 metres from the railway. The measurements were conducted in general accordance with NZS 6801:2008, Acoustics – Measurement of Environmental Sound. While there are no standardised criteria for noise from rail lines in New Zealand, it is understood that KiwiRail has been developing a reverse sensitivity policy which includes a buffer area of up to 40 metres from the rail corridor, where development is discouraged, and a rail noise effects zone which continues up to 80 metres from the nearest track edge. While this reverse sensitivity policy does not apply to new and altered railways, the criteria is considered to be a useful reference.

Train noise levels have been predicted at four different distances and only three PPFs fall within the 80 metre buffer zone.

**Changes since 2002 SAR:** While there are likely to have been isolated houses built, there appears to have been no significant new development close to the existing road or proposed alignment since the 2002 assessment.

The assessment standard used by the NZTA for road-traffic noise changed in 2010 to NZS 6806. Therefore, the mitigation may differ in places than compared with the 2002 assessment. However, the new Standard promotes integrated design to achieve the Best Practicable Option, which should result in better outcomes for all stakeholders.

## 4.13 Geology and Geomorphology

The proposed expressway runs through an area predominantly comprising the rolling terrain of the recent sand dunes and inter-dunal deposits, the slightly raised terrace alluvial plateau, and the wide recent alluvial plain of Otaki River. The route is about 1 km to 2.5 km west of the foothills of the Tararua Range and 3 km to 4 km east of the Te Horo-Otaki Coast. Refer Figure 4-16.


**Figure 4-16: Oblique aerial photograph showing topography of the area (Reference Google Earth 2011)**

As described previously the route is dissected by a number of watercourses including the Mangaone Stream (at Te Horo), Otaki River (south of Otaki township), Mangapouri Stream (near Country Road, Otaki) and Waitohu Stream (north of Otaki). An abandoned sea cliff at Te Horo has been identified along Te Waka Road between Lethbridge Road and Te Horo Beach Road.

The expressway is proposed through an area underlain predominantly by:

- Aeolian dunes of Quaternary age to the south of Mary Crest, and north of Otaki
- Poorly to moderately sorted gravel with minor sand to silt underlying aggradational and degradational terraces of Quaternary age from Mary Crest to Otaki River
- Well sorted floodplain gravels of Holocene along the Otaki floodplain to the north of Otaki River, and along the Waitohu Stream flood plain.

Plans included within volume 4 of this report overlay the proposed route on the underlying geology of the area.

## 4.14 Issues and Constraints Map

Figure 4-17 illustrates a number of the issues and constraints raised through this section. More detailed information is available on the constraints plans which are included in Volume 4 of the document.

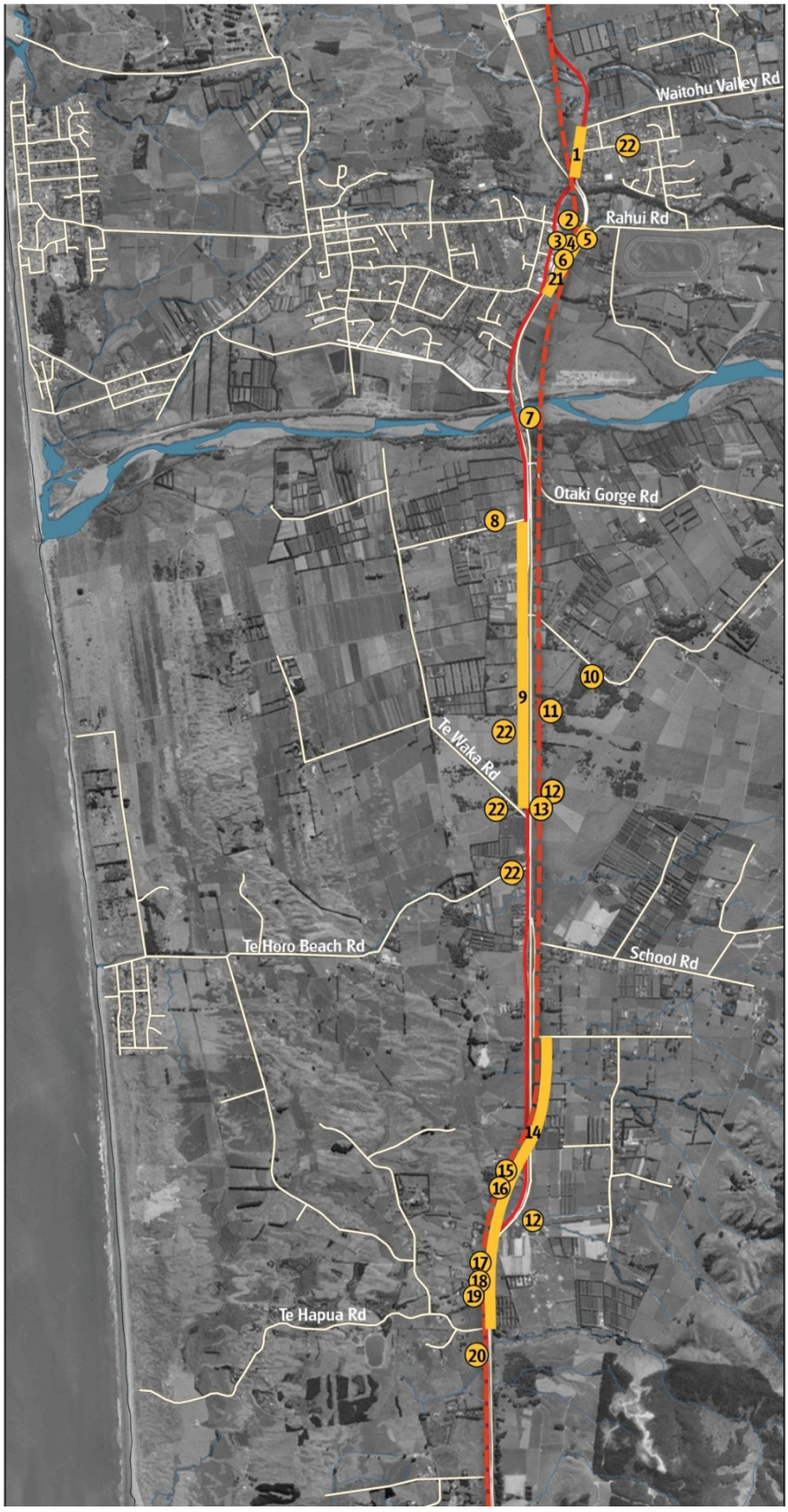



**Figure 4-17: Issues and Constraints Map**

**Key to Issues and Constraints Map, Figure 4-16:**

1. Landscape effects at Waitohu Valley Rd to SH1 overbridge and County Rd.
2. The key factor that would influence retail impacts/impacts on the Otaki town centre is connectivity between Otaki and SH1. That is, travellers should be able to get on and off SH1 to access the town centre easily (i.e. on- and off-ramps north and south bound) so the spend potential they represent is not necessarily lost to Otaki.
3. Late Victorian Bay Villa at 230 Main Highway Otaki.
4. The alignment is likely to require removal of a number of stands of mature trees including the following: On the north side of the railway station several karaka trees about 60yrs old, a kohekohe and a planted kauri estimated to be 80yrs old.
5. Rahui Factory Social Hall and Rahui Milk Treatment Station (in close proximity). NZHPT Register No. 4101 Cat. II (1509157005).
6. Otaki Railway Station
7. The new Otaki Bridge is not expected to have adverse effects on current recreational activities carried out in the area. Noted that Iwi titles pass right through the river.
8. Opportunity to reduce severance currently created by SH1.
9. Landscape effects at Addington Rd to Te Waka Rd, and at Te Horo Rd.
10. South of Old Hautere Rd a stand of totaramatai-titoki forest. Approximately 60 trees, mainly totara, could be lost from this stand, and a further 40 may need to be removed.
11. Another 60 scattered totara trees could be in the path of the expressway 250m further south.
12. Less than 200m further south, the expressway passes through the western side of Cottle Bush, where a further 350 trees could be within the designation boundary. In addition, planted trees including 32 pohutukawa trees and a kauri tree c.60 years old are in the path of the expressway.
13. The group of buildings at the Mirek Smisek pottery site, including the former Te Horo Railway Station (listed under KCDC's register), beehive and other kilns, railway workers hut and house. These buildings are considered to have significant heritage values and require relocation (near Te Waka Road).
14. Potential landscape effects South of Gear Rd to North of Te Hapua Rd.
15. The 2009 expressway alignment and the new local road cut through the grounds of Mary Crest. This has potential effects on potentially regionally significant stands of native forest.
16. Effects South of Gear Rd to the North of Te Hapua Rd.
17. The expressway and the new local road would pass either side of two mature kahikatea trees, located 2km north of Te Kowhai Rd.
18. Maori pits (reference: R25/14 ) consisting of one large pit and one probable pit located on low dunes beside a wetland immediately adjacent to SH1, north of Te Hapua Rd. Eastings and northings given but not in relation to this reference.
19. Newly recorded pit site north of Te Hapua Rd, just outside the alignment (near property 1023 Meritec Reference) beside a wetland in this section that has been enhanced by recent planting, located immediately north of the house.
20. South of Te Hapua Rd the local road cuts through a small shelterbelt forest remnant dominated by tawa but which contains a mixture of other broad-leaf species and nikau.
21. Changes to character from Rahui Rd to Wairanga Rd but with opportunities to improve amenity.
22. Nga Hapu-o-Otaki completed an initial cultural assessment and consider there is some risk of damage to waahi tapu sites from construction of the expressway on the Preferred Route. The assessment considers the probability of damage to sites being high between Taylors Rd and Rahui Rd, and between Otaki River and Peka Peka Rd and low between Rahui Rd and Otaki River. Sites of concern include:
    - Pareomatangi Reserve has significance as being an area reserved by Chief Matangi and later settled by a Hauhau community.
    - Te Manuao to the east of SH 1 that was a former clearing and kainga of Ngati Raukawa.
    - Karu-o-te -whenua, a clearing of Ngati Turanga to the west of SH 1 near Te Waka Rd.
    - Te Horo Pa located south of Mary Crest (west of the proposed alignment).
    - Te Waka cultivation area and spot where Te Atiawa rangatira were killed, also west of SH 1.
    - Makahuri, near Mary Crest, a cultivation area and also known as a burial ground.
    - Te Matenga-o-te Tupe in the vicinity of Te Horo Beach Rd.
    - Apa a former cultivation and clearing in the bush.
    - Pare-o-Te-Puoho a clearing east of Hautere.

More information is provided in the constraints plans (Volume 4)

# 5 Collected Data

## 5.1 Topographical Survey

### Field Survey

A topographical survey has been produced based on an aerial laser survey commissioned by NZTA in August 2010. The resulting digital ground model has been used for the geometric design using MX Roads. Aerial photographs of the route taken in March 2010 by New Zealand Aerial Mapping (NZAM) have formed the basis of the scheme layout drawings.

### Survey Verification

Verification of the aerial survey was carried out using existing ground data obtained at Otaki roundabout and Rahui Road approaches. Spot level comparisons were carried out on the road surface, footpaths and surrounding vegetation.

The accuracy of the survey is considered adequate for the purposes of the scheme design and determining quantities for cost estimating purposes.

### Survey Datum

The horizontal and vertical coordinates from the aerial and ground verification surveys are in accordance with the New Zealand Geodetic Datum 2000 (NZGD2000).

The northing and easting coordinates are expressed in terms of the New Zealand Transverse Mercator (NZTM) projection. The vertical coordinates (heights) are the ellipsoidal heights in accordance with NZGD2000.

### Additional Survey

For the detail design phase additional topographical survey will be required at the following locations:

- At bridge structure locations. – at approach embankments and to determine headroom clearances.
- Survey to provide sufficient information to accurately model the hydraulics of the streams and associated the floodplains. A survey of the riverbed will also allow future analysis of changes in the river bed profile through comparison with historical surveys.
- Property accesses and local road tie-ins.
- Existing rail tracks tie-ins for realigned sections.

## 5.2 Traffic Data

During the SARA phase of this project the team have collected a range of traffic and transport related data. Data has primarily been collected to represent weekday peak and interpeak periods; however data has also been collected during holiday periods as part of earlier work undertaken by Opus and further survey work undertaken to capture one of Otaki's major race events at the Otaki Maori Racing Club.

Some of the data provided below was collected in order to validate the 2010 Peka Peka to Otaki Traffic Model. The model was constructed using the SATURN software and extends from Taylors Road in the north to Peka Peka Road in the south.

### Access to Motor Vehicles

45% of households in Kapiti Coast District have access to one motor vehicle, and 33% have access to two. Only 8% of households have no access to a motor vehicle in the Kapiti Coast District.

## Travel to Work

The most common means of travel to work in Kapiti Coast District on Census Day 2006 was driving a private car, truck or van with 42% of those who worked travelling by this means.

## Surveys

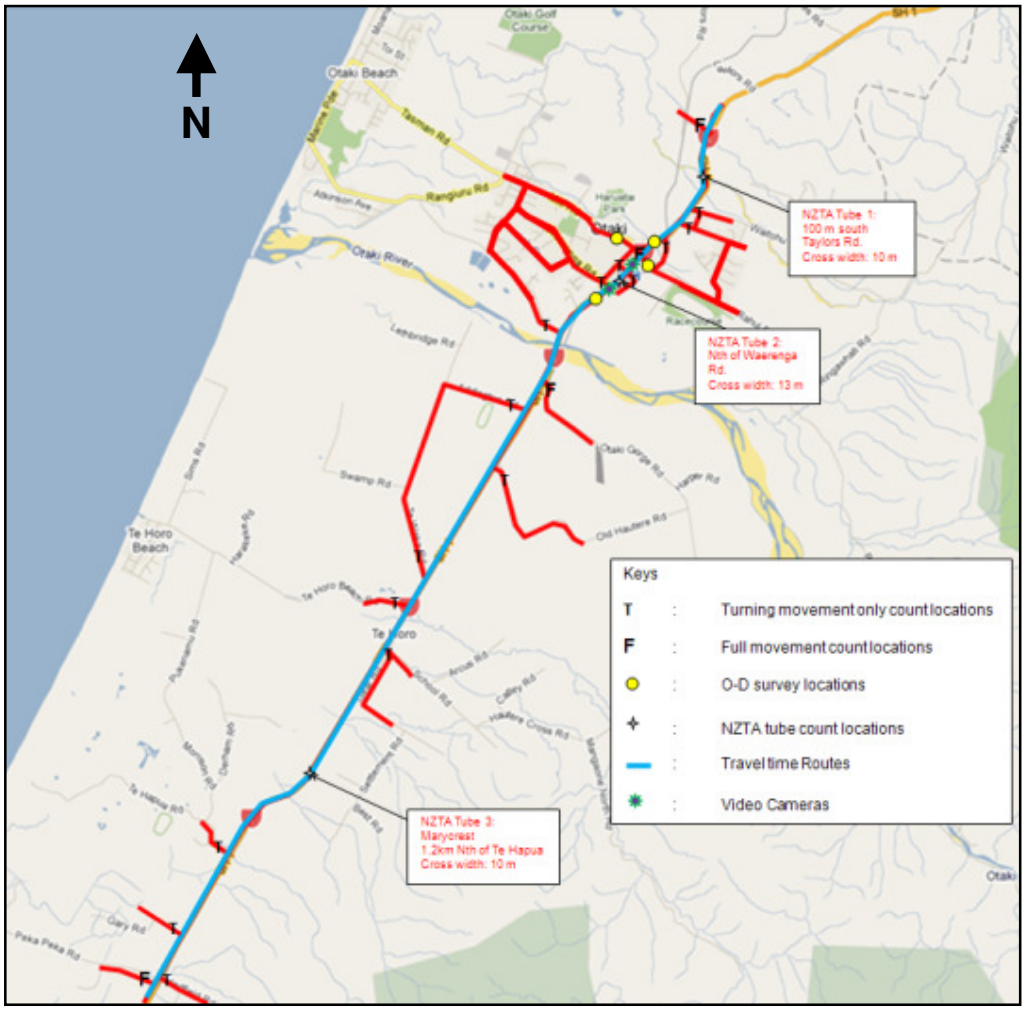
Extensive project specific traffic data was collected for the development and validation of the PP2O SATURN model and this has been captured in the Model Validation and Forecast Report 2010 (Refer Appendix K). Additional data is provided in Appendix A and below.

A relatively extensive data collection exercise was undertaken for the study area. This included:

- Light and HCV classified turning count surveys;
- Side road turning delay surveys;
- Travel time surveys;
- Origin and destination number plate surveys;
- Video camera surveys; and
- SH1 crossing pedestrian count.

Figure 5-1 below details the location of the various surveys undertaken. All data was adjusted for seasonality, producing an average flow for the year.

**Figure 5-1: Location of Traffic Count Information within Study Area**



**Full Classified Turning Counts**

Turning count surveys where undertaken throughout the modelled network. These observations were a mixture of full turning count surveys and turn only surveys (i.e. not observing the through movements). The turn only surveys where undertaken on the State Highway and were done in such a way as to enable the through movements to be calculated from adjacent full turning count locations. Turning count observations were made on Wednesday the 21st and Thursday the 22nd of July 2010 between the hours of 07.00 to 09.00, 11.00 to 1300 and 16.00 to 18.00 at the following locations:

- SH1 / Taylors Road (full);
- SH1 / Waitohu Valley road (turns only);
- SH1 / Te Manuao Road (turns only);
- SH1 / County Road (turns only);
- SH1 / Mill Road / Rahui Road (full);
- SH1 / Arthur Street (turns only);
- SH1 / Waerenga Road (turns only) ;
- SH1 / Riverbank Road (turns only);
- SH1 / Otaki Gorge Road (full);
- SH1 / Addington Road (turns only);
- SH1 / Old Hautere Road (turns only);
- SH1 / Te Waka Road (turns only);
- SH1 / Te Horo Beach Road (turns only);
- SH1 / School Road (turns only);
- SH1 / Te Hapue Road (turns only);
- SH1 / Te Kowhai Road (turns only);
- SH1 / Hadfield Road (turns only);
- SH1 / Peka Peka Road (full).

**Side Road Turning Delay Surveys**

Turning delays where measured on the side roads at the same time as the turning count information was completed. This was done for all the above intersections apart from Taylors Road, Otaki Gorge Road and Peka Peka Road. The measurement was based on the time that the first queuing vehicles waited at the stop line before exiting the side road.

**Travel Time Surveys**

Travel time surveys where undertaken on Tuesday the 20th and Thursday the 22nd of July 2010. Two cars where used in opposing directions to increase the number of observations obtained in the survey period. The route was:

State Highway 1 – Peka Peka Road through Otaki up to and including Taylors Road;

In the AM peak six observations were made northbound and five southbound while in the inter peak seven observations were made in each direction. In the PM peak the nine observations where made northbound and ten southbound.

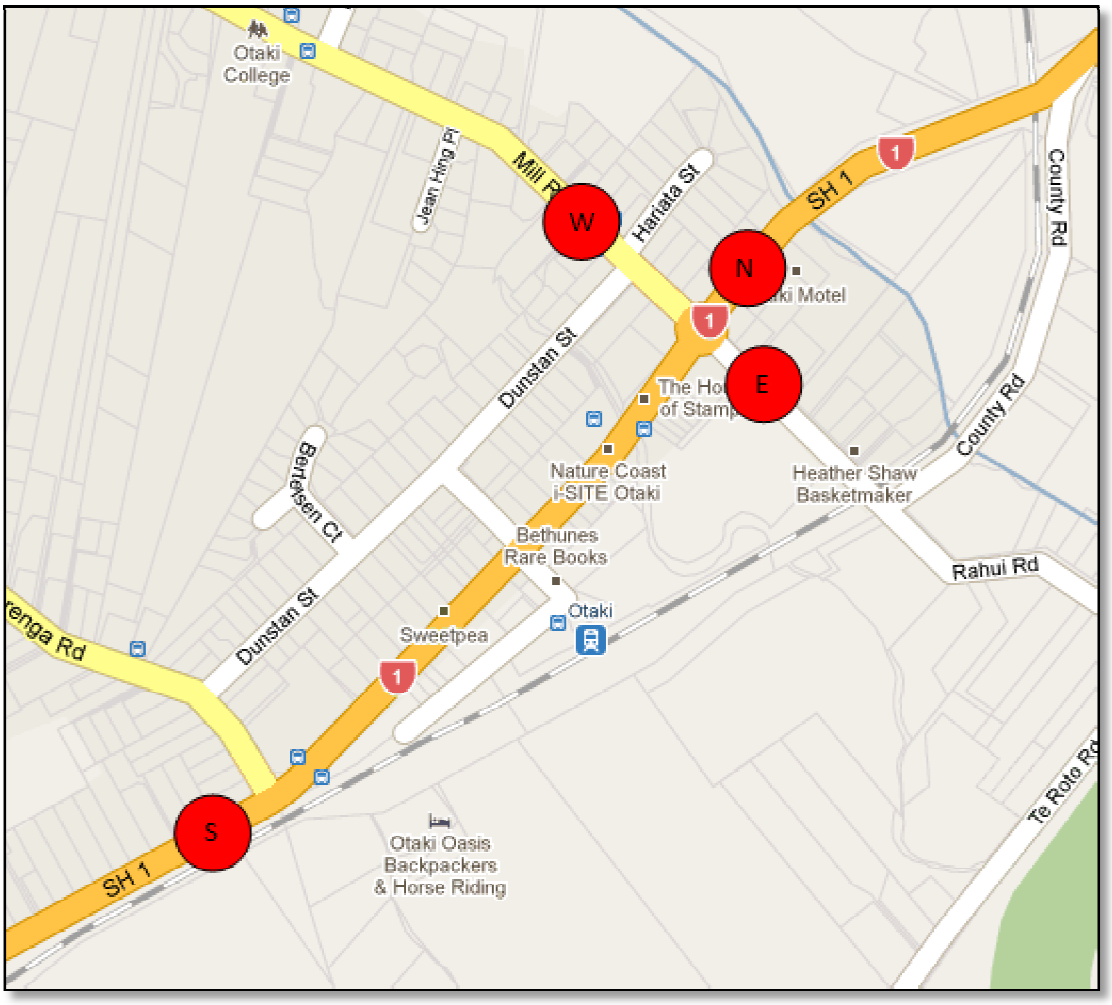
The travel time survey proved to be statistically robust in all peak periods and in each direction, with a 99% significant confidence level and an associated 5% precision level.

**Origin and Destination Number Plate Surveys**

Number plate origin and destination surveys were undertaken on Tuesday the 30th of June for the peak periods of 07.00 to 09.00, 11.00 to 13.00 and 16.00 to 18.00.

The locations of observations were the eastern and northern arms of the Mill Road roundabout; west of Dunstan Street on Mill Road plus State Highway One south of Waerenga Road as shown in Figure 5-2. This enabled analysis to capture the level of through trips in Otaki.

**Figure 5-2: Otaki town centre O-D survey location diagram**




The number plate data was input to an Opus developed matching excel spreadsheet and initially the software gained a matching rate of 57% in the AM peak, 56% in the inter peak and 53% in the PM peak. Considering that the AM and PM peaks involved low light conditions with the surveys having happened in winter we considered this to be a reasonable result.

The software only unites exact matches and there are a number of situations in number plate observations which could be a match but have been inaccurately noted by the enumerator. Examples of this would include the number 0 and the letter O, the number 5 and the letter S etc. After manual adjustment of such enumerator errors the matching rate was increased to 78% in the AM peak, 86% in the inter peak and 79% in the PM peak.

## Future data collections

One of the key time periods for this network is at the weekend and on the Monday evening of a public holiday weekend. At this stage a model has not been developed for these periods but it could be considered for sensitivity testing. In order to do this the following data would need collecting:

- Typical weekend traffic flow, origin and destination data, travel time, turning delay and pedestrian demand etc,
- Public holiday weekend traffic flow, origin and destination data, travel time, turning delay and pedestrian demand etc,
- Retail demand patterns.

Some of the above data has already been collected for other studies in the area such as Friday and Monday public holiday turning counts at the Mill Road roundabout and travel times up and down SH1 between Waerenga Road and South Manakau Road. Car parking demand surveys were also completed for the bank holiday weekend (see below).

## Existing Data Collections

The average travel time along SH1 between Otaki and Manakau in both directions (north and south bound) was recorded by Opus International Consultants on the Friday and Monday of Labour Weekend (24-27 October) 2008[9]. These times have been shown previously in

**Figure 3-1**.

Further traffic surveys were undertaken on Easter weekend 2009. Figure 5-3 highlights the traffic volumes heading south on a Monday at the end of the weekend compared to a normal weekday.

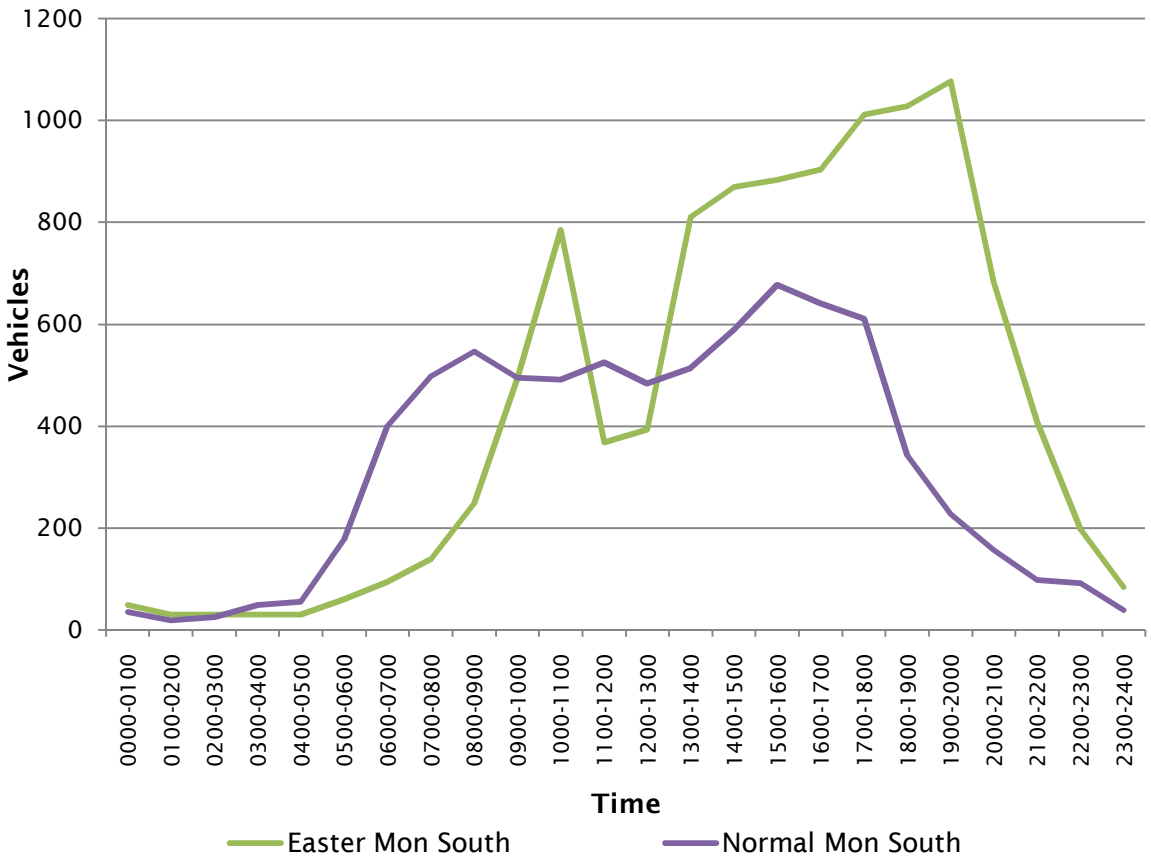



**Figure 5-3: Comparison of Southbound Traffic Flows, Monday 13 April & Monday 16 February 2009**

These graphs are extracts from previous studies that highlight the holiday weekend peak flow situations.

Some further traffic surveys were also completed on weekdays during July 2010. Figure 5-4, below summarises the average northbound and southbound travel time for the AM, IP and PM peak periods. Generally, there was minimal variation in the travel time between the three peak periods.

[9] Otaki Traffic and Transportation Report, Opus International Consultants, November 2009

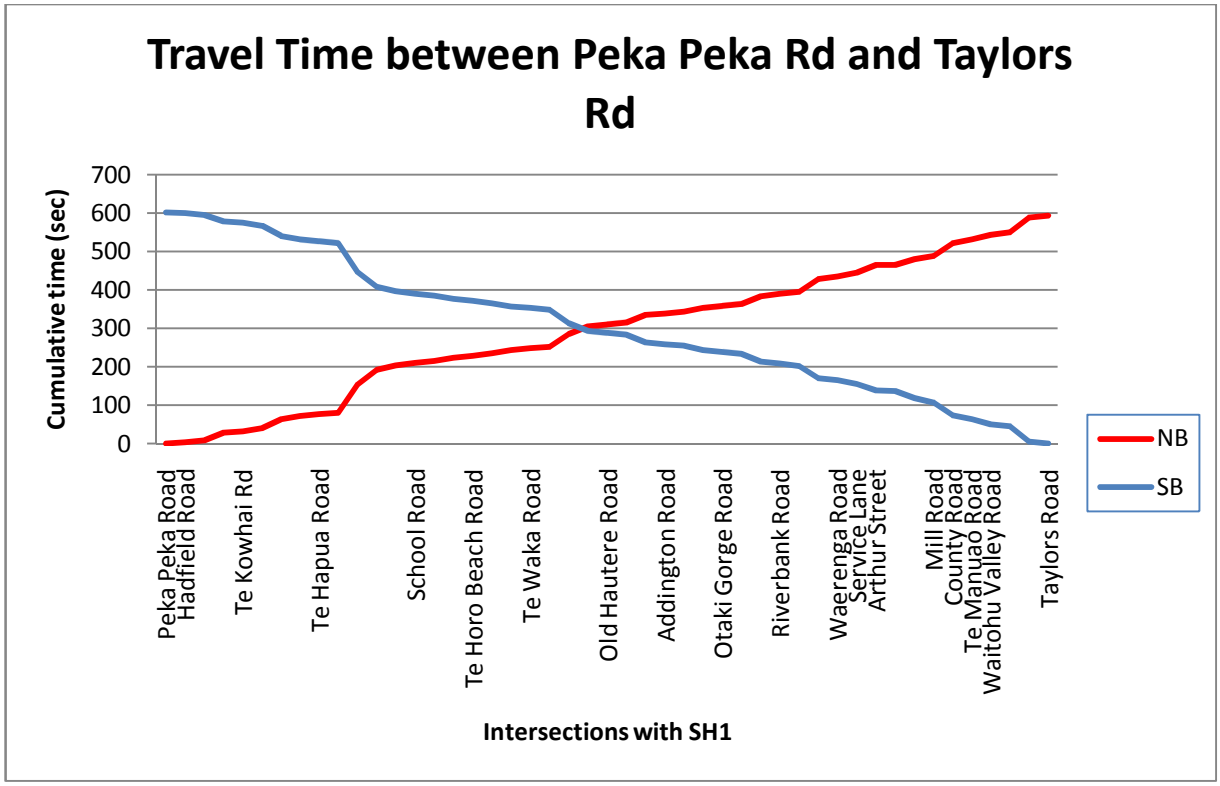



**Figure 5-4: 2010 Weekday Northbound and Southbound Travel Time Peka Peka Rd to Taylors Rd**

## Description of the Existing Traffic Situation

Generally SH1 between Peka Peka and Taylor's Road north of Otaki has a 100km/h speed limit. However, there are a couple of exceptions:

- 80km/h speed limit through Te Horo (for approximately 1km);
- 70km/h speed limit from northern side of the Otaki River bridge to 130m south of Waerenga Road; and
- 50km/h speed limit from 130m south of Waerenga Road to 200m north of the roundabout at Mill Road/Rahui Road.

The forecast 2010 average annual daily traffic flow (AADT) for SH1 from the NZTA Traffic Count Data are summarised in Table 5-1. There are approximately 2,000 more vehicles per day using SH1 in the southern part of the study area compared to closer to Otaki.

**Table 5-1: 2010 AADT Existing SH1 Traffic (NZTA Count Data)**

| Location | Two-Way | HCV |
|---|---|---|
| SH1 – North of Peka Peka | 16,800 | 11.7 % |
| SH1 – Within Otaki (Waerenga Road) | 16,600 | 10.7 % |
| SH1 – North of Otaki | 14,700 | 8.0 % |

The proportion of SH1 traffic travelling through and to each side of Otaki is summarised in Figure 5-5. This forecast is based on the 2010 trip matrices in the SATURN model. Roughly 70% of the southbound traffic on SH1 is travelling to a destination south of Otaki, while 23% is travelling to the western portion of Otaki. Traffic primarily uses Mill Road, Waerenga Road or Riverbank Road to access the western portion of Otaki.

Approximately 60% of the northbound traffic on SH1 is travelling to destinations to the north of Otaki. 30% of the northbound traffic is destined to locations to the west of SH1 in Otaki. The remaining 10% of the northbound SH1 traffic is travelling to a location east of SH1 in Otaki.


**Figure 5-5: SH1 Otaki Origin and Destinations**

Heavy commercial vehicles (HCVs) constitute approximately 10.[10]% of the traffic using SH1 in the study area.

Generally, 65% of the HCVs travelling on SH1 just south of Otaki are travelling to or from Otaki. The remaining 35% are travelling to or from locations further north. When examining the HCVs on SH1 to the north of Otaki, approximately 35% are travelling to or from Otaki, while the remaining 65% are travelling to or from locations further south. When considering the origin/designation of HCVs that start or end a trip in Otaki, 75% are heading south with the remaining 25% going northbound on SH1.

On Sunday afternoons and at the end of holiday weekends, extensive queues often form on the northern approach to Otaki for southbound motorists heading towards Wellington. These queues are caused by higher than normal traffic volumes and competing uses of SH1 in Otaki which is used as a through route for SH1 traffic travelling to Wellington, and a shopping area with a high number of pedestrians and side friction caused by parking manoeuvres. The Otaki Traffic and Transportation Report[11] identifies a bypass as the long term solution to relieve congestion on SH1 in Otaki. A bypass will provide an efficient route for through traffic while allowing the existing SH1 alignment to cater for local access to Otaki, provide retail parking and appropriate pedestrian crossing facilities.

## Local Roads

Table 5-2 provides traffic volumes on selected side roads from the 2010 SATURN Base Model.

**Table 5-2: 2010 AADT on Side Roads**

| 2010 | AM | IP | PM | AADT |
|---|---|---|---|---|
| Taylors Rd | 18 | 16 | 22 | 262 |
| Mill Rd | 433 | 415 | 499 | 6589 |
| Rahui Rd | 204 | 162 | 232 | 2716 |
| Otaki Gorge Rd | 66 | 59 | 81 | 966 |

[10] Based on NZTA counts
[11] Otaki Traffic and Transportation Report, prepared by Opus International Consultants, November 2009.

| | | | | |
|---|---|---|---|---|
| School Rd | 181 | 178 | 232 | 2852 |

## Riverbank Road Development

A Kapiti Coast District Plan change to rezone 20 hectares of land on the southern side of Riverbank Road from rural to industrial/service has been approved. The transportation assessment indicated that potential development in the area could generate an additional 3,380 vehicle movements per day (two-way). HCVs are expected to comprise 27% of these new trips.

The expected traffic distribution is summarised in Table 5-3. Most of the trips (approximately 40%) are expected to be local in nature and not utilise SH1. Approximately 35% of the trips are expected to travel to or from the south on SH1 with the remaining 25% travelling to or from the north on SH1.

**Table 5-3: Riverbank Road Development Trip Distribution**

| Origin/Destination | Route | Percentage Trips | Trips/Day (2-way) |
|---|---|---|---|
| Otaki (local) | Riverbank Road (west) | 40 | 1,350 |
| North Island beyond Otaki, eastern Otaki | Riverbank Road (east)/SH1 (north) | 25 | 850 |
| Kapiti, Wellington | Riverbank Road (east)/SH1 (south) | 35 | 1,180 |

## Walking and Cycling

Observations of pedestrians crossing side streets and SH1 were made when carrying out traffic counts in July 2010 and further data was also supplied by KCDC for Rahui Road.

Table 5-5 shows the locations along the route where pedestrians were observed crossing SH1[12]. Counts were undertaken in the AM Peak (7am – 9am), Interpeak (11am – 1pm) and PM Peak (4pm – 6pm). The busiest period for pedestrians was during the Inter Peak (IP) when a total of 170 pedestrians were counted crossing SH1. It should be noted that these observations were made during winter on a weekday, and pedestrian numbers could be higher on weekends and during the summer.

**Table 5-4: Pedestrians Counts**

| Location | AM | IP | PM | Total |
|---|---|---|---|---|
| School Road | 0 | 2 | 3 | 5 |
| Old Hautere Road | 0 | 0 | 1 | 1 |
| Riverbank Road | 1 | 3 | 2 | 6 |
| Waerenga Road | 4 | 28 | 22 | 54 |
| Arthur Street | 14 | 133 | 61 | 208 |
| Mill/Rahui Roads | 1 | 3 | 2 | 6 |
| Country Road | 41 | 9 | 23 | 73 |
| Te Manuao Road | 6 | 0 | 0 | 6 |
| Waitohu Valley Road | 4 | 1 | 1 | 6 |
| TOTAL | 71 | 179 | 115 | 365 |

The busiest locations for pedestrians crossing were within Otaki Railway Retail area, which is to be expected. A total of 208 pedestrians were counted crossing SH1 at Arthur Street. This is in the heart of the Otaki retail area and is the only controlled pedestrian crossing, in the form of a zebra crossing, which allows pedestrians to cross safely. The next busiest location was at the junction with County Road where 73 pedestrians were counted crossing SH1. This is a residential area just north of Otaki town where a median refuge is provided to allow pedestrians to safely cross one lane of SH1 at a time.

[12] Locations where no pedestrians were counted crossing were: Peka Peka Rd, Hadfield Rd, Te Horo Beach Rd, Te Waka Rd Te Kowhai Rd, Te Hapua Rd, Addington Rd, Otaki Gorge Rd and Taylors Rd

Cycle data supplied by KCDC for Mill Road and Rahui Road displayed that approximately 15 cycles per day used Rahui Road, while approximately 40 cycles per day used Mill Road (March 2010). While surveying SH1 during the traffic counts for the project, there were isolated cycle movements, however they were very infrequent.

The above counts highlight some of the key desire lines that were utilised for consideration in the project development.

Abley Transportation Consultants were commissioned by NZTA to undertake an accessibility assessment for the Otaki area of the PP2O project. This analysis uses Statistic NZ, GWRC, Ministry of Education and traffic data collected specifically for the project in order to develop the accessibility model.

This accessibility model aimed to provide GIS analysis that determines the change in accessibility due to the PP2O project.

## 5.3 Crash Data

This road safety analysis is based on data from NZTA's Crash Analysis System (CAS) for the five year period between 1 January 2006 and 31 December 2010. The crashes in the study area were grouped based on the speed environment:

- The 50 km/h section through Otaki Township (1.6km long);
- The 70km/h section adjacent to Otaki Township (0.8km long); and
- The 100km/h section south of Otaki Township to Peka Peka[13] (9.3km long) and north of Otaki Township to Taylors Road.

Table 5-5 below summarises the crash history by year in the study area. The number of collisions per year tends to be increasing. This is largely due to an increase in the number of non-injury crashes.

**Table 5-5: Crash History by Year**

| Year | Fatal | Serious | Minor | Non-Injury | Total |
|---|---|---|---|---|---|
| 2006 | 0 | 1 | 3 | 12 | 16 |
| 2007 | 1 | 3 | 5 | 12 | 21 |
| 2008 | 0 | 4 | 4 | 27 | 35 |
| 2009 | 2 | 3 | 7 | 25 | 37 |
| 2010 | 0 | 2 | 13 | 28 | 43 |
| Sub Total | 3 | 13 | 32 | 104 | 152 |

In the first six months of 2011 there has been one serious crash, four minor and six non-injury crashes.

The fatal crash in 2007 occurred when a motorist turning right from Hadfield Road to SH1 failed to give way to a through vehicle on SH1. It should be noted that this crash occurred on the boundary of the M2PP and PP2O projects. One of the fatal crashes in 2009 was the result of a cyclist being hit from behind by a vehicle. Alcohol (consumed by the motorist) was most likely a factor in this crash. The second fatality that year was a head-on crash on a straight section of road. It occurred during bright and dry conditions. The key opportunity for the PP2O project is to provide an expressway route with median separation, no local accessways and a reduction in conflict between local and through traffic on the existing SH1.

Table 5-6 below summarises the five year crash history for each speed environment. The three fatal crashes all occurred in the 100km/h speed zone. There have been approximately three times more crashes per kilometre in the 50km/h speed zone (Otaki Township) than the 70km/h or 100km/h zones. However, these crashes are primarily rear end/obstruction or crossing/turning type non-injury crashes which are expected in a developed area.

[13] The 1km long 80km/h speed zone through Te Horo has been included as part of the 100km/h speed environment for this analysis.

**Table 5-6: Crash History by Severity and Speed Environment**

| Section | Fatal | | Serious | | Minor | | Non-Injury | | Total |
|---|---|---|---|---|---|---|---|---|---|
| | Intersection | Mid-block | Intersection | Mid-block | Intersection | Mid-block | Intersection | Mid-block | |
| 100km/h | 1 | 2 | 3 | 7 | 11 | 13 | 12 | 37 | **93** |
| 70km/h | 0 | 0 | 0 | 2 | 0 | 1 | 1 | 1 | **5** |
| 50km/h | 0 | 0 | 1 | 0 | 3 | 4 | 21 | 25 | **54** |
| **Sub Total** | **1** | **2** | **4** | **9** | **10** | **13** | **29** | **59** | **152** |

There have been a total of three crashes involving cyclists and one crash involving a pedestrian. The pedestrian crash and one of the cyclist crashes occurred within the 50km/h zone in Otaki, while the two remaining cyclist crashes occurred in the 100km/h section of SH1 south of Otaki. One of the 100km/h crashes involving a cyclist was the fatal outlined above, while the other was caused by an intoxicated cyclist losing control and sustaining a minor injury.

## 5.4 Geotechnical Data

### Preliminary Geotechnical Appraisal

A preliminary geotechnical appraisal was carried out as part of the original SAR for the proposed route, North Otaki to Peka Peka Road (Meritec, 2002). This was reviewed by Opus as part of the scheme assessment study, and an additional appraisal was carried out together with development of a scope of geotechnical investigations for completion during these secondary investigations.

An investigation of the seismic and scour performance of the Otaki River Bridge was carried out by Opus International Consultants (2009) and this included the drilling of 4 boreholes and geophysical logging.

Seismic geohazard maps prepared by Opus and GNS (Geological and Nuclear Sciences) for Greater Wellington Regional Council provide ground shaking, liquefaction and earthquake induced slope failure hazard information for the area (Wellington Regional Council, 1992, 1993 and 1995). In addition, fault hazard studies for the northern section of the Ohariu fault have been carried out by GNS for Kapiti Coast District Council (Institute of Geological & Nuclear Sciences, 2003).

The logs of a significant number of water bores and some exploratory boreholes were obtained by GWRC. The borehole logs only provide a very general description of the soils.

Opus has carried out a desktop study of the published geological maps, available ground and geotechnical information. Opus also carried out engineering geological mapping of the area, and the maps prepared are presented in the Geotechnical Interpretative Report presented in Appendix E.

The hazard maps indicate a moderate potential for liquefaction in the areas underlain by sand dunes and inter-dunal deposits, south of Gear Road. There is very low or no potential for liquefaction between Gear Road and Addington Road. A variable potential for liquefaction is indicated north of Addington Road, and may vary from low to high depending on local ground conditions. The hazard maps indicate a generally low susceptibility to earthquake induced slope failure, apart from the section at Te Kowhai Road where a moderate-to-high susceptibility is indicated in the beach and dune deposits.

### Geotechnical Investigations and Factual Report

A programme of geotechnical site investigations for the project were developed by Opus, and carried out by AECOM during January to April 2011, to specifications prepared by Opus. The geotechnical investigations comprised the drilling of 15 boreholes, excavation of 34 trial pits, engineering geological logging of the trial pits and borehole samples, 26 static cone penetration tests and laboratory tests. The boreholes were drilled by Perry Drilling based in Tauranga, Static Cone Penetration tests carried out partly by Opus and partly by Perry Drilling, and the laboratory tests were carried out partly by Opus and partly by AECOM. The engineering geological logging was carried out to the Guidelines for Filed Description of Soils and Rocks in

Engineering Practice (NZ Geotechnical Society, 2005), and the laboratory tests were carried out to relevant NZ Standards. The results from these site investigations are presented in the Geotechnical Factual Report (AECOM, 2011). The site investigations confirm the geology identified from the desk study and the engineering geological mapping.

The locations of the site investigations are presented in the Geotechnical Interpretative Report in Appendix E.

The geological maps and borehole logs indicate the proposed expressway route will cross areas underlain by dune sand, inter-dunal deposits (peat), recent alluvium, and terrace alluvium. The active NE-SW trending Northern Ohariu fault crosses the proposed road alignment near Te Horo.

## Geotechnical Interpretation and Report

### Geotechnical Interpretation

A geotechnical assessment has been carried out by Opus to provide engineering interpretation of the ground conditions for the proposed Peka Peka to Otaki Expressway route and to provide geotechnical recommendations for the design and construction of earthworks, cuttings, fill embankments, bridges, pavements, culverts, and ground improvement. The geotechnical interpretative report is presented in Appendix E.

### Ground and Groundwater Conditions

The proposed expressway will be constructed in an area underlain by predominantly older terrace alluvium, recent alluvium, sand dunes, and inter-dunal swamp deposits.

Alluvial floodplain deposits are found in the Otaki River floodplain and along other watercourses including the Mangaone Stream and the Waitohu Stream. The floodplain alluvium comprises well sorted sub-angular to rounded gravel and cobbles with some boulders in a sand and/or silt matrix. The gravel and cobbles are generally loose to medium dense (SPT N values generally less than 10 to 25) near surface and become dense to very dense (SPT N values from 30 to 50+) with depth. (Large SPT N values are sometimes due to large clasts of gravel, cobble or boulders being encountered in the alluvium). The groundwater levels within the alluvial floodplain deposits are generally determined by the level of the adjacent watercourses such as rivers and streams, and are typically at 3 m to 5 m depth.

Dune sand is located at the southern part of the proposed route (south of Mary Crest) and at the northern end (between Waitohu Stream and Rahui Road). The dune sand is generally fine to medium sand with some to trace of silt and is generally loose (CPT cone resistance between 4 MPa and 10 MPa) at the surface and becomes denser with depth (CPT cone resistance from 10 MPa to 25+ MPa).

The swamp deposits are commonly encountered within isolated and sometimes inter-connected inter-dunal depressions between sand dunes. The swamp deposits generally comprise organic silt, clay, peat and sand. The peat is generally soft, fibrous and spongy and sometimes consists of decomposing fine rootlets and wood fragments. The silt and clay materials have a variable plasticity from low to high. The peat is generally up to 3 m thick, except immediately south of Mary Crest, where it is up to 4.5 m thick. Groundwater seepage was commonly observed at 1 to 2 m depths within layers of inter-dunal swamp deposits during excavation of trial pits in the dry summer conditions. Groundwater level was also measured at shallow depths of 0 to 2 m in piezometers installed in the borehole drilled in the inter-dunal areas. Some low-lying inter-dunal areas are commonly water-logged with standing water during the wet winter periods.

A significant length of the proposed route (from south of Otaki River to north of Mary Crest) is underlain by terrace alluvium. The terrace alluvium is comprised of well graded sub-angular to sub-rounded gravel, cobbles and boulders in a sand and/or silt matrix. Generally refusal of Scala Penetrometer Tests and N values of 50+ in Standard Penetration Tests (SPT) were recorded in the terrace alluvium that comprised gravel, cobbles and boulders. This can be due to the high density of the alluvium, or the presence of large cobbles/boulders, or a combination of both. Groundwater levels were found to be about 10 m below surface in the alluvial terrace deposits.

**Earthquake Hazards and Route Security**

The Northern Ohariu Fault, with a recurrence interval of 1,000 to 3,000 years, is likely to cross the alignment, and its location would need to be confirmed. The expressway should be constructed so that it crosses the fault on an earth embankment, so that in the event of an earthquake associated with rupture along this fault, access can be quickly reinstated.

The expressway will be constructed in an area of high seismicity, and the deep alluvium deposits means that it is characterised as site class D in accordance with NZS 1170.5. The bridges structures would need to be designed for an earthquake with a recurrence interval of 1 in 2,500 years (peak ground acceleration of 0.81g) and other free standing retaining structures and earthworks to an earthquake with a recurrence interval of 1 in 1,500 years (peak ground acceleration of 0.67g).

There is a variable liquefaction hazard along the route. The alignment and form of construction proposed is such that only minor damage is expected from liquefaction. Localised ground improvement is expected to be required at some structure locations.

**Cuttings**

Cuttings up to 20 m high in the sand dunes should be formed at a slope of about 20˚ to 25˚, and cuttings up to 8 m high in the terrace gravels shall be formed at maximum slope angle of 40˚. Given the shortage of cut materials for forming the embankments, it would be prudent to form flatter cut slopes or cuttings set back from the highway to obtain more cut materials, where land space is available. Sub-horizontal drainage holes supplemented by sub-soil drains at the toe should be incorporated to draw down the water levels, and erosion protection measures (erosion protection matting and revegetation) to protect the surface from rilling, particularly in the erodible dune sand.

**Embankments**

The predominant materials (dune sand and terrace gravels) from the cuttings are likely to be suitable for embankment construction with side slopes of about 25˚. The embankments in the low lying swamp (inter-dunal areas) underlain by peat and silt/clay will require ground improvement. We recommend that where possible the peat deposits up to 3 m should be removed and replaced with engineered fill. Locally where the peat is thicker (up to 4.5 m ) it may be economical to only undercut the upper 3 m depth, and carry out preloading to reduce post-construction settlements. The undercut and replacement approach is generally economical for the limited thicknesses and also minimises ongoing maintenance costs associated with future settlements. The embankments should be monitored using a combination of vibrating wire piezometers, shear probes, inclinometers and settlement plates.

**Pavement Subgrade**

The road pavements will be either on insitu dune sand or terrace gravel, or embankment fill (formed using dune sand, terrace gravel or borrow materials). Although the limited programme of testing has given high CBR values, the experience with similar materials is that the fine matrix leads to lower CBR during construction. A CBR of 6% to 10% is recommended for design of the pavements, with further compaction and CBR testing through trials during the design stage, and allowance for Benkelman Beam testing prior to construction of the road pavement (as noted in Section 8 of the Design Philosophy Statement, pavements have been designed for a CBR of 10 with allowance for a thicker pavement, undercut, or additional 150mm granular subbase layer in areas of potentially lower CBR). The installation of subsoil drains along the pavements is also important.

**Bridge Foundations**

The bridge structures can be formed using spill through abutments in line with the rural open land form in the area, or using reinforced soil wall abutments. Given the ground conditions, it is expected that the majority of the bridges will be supported by pile foundations. Bored cylinder piles are appropriate in the majority of the locations given the presence of dense alluvium including cobble and boulders that may retard driven piles. Locally some bridge abutments may require ground improvement to mitigate liquefaction hazards, though this is not likely to be a widespread requirement along this section of the expressway.

**Further Geotechnical Investigations**

The geotechnical investigation carried out during this scheme assessment addendum stage has enabled a good characterisation of the materials along the route, and development of design solutions that are appropriate for these conditions. More specific geotechnical investigations for the chosen scheme, and in particular at the specific structure locations, are essential before either detailed design or specimen design, depending on the procurement approach chosen. The investigation should also include further detailed mapping of the location of the Northern Ohariu Fault where the proposed expressway is predicted to cross the fault. The investigations should be carried out early so that it would enable monitoring groundwater levels over a period time over the different seasons and inform the Assessment of Environmental Effects and Submission to the Board of Inquiry.

## 5.5 Hydrological Data

The following hydrological and hydraulic data were collated as part of the hydraulic investigations of the effects of the proposed expressway on existing flood hazards and the determination of design flood levels for each river and stream crossing.

### Topographical Data

LiDAR-sourced topographic data were obtained from both KCDC and NZTA in order to define the topography of the floodplain for each major watercourse crossed by the proposed expressway. This enabled the effects of the expressway on existing flood hazards to be determined.

Ground levels for the LiDAR-sourced data were generally in terms of the NZ Vertical Datum (2009). As existing flood hazards across floodplain areas have been defined by GWRC in terms of the Mean Sea Level Wellington (1953) datum, it was necessary to translate between the two level datums.

Ground levels relative to the NZ Vertical Datum (2009) can be translated to a level in terms of the Mean Sea Level Wellington (1953) datum by subtracting -0.44m. To facilitate comparison with existing flood hazard information, all hydraulic investigations were carried out in terms of the Mean Sea Level Wellington (1953) datum.

### Hydrological Data

Stream flow data from the following hydrological gauging stations were collated to facilitate frequency analyses of the series of annual flood maxima and to provide discharge hydrographs for historic flood events. This is discussed more fully in Appendix C.

- Waitohu Stream and Water Supply Intake (1994-2010)
- Mangaone Stream at Ratanui (1993-2010)

The Otaki River is also gauged at Pukehinau although it was found not to be necessary to access the long-term flow record for this site in order to estimate flood magnitudes for the river.

### Floodplain Management Investigations Reports

An extensive number of reports of previous floodplain management-related investigations were made available by GWRC for the purposes of our investigations. These covered the Waitohu Stream and floodplain, the Otaki River and floodplain, the Mangapouri Stream and the Mangaone Stream and floodplain. The reports were used as background material to define the existing flood hazard across each of floodplains in the vicinity of the various watercourses. They are referenced in full in Appendix C.

### Computational Hydraulic Models

As part of the GWRC investigations referred to above, GWRC have also in the past either developed or commissioned the development of a number of computational hydraulic models of the different stream and

floodplain systems. They kindly made available copies of these models for the purposes of our hydraulic investigations. The models included:

- a one-dimensional MIKE11 computational hydraulic model of the Waitohu Stream and floodplain system coupled also to a rainfall / runoff model
- a composite one-dimensional / two-dimensional MIKE FLOOD model of the Otaki River
- a HEC-RAS model of the Mangapouri Stream
- a one-dimensional MIKE11 computational hydraulic model of the Mangaone Stream and floodplain system

The adaptation and use of these models for our hydraulic investigations are discussed more fully in Appendix C.

### Stream Cross-Section Data

The computational hydraulic models referred to above incorporated surveyed stream cross-section data. In the case of a couple of the stream crossings (the Mangapouri and Mangaone Stream crossings), the GWRC-sourced hydraulic models were not utilised directly. Instead discrete models of these crossings were set up as entirely new hydraulic models to provide greater resolution of design flood levels in the area of interest. The surveyed stream cross-section data were used in conjunction with the LiDAR-sourced ground topography data to define the geometry of the stream channel and floodplain system in each case.

### Photographs of Historic Flood Events

GWRC also provided copies of photographs for a number of historic flood events to assist us with our investigations of the effects of the proposed expressway on existing flood hazards. Some of these photographs have been included in Appendix C (e.g. aerial photographs of the aftermath of the 28 October 1998 flood in the Mangaone Stream).

## 5.6 Utilities Data

Utilities Data has been collected from the affected utilities providers. The following utilities providers with affected lines provided data;

- Telecom
- Vector Gas
- Electrix (power lines)
- KCDC (water, sewer and stormwater)

The data is included on the scheme drawings and has been used to determine estimates for relocations and diversions. These drawings are attached in Volume 4.

## 5.7 GIS and Constraints Data

GIS data was sourced from KCDC for use on the project. This data included information on the location of features identified in the KCDC district plan such as waterways and significant bush remnants. Utilising this data together with further input from the various social and environmental specialists a constraints map for the expressway was produced which allowed the alignment and associated link roads to be assessed and developed with consideration for identified features which could have environmental, social or cultural issues which may impact on the consenting of the expressway. The Constraints Map is included in Volume 4.

# 6 Option Description

## 6.1 Do Minimum

The do minimum for the Peka Peka to north Otaki project area takes into account projects and options which have been considered and are currently identified for implementation by NZTA or KCDC. The only existing SH1 project within the project area identified is the signalised pedestrian crossing on SH1 north of Arthur Street, which has been assumed to be constructed by 2016 in the assessment undertaken for the project.

There are a number of other options that have been developed and assessments carried out over recent years to identify interim solutions to address weekend and holiday traffic congestion and delays in Otaki (Otaki Traffic and Transportation Report[14]). These included such options as:

- Creating 2 lanes of southbound traffic SH1 between the Mill Road roundabout and Waerenga Road during peak periods and holidays.
- Restricting parking southbound on SH1 between the Mill Road roundabout and Waerenga Road during peak periods and holidays.
- Removing the central median and replacing it with a hatched area for vehicles manoeuvring in and out of parking spaces in a southbound direction.
- Increased enforcement of parking restrictions.
- Increased side road parking provision.

The objectives of the PP2O project are inter-related to the total Wellington RoNS corridor and as such those options identified above would not facilitate the provision of a high quality, safe and effective expressway between Levin and Wellington. None of these alternative options are included in the do-minimum as they have not been funding by NZTA.

It should also be noted that the Forest Lakes wire rope barrier could also be implemented as a do minimum project to the north of Otaki; however this project would have little or no impact on the PP2O project or vice versa.

For the purposes of this assessment, the effects of the expressway projects to the north (Levin to Otaki) and south (M2PP) were also considered as part of the do minimum in accordance with the programmed dates for construction. Although these projects have been included in the Do Minimum associated with the travel demand matrices from WTSM (as with all of the Wellington RoNS projects included) the project specific network model does not cover areas to the north or south, however the M2PP project model has recently been completed to model the M2PP project to the south. The do minimum trip demands have been based on the WTSM medium growth scenario, with recently approved permitted development demand at Otaki (Riverside Development), North Waikanae, Paraparaumu Airport, and Town Centre developments.

## 6.2 Corridor Options

The PP2O project has been the subject of numerous investigation and studies over many years and several consultation stages with stakeholders and the wider public. In December 2009 the NZTA Board adopted a preferred route option, subject to a range of ongoing reviews and detailed investigations. This option was substantially the same as an earlier (2003) alignment approved by the Transit NZ Board, following consideration of a range of Options. This SARA provides further secondary investigation around this preferred corridor.

Given that possible route alternatives have already been considered over a long period and across various reports the NZTA has commissioned a separate specialist report to review the historical work, update it as necessary, and bring it together in a comprehensive report. A separate Route Options Review[15] has been

[14] Otaki Traffic and Transportation Report, prepared by Opus International Consultants, November 2009.
[15] Peka Peka to Otaki Expressway, Route Options Review, Sylvia Allen (2011)

completed to document the range of feasible route options considered and to assess these against current assessment criteria prior to the NZTA Board making a final decision on the proposal in late 2011.

## 6.3 Option Development Process

A structured process has been followed to identify, assess, screen and then develop alignment improvements, expressway connectivity (interchanges) and local cross-corridor connections.

As described in Section 2.1 an initial scoping phase (PP2O Scoping Report, Final Draft 2011) adopted the following process to identify options that responded to the project objectives and NZTA Board directives (December 2009):

- Review and identification of issues, opportunities and constraints.
- Development of options at a series of option generation workshops to identify options that address the project objectives, issues, opportunities and constraints.
- Option assessment and screening to identify options to be taken forward to consultation and scheme assessment.

Following completion of the scoping phase the scheme assessment phase has further developed and assessed options using the following overall process:

- Completion of further baseline environmental assessments.
- Public and stakeholder consultation on options shortlisted from the scoping phase (with a primary focus on interchanges and local connection forms) (refer Section 8).
- Consideration of consultation and baseline assessment feedback.
- Further refinement of options in liaison with key stakeholders.
- Further assessment of options and workshopping with stakeholders to identify preferred options (refer Section 7).

Sections 6.4 to 6.7 outline the alignment, interchanges and local cross corridor connection options that have been identified as part of the above process.

## 6.4 Alignment Options at Mary-Crest and Te Horo

During the scoping phase, consultation process and completion of the baseline assessments a number of new constraints and alternative alignment options were identified within the central corridor. These alternative alignments maintain the expressway within proximity of the existing SH1 and NIMT transport corridor. However, they include an alternative railway overpass location at Mary Crest and an alternative expressway alignment through Te Horo.

The 2009 Board Preferred alignment and alternatives are shown in Figure 6-1 and are described in more detail below.


**Figure 6-1: Alignment Option Alternatives (Central Corridor)**

## Te Horo Alternative

An alternative rail crossing location north of Te Horo was suggested by the Otaki Community Board (OCB) in their 2009 submission to the NZTA. No diagram of the route was provided however from interpretation of their submission and discussion with KCDC the route would continue north from Mary Crest on the western side of SH1 and then through a defined corridor behind the existing Te Horo settlement before crossing to the east on the northern side of Te Horo, approximately adjacent to Te Waka Road.

The Te Horo Alternative does not affect properties along Gear Road and maintains the existing intersection arrangement for access onto SH1 from the eastern areas of Te Horo. This option also results in the existing School Road level crossing being maintained.

Local connectivity is maintained through an additional local arterial overbridge at Mary Crest while an overbridge maintains the Te Horo Beach Road connection and there is provision beneath the expressway overbridge for the Te Waka Road intersection with SH1 to be maintained[16].

The Te Horo Alternative would involve an expressway overbridge structure (over the rail and existing SH1) similar to that in the 2009 Board Preferred Option. The overbridge would be generally in the form of a concrete bridge supported by mechanically stabilised earth (MSE) walls on each abutment. The Te Horo overbridge is slightly longer due to the extra skew of the structure. The Te Horo Alternative would also include two local road overbridges (rather than one with the 2009 Board Preferred), one to connect Te Horo Beach Road and another to cross the existing SH1 over the expressway.

This option retains an impact on the eastern bush remnants at Mary Crest.

## Mary Crest Alternatives

Through the scoping, early ecological investigation and consultation processes areas of ecological and cultural/heritage significance were identified in the vicinity of Mary Crest. As a result alternative locations were suggested for crossing the rail and local road corridor near Mary Crest. These alignments are indicated in Figure 6-1.

**Western Alignment**

Western alignment 2 (west 2) is a refined version of the 2009 Board Preferred western alignment. This refinement was made when the importance of the Mary Crest bush remnants was realised (changes to the district plan will identify this bush as regionally significant). The west 2 alignment has reduced radius curves (820m, therefore meeting RONS guidelines) to allow the expressway to cross SH1 further south than the Western alignment 1. The west 2 alignment avoids the bush remnants and also more of the peat deposits further to the west. The west 2 alignment also impacts on fewer dwellings than the 2009 Board-Preferred alignment.

The western alignment 2 also reduces the construction footprint within the dunescape in the MaryCrest area.

The Mary Crest Western Alignment 2 has identical bridging requirements as the Board Preferred Option. However, the expressway bridge may be shorter as it has a reduced skew.

**Eastern Alignment**

The Mary Crest Eastern Alignment makes use of the existing plateau on the eastern side of the North Island Main Trunk Line (NIMT) to create a crossing location using the natural embankment for the northern approach of the overbridge. The crossing occurs approximately 300m North of Te Hapua Road. The expressway then utilises the natural topography for the northern approach ramp and rejoins the Board Preferred option just to the north of Mary Crest. The eastern alignment avoids most of the anticipated peat areas on the western side of the NIMT and also avoids the Mary Crest bush remnants and potential cultural sites. The alternative will not affect as many dwellings as the Board Preferred Option (west 1) and will avoid the equestrian centre at Mary Crest. The alternative also allows a larger portion of the existing SH1 to be used as a local road.

The location of the crossing south of the dunes leads to a localised high embankment to the south of up to approximately 15m above the adjacent low ground. Further details are contained in a working paper within Appendix D.

A crossing point even further to the south than the one in Figure 6-1 was investigated (refer to section 12.4 of the 2011 Scoping Report) however, crossings further south were discounted for the following reasons;

- The alignment cut through areas of regionally significant native bush.
- The alignment would require crossing of more deeply incised natural drainage channels.

[16] Alternatively, Te Horo beach Road would need to be diverted north to connect with Te Waka Road.

- It would complicate the proposed Peka Peka interchange and the connection to Hadfield Road, increasing cost.
- Property accesses would be required either under or over the expressway to gain access to the local road.

## 6.5 Connectivity Scenarios

A key focus of the 2010 Scoping Assessment[17] was an in depth review and assessment of the location and form of interchanges and connections along the expressway corridor with consideration for previous 2009 engagement feedback, and a focus on improving legibility of access for Otaki.

Seven route connectivity scenarios were developed, assessed by the team, and workshopped with key stakeholders. As an outcome of the scoping phase process the following scenarios were recommended and adopted to be taken forward to public consultation and the scheme assessment addendum phase:

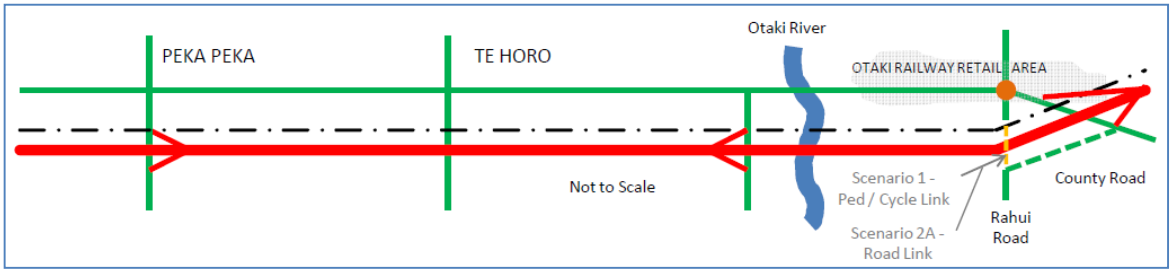



**Figure 6-2: Shortlisted Connectivity Scenarios (1 and 2A)**

The above scenario provides a split interchange to the north and south of Otaki with either a pedestrian/cycle link (Scenario 1), or road link (Scenario 2A) at Rahui Road. These connectivity scenarios were shortlisted because they provide the best balance between improved transport outcomes, social, environmental and economic value. The provision of a split interchange on either side of Otaki also provides for legible and intuitive access to and from the township while supporting the Otaki Vision for future growth to be focused within the Otaki Township.

This Scheme Assessment Report Addendum focuses on further option consideration for the split interchange options at North and South Otaki, the cross corridor connections at Rahui Road, and the connection form at Te Horo. This further assessment includes feedback from a public consultation process conducted in early 2011, which also highlighted the need for further consideration of the cross-corridor connectivity proposed at Old Hautere Rd.

### Potential Te Horo Northbound Access

The desire to consider a Te Horo off ramp in a northbound direction came as a result of public feedback (local business group) and the OCB's submission to the 2011 consultation phase. The aim of this concept was to improve access to businesses and trade activities in Te Horo and north to Otaki while avoiding direct access to and from Te Horo to minimise growth pressures.

Previous options for a full interchange at Te Horo and Peka Peka had been discarded due to concerns around managing growth pressures while also considering impacts on land use, proximity to alternative interchange options, relatively low vehicular demands, design and environmental issues, and the fact that such facilities would offer poor value for money.

In response to the public consultation the option of a northbound off ramp only has been investigated (thus seeking to achieve a balance between improved access and managing growth pressure). Viable locations for such an option include Peka Peka and south of the Mary Crest curve.

[17] Peka Peka to Otaki Expressway Scoping Report, Final Draft, January 2011

Figure 6-3 below illustrates the potential off-ramp configuration (located as far as practicable to the north). A location any further to the north would either impact on identified ecological and cultural areas or introduce further grade separated infrastructure.

**Figure 6-3: Potential Te Horo Northbound Access**

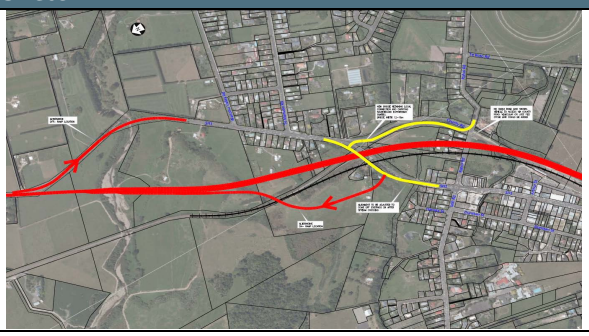
The option of a northbound off-ramp at Peka Peka has been considered and assessed as part of the M2PP project, Based on the traffic modelling undertaken and the suitability of the different sites, it was identified that Peka Peka provided much greater justification, however still had the same issues relating to growth management. Although some work has been undertaken to understand the benefits and effects of such an interchange, further work is being undertaken by the M2PP team to determine the outcome. Initial analysis suggests that the transportation benefits for these ramps could be as much as $10m (NPV). As a minimum, it has been suggested that the M2PP project should provide future proofing for a full interchange at this location as the best point of accessing to or from the expressway south between Waikanae North and Te Horo.

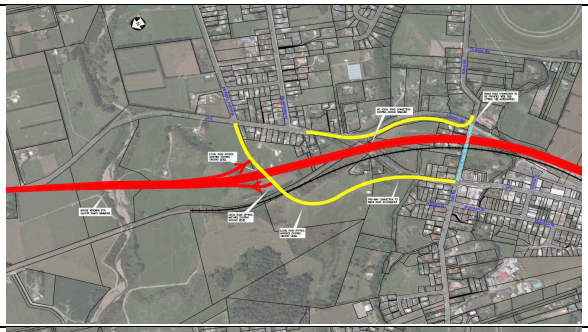
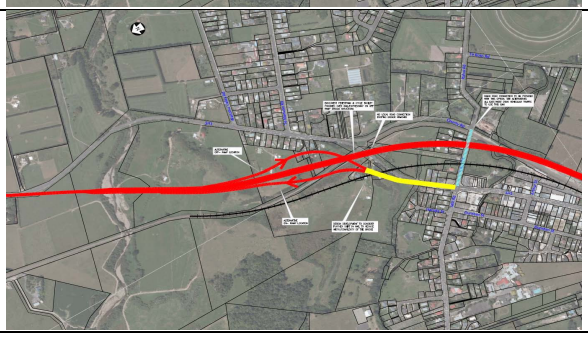
## 6.6 Interchange Form Options

At each of the interchange locations a number of different options were considered for the form of the interchange. The different interchange forms are unlikely to influence whether people choose to use the expressway for their trip but they will have different effects on the local area. The following sections outline the options considered at each interchange location (cross corridor connections are discussed in Section 6.7).

### North Otaki Interchange

Options considered under the preferred connectivity scenario at North Otaki included north facing ramps in a variety of different configurations – providing access to and from the north. The options taken forward for preliminary specialist assessments were:

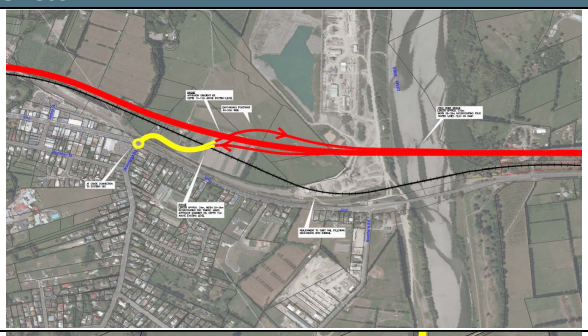
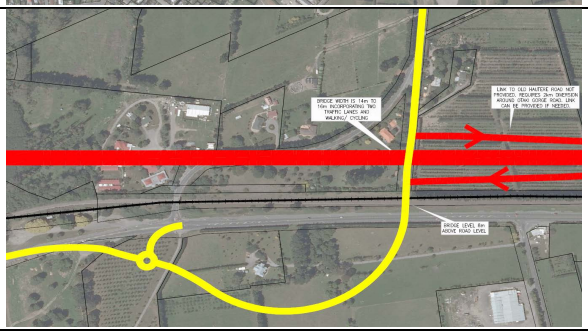
| Sketch | Option Description and Key Notes |
|---|---|
|  | NO02. 2009 scheme option with alternative ramp locations to eliminate complex rail bridge skew and short stacking length between on-ramps in existing scheme. Southbound on-ramp removed.<br>Closure of Rahui Road results in detour via County Road, for racecourse traffic also. Pedestrian/Cycle link assumed at Rahui Road.<br>New bridge (adjacent to existing rail bridge) constructed over expressway and Rail corridor. Provides access to Waitohu Plateau. |

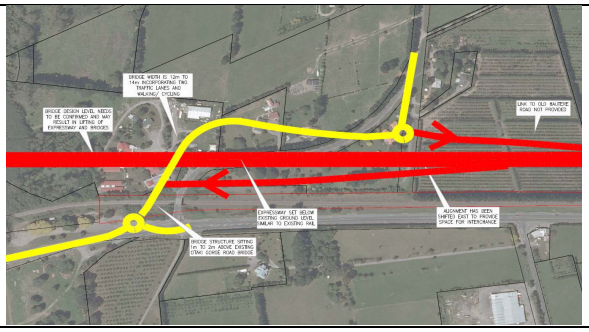
| | |
|---|---|
|  | NO09. North facing ramps.<br>Expressway crossing further north than NO02.<br>Vehicle link assumed at Rahui Road. No alteration to County Road function<br>No connection over expressway and Rail corridor in location of existing SH1 rail bridge. Access to Waitohu plateau via new interchange. Existing SB Otaki entrance re-located |
|  | NO11. North facing ramps.<br>North facing ramps provide direct access into Otaki<br>Vehicle link required at Rahui Road as no alternative access to Waitohu plateau, flood prone. County Road upgraded.<br>No connection over expressway and Rail corridor in location of existing rail bridge. Pedestrian access provided on interchange bridge near to existing SH rail bridge.<br>Rail realignment to shift further west. |

## South Otaki Interchange

For an interchange on the south side of Otaki under the preferred connectivity scenario, options were considered both on the northern and southern side of Otaki River. Options considered included south facing ramps in a variety of different configurations – providing access to and from the south. All options provided a local road link from Otaki Gorge Road to the existing SH1. A connection to Old Hautere Road was not included as part of the options but can be added to all options (increased footprint).

The options taken forward for preliminary specialist assessment were:

| Sketch | Option Description and Key Notes |
|---|---|
|  | SO02. South facing ramps on north side of river.<br>Underpass – local bridge over expressway and rail corridor.<br>Requires additional rail realignment and reduction in radius (down to 420m) off the river bridge thereby compromising rail geometry.<br>Steep approach/exit from roundabout to existing SH1.<br>Ramp lengths extend onto bridge requiring widening. More extensive works in flood plain<br>Additional local connection across expressway at Otaki Gorge Road |
|  | OG03. South facing ramps. Underpass (Local Bridge over expressway).<br>Ramps raised up to meet bridge over expressway.<br>Bridge aligned with Otaki Gorge Road. |

| | |
|---|---|
|  | OG07. South facing ramps.<br>Local road bridge over expressway utilises topography by depressing expressway to minimise height of bridge.<br>Bridge for crossing of expressway/rail set approximately 2-4m above existing Otaki Gorge Road rail crossing. |

### Peka Peka Interchange

The form of the intersection at Peka Peka is included as part of the MacKays to Peka Peka project. Liaison with the M2PP Alliance will continue throughout the development of both schemes. It has been agreed that for the PP2O project it will be assumed that north facing ramps will be provided to the expressway at Peka Peka. Other connectivity scenarios (such as south facing ramps) will be tested as part of the traffic modelling sensitivity testing.

## 6.7 Cross-Corridor Connectivity Options

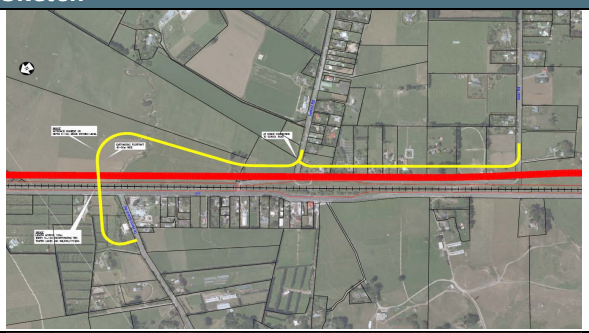
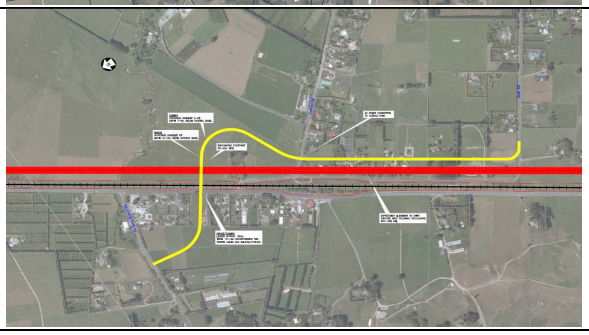
Connectivity across the expressway corridor (without connection to it) was considered at Rahui Road, Te Horo and Old Hautere Road. At these locations a number of options were developed.

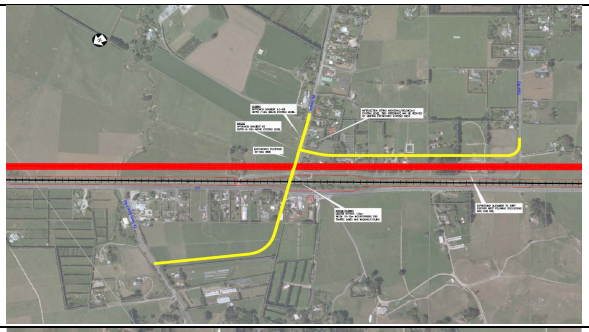
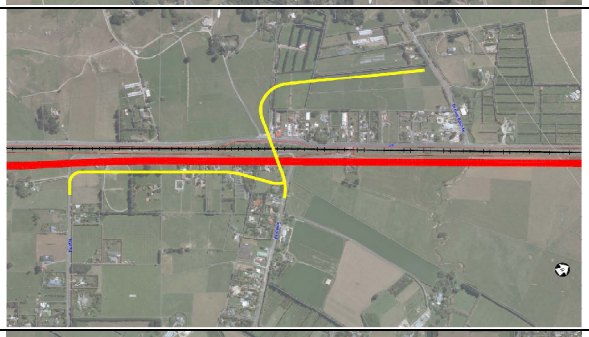
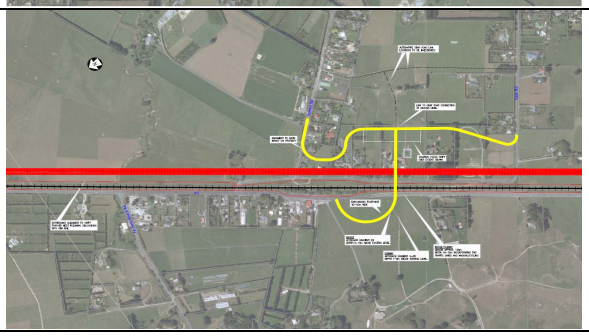
### Te Horo

For the connection of Te Horo Beach Road to School Road, the options considered either a local road bridge over, or a subway under, the proposed expressway.

At-grade options (rail and expressway were eliminated due to safety and operating concerns, together with poor amenity for any potential non motorised users. Other options that elevated the expressway at this location while retaining the local link at-grade were also considered but eliminated due to visual impact, cost and safety concerns regarding retention of the at-grade rail crossing.

The options taken forward to specialist assessment were:

| Sketch | Option Description and Key Notes |
|---|---|
|  | **TH01. Existing 2009 Scheme Option – Underpass, local road bridge over expressway.**<br>New Gear Road connection provided to School Road.<br>Local road subway not considered at this location due to location and extent of flood plain |
|  | **TH02. Underpass (Local Bridge over expressway) or potentially Overpass (Local Subway under expressway).**<br>New Gear Road connection provided to School Road.<br>Both local road subway and local road bridge considered at this location.<br>Potential for pedestrian/cyclist ramp/stairs from SH1 properties up to bridge.<br>Subway option was considered but eliminated given flood plain issues at this location |

| | |
|---|---|
|  | **TH03. Underpass (Local Bridge over expressway – TH03a) or potentially Overpass (Local Subway under expressway-TH03b).**<br>New Gear Road connection provided to School Road.<br>Both local road subway and local road bridge considered at this location.<br>Potential for pedestrian/cyclist ramp/stairs from SH1 properties up to bridge. |
|  | **TH08. As per Option TH03, but with the bridge alignment skewed to the south to avoid the Red Cafe and hence reduce impacts on the western settlement.**<br><br>(Note – this option was developed following assessment of options TH01 to TH04 as an improvement to Option TH03) |
|  | **TH04. Underpass (Local Bridge over expressway) or potentially Overpass (Local Subway under expressway).**<br>New Gear Road connection provided to School Road.<br>Both local road subway and local road bridge considered at this location.<br>Potential for pedestrian/cyclist ramp/stairs from SH1 properties up to bridge. |

## Rahui Road / Waerenga Road

The proposals put forward as part of the 2009 consultation process identified the potential for a pedestrian/cyclist underpass at Rahui Road. Further stakeholder and public feedback during the 2011 consultation process stressed the importance of maintaining two east-west linkages at Otaki and as a result option development and assessment has considered both pedestrian/cyclist and vehicle links at Rahui Road and Waerenga Road. Local underpass and bridge connections were considered.

The options taken forward for preliminary specialist assessment were:

| Sketch | Option Description and Key Notes |
|---|---|
|  | **EW1. Pedestrian/Cyclist Bridge at Rahui Road**<br>Bridge structure approximately 8.5m above existing ground level.<br>Approach ramp straightened to improve desire lines and aesthetic outcomes.<br>Grades of approximately 8% on approaches.<br>Upgrade of County Road required. |
|  | **EW2. Rahui Road Bridge.**<br>Grades of approximately 8% on both approaches with height of approximately 8.5m.<br>County Road realigned at southern end to tie in to Rahui Road and provide property accesses (remainder of County Road retained in current form).<br>Note – a subway option was considered but discounted due to flood risks. |
|  | **EW3. Waerenga Road Overbridge (expressway over Waerenga Road) with at-grade rail.**<br>Expressway raised approximately 6m to accommodate overbridge.<br>At grade level crossing retained.<br>At grade connection to former SH1 adjacent to Waerenga Road.<br>Includes pedestrian/cycle bridge at Rahui Road to meet desire lines and demand. |
|  | **EW4. Waerenga Road Underpass (Waerenga Road over expressway).**<br>Local road underpass (over the expressway and existing SH1).<br>At-grade connection to Waerenga Road and Dunstan Street with large/long bridge structure over south end of New World car park.<br>Includes pedestrian/cycle bridge at Rahui Road to meet desire lines and demand. |

Further details of the above options are provided in a working paper (PP2O Further SAR Phase MCAT Assessment) included in Appendix D.

Other alternative options identified but not taken forward due to highly significant effects or identified technical fatal flaws included options for elevating the expressway over Rahui Road, and provision of an alternative east-west link from Te Roto Road, across the expressway and railway, to the south connecting with Riverside Drive.

### Old Hautere Road

Following feedback from the 2011 consultation process, further connectivity options for Old Hautere Road were identified. The 2011 consultation material had shown Old Hautere Road as becoming a dead end where it previously crossed the NIMT to connect into SH1. Further options were developed to provide a connection to either; the existing SH1, Otaki Gorge Road in the north, or the extended School Road in the south.

The options taken forward for preliminary assessment were:

| Sketch | Option Description and Key Notes |
|---|---|
| Not Applicable | **OH1. Cul de Sac Option.**<br>Closing of Old Hautere Road and construction of a cul de sac turn around area.<br>All access via the eastern end of Old Hautere Road to Otaki Gorge Road.<br>May require small property purchases in order to create enough space for turn-around area. |
|  | **OH2. Underpass (Local Bridge over expressway).**<br>Grade separated connection to SH1 to maintain existing connectivity.<br>Approach embankment grades up to 8% with a bridge height of 7-8m.<br>Will require additional property purchases on both west and east sides of the expressway and introduces associated approach embankments. |
|  | **OH3. Link road to Otaki Gorge Road. (2009 Scheme Option)**<br>Old Hautere Road extended north to Otaki Gorge Road via local road approximately 1km long.<br>Will require additional property purchases from already affected land owners.<br>Opportunity to provide traffic calming, or vary the alignment to deter higher speeds. |

Further details of the above options are provided in a working paper (PP2O Further SAR Phase MCAT Assessment) included in Appendix D.

## 6.8 Property Access Options

As part of the PP20 Expressway a number of properties will have their current accesses severed. NZTA will be required to provide new accesses, which in some cases will require constructing new local access roads across other private properties in order to get access onto existing local roads or proposed new local roads.

The locations requiring new property access treatments are summarised below, and indicated in Figure 6-4:

(a) Taylors Road (properties with current direct access to SH1)

(b) Former SH1 Access (properties with direct access to SH1 at the new off-ramp)

(c) North Otaki adjacent to the new Otaki Ramp Bridge

(d) Rahui Road

(e) Adjacent to the Winstone Quarry in Otaki

(f) Various properties at Te Horo

(g) Various properties at Mary Crest

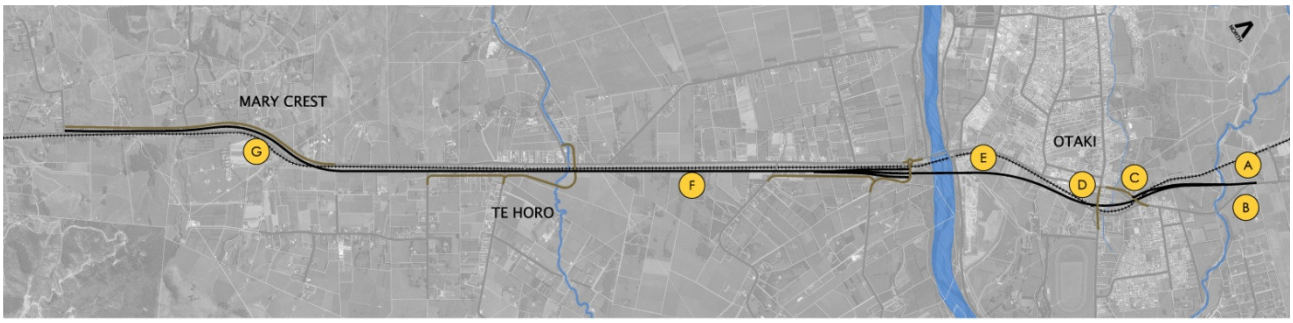



**Figure 6-4: Location of Private Accesses**

A range of options to maintain access to these localised private properties have been considered in conjunction with the assessment of access options for the key interchanges and local road cross-corridor connections.

Given that the form and location of these local property access proposals is heavily influenced by the local road and interchange outcomes, the description, assessment, and recommendations for preferred treatments are documented in Section 7.5 of this report following reporting on the preferred local road and expressway connectivity outcomes.

The options have been identified as part of the preferred scheme and are documented in Section 7.5.

## 6.9 Pedestrian-Cyclist Access Options

Although pedestrian and cycle demands are limited in the project area due to the largely rural environment and spread out nature of development outside of Otaki, non motorised users (including equestrians) are considered important by KCDC and other stakeholders.

The project has assumed that pedestrian and cycle facilities would be provided on all local road linkages being modified or created as part of the project, while an off road north / south linkage would also be developed as part of the project.

A number of options were considered as part of the scoping phase and were documented in the PP2O SARA Scoping Report 2011. Assessment concluded that the facility should be provided within the existing SH1 corridor, and not the expressway corridor, given that this is where people want to move to and from. The preference at this time was for an off road pedestrian and cycle facility to be located on the eastern side of the existing SH1. It was also recommended that shoulders on the existing SH1 should be of sufficient width to provide a safe area in which road and commuter cyclists could ride.

Meetings with KCDC and other stakeholders have confirmed that a facility is best located adjacent to existing SH1; however, feedback from stakeholders provides greater support for a facility on the western side, however there are a number of design, safety and value for money issues that need to be addressed.

The table below presents the pros and cons of these two options.

| West side of Existing SH1 | East side of Existing SH1 |
|---|---|
| • Furthest from higher volume expressway traffic and railway (noise).<br>• In areas the Existing SH1 will need to be re-configured/shifted east, or the path is located adjacent to the road shoulder. There could be a requirement for additional land at certain locations unless everything is moved over to the east.<br>• Path will cross numerous private accesses, and local roads, creating a potential safety issue at each conflict point. Additional private access crossing points will be expected in the future when land on the western side of the existing SH is developed thus increasing the number of potential crossing points of the western route option.<br>• Easy to access the local road network and facilities from the path.<br>• Requires all users to cross a Otaki Gorge Road / Southern Interchange if a clip on facility is to be provided on the east side of the bridge. This is based on the preference for pedestrians and cyclists to be on the east side through Otaki due to available space for an off road facility and linkages with the railway station, Rahui Road and recreational land.<br>• Pedestrians and cycles will be required to give way to side road traffic (i.e. Te Kowhai Rd, Te Hapua Rd, Te Horo Beach Rd, Te Waka and Addington Road).<br>• Could provide a good link into areas of vegetation south of Mary Crest.<br>• No bridges required.<br>• Expected cost of $3.3M (range $2.7M - $3.6M) exclusive of Otaki River Bridge crossing. | • Closer to higher volume expressway traffic and railway (noise). This is particularly relevant for the section south of Mary Crest where the distance between the expressway and the existing SH1 is significantly reduced and not separated by the rail corridor. The separation is approximately 10m for this option compared to 40m for a facility on the west side. This situation is for approximately 2.5km of the 8.5km distance from Te Hapua Road to the Otaki River.<br>• Could be provided within expressway footprint or in safety zone between the Existing SH1 and railway requiring no additional land, and reduced re-configuration of the existing SH1.<br>• Easy to access the local road network from the path. Path users will be required to cross the existing SH1 between the main population on the west and the proposed facility. It is expected that dedicated pedestrian/cycle crossing facilities will be provided at suitable locations along the route to provide safe and highly visible east-west crossing points.<br>• Continuous route from Peka Peka (could be grade separated at this location also) through to Otaki North, avoiding the need for pedestrians and cycles to give way to side road traffic (with the exception of one local accessway at Mary Crest).<br>• The eastern option has very limited potential for additional private accesses and side roads in the future as the route is directly adjacent to the rail/road corridors for the majority of the route, thus providing physical barriers providing no potential for additional future private access or side road crossing/conflict points<br>• No bridges required (except those linkages to the east which will be provided for east/west movements in all options).<br>• Expected cost of $2.5M (range $2.1M - $2.8M) exclusive of Otaki River Bridge crossing. |

There are a number of problems associated with both options and for the purposes of this SARA it has been identified that a facility could be provided within the existing SH1 corridor. It has been agreed that the project being undertaken to look at the revocation of SH1 should look at this facility in more detail, taking into account the following design issues:

- Ensuring pedestrians and cyclists are safely protected from adjustment transport corridor activities e.g. Rail north of Mary Crest and the expressway.
- Consideration also needs to be given to the passing motorists on the existing SH1 corridor.
- Ensure safe and defined crossing points are located at key side roads and areas of residential activity. This could be incorporated into threshold treatments where appropriate or specific facilities designed at defined crossing points.
- Provide adequate surveillance to ensure users are not hidden.
- Provide appropriate landscaping and drainage to ensure a pleasant and uninterrupted experience for users.

Following discussions with KCDC, it was identified that a 4m corridor should be provided, which would include a 2.5m pedestrian and cycle facility and 1.5m of grassed area for equestrian users.

Consideration was given to the ability to provide an underpass / overbridge at Mary Crest to shift pedestrians and cyclists between the east and west sides through this area, however the options are limited and could be costly and undesirable to users.

## 6.10 NIMT Rail Options

The outcomes for the existing and proposed rail corridor have been the subject of several discussions with KiwiRail. The proposed outcomes for the NIMT (North Island Main Trunk) rail corridor are summarized in the document, KiwiRail Outcomes and Basis of Design, which is included as Appendix O.

The Basis of Design document has been developed to ensure that:

- the proposed adjustments to the rail corridor meet KiwiRail standards;
- the expressway design recognises and allows for possible future upgrades to the NIMT line; and
- where possible existing level crossings are removed as part of the project providing a safer outcome.

This document will continue to be developed through the consenting, and design stages of the project.

Three options have been considered for the Otaki Railway Station treatment, ranging from relocation to the west, retention in its current orientation with a modified canopy and platform, and lastly rotation of the building and platform at its current location. The latter Option has been adopted as it has received support from all parties.

## 6.11 Landscape Mitigation Options

The current proposed landscape outcomes have been the result of several meetings with Kapiti Coast District Council and NZTA. The current proposed outcomes are described in the Urban and Landscape Design Framework (Appendix M), and the Landscape Scheme Drawings (Volume 4).

The Landscape Scheme Drawings portray the landscape mitigation proposals, as well as identifying landscape and urban design opportunities.

Both the Urban and Landscape Design Framework and the Landscape Drawings will continue to be developed throughout the project.

## 6.12 Noise Mitigation Options

Noise mitigation measures will be required in areas where existing residents are located near to the alignment. This occurs in areas around Otaki and Te Horo. A number of existing properties are already subject to high levels of road traffic noise.

As described in section 4.12 an ambient noise survey has been conducted to assist in determining current noise levels and best practicable treatment options under the New Zealand noise guidelines NZS 6806: 2010. In addition, rail noise effects have been assessed where the NIMT is relocated through Otaki.

A number of noise mitigation measures have been considered. These include noise walls, bunding, low noise road surfacing or a combination of these, for example low bunds with noise fence on top.

A preliminary Acoustics Assessment (URS, 2011 – Appendix Y) has been competed for the scheme. Based on the preliminary assessment the most likely range of treatment options include the use of low noise surfacing (e.g. OGPA) in sensitive areas, and localised noise fences at particular properties, rather than the provision of noise barriers or bunds along the corridor.

Further detailed assessment will be completed at the AEE stage to refine the best practicable option.

## 6.13 Stormwater Mitigation Options

The proposed approach for stormwater management has been the subject of early consultation with the relevant councils (KCDC and GWRC), to allow the design approach to be shaped collectively. The approach that emerged is considered current best practice including using: local rainfall data, most likely climate change, providing attenuation, treatment and waterway crossing requirements as defined by council and NZTA guidelines.

The design philosophy proposed is summarised in two documents:

- Stormwater Design philosophy
- Preliminary Design Philosophy Statement

These are included as Appendix N and Q.

### Road runoff management

A range of runoff management solutions have been considered and a whole of life cost analysis has been undertaken for the most likely solutions. This showed that the existing topography had a significant influence on the best value solution. Further details on this assessment are included in the Stormwater Design Philosophy document.

The design philosophy selected is to utilise several different treatment train methods to collect, treat and attenuate the road run off. The most frequently used treatment train in this project is attenuation swales which consist of multiple cells, these cumulatively provide the required attenuation and water treatment. The use of attenuation swales responds to the relatively flat nature of much of the project length and minimal 'left over' spaces where it would be appropriate to locate concentrated attenuation areas.

Where attenuation swales are not appropriate, normal swales (which provide water treatment) have been used in conjunction with dry ponds (which provide attenuation).

Attenuation is not provided for discharge in to the largest watercourse on the project, the Otaki River.

Other variations to the solution described above include where kerb and channel (with associated pipework) is used to collect the road runoff, and where attenuation is not deemed to be necessary. Kerb and channel is only expected to be used at bridge locations (and possibly some junctions), with treatment still provided by swales before the water is discharged.

Typically the road runoff is finally discharged to waterways, however in isolated places the water is discharged to the ground.

### Waterway crossings

Waterway crossings have been identified and a preliminary size calculated to enable the road level to be set.

Following discussion with the ecology team it has been decided that apart from the major river crossings (Waitohu and Otaki River) all other watercourse crossings will be culverted. This includes the expressway and local roads. This approach has not yet been agreed with KCDC.

More specific details on culvert design will be available through the preliminary design process. The assessment at that stage will define the locations where fish passage will be provided.

Where existing culverts act as a throttle to the flood flows (providing downstream flood protection) this throttling effect will be maintained.

Further assessment required for completion of the AEE

For the road runoff designs the work needed moving to the AEE stage includes:

- Document the detail around attenuation not being needed where discharging to the Otaki River;
- Consider requirement for soakage tests just north of the Otaki River;
- Look for opportunities to refine attenuation swale sizes based on specific location (grade and catchment);
- Confirm which swales require erosion protection (check dams);
- Consider refinement of dry pond sizing;
- Providing typical design details for attenuation swales, swales, and dry ponds;
- Confirming with NZTA and KCDC responsibilities for maintaining stormwater devices that service both roads; and
- Agreeing tie-in details for projects to north and south of PP2O.

For the culvert designs the work needed moving to the AEE stage includes:

- Considering more detailed survey information for assessment of downstream water levels;
- Where necessary checking some of the smaller culvert catchments (based on additional information);
- Further defining flows and culverts sizes including more detailed assessment of effects in extreme storm events;
- Defining any upstream effects; and
- Confirming where fish passage is required and providing typical preliminary detail designs for different culvert types.

## 6.14 Bridge Design Options

### Introduction

The bridges of PP20 are described in the following section. Criteria for choosing appropriate forms for these structures are also presented. This is followed by an evaluation of the options leading into final recommendations and costings.

### Summary

The ten key bridges in this project are as follows:

**Table 6-1: PP2O Bridges**

| Bridge No. | Name | Description | length (m) | width (m) |
|---|---|---|---|---|
| 1 | Waitohu | Expressway over Waitohu River | 82 | 23 |
| 2 | Otaki North rail | Local road over NIMT rail | 18.4 | 16.9 |
| 3 | Otaki North | Local Road over expressway | 36.2 | 16.9 |
| 4 | Rahui Road | Rahui Road over expressway | 115 | 13.9 |
| 5 | Otaki River Bridge | Expressway over Otaki River | 332 | 23 |
| 6 | South Otaki rail | Local road over NIMT rail | 17.1 | 15.4 |
| 7 | South Otaki | Local road over expressway | 58 | 15.4 |
| 8 | Te Horo | Local road over expressway | 102 | 11.9 |
| 9 | Mary's Crest | Expressway over NIMT & local road | 152 | 19.3 |
| 10 | Pedestrian/Cycle extension to existing Otaki River Bridge | Pedestrian/Cycle extension over river (part of SH1 revocation) | 190 | 3 |

The length, width and span arrangements of the bridges is generally governed the roading geometry.

Wherever possible, sloped abutment walls have been adopted as these are considered visually superior to vertical abutment walls.

A number of bridge forms were considered for each these structures. The forms are listed below in order of increasing cost. Generally the higher cost the better aesthetics.

Bridge forms considered:

(a) Lowest cost super 'T' and hollow core options (considered for all 10 bridges). No architectural enhancements are provided with this approach.

(b) Super 'T' bridges with architectural treatments to piers and barriers (river crossings and Otaki North, Rahui, Otaki South and Te Horo)

(c) More expensive and aesthetically superior concrete box bridges (river bridges and Otaki North, Rahui, Otaki South and Te Horo)

(d) Gateway and or iconic style bridge including arches, cable stayed and other 'gateway' 'iconic' forms (Otaki & Waitohu River Bridges)

Early on it was identified that gateway or iconic structural forms that were prominent in the landscape, were not desirable from a landscape and urban design viewpoint (see Landscape and Urban Design Framework). Therefore gateway or iconic structural forms were eliminated from the options list.

Gateway treatments are however considered appropriate in the landscape before, after and between interchanges rather than at structure locations. Recommended treatments are discussed in detail in the Urban and Landscape Design Framework.

Bridge solutions with good architectural design were considered a 'must have' particularly at the more visible local road over expressway crossings and this is reflected in concrete box structure types being proposed for Otaki North (No. 3), Rahui (No. 4), Otaki South (No. 7) and Te Horo (No. 8) crossings.

Super 'T' bridges with treatments to piers and barriers are proposed for the river crossings as the costs with adopting the more elegant concrete box bridge form for these relatively large structures is probably not justified.

The local road over rail bridges are small relatively short spans and generally hidden so lower cost hollow core bridges are proposed for these.

The Mary Crest structure, described in detail in later sections, is an economic and elegant beam and slab bridge.

## Bridge Selection Criteria

**Introduction**

Selection of bridge types considered each of the following:

- Requirement to provide value for money (best value)
- The need for robustness in a seismically active region
- Whole of life performance
- Community expectations
- Aesthetics

An outline of how each of these influenced the final outcomes is described below.

**Best value**

Best value aims to deliver the best outcome taking into account all relevant criteria including initial cost, whole of life performance, community expectations and aesthetics. Recommended best value solutions are not always the cheapest options as desired or must- have outcomes such as good aesthetics generally but not always come at an extra cost.

Perhaps the stand-out 'best value' example in this scheme is the recommended structural form for Mary Crest Bridge. A very economic solution that is also an elegant bridge form is proposed, turning what could of

otherwise have been a chunky and dingy rail crossing into an interesting and airy rail and local road overbridge. The fully framed portal bridge has no bearings and joints meaning little or no maintenance for much of its life. It is also a highly redundant and robust form that is likely to perform well under earthquake loading.

Sleek concrete box bridges are proposed for the local road over expressway underbridges (bridges 3, 4, 7 & 8). The bridges are more expensive than generally less attractive super 'T' bridges. The additional cost involved in providing a superior visual outcome at these locations is not considered excessive in the context of the overall project. Again this is a 'best value' outcome with a good balance between aesthetics and cost delivered.

Use of more conventional Super 'T' structural forms for the river crossings but with architectural treatments provided to the piers and barriers is considered the best value for these structures. The large scale of these structures and the limited visibility of these bridges from the expressway or existing SH1 roads does not warrant the adoption of the more expensive concrete box form.

Economical hollow core bridges provide the best value solution for the local road over rail bridges (bridges 2 & 6). These bridges are not particularly visible and therefore do not warrant significant investment on aesthetic treatments. Best value here is to use the cheapest bridge form for these bridges.

**Robustness**

An objective of the project is to provide a strategic link for Wellington with improved regional network security. The most significant threat to route security is large earthquakes. This risk has influenced the selection of structural configurations in a number of ways. In particular, robust structural forms with high levels of redundancy have been adopted wherever possible. Features of the various bridge forms used for the project follow.

Bridges 2 – 4 and 6 – 9 are of fully integral construction at the abutments and piers as these bridges have appropriate configurations (overall length less than 100m and flexible substructures) to permit this form of construction. These structures have cast in-situ concrete connections between the superstructure components (deck and beams), and substructure (piers and abutments), which provide very good resistance to earthquake forces and potential ground movements. The bridges are founded on bored piles which are robust and perform well in earthquakes.

Otaki & Waitohu River Bridges (bridges 1, 5 & 10) are founded on bored piles supporting reinforced concrete piers and abutments. This commonly used and proven structural form performs well in earthquakes with seismic resistance being provided by cantilever piers and pile/ pile cap bents. The bridges are either too long and or too stiff to be made fully integral and as such the superstructures will be supported on bearings at each pier.

**Whole of Life Performance**

Bridge maintenance and repair costs are considerations in whole of life costing. Generally the most maintenance intensive items in a bridge are bearings and joints and in the case of steel bridges, repainting costs. Low maintenance bridge forms have therefore been chosen for the bridges.

Bridges 2– 4 and 6 – 9 are particularly low maintenance structures with no bearings, expansion joints or coating systems that may require attention during the life of the structure. Whole of life performance is expected to be excellent for these structures.

With careful detailing of the Waitohu and Otaki River bridges, ensuring that good access for inspection and maintenance as well as provision for bearing and expansion joint repair and replacement is provided, a reasonable 'whole of life' performance of these bridges is also anticipated.

**Community Expectations**

Throughout the development of bridge concepts, the views of stakeholders have been sought and considered in light of the overall project objectives. This process has generally delivered outcomes that are visually acceptable, have stakeholder buy in and are still economic.

Rahui Road Bridge is a prime example of successful stakeholder involvement. Many options were considered for the bridge with the final solution (meeting with good feedback from KCDC and OCB to-date) being an affordable, sleek, soft and elegant concrete box bridge founded on shaped piers.

The bridge form proposed at Rahui Road has subsequently been adopted for the other under bridges (3, 7 & 8) for consistency of bridge structural form and appearance on this project. This proposed structural for could also be used for the Otaki and Waitohu River road bridges should funds permit.

**Aesthetics**

The intrinsic but unquantifiable value of good design aesthetics has been rediscovered. Cheap chunky bridges are generally no longer acceptable. Of course good looking bridges also need to be (and can be) affordable.

The solutions proposed for the scheme demonstrate a good balance between aesthetics and cost. Case in point are the four under bridges (3, 4, 7 & 8) which all have a similar concrete box forms. Economy is realised through re-use of formwork and falsework across several structures. At the same time subtle elegant bridges with a contemporary form that is unlikely to date, are provided.

The Otaki and Waitohu River Bridges are fitted with architecturally designed piers and abutments and will have greatly improved aesthetics for a relatively small additional cost.

Considerable care has been taken in the development of the concept for Mary Crest. A very economic solution that is also an elegant bridge form is proposed turning what could of otherwise have been a chunky and dark rail crossing into an interesting and airy rail and local road overbridge.

Bridge aesthetics are also covered in detail in the Urban Design and Landscape Design Framework.

## Options Considered

**Waitohu & Otaki River (Bridges 1 & 5)**

Options considered for these bridges included:

- Lowest cost option – Super 'T' beams on circular columns and reinforce concrete hammerhead caps.
- Intermediate option – Super 'T' beams on architecturally designed piers with elegant precast barriers
- A Best visual outcome option – Architecturally designed concrete box bridge deck and substructure
- Iconic/ Gateway bridges - Long-span arch bridge across the Otaki River (substantially more expensive than any of the other 3 solutions)

Cross-sections at the piers for Options 1 -3 are as follows.

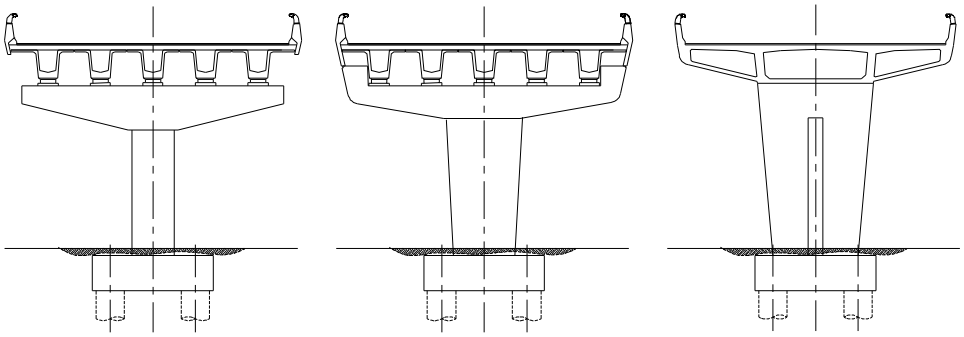



**Figure 6-5: Potential Bridge Forms**

As noted earlier, Option 4 was eliminated early on in the process on the premise that gateway or iconic structural bridge forms did not fit with this section of the RoNS.

Option 1 is probably not in line with the expectations of the local community who are strongly in favour of a good visual outcome and is therefore ruled out.

Option 3 provides an aesthetically superior bridge form which is consistent with the proposed local bridges but at a higher cost.

Given architectural/urban design inputs and available view shafts to the new river crossing Option 2 is considered to provide the best compromise between cost and aesthetics and is therefore the recommended bridge form for the river crossings. The proposal is aesthetically superior to Option 1 and aims to adopt style articulations from the other local road bridges (e.g. Rahui Road Bridge) through adopting an extended barrier profile. Appearance of these bridges from the viewpoint of recreational river users will be a key focus given the limited visibility of these bridges from the expressway or existing SH1 roads.

Comparative costings of these options are summarised later in this section.

**Otaki North, Rahui, South Otaki and Te Horo (bridges 3, 4, 7 & 8)**

Options 1 – 3 bridge forms considered above for the Otaki and Waitohu River Bridges are also appropriate for these four bridges.

Given the visual prominence and setting of these structures the architectural/urban design treatment is considered important. At Rahui Road and at the Otaki North structure the bridges will be highly visible from surrounding reserve/open space areas. As such it is felt that Option 1 or 2 are unlikely to meet the expectations of stakeholders and the stated desire of NZTA to provide a structure of lasting visual value. It is also important that all four underbridges on this project read similarly so a consistent structural form is recommended for these structures.

Option 3 is the proposed configuration for these four bridges delivering sleek, soft and elegant bridge structures founded on shaped piers and at a reasonable cost. Given that the four bridges account for only 30% of the total structures estimate, the resulting increase in total bridge budget is relatively modest when compared to the cheapest conforming solution approach.

The box girder bridge decks could be constructed by a number of methods including:

- Segmental construction where 2.5m – 3.5m wide full bridge width precast elements are lifted into position and post-tensioned together once all the units are in place;

- Cast insitu post tensioned box construction; and

- A series of longitudinal spanning precast box beams. The outer beams would be cast with a curved profile to produce the desired shape.

**Bridges 2 & 6**

These bridges carry local roads over the NIMT and are not highly visible from any adjacent vantage points. The railway alignment will be obscured in a cut at south Otaki and enters through a fill embankment at North Otaki. Both structures are relatively short span in scale. Simple, robust and slim-line hollow core bridges are considered the sensible option for these bridges. Attention to detail (e.g. barrier and wingwall arrangement) should ensure a reasonable visual outcome with these bridges.

**Bridge 9 – Mary Crest**

The Mary Crest bridge crossing carries the expressway over the NIMT and a local access road. The crossing is particularly challenging as the road is highly skewed relative to the rail corridor below.

Alternatives investigated for this bridge included:

- Option 1 - A hollow core 'tunnel' similar to McKay's Crossing but much wider and longer;
- Option 2 - A two-span steel composite bridge; and
- Option 3 - A day-lighted beam and slab deck (see scheme drawings in the Bridge Design Statement).

Initial estimates indicate that the cost of each of these options is similar.

The hollow core tunnel (Option 1) is a well understood and is an economic form. The down-side of this arrangement are the large 'dead areas' outside of the footprint of the carriageway making for a long and dark tunnel under the deck and unsightly areas of bridge deck beyond the footprint of the expressway above.

The two span composite steel bridge (Option 2) is made complex by a high skew angle increasing costs when compared to a square (zero skew angle) bridge. The structural depth required for this form of crossing (1.8 – 2m) is also considerably more than either the hollow core bridge (0.9 - 1.1m) or a beam and slab bridge (1.2 – 1.4m) making for more extensive earthworks and approach embankment heights. Although the bridge cost per square metre is high for this option, the bridge footprint matches the expressway above and the deck area is therefore smaller than for Options 1 & 3. All these factors deliver a bridge of similar overall cost to Options 1 & 3 providing the extra costs of the higher approach embankments is not included.

The beam and slab system (Option 3) proposed for this bridge structure is similar to Option 1 but with day-lighting of the structure not directly under the footprint of the expressway. The outcome is an attractive pergola effect at the portals of the bridge, a much brighter environment under the deck when compared to the hollow core tunnel, less materials as a result of the day-lighting and all at a similar cost to the hollow core or steel girder bridge options. Option 3 is therefore a clear winner for this bridge providing a cost effective, attractive bridge with a pleasant light environment for users travelling underneath.

**Pedestrian/Cycle extension to the existing Otaki River Bridge**

The logical form for this structure is a single 1m deep Super 'T' girder founded on new circular columns adjacent existing piers. This provides a durable and economic structure that does not rely on the existing bridge for support. Seismic separation between new and old structures may need to be provided.

The 3m wide extension as proposed will need to be self supporting because the existing bridge is unlikely to have sufficient reserve strength capacity to carry an extension of this size.

It must be noted that a narrower extension constructed of much lighter structural steel, could possibly be supported by cantilever brackets fitted to the piers of the existing bridge. Feasibility of this option would require further investigation.

## Options Combinations

**Summary**

As various structural forms could be adopted at a number of the bridge structure locations, cost estimates considering 4 combinations of bridge structure forms were investigated as follows:

- Combination A: Lowest cost conforming design solution. All bridges other than bridge 8 (beam and slab bridge) are either super 'T' or hollow core bridges with no allowance provided for architectural enhancement.
- Combination B: Similar to the Combination A but with pier and barrier treatments added to bridges 1, 3, 4, 5, 7 & 8.
- Combination C: Bridges 1 & 5 are super 'T' and have architecturally designed piers and barriers. Bridges 3, 4, 7 & 8 are concrete box in form and also have architecturally designed piers and barriers.
- Combination D: Bridges 1, 3, 4, 5, 7 & 8 are all concrete box in form and also have architecturally designed piers and barriers.

In all combinations, bridges 3 & 6 are simple hollow core bridges, bridge 9 is a beam and slab arrangement and bridge 10 is a Super 'T' beam supported on circular columns.

**Comparison of Costs**

The base cost comparison for the above scenarios is summarised in the following table:

| Combination | Bridge Cost ($1000) |
|---|---|
| Combination A | $50,390 |
| Combination B | $52,880 |
| Combination C | $55,250 |
| Combination D | $60,490 |

## Recommendations

As documented above and in the project Value for Money Statement (refer Appendix J), it is considered important that the appropriate aesthetic outcomes are delivered in order to meet the stated project objectives. Based on combination C, described above, the recommended forms for the project bridges are summarised as follows:

| Bridge No. | Bridge Name | Bridge Form |
|---|---|---|
| 1 | Waitohu | Architecturally designed 3-span super 'T', |
| 2 | Otaki North | Single span hollow core |
| 3 | Otaki North local road | 2-span concrete box |
| 4 | Rahui Road | 5-span concrete box |
| 5 | Otaki River Bridge | Architecturally designed 11-span Super 'T' |
| 6 | South Otaki rail crossing | Single span hollow core |
| 7 | South Otaki expressway crossing | 2-span concrete box |
| 8 | Te Horo | 5-span concrete box |
| 9 | Mary Crest | Precast beam & slab bridge |
| 10 | Otaki River Bridge Extension | Super 'T' on circular columns |

These bridge forms are documented within the Bridge Design Statement (included in Appendix P) and within the scheme plans included in Volume 4 of this SARA. The above solutions aim to deliver the following outcomes:

**Best value outcomes taking into account all relevant criteria including initial cost, whole of life considerations, community expectations and aesthetics**

For example, the proposed bridge at Mary Crest (9) is very economic solution that is also an elegant bridge form turning what could of otherwise have been a chunky and dark rail crossing into an interesting and airy rail and local road overbridge.

Sleek concrete box bridges are proposed for the local road over expressway underbridges (bridges 3, 4, 7 & 8). The bridges are more expensive than generally less attractive super 'T' bridges. The additional cost involved in providing a superior visual outcome at these locations is not considered excessive in the context of the overall project. Again this is a 'best value' outcome.

**Robust bridges capable of withstanding large earthquakes**

Bridges 2, 3, 4, 6 – 9 are of fully integral construction. These structures have cast in-situ concrete connections between the superstructure components (deck and beams), and substructure (piers and abutments), which provide very good resistance to earthquake forces and potential ground movements.

Otaki & Waitohu River Bridges (bridges 1 & 5) are founded on large diameter bored piles supporting reinforced concrete piers and abutments. This commonly used and proven structural form performs well in earthquakes with seismic resistance being provided by cantilever piers and pile/ pile cap bents.

**Good 'whole of life' performance**

Bridges 2, 3, 4, 6 – 9 are particularly low maintenance structures with no bearings and joints, or coating systems. Whole of life performance is expected to be excellent for these structures.

With careful detailing of Waitohu and Otaki River bridges insuring that good access and provision for bearing and joint repairs and replacement is provided, a reasonable 'whole of life' performance of these bridges is also anticipated.

**Local community acceptance**

Throughout the development of bridge concepts, the views of stakeholders have been considered in the selection of form. The process has generally delivered outcomes that are visually acceptable, are likely to achieve stakeholder buy in, and are still economic.

**Bridges that have good design aesthetics**

Bridge aesthetics are described in detail in the Urban Design and Landscape Design Framework.

Appropriate treatments have being adopted on a location by location basis. For instance, the highly visible underbridges (3, 4, 7 & 8) are sleek 'concrete box' style structures. Treatments to the piers and barriers are assumed for the larger river crossings (1 & 5). An attractive beam and slab bridge is proposed for the expressway over rail bridge (Mary Crest (9)). No treatments are required for the local road over rail structures (2 & 6) as these are not particularly visible structures.

## 6.15 Option Summary

The alternative alignment, interchange and cross-corridor connection options described in the sections above are summarised in the table below.

| Option Type | Location | Option Name | Option Description |
|---|---|---|---|
| Alignment Options | Mary Crest | Western 1 Alignment | The 2009 Board preferred alignment which passes through the eastern bush remnant at Mary Crest |

| | | | |
|---|---|---|---|
| | | | prior to crossing to the east of the existing SH1. |
| | | Western 2 Alignment | This western alignment crosses the existing SH1 just to the north of the 'S' curve in the existing SH1 at Mary Crest, passing through areas of sand dunes and peat deposits, but missing the bush remnants. |
| | | Eastern Alignment | The eastern alignment stays on the east side of the NIMTL until just to the south of the 'S' curve in the existing SH1 at Mary Crest, keeping the route elevated on a historic cliff remnant. |
| | Te Horo | Te Horo Alignment | The Te Horo alignment crosses the NIMTL and existing SH1 just north of Te Waka Road and then continues through a defined strip of land behind Te Horo before rejoining the Board Preferred alignment south of Mary Crest. |
| Interchange Form Options | North Otaki | NO 02 | NO 02 involves a southbound off-ramp that utilises the existing SH1 route into Otaki, and a northbound on-ramp which diverges from the existing SH1 just prior to the Otaki 'ramp' bridge (a new 'ramp' bridge is constructed adjacent to the existing). |
| | | NO 09 | NO 09 involves a half diamond interchange with north facing ramps to the north of Otaki, and eliminates the existing diagonal local link between east and west Otaki. Access into Otaki is provided by a new expressway over-bridge 400m to the north of the existing, and an upgraded Rahui Road. |
| | | NO 11 | NO 11 involves an interchange with north facing freeflow ramps connecting into the Mill Road roundabout. Connection between the plateau and town, and the associated existing SH1 route, is provided via a Rahui Road bridge. |
| | South Otaki | SO 02 | SO 02 involves a half diamond interchange with south facing ramps on the northern side of the Otaki River. Connection into Otaki and the existing SH1 is provided via a roundabout at Waerenga Road. |
| | | OG 03 | OG 03 is an elevated half interchange with south facing ramps connecting into an extended Otaki Gorge Road which then loops over and around the existing SH1to connect via a roundabout. |
| | | OG 07 | OG 07 is a half diamond interchange located just north of the existing rail overbridge that utilises the topography and a depressed expressway to provide a direct tie in to a roundabout on the existing SH1. |
| Cross Corridor Connection Options | Te Horo | TH 01 | TH 01 is a local road overbridge connecting eastern Te Horo with western Te Horo via an extension of School Road to the north of Te Horo Beach Road and the main Te Horo settlement. |
| | | TH 02 | TH 02 is a local road overbridge connecting eastern Te Horo with western Te Horo via a local road bridge located midway along the western settlement block, with a connection into the southern side of Te Horo Beach Road. Option |
| | | TH 03 | TH 03 is a local road over-bridge connecting eastern Te Horo with western Te Horo via a direct extension of School Road with a bridge across the NIMTL and through the southern portion of the western Te Horo settlement (impacting on the 'Red Cafe'). (Note: Option TH03B considered a subway rather than bridge option at the same location.) |

| | | | |
|---|---|---|---|
| | | TH 04 | TH04 involves realigning Gear Road further east behind the existing row of properties and then providing a looped connection from midway along Gear Road to the south west side of Te Horo via an over-bridge with a tie-in to the existing SH1. (Note: Option TH04B considered a subway rather than bridge option at the same location.) |
| | | TH08 | TH08 is a refinement of Option TH03 to skew the local bridge crossing south to miss the 'Red Cafe'. |
| | Rahui Road / Waerenga Road | EW 01 | EW 01 is a pedestrian/cycle only bridge connecting the eastern and western sides of Rahui Road across the expressway and NIMTL. |
| | | EW 02 | EW 02 is a road bridge (with pedestrian/cyclist provision) connecting the eastern and western sides of Rahui Road across the expressway and NIMTL. |
| | | EW 03 | EW 03 provides a Waerenga Road link under the expressway with and at-grade rail crossing from the existing SH1 linking through to Te Roto Road. EW03 also includes a pedestrian/cycle only bridge at Rahui Road. |
| | | EW 04 | EW 04 provides a Waerenga Road link grade separated over the existing SH1, NIMTL and expressway to connect into Te Roto Road. EW03 also includes a pedestrian/cycle only bridge at Rahui Road. |
| | Old Hautere Road | OH 01 | OH 01 involves the creation of a cul-de-sac at the end of Old Hautere Road, effectively turning it into a dead-end. |
| | | OH 02 | OH 02 involves a grade separated bridge connection over the expressway connecting Old Hautere Road into the existing SH1. |
| | | OH 03 | OH 03 involves a local at-grade road connection from Old Hautere Road to Otaki Gorge Road. |

# 7 Option Assessment / Evaluation

This section outlines the key outcomes from the assessment and screening of the options described in section 6.

## 7.1 Option Assessment and MCAT Process

### Background and Purpose

A number of expressway connectivity scenarios and interchange/connection options were identified, assessed and screened during the scoping phase of the investigations, as reported in the Peka Peka to Otaki Expressway Scoping Report (Final Draft, January 2011). Shortlisted options for interchanges and cross-corridor connections were then taken to a public consultation process in February 2011 to obtain feedback and provide input for consideration in the option refinement and assessment during the scheme assessment phase (refer to Section 8).

In order to be able to assess, compare and then screen options the team needed to develop a robust process and a tool to inform the decision making. A Multi Criteria Assessment Tool (MCAT) was used to inform the decision processes around options for the following key elements:

- Expressway interchange forms;
- Cross-corridor connections (local network); and
- Alignment improvement options.

The process involved the following:

**Scoping Phase:**

- A total of 4 staged issues and option development workshops were held during the initial scoping phase of the project – the focus of these was to identify and develop options that contributed to the agreed project objectives and responded to the identified issues and outcomes sought;
- Further technical development of options – as options were identified at the staged workshops they were developed to a level where technical feasibility could be ascertained for feedback at the next staged workshop;
- An initial screen/decision process was applied to the options generated and developed to test that the options were indeed feasible and did align with the key objectives. Those that were deemed not feasible were not taken further, but the rationale was documented to provide an audit trail;
- Where identified options provided similar outcomes and contained only finite differences between one another these were amalgamated to simplify further assessment, recognising that later design development will result in fine tuning variations;
- An issues and options workshop was held with Key technical stakeholders (KCDC, GWRC and KiwiRail) on 17th August 2010 to confirm that the key project issues and local areas of concern had been captured for consideration in further option development and preliminary assessment;
- Further option development and staged technical meetings were held with key technical stakeholders as options were developed to ensure a staged involvement prior to a further stakeholder workshop on the 23rd September 2010;
- A Multi Criteria Assessment Tool (MCAT) was developed to assist the team with option comparison and screening decisions;
- Specialist assessment of the potential options was provided by the various environmental and technical specialists. At the same time as completing these preliminary assessments the specialists were asked to rate options against the developed MCAT to provide input into an MCAT option screening workshop;
- A full day team MCAT option screening workshop (including NZTA) was held on the 14th September 2010 where the specialists' assessments and ratings were combined and challenged

by the core team to inform the decisions as to which options should be short-listed to be taken forward for public engagement and further scheme assessment. This was followed by a further review and challenge of the MCAT outcomes with NZTA;

- An Option Development and Screening Workshop was then held with Key Stakeholders (KCDC, GWRC, KiwiRail, HPT) on the 23rd September 2010 to workshop the options developed and assessment and screening outcomes and recommendations. The aim was to seek general consensus on the outcomes;
- Further technical option refinement and re-confirmation of screening outcomes followed the 23rd September 2010 workshop, together with a further stakeholder technical meeting with KCDC on 6th October 2010 to confirm and discuss the options to be taken to public engagement; and
- Regional NZTA team presentations of the option screening and team recommendations were completed on the 18th September 2010 and 7th October 2010 to enable open debate and challenge around the outcomes and options to be taken forward;

**Scheme Phase**

- Shortlisted options for interchanges and cross-corridor connections were then taken to a public consultation process in February 2011 to obtain feedback and provide input into the scheme assessment phase (refer to Section 8 for details);
- Feedback from consultation indicated strong support for the preferred interchange proposals at North Otaki (Proposal A/Option NO02) and South Otaki (Proposal A/Option OG07), while issues for further consideration, in relation to connectivity, were raised specifically relating to: Otaki East-west connectivity (Rahui Road), Old Hautere Rd, and a preference for proposal B at Te Horo, over the promoted preferred option;
- Further staged workshops and meetings were held with stakeholders during April and May 2011 to refine and then re-assess options at Rahui Road, Old Hautere Rd, and Te Horo, together with alignment options at Mary Crest (refer to Section 8 for details);
- Further specialist assessment was completed for these options, together with a further assessment and MCAT screening workshop (4th May 2011) to assist in determining the preferred options; and
- Following further consideration and analysis of the screening outcomes (together with stakeholder liaison) the preferred options were presented to NZTA's Decision Making Team for approval on the 23rd May 2011. The preferred options were then refined for incorporation into the scheme proposal.

## Assessment Criteria and MCAT

**MCAT Development**

While a full Social and Environmental Screen as been completed for the project as a whole (refer to Appendix D) it was also necessary to develop an MCAT to assist in highlighting key differences between options in respect of social, environmental and engineering aspects. The MCAT tool, including primary and secondary criteria was developed with inputs from the following sources:

- NZTA's Project Objectives – from the RFT;
- Expanded project objectives – RFT objectives developed further by the project team;
- Recognition of statutory requirements & considerations including the RMA and LTMA etc;
- NZTA Board Interchange Location Guiding Principles; and
- Observations and feedback from Stakeholders on preliminary criteria tabled at the 17th August 2010 Stakeholder Workshop.

The MCAT has 4 Primary Criteria (Transport Outcomes, Social / Community Outcomes, Environmental Outcomes and Economic Value). Each of the Primary Criteria has a number of Secondary Criteria e.g. For Environmental Outcomes these are areas such as Urban Form, Flood Risk, Noise etc. Table 7-2 below summarises the primary and secondary criteria adopted for the screening process.

**Table 7-1: MCAT Primary and Secondary Criteria**

| Primary Criteria | Secondary Criteria | Criteria explained |
|---|---|---|
| **Transport Outcomes** | Road user safety | Level of safety provided by option including consideration of emergency response times (includes SH1 expressway and local roads) |
| | Traffic level of service | Significance of effect on congestion, trip reliability, travel times |
| | Integration with others modes | Significance of effect on public transport users, cyclist and pedestrian trips |
| | Strategic fit with RoNS | Significance of fit with RoNS objectives and consistency / integration with neighbouring RoNS projects |
| | SH / Local Road integration (Otaki Inter-regional access) | Significance on ability to achieve the optimal balance between utilisation of the SH infrastructure; and keeping local trips off the SH. |
| **Social/Community Outcomes** | Severance | Significance of effect of physical severance and legibility of options on community connectivity and access to community services. |
| | Economic effects / business activity | Significance of effect on local economy / business activity particularly as related to KCDC plans / strategies including the Otaki Vision document. |
| | Support for current and future land use | Significance of effect on support for current and future land use plans - including consideration of strategic growth management, effect on productive land use, and retention of rural character. |
| | Improve connectivity to key regional services / facilities | Significance of effect on connectivity to key regional services and facilities for both local community and for those in communities north and south of project. |
| | Recreational activity | Significance of effect on amenities and public areas available for recreation, including access. |
| | Disturbance to community during construction | Significance of effect on the local community and road users during construction |
| **Environmental Outcomes** | Urban Form | Significance of effects on the local urban form and on urban design aspects such as connectivity, context and character, with emphasis on Otaki township and Te Horo and on the Otaki Railway Hub in particular. |
| | Landscape and Visual | Significance of the effects on the local landscape, being landform, landcover and landuse and the extent of change the project/expressway will bring to these. The extent to which the visual effects of the expressway, its earthworks construction, road form, structures and noise and landscape mitigation measures will impact upon the local community and the travelling public. |
| | Flood risk | Significance and extent of the effects on flood plain patterns and pathways. |
| | Heritage | Significance of effects on identified heritage including buildings, structures and features. |
| | Archaeology | Significance of the effect on archaeological sites. |
| | Iwi / cultural | Significance of the effect on matters of importance to iwi including but not limited to cultural sites. |

| | | |
|---|---|---|
| | Ecology (terrestrial and aquatic) | Significance and extent of the effects on wildlife and habitat and natural processes and systems. |
| | Water Quality | Significance and extent of effects on surface water resources, and on ground water and underground aquifers. |
| | Air Quality | Significance and extent of effects on air quality from changes in fuel consumption levels. |
| | Noise | Significance and extent of effects on noise levels in relation to urban villages, residential and public amenity locations. |
| **Economic Value** | Capital investment | Significance of effect on capital required for project implementation (including constructability considerations and property acquisition). |
| | Whole of life costs | Significance of effect on the whole of life costs of the infrastructure asset. |
| | Achieving RMA Approval | Significance of effect on ability to achieve RMA approvals i.e. consentability of option. |
| | Timeliness of project completion | Significance of effect on project completion and hence timeliness of releasing the economic benefits of the project to the community. |

**Application of MCAT in Option Screening**

The MCAT has been used as a high level assessment tool for options relating to the Interchanges, cross-corridor connections, and the main alignment refinement options.

For each of the primary criteria areas, the team identified secondary criteria that were known to provide the key points of differentiation between options. These points of differentiation were tested and agreed and each of the MCAT workshops. This enabled the specialists and team to focus on matters critical to comparing and screening the options, rather than matters that are common across the options. The key secondary criteria were identified as follows:

Key differentiators for Interchange Form:

- Transport Outcomes: Road user safety; Integration with others modes
- Social/Community Outcomes: Severance; Support for current and future land use
- Environmental Outcomes: Urban Form; Landscape and Visual; Flood risk; Noise
- Economic Value: Capital investment; Achieving RMA Approval

Key differentiators for Cross-corridor options:

- Transport Outcomes: Road user safety; Traffic level of service; Integration with others modes
- Social/Community Outcomes: Severance; Economic effects/business activity; Support for current and future land use; and Recreational activity
- Environmental Outcomes: Urban Form; Landscape and Visual; Flood risk; Heritage/archaeology; and Noise
- Economic Value: Capital investment; Achieving RMA Approval

Key differentiators for alignment improvement options:

- Transport Outcomes: Road user safety
- Social/Community Outcomes: Severance; Support for current and future land use
- Environmental Outcomes: Urban Form; Landscape and Visual; Iwi/cultural; Ecological (primarily terrestrial)
- Economic Value: Capital investment

Spreadsheets were developed to provide the scoring template for the MCAT workshops on the 14th September 2010 and 4th May 2011. These were designed to generate graphs to support the decision making process by the team once the spreadsheet was populated and agreed by the workshop attendees.

For the purposes of informing the team weightings across secondary criteria were removed from the process given that the intent was not to directly compare scores, rather focus on the points of difference across the options. However, averaged ratings were developed for each primary criteria to feed into radar and bar charts.

**Effects Ratings**

The following subjective rating system was developed and discussed with stakeholders and NZTA to assess the performance of an option. Ratings for each factor in the option assessment exercise were assessed with reasonable mitigation applied and with clear justification for the rating identified. Specialists were asked to assess effects on an absolute basis, rather than a relative basis e.g. effects were considered on their own, not relative to any other effects of the project. Knowledge of other similar projects assisted in rating potential effects.

**Table 7-2: Effects Ratings Adopted for MCAT Assessment**

| Rating | Explanation / Thresholds |
|---|---|
| +3 Highly Significant Positive | Of *significant* local, regional or national benefit |
| +2 Moderate Positive | Of local and/or regional benefit |
| +1 Minor | Of local benefit only |
| 0 Neutral | No or negligible effects |
| -1 Minor | Of a local impact only – easily mitigated |
| -2 Moderate Negative | Moderate negative local and/or regional negative effects that can be mitigated |
| -3 Highly Significant | Of local, regional or national negative *significance*. Very difficult to mitigate. |
| FATAL FLAW (FF) | Will *stop* the project – of such national/regional/local significance, or technical constraint that it cannot be mitigated or consented. |

**MCAT Outputs**

A graphical "radar plot" was adopted to represent the assessment and screening process outputs for each option as illustrated in Figure 7-1 below.

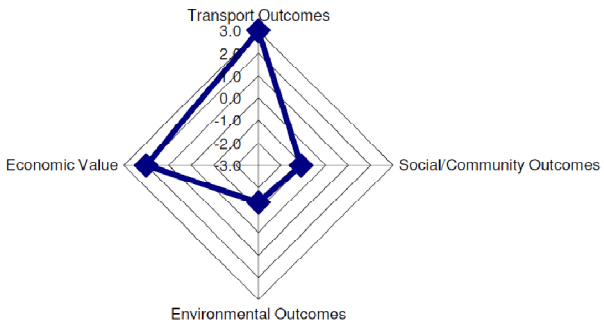



**Figure 7-1: Example radar diagram**

The centre of the radar plot represents the least-desirable outcome, while the outer edge represents the best outcome. The mid-point of each radar arm represents a neutral position. This roughly equates to the existing situation, except in the case of "Economic Value" where the 2009 scheme option was typically adopted as the base comparison. Each arm of the radar plot represents one of the primary criteria shown in Table 7-2. The evaluation process entailed scoring each of the sub-criteria relative to the existing situation. An overall score for the primary criteria was then decided. The primary criteria score was decided, based on individual sub-criteria scores and an overall relative view of the option. In the example shown above, the transport outcomes of the option are considered to be "Significant positive" compared to the existing situation. Radar plots provide a ready means of option comparison, with options that enclose a large radar plot area generally considered preferable to options enclosing a small area.

As discussed above, the team utilised the MCAT outputs as a tool to assist them in the decision making process on which options should be taken forward, however applied judgement and experience of the team were also applied to arrive at a decision. The outcomes and team recommendations were then workshopped with key stakeholders at the following workshops:

- 23rd September 2010 Option Development and Screening Workshop. (this determined the North and South Otaki interchange outcomes that were strongly supported in the Feb 2011 consultation process)
- 4th May 2011 (this provided input into determining improved options at Rahui Road, Old Hautere, Te Horo, and Mary Crest following the Feb 2011 consultation process)

The option screening outcomes are summarised in the following sections.

## 7.2 Alignment Options Assessment

Specialist's assessment of alignment alternatives centred around the 2009 NZTA Board preferred alignment were undertaken in a staged manner following the initial scoping and then consultation phase.

The alternatives were compared with the NZTA Board Preferred Option only over the length of the expressway that the route differs. Therefore the working paper provides an assessment of effects for each alternative, rather a comparison of effects between the Board Preferred Option and the alternatives.

### Te Horo Alternative

**Specialist Assessment Summary**

As noted in Section 6, an alternative rail crossing location north of Te Horo was suggested by the Otaki Community Board (OCB) in their 2009 submission to the NZTA. Specialist assessment of this alignment alternative at Te Horo, was completed in early 2011 and is documented within the following working paper included in Appendix D of this scheme report addendum:

- PP2O Expressway – Preferred Option Alternative Alignments Working Paper, DRAFT V2 March 2011.

**Assessment Outcomes**

Figure 7-2 summarises the resulting MCAT radar plots for the 2009 NZTA Board Preferred Te Horo alignment and the Alternative Te Horo alignment.

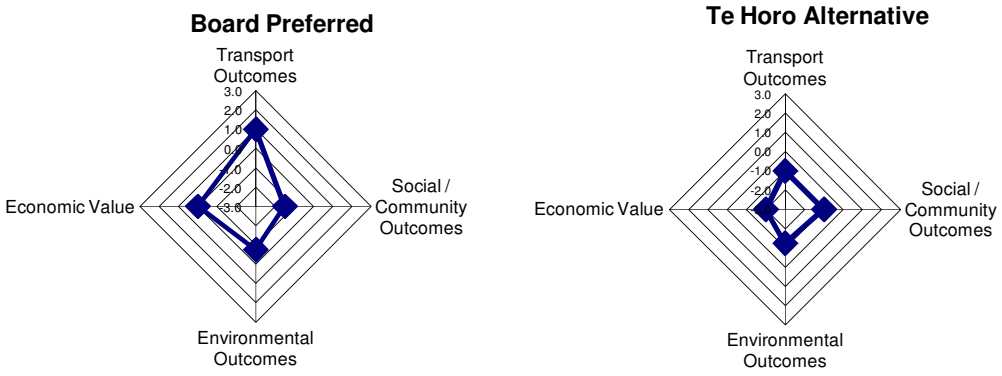



**Figure 7-2: MCAT Plots for Te Horo Alignments**

The Board Preferred Alignment delivers equal or better outcomes in relation to transport, environmental and economic criteria, while social and community outcomes have been assessed as marginally better for the Te Horo Alternative due primarily to potential severance effects.

The key assessed differences between the options are:

- Less favourable urban design outcomes with the Te Horo Alternative due to adverse residual land parcels and a widening of the overall transport corridor;
- Retention of the at-grade rail crossing with the Te Horo Alternative compared with grade separation in the Board Preferred option;
- Increased ecological impacts (minor negative) on bush remnants with the Te Horo Alternative option; and
- A significant difference in capital investment between the options given the need for additional linkages/local bridge crossings.

It was also noted that the Te Horo Alternative could not occur in conjunction with options developed at Mary Crest that could avoid significant impacts on areas of ecologically significant bush remnant. However, this was not specifically factored into the above assessment.

On balance the team concluded that the Board Preferred Option delivered better overall transport and environmental outcomes while providing similar social and community outcomes. On this basis the team re-confirmed that a recommendation should be made to continue to progress the NZTA Board Preferred Alignment at Te Horo.

## Mary Crest Alternatives

### Specialist Assessment Summary

As noted in Section 6, through the scoping and consultation process areas of ecological and cultural/heritage significance were identified in the vicinity of Mary Crest. As a result alternative locations were suggested for crossing the rail and local road corridor near Mary Crest.

Specialist assessment of potential alternatives at Mary Crest were initially investigated and assesses in early 2011 in conjunction with the Te Horo alternative and were documented within the following working paper included in Appendix D of this scheme report addendum:

- PP2O Expressway – Preferred Option Alternative Alignments Working Paper, DRAFT V2 March 2011.

This paper highlighted a potential eastern alternative at Mary Crest, which was then subject to further more detailed scheme development and assessment. Further option alternatives on the west side of the railway

were also investigated and identified to provide a western alternative that could also avoid impacts on the identified areas of significant bush remnant (The West 2 option described in Section 6.4 of this report).

This more in-depth investigation and assessment was input into a further MCAT assessment process and shared with key stakeholders at the Stakeholder Briefing No:03 workshop held on 11th May 2011. The key specialist assessment findings, and further MCAT outcomes are documented in the following working paper included in Appendix D:

- PP2O Expressway - Further SAR Phase MCAT Assessment: Working Paper FINAL September 2011

**Assessment Outcomes**

The assessment of the Mary Crest Alternatives is summarised below, the full assessment criteria and outputs are provided in the Working Paper in Appendix D.

The assessment and MCAT process has confirmed that the Mary Crest Western 2 and Eastern alignments are likely to deliver improved environmental and economic outcomes while delivering similar social and transport outcomes as the Board Preferred Option.

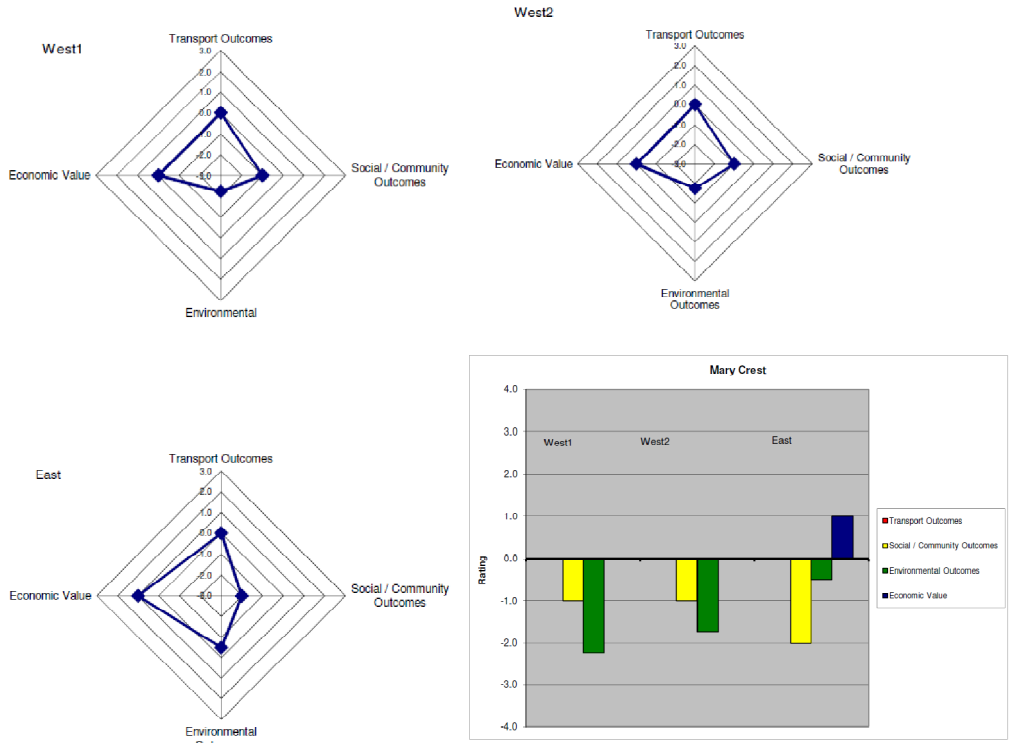



**Figure 7-3: MCAT Assessment for Mary Crest Alternative Alignments**

Figure 7-3 above shows the MCAT assessment for Mary Crest.

The key assessment outcomes are summarised as follows:

- Both the West2 and Eastern options provide significantly improved environmental outcomes compared to the West1 option. This is primarily due to the avoidance of significant bush remnants and reduced impact on sites of cultural significance.
- The eastern alternative will affect a lower number of dwellings but a greater number of land parcels. These land parcels may be more productive than those affected in the West1 Option and this was reflected in a moderate negative impact for the alternative and minor negative.
- While the MCAT indicated that the Eastern option may provide an improved environmental outcome it involves a significant height of embankment (approximately 15m) over a reasonable length on the southern approach to the rail crossing. Despite this the landscape specialist

assessed this to have a reduced landscape impact relative to Western options as the northern approach is able to utilise the natural topography.

- The assessment completed and MCAT has confirmed that the Mary Crest Western 2 and Eastern alignments are likely to deliver improved environmental and economic outcomes while delivering similar social and transport outcomes as the West1 Option.

When considering all factors a preference was identified for the West2 alignment in that it significantly reduces impacts relative to West1, avoids the very significant southern fill embankment, limits impact on more properties to the east, and is more consistent with the historic corridor.

The Eastern alignment has been assessed in the MCAT as potentially providing the best overall outcomes, especially with regard to ecology and cultural issues and value for money. However, the West2 option is considered consentable as it does not affect a large number of new properties. It also achieves a significant reduction in effects over West1, avoids a large fill embankment, and is more consistent with the historic corridor.

As a result the working paper recommended that the Mary Crest West 2 Alignment be taken forward as the preferred scheme.

## Preferred Mary Crest Alignment

The outcomes from the Mary Crest MCAT and further assessment process were shared with key stakeholders at a workshop and briefing on the 11th May 2011, together with further liaison meetings with KCDC and KiwiRail. The West2 option concept was also shared with Raukawa and Nga Hapu o Otaki during s site walkover on the 29th of July 2011. Feedback on the West2 option has been supportive, however moving forward KiwiRail would be keen to explore further opportunities to integrate a potential future rail realignment (this is not precluded by the West2 option). As a result of alternative alignment investigations, the proposed alignment now avoids the bush and wetland at Mary Crest, which is considered to be a very positive outcome for the project.

Based on the assessment outcomes and liaison with stakeholders the West2 alignment at Mary Crest has been chosen as the preferred option to be incorporated into the scheme design, as illustrated in Figure 7-4 below.

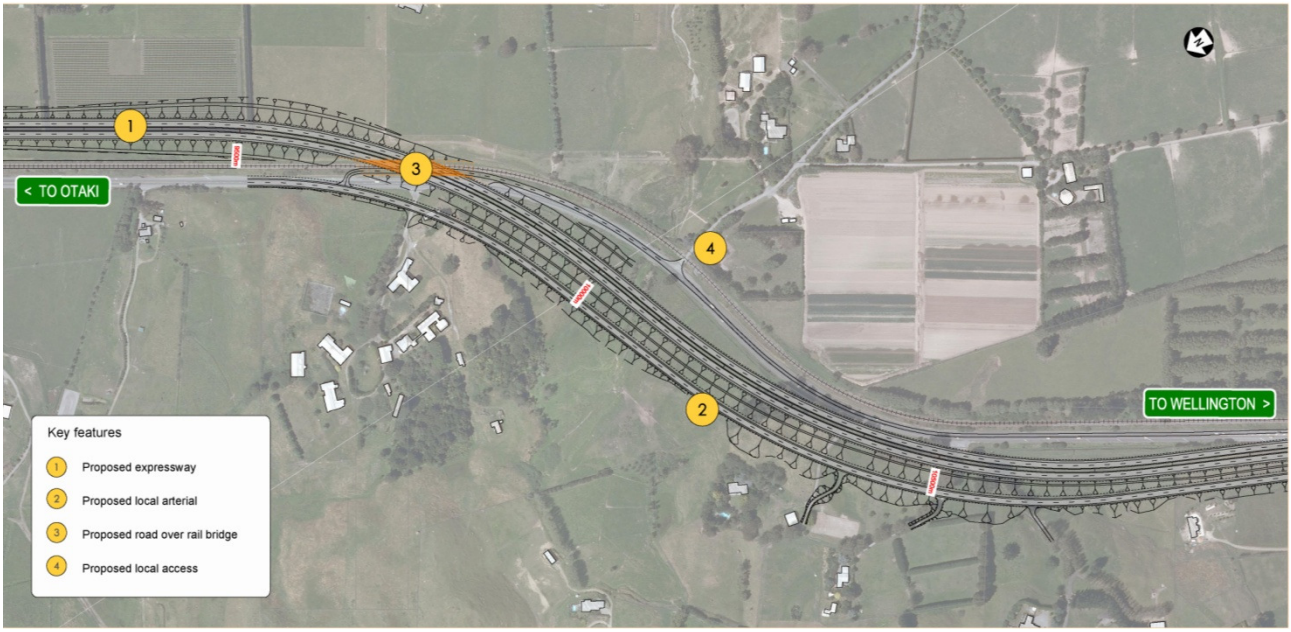



**Figure 7-4: Preferred Mary Crest Alignment**

## 7.3 Interchange Form Options

The MCAT screening process was applied at the key interchange locations at North Otaki and South Otaki during the scoping phase. The results of the assessment are summarised below. Images of the interchange options can be seen in Section 6.6.

### North Otaki Interchange Assessment

**Specialist Assessment Summary**

Option NO02

This option was assessed on the basis that a pedestrian/cycle link would be provided as a minimum at Rahui Road.

Transport — In Option NO02 a new bridge alongside the existing SH1 alignment is provided over the new expressway and railway tracks. The traffic volumes on this link will be relatively low since it will only be used by southbound traffic after exiting the expressway and local traffic travelling to and from the eastern side of Otaki. This option will provide a direct and safe route for children walking between school and the eastern side of Otaki. There are no ramp connections that pedestrians and cyclists have to cross on the south side. Inclusion of a pedestrian/cyclist link as a minimum at Rahui Road also provides for non-motorised connectivity.

Urban Design — NO02 has a relatively small footprint utilising the existing SH1 for a southbound off-ramp or via an alternative off-ramp location that respects the street pattern with the intersection at Waitohu Valley Road. The local road connection follows the diagonal desire line from the Waitohu Plateau to east Otaki. However, there is no vehicular connection at Rahui Road. The existing entrance to the Otaki Railway Retail Area is maintained southbound.

Social Impact — This option provides a northbound on-ramp but was assessed on the basis of removing the Rahui Road vehicular link.

The removal of a Rahui Road vehicular link is considered to be a negative outcome for the community. However, if a pedestrian and cycle link was provided at Rahui Road this would decrease the negative impact of this option. This would allow for continued connectivity between east and west Otaki, and would improve pedestrian and cyclist safety by providing a grade separated connection.

Option NO09

This option was assessed on the basis that either a pedestrian/cycle or vehicular connection could be provided at Rahui Road.

Transport — From a non-motorised user perspective this option shifts the entrance to Otaki away from the existing SH1. A link on the former SH1 alignment does not exist and instead pedestrians and cyclists must use the new connection between Waitohu Valley Road and the Rahui Road/ Mill Road roundabout. For people travelling between the roundabout and Te Manuao Road this increases their trip distance by 500m to 1.1km. Using Rahui Road then County Road is a total 900m, so this the shorter route for pedestrians and cyclists in this option. Only north facing ramps are provided, so any pedestrians or cyclists on the eastern side of the new connection from Waitohu Valley Road to Mill Road do not have to cross any on or off ramps.

If a vehicular connection at Rahui Road was not provided this option would present significant additional detour effects for local traffic.

Urban Design — This intersection option would signal the gateway to the northern edge of Otaki, however the footprint and potential landscape effects are more significant than for option NO02. The

option has reasonable prioritisation of access to and from the proposed expressway for the Railway Retail Area, however it does not allow for the diagonal desire line to and from the residential area to the east of Otaki.

Noise — Option NO09 may move local traffic away from some PPFs by the existing SH1, which could provide a benefit.

Social Impact — Option NO09 provides for a Rahui Road link based on the various options discussed above. This is a positive outcome as it will provide a key link between east and west Otaki that will improve connectivity and safety.

This option will also remove the existing SH1 bridge over the rail corridor. However, a new local road bridge will be provided connecting to Waitohu Valley Road. This will maintain the connection to north-east Otaki, and improve safety by providing a grade separated intersection. This is important for Waitohu Primary School which utilises the services (such as the library) in the Otaki Township.

However as noted under Urban Design the diagonal desire line between the Waitohu plateau and Otaki is lost.

Option NO11

This option was assessed on the basis that a Rahui Road link is critical to maintain local N-S and E-W access. A key risk identified with this option is that the cross-corridor link would be flood prone, with no practical alternative (refer flood discussions below).

Transport — This option provides direct free flow access in to the Otaki Railway Retail Area, but at the expense of disconnecting the existing SH1 route and diverting it via County Road and Rahui Road.

In Option NO11 a connection from the rail/expressway underpass structure to the former SH1 is provided for pedestrians and cyclists. This route is essentially the same length as using the existing SH1.

Urban Design — This intersection option would signal the gateway to the northern edge of Otaki, and has a relatively small footprint. However, it does affect more residential properties. It provides good prioritisation of access to and from the proposed expressway for the Railway Retail Area, and does allow for the diagonal desire line from the residential area for pedestrians and cyclists, but not vehicles.

Ecology — The need for more extensive railway realignment under option NO11 is likely to result in a larger area of the Mangapouri Stream and reserve area potentially being affected.

Social Impact — Option NO11 requires a Rahui Road link. This is a positive outcome as it will provide the key link between east and west Otaki that will improve connectivity and safety.

No local road will be provided to connect in with Waitohu Valley Road to replace the existing link provided by SH1. This is potentially a negative outcome in terms of connectivity as it means that the only east-west connection is Rahui Road. However, a pedestrian/cyclist link will be provided. This will maintain or improve on the existing situation by providing a grade separated link for walking and cycling.

Flood Risk — The primary concern raised surrounds the flood prone nature of the County Road and Rahui Road area, particularly given that under Option NO11 this becomes the primary north-south arterial.

North Otaki Option Relative Costs

Comparative cost estimates were developed for the options. The relative rough order costs for the options are summarised as follows (these are stated as relative to the 2009 scheme option concept):

**Table 7-3: North Otaki Options relative costs**

| Option | Cost Difference ($) | Comments |
|---|---|---|
| NO02 | -7.2M | Bridge simplified and on-ramp removed. Rahui Road pedestrian link included. |
| NO09 | +4.8M | Includes Rahui Road Link |
| NO11 | +4.1M | Includes Rahui Road Link |

**Assessment Outcomes**

Figure 7-5 summarises the MCAT radar plots for each of the North Otaki scenarios described in Section 6.6. All scenarios provided for north facing ramps to the north of Otaki. The MCAT assessment included the following assumptions around the form of Rahui Road to ensure a conservative assessment outcome:

- NO02 - Rahui Rd has pedestrian link only.
- NO09 - Rahui Rd could be a road or a pedestrian link.
- NO011 - Rahui Rd requires a road connection to function and provides the critical link for the local N-S arterial.

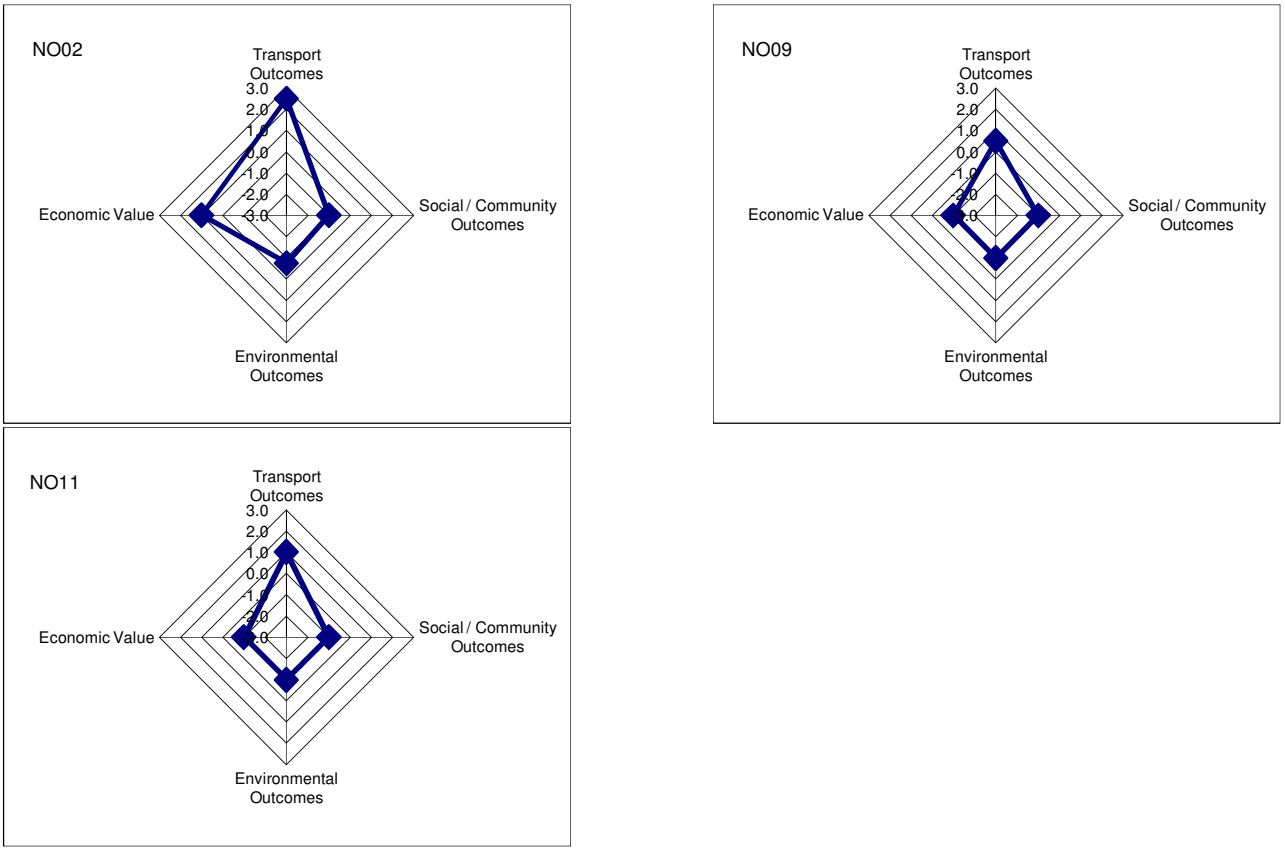



**Figure 7-5: MCAT plots for North Otaki Interchange**

Option NO02 was identified as a clear option to be taken forward, and was assessed to provide the better overall transportation and social-environmental outcomes while providing the best capital investment outcome.

Option NO11 screen outcomes are similar to Option NO09, however Option NO11 relies on utilising a County Rd/Rahui Rd connection to provide the only local arterial connection between the North and South which will be prone to closure during flood events. On this basis Option NO11 was dropped from further consideration.

Options NO02 and NO09 were therefore identified as options to be taken forward to the Stakeholder Option Development and Screening Workshop. On balance, Option NO02 was considered to be the most beneficial over Option NO09.

**Outcomes from Stakeholder workshops & Consultation**

Options NO02 and NO09 were taken forward to a Stakeholder Option Development and Screening Workshop on the 23rd September 2010. On balance, Option NO02 was considered to be the most beneficial over Option NO09, however KCDC also noted a preference for retaining vehicular connectivity at Rahui Road. Both options were taken to public consultation in February 2011.

Feedback from the 2011 consultation process showed overwhelming support for Option NO02 (Proposal A in the brochure) and both the OCB and KCDC noted a strong preference for this option in their submissions. On the basis of the assessment and consultation outcomes it was recommended that Option NO02 (Proposal A) was incorporated into the scheme, and this was endorsed by the NZTA Regional Decision Making Team at its 23rd May 2011 meeting.

## North Otaki Interchange Scheme

Figure 7-6 shows the scheme recommended at North Otaki that has been progressed through to scheme design.

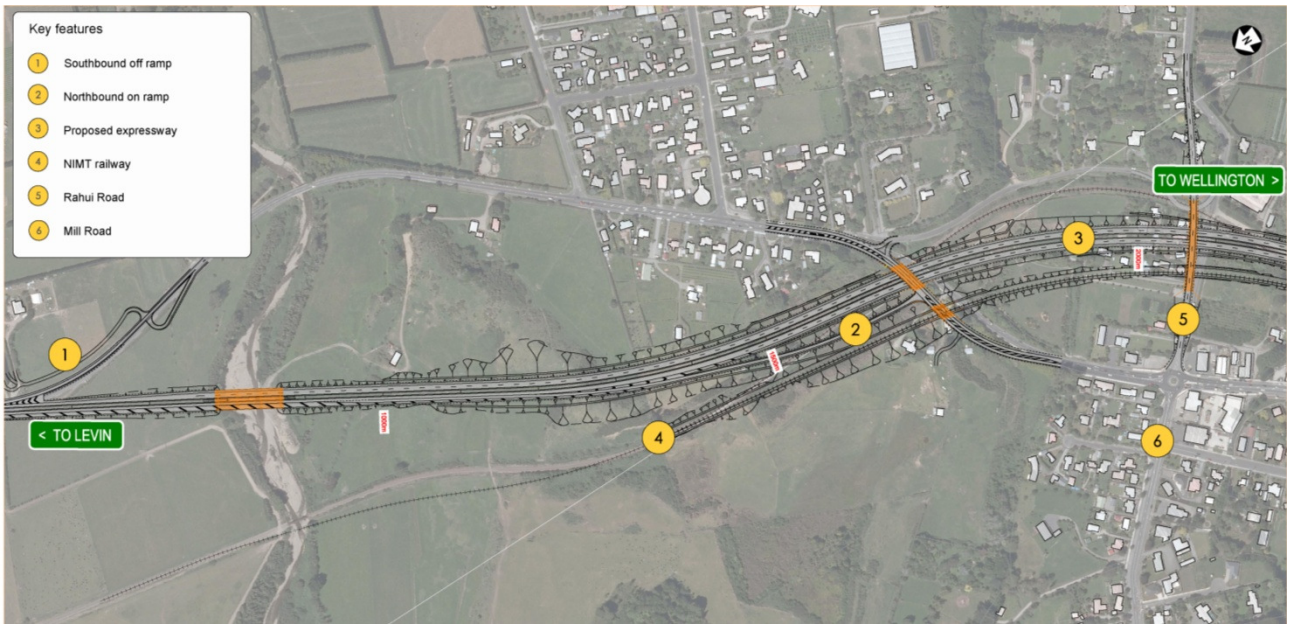



**Figure 7-6: North Otaki Preferred Scheme**

This option was developed in more detail through the scheme assessment phase to further mitigate potential effects. The key changes incorporated into the design since presentation of the Feb 2011 consultation brochure include:

- Adoption of a vehicular and pedestrian bridge at Rahui Road has allowed County Road to remain as a local access road, rather than being upgraded to take all of the Rahui Road and race day traffic.
- Adoption of the bridge at Rahui Road has enabled the north bound on-ramp intersection to be shifted to between the rail and the expressway, as opposed to being on the western side of the rail (proximity to County Rd is no longer a key concern). This has reduced impacts on the dunes to the west of the route and reduced bridge costs.
- The north bound expressway lanes are now reduced to a single lane prior to the merge with the north bound on-ramp, so as to improve safety of the transition back to a 2-lane state highway (an issue that was raised during the interim safety audit process).

The interim stage safety audit also raised issues with the as-consulted Taylors Road intersection and southbound off-ramp arrangement. Following this feedback the intersection and ramp have been reconfigured. Figure 7-7 shows the scheme for Taylors Road to progress through to scheme design.

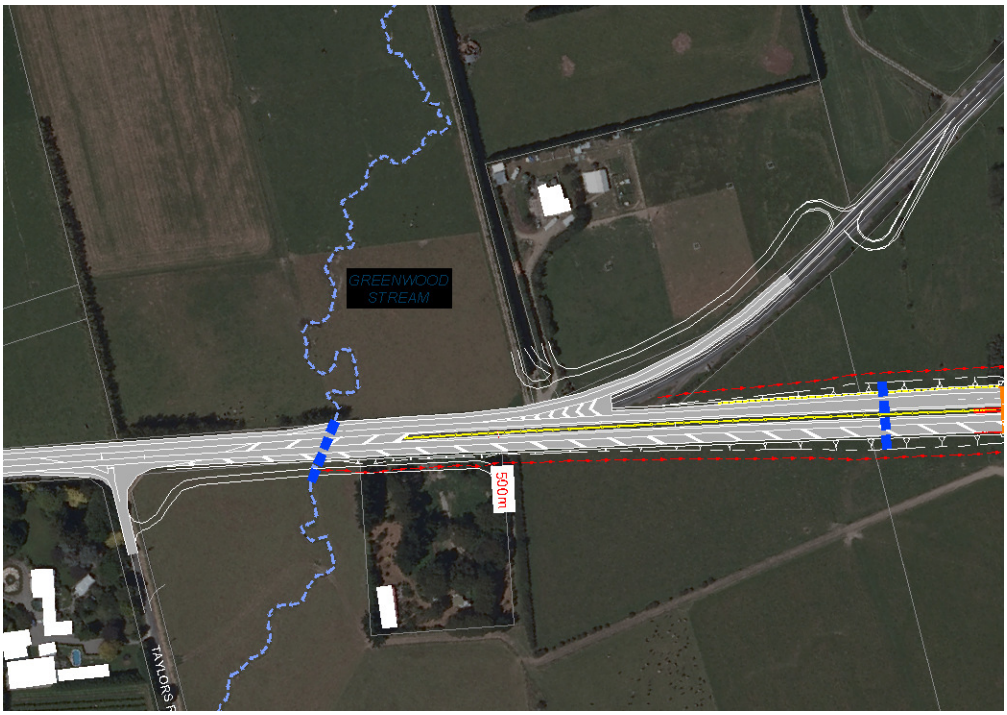



**Figure 7-7: Taylors Road Preferred Scheme**

This option was developed in more detail through the scheme assessment phase. The key changes incorporated into the design since presentation of the Feb 2011 consultation brochure include:

- In conjunction with the changes around the North Otaki Interchange, the lane drop from the expressway and then subsequent merge from the northbound on-ramp occur prior to the Taylors Road intersection.
- The median width from the expressway is maintained passed the southbound off-ramp, this blocks northbound traffic from making a 'U' turn onto the southbound off-ramp. This also provides room for traffic exiting Taylors Road and heading southbound to wait in the median before merging with southbound traffic.
- Property accesses onto SH1 adjacent to Taylors Road are removed and replaced by an access onto Taylors Road.
- The PP2O scope includes purchasing enough land on the west side of the existing SH to widen from the proposed interim solution to accommodate the future requirements of two lanes each way along the expressway (SH1) south of Taylors Road and also accommodate the private access off Taylors road on the west of SH1. The private access will be located appropriately to avoid any future realignment requirements.

## South Otaki Interchange Assessment

### Specialist Assessment Summary

Option SO02

Following further assessment Option SO02 was not taken forward to the MCAT process given the potential for significant effects of flood regimes, the necessity to compromise the railway geometry, and significant additional costs involved in forming an interchange on the northern side of the Otaki River.

Option OG03

Transport — In Option OG03 there are only connections to the expressway on the southern side allowing pedestrians and cyclists to travel on the northern side of the bridge/subway (along Otaki Gorge Road) and not have to cross any ramps.

Improved access legibility compared with the 2009 scheme given the same route for access on and off the expressway.

Urban Design — This direct bridge route aligns with Otaki Gorge Road but its position means major embankments and structures are required which are visually intrusive. It provides poor priority for southbound expressway access.

Noise — No significant issues.

Social Impact — This option provides for egress from the south and access from the north. For communities to the south of Otaki this is a positive outcome as it allows them access to Otaki and access back onto the expressway.

A grade separated connection is provided linking Otaki Gorge Road to the Existing SH1. This is a positive outcome for east-west movements as there are currently no grade separated crossing facilities and traffic is moving at high speeds through the area, the provision of a grade separated connection is likely to increase accessibility and safety for people travelling from east to west.

Option OG07

Transport — OG07 provides good legibility for access to and from the expressway to Otaki.

As with OG03, there are only expressway connections on the southern side allowing pedestrians and cyclists to travel on the northern side of the bridge/subway and not have to cross any ramps.

Urban Design — Option OG07 has a small interchange footprint and uses the existing topography for cutting the expressway into the ground and reducing the elevation of the interchange. The east-west bridge structure for the local roads is closer to the Otaki River which is the natural gateway to Otaki. It provides good priority for north and southbound access to the proposed expressway which would benefit businesses in Otaki. Safe access to Otaki Gorge Road needs to be provided.

Noise — In Option OG07 the proposed expressway is in cut heading toward the Otaki River, and the local road passes above and is only slightly elevated. This provides greater opportunities for noise mitigation than other options.

Social Impact — This option was assessed as similar to Option OG03.

**Option Relative Costs**

Comparative cost estimates were developed for the options using Option OG03 as the base option (a half interchange with bridge over expressway). The relative rough order costs for the options are summarised as follows:

**Table 7-4: South Otaki Options relative costs**

| Option | Cost Difference ($) | Comments |
|---|---|---|
| OG03 | | Base Option. Local bridge over expressway. |
| OG07 | -8.2M | Depressed expressway with reduced height interchange at Otaki Gorge Rd. |

**Assessment Outcomes**

Figure 7-8 summarises the MCAT radar plots for each of the South Otaki scenarios described in Section 6.6. Both scenarios provide for south facing ramps to the south of Otaki River.

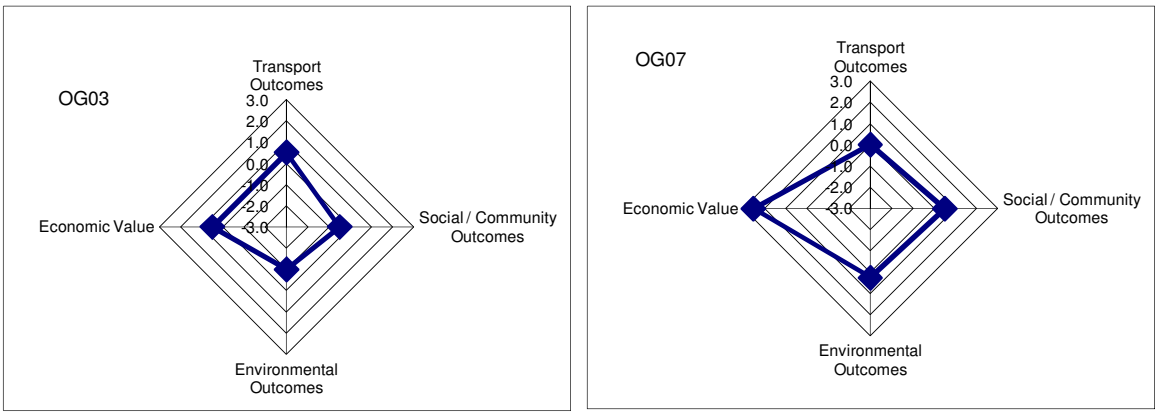



**Figure 7-8: MCAT plots for South Otaki Interchange**

Option OG07 clearly provides better economic, environmental and social outcomes, while transport outcomes are comparable to OG03. This is primarily due to the fact that Option OG07 better utilises the topography to reduce visual and land effects and was assessed to provide a better legibility and gateway for access to and from Otaki. On this basis Option OG07 was identified as a preferred option.

**Outcomes from Stakeholder workshops & Consultation**

Options OG03 and OG07 were taken forward to a Stakeholder Option Development and Screening Workshop on the 23rd September 2010. Option OG07 was confirmed as a clear preference. Both options were taken to public consultation in February 2011.

Feedback from the 2011 consultation process showed overwhelming support for Option OG07 (Proposal A in the brochure) and both the OCB and KCDC noted a strong preference for this option in their submissions. On the basis of the assessment and consultation outcomes it was recommended that Option OG07 (Proposal A) was incorporated into the scheme, and this was endorsed by the NZTA Regional Decision Making Team at its 23rd May 2011 meeting.

## South Otaki Interchange Scheme

Figure 7-9 shows the scheme recommended at South Otaki that has been progressed through to scheme design.

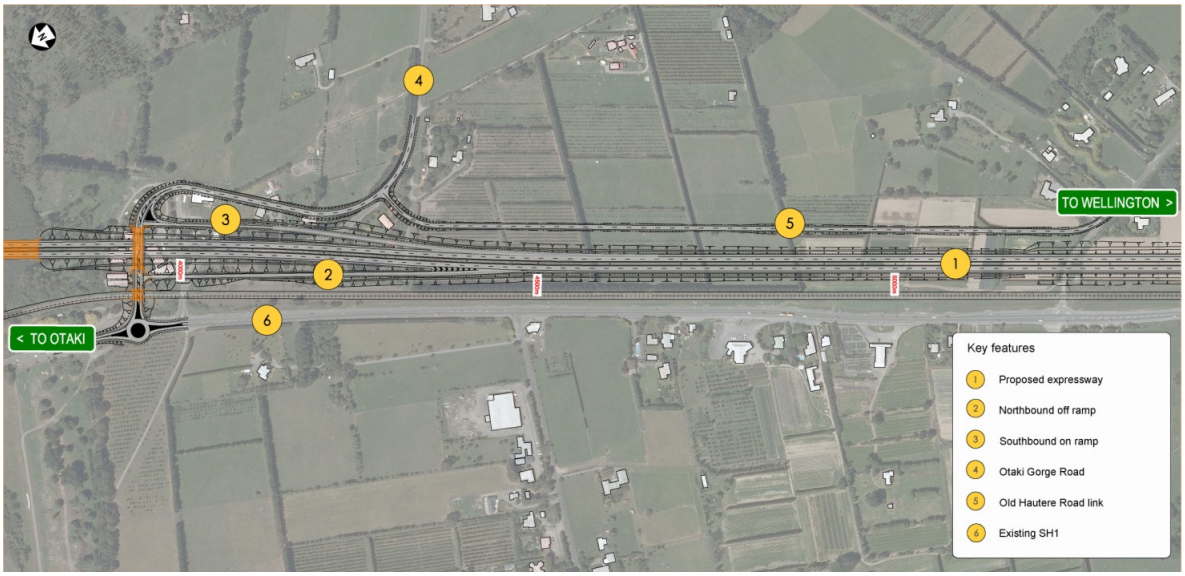



**Figure 7-9: South Otaki Preferred Scheme**

This option was developed in more detail through the scheme assessment phase to further mitigate potential effects. The key changes incorporated into the design since presentation of the Feb 2011 consultation brochure include:

- Squaring up of the bridges over the expressway and rail to remove skew and hence improve visibility from the expressway ramps.
- Improving legibility and safety by creating a more conventional half diamond interchange. This has been achieved by bringing the southbound onramp up to the Otaki Gorge Road Bridge, rather than an earlier concept that tied this into the Otaki Gorge Road south of the bridge.
- Removal of the roundabout at the intersection with Otaki Gorge Road and replacement with a conventional 'T' intersection.
- Inclusion of an at-grade link to Old Hautere Road (refer to Section 6.7 below).

## Te Horo Northbound Access

As noted in Section 6.5, a full MCAT process was completed at scoping phase to determine the overall interchange connectivity proposal for PP2O. In response to public consultation the option of a potential northbound (only) off ramp has been investigated between Peka Peka and south of the Mary Crest curve.

The results of this further investigation and assessment are summarised as follows:

**key features of a potential off-ramp:**

- Priority should be assigned to the existing SH1, not the off-ramp.
- The off-ramp connects to the existing SH1 just north of Te Hapua Road (the most northerly pragmatic location), only approximately 2km north of the Peka Peka interchange.
- Localised increased property impacts occur in the vicinity of Te Hapua Rd.
- The extent of impact on the bush remnant (identified in District Plan) to the south of Te Hapua Road is increased, by the need to "pull" the existing SH1 further from its current alignment.
- An alternative (and potentially lower environmental impact) is to locate the off-ramp at the Peka Peka interchange.

**Outcomes from Assessment:**

- The physical constraints place the potential NB off-ramp further to the south than desired (2km or less from the Peka Peka interchange).

- Landscape mitigation, and reduction in impacts to an existing bush remnant may drive the off-ramp further south for the Eastern Mary Crest alignment (midway between Te Kowhai and Te Hapua Rd) which further reduces separation from the Peka Peka interchange.
- In light of the above, a further traffic assessment was completed to consider the comparative effects and benefits of a NB off-ramp located at Peka Peka (providing the potential for a more intuitively placed off-ramp with reduced environmental/residential impacts). This is summarised in Table 7-5 below.

**Table 7-5: 2026 PM Peak Traffic Volumes from the Kapiti Combined SATURN model – Te Horo Off Ramp Options**

| Scenario 2026 PM Peak | Direction | North of Peka Peka | North of Mary Crest | North of Te Horo | South of Otaki | Expressway south of Otaki south |
|---|---|---|---|---|---|---|
| V4 Option (Otaki South off ramp only) | N/B | 279 | 241 | 191 | 369 | 696 |
| | S/B | 199 | 208 | 222 | 394 | 569 |
| Te Hapua Road Off-Ramp | N/B | 173 | 251 | 201 | 369 | 686 |
| | S/B | 203 | 208 | 222 | 394 | 569 |
| Peka Peka Off Ramp | N/B | 327 | 279 | 229 | 369 | 658 |
| | S/B | 199 | 208 | 222 | 394 | 569 |

Based on the traffic demands for the 2 different options tested there will be approximately 119 veh/hr in the PM peak (2026) using an off ramp at Te Hapua Road, which only equates to an increase in 10vphr on the existing SH1 northbound. The number of vehicles using a Peka Peka off ramp is higher with 181 veh/hr, however this still only equate to an increase in 38vphr on the existing SH1 northbound in the 2026 PM peak.

Without this off ramp, vehicles either travel up the existing SH1 to their destination or travel north on the expressway to the Otaki South interchange and then come back towards Te Horo. Modelling confirms that without an off ramp, the split between vehicles travelling north to Otaki South interchange or using the existing SH1 is approximately Beach Road, Te Horo.

Based on the change in vehicle numbers using the existing SH1 and the resulting environmental impacts issues, it is evident that Peka Peka is the most appropriate location for an off ramp should one be provided. However, the reasons as to why a full interchange was removed from Peka Peka and/or Te Horo remain valid for a northbound ramp and as such it is recommended that further work is undertaken to understand the economic benefit of this option and at the very least safeguarded for should it be required in the future. If a ramp is not provided at Peka Peka, then the option of an off ramp between Peka Peka and Otaki South is considered unsuitable, with other mitigation considerations given to the effects on businesses in Te Horo.

Other options to provide an off ramp north of Mary Crest have been considered, however they either have significant cost or environmental implications, and as such are not considered appropriate for further progression.

The presence or otherwise of northbound access off the expressway at either Peka Peka, or Mary Crest does not influence the assessment and screening process adopted to develop optimal access configurations at Otaki.

## 7.4 Cross-Corridor Connectivity Options

The following sections summarise the assessment undertaken for cross-corridor connections along the PP2O corridor.

### Te Horo Assessment

**Specialist Assessment Summary**

Option TH01

Transport In Option TH01 pedestrians and cyclists travelling between School Road and the Red House Café must travel an additional 1.5km. If ramps or stairs are provided from the bridge to the western side of SH1 for pedestrians and cyclists the trip distance can be reduced by about 400m. For people travelling from School Road to Te Horo Beach Road, TH01 increases their trip distance by about 300m. While this option provides a grade separated link across SH1, it more than doubles the trip distance for people wishing to walk between School Road and SH1. All Te Horo options introduce grades to a previously flat trip.

Urban Design The location of bridge and ramps in this option has minimal impact on existing buildings, however it does not follow the natural desire line for more direct connections aligning with School Road.

Environmental Ecology - The main issue concerning this option is that it will involve two crossings of the Mangaone Stream which will require the construction of additional culverts. If these are poorly designed they could have long-term effects on in-stream ecology. There may also be temporary effects associated with the construction and placement of the culverts. If not adequately mitigated this option therefore has the potential for more adverse ecological effects than other options at Te Horo.

Flood/Waterways Approach embankments for the bridge sit within the Mangaone Stream flood plain on both sides of the expressway, increasing the works footprint within the flat flood prone area.

Heritage/Archaeology There are no recorded heritage features or archaeological sites within the area however there is the potential for sites to be discovered, particularly for this option which crosses a stream gully on either side of the proposed expressway.

Air Quality This option affects the least number of properties (approximately 14) and is therefore preferred. The predominant northwest wind direction is likely to carry dust away from the majority of properties to open farmland to the southeast, thus minimising the impact from construction activities.

Social Impact Apart from the properties along Gear Road parallel to the SH1 corridor (which are affected by all options), this option avoids any further impact on residential properties.

This option provides a local road bridge with walking/cycling over the expressway. The proposed alignment for this connection loops some way to the northeast before crossing the expressway. This means a longer distance to travel relative to the existing situation.

The provision of a grade separated connection will improve safety for members of the Te Horo community crossing the expressway. However, the increase in the travel distance is potentially a negative outcome in that it may act as a disincentive to people walking or cycling. In addition, this option reduces accessibility to the Te Horo township for residents directly adjacent to SH1.

Overall, there is a definite improvement in overall connectivity due to the grade separated interchange. The minimisation of impacts on residential properties is seen as a positive.

<u>Option TH02</u>

Transport In Option TH02 pedestrians and cyclists travelling between School Road and the Red House Café must travel an additional 1.3km. If ramps or stairs are provided from the bridge to the western side of SH1 for pedestrians and cyclists the trip distance can be reduced by about 900m meaning this trip is only 400m longer than the base case with no grade separated link. For people travelling from School Road to Te Horo Beach Road TH02 increases their trip distance by about 100m. This option provides a grade separated link across SH1, but increases the trip distance by at least 400m for people wishing to walk between School Road and SH1.

Urban Design The location of bridge and ramps in this option has minimal impact on property and buildings going through agricultural land on the western side, however it does not follow the natural desire line for more direct connections aligning with School Road. Embankments and the bridge structure could be visually intrusive to immediate neighbours unless well designed and the western community on the existing Sh1 is potentially severed.

Environmental Ecology - No significant issues identified.

Flood/Waterways Subway option identified as fatally flawed at this location given the crossing is located on an overflow path from the Mangaone flood plain. Flood flow path can be mitigated with the bridge option, however this introduces additional works within the flood plain (assessed as similar to TH01).

Social Impact One of the residential properties adjoining SH1 (west side) will have to be removed.

This option provides a local road bridge with walking/cycling to cross the expressway. The proposed alignment for this connection loops to the east before crossing the expressway to link with Te Horo Beach Road. This means a slightly longer distance to travel relative to the existing situation, but also allows for the possibility of providing pedestrian access to the houses/businesses adjoining SH1. This is a largely positive outcome.

The provision of a grade separated connection will improve safety for members of the Te Horo community crossing the SH1. The relatively direct route with only a slight increase in travel distance is likely to encourage walking and cycling.

Overall, this option is positive in that it will improve connectivity. The impact on residential properties to the west (crossing through the midblock) is a potentially negative outcome, but the proposed route will benefit the community overall.

<u>Option TH03</u>

Transport In Option TH03 pedestrians and cyclists travelling between School Road and the Red House Café must travel an additional 1.2km. If ramps or stairs are provided from the bridge to the western side of SH1 for pedestrians and cyclists the trip distance can be reduced by about 1.5km meaning this trip is actually 300m shorter than in the base case with no grade separated link. For people travelling from School Road to Te Horo Beach Road TH03 reduces their trip distance by about 200m when compared to the base case.

This is the preferred option from a pedestrian and cyclist perspective for Te Horo.

Urban Design The location of bridge and ramps in this option has an impact on property and buildings on the western side together with localised impact on the eastern side. However it does follow the natural desire line for more direct connections aligning with School Road and connecting with Te Horo Beach Road. A local connection to Gear Road is provided but the intersection is raised slightly and may affect access to properties to the east. Embankments and the bridge structure could be visually intrusive to immediate neighbours unless well designed. The option also retains the majority of the existing settlement to the north of the crossing.

Environmental Ecology - No significant issues.

Flood/Waterways This option is located south of any significant mapped flood plain areas.

Social Impact This route will impact on several properties adjacent to SH1 including at least one residential property.

This option provides a local road bridge or subway with walking/cycling to cross the expressway. The proposed alignment crosses the expressway directly from School Road and then loops north to connect to Te Horo Beach Road. This option provides a direct route from

School Road to Te Horo road and also allows for the possibility of providing pedestrian access to the houses/businesses adjoining SH1.

As discussed above, a bridge (TH03A) is preferable to a subway (TH03B) and is likely to encourage greater use by pedestrians and cyclists.

The provision of a grade separated connection will improve safety for members of the Te Horo community crossing the SH1. As the most direct route this option has the most benefits for the overall community. It maintains essentially the same route between the east and west as is currently utilised, and is less likely to result in severance for businesses and residents directly adjacent to SH1.

Option TH04

Transport In Option TH04 pedestrians and cyclists travelling between School Road and the Red House Café must travel an additional 500m. For people travelling from School Road to Te Horo Beach Road, TH04 increases their trip distance by about 1000m. While this option provides a grade separated link across SH1, it is a very indirect route which will not be very appealing to pedestrians or cyclists.

Urban Design Option TH04 results in convoluted street patterns which do not accord with the existing urban form. Although the eastern side is connected directly to the existing SH1, the connection to Gear Road is shifted further to the east, and there is no direct access to Te Horo Beach Road and the coastal community. Embankments and bridge structures could be visually intrusive to immediate neighbours unless well designed.

Environmental Ecology - No significant issues.

Flood/Waterways This option is located south of any significant mapped flood plain areas.

Social Impact This option provides a local road bridge or subway with walking/cycling to cross the expressway. The proposed alignment crosses the expressway to the south of School Road mid-way between School and Gear Road. The local road then connects with the existing SH1. This is an indirect connection with a significant increase in travel distance between School Road and Te Horo Beach Road.

Although the provision of a grade separated connection may have positive safety benefits, the considerable distance to travel between School Road and Te Horo Beach Road is a negative outcome. The increased distance is likely to discourage walking and cycling.

Option TH08

Option TH08 was not assessed by the specialists but was raised at Stakeholder Workshop Number 2 (September 2011) as an alternative to TH03 to further reduce property impacts on the west side of the existing SH1. Many of the comments for TH03 above will apply to this option with the following amendments:

- The route is marginally longer.
- The slight deviation from the natural desire line removes the direct impact on existing properties adjacent to SH1 and retains the existing Red Café.
- Bridge costs are increased over Option TH03A given the increased bridge skew and length.

**Option Relative Costs**

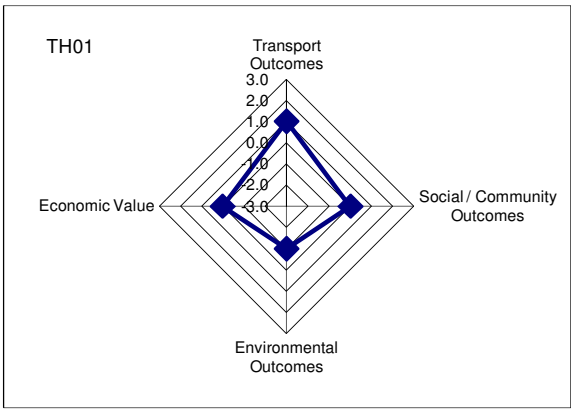
Comparative cost estimates were developed for the options using the 2009 scheme (Option TH01) as the base for comparison. These costs are summarised in Table 7-6 below.

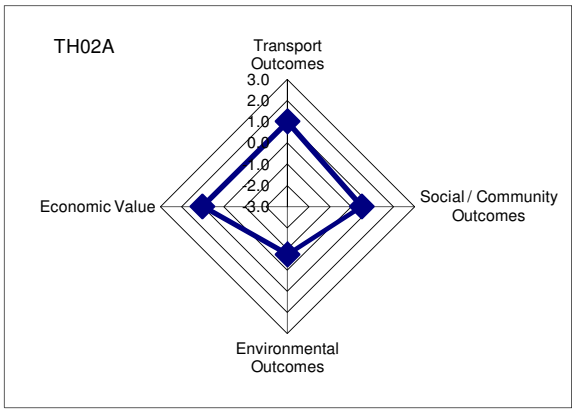
**Table 7-6: Te Horo Options relative costs**

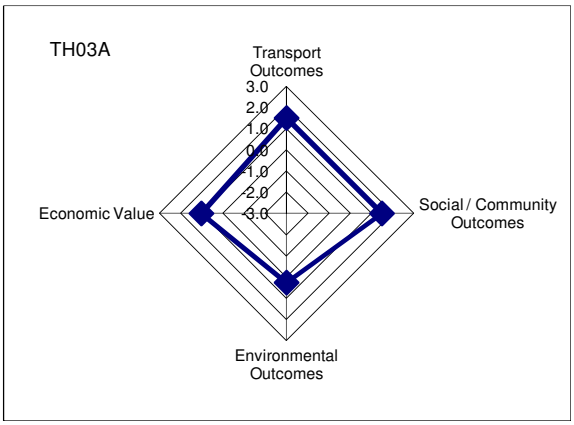
| Option | Cost Difference ($) | Comments |
|---|---|---|
| TH01 | | Base Option |
| TH02A (Local Bridge) | -1.1M | |
| TH02B (Local Subway) | +4.4M | Local road subways more expensive than bridges. |
| TH03A (Local Bridge) | -0.6M | Highest property cost of all options. |
| TH03B (Local Subway) | +5.6M | |
| TH04A (Local Bridge) | -3.6M | Cheapest property cost. Cheapest overall scenario. |
| TH04B (Local Subway) | +3.7M | |

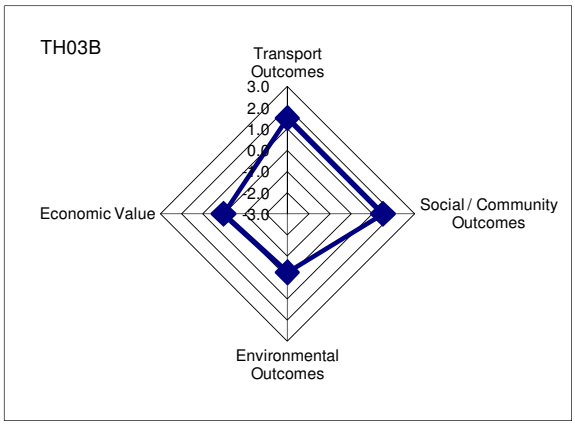
**Assessment Outcomes**

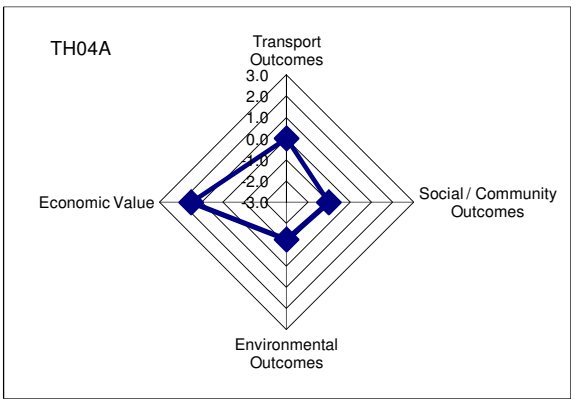
The following figures summarise the MCAT radar plots for each of the Te Horo cross corridor connection scenarios described in Section 6.7. None of the scenarios provides for a connection to the expressway.



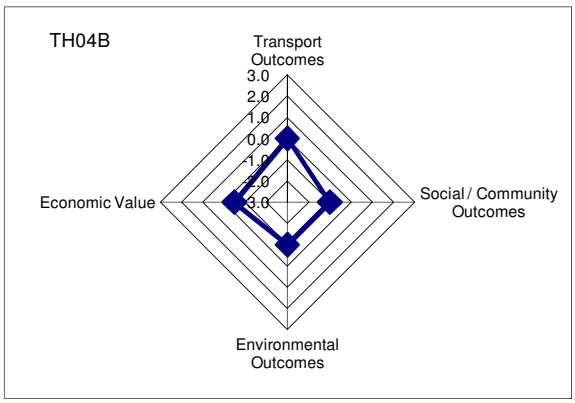



**Figure 7-10: MCAT plots for Te Horo**

Options TH01 and TH03A were identified as options to be taken forward to the Option Development and Screening Workshop in September 2010 as they delivered the best balance between improved transport outcomes, social and environmental factors and economic value.

Options TH04 and TH04B provided poorer transportation and social environmental outcomes and were therefore dropped from further consideration.

On a pairwise option comparison basis, Option TH03A was preferred over TH03B (subway) in all categories and has a significant benefit in terms of capital investment. On this basis Option TH03B (subway) was dropped from further consideration.

Options TH02A and TH03A (both local bridges over) provide, on balance, the best transportation and social environmental outcomes. However, Option TH02A provides a similar function to TH01, and when compared with Option TH03A, on a pairwise basis, is less favourable. On this basis Option TH02A was dropped from further consideration.

**Outcomes from Stakeholder workshops & Consultation**

Options TH01 and TH03A were taken forward to a Stakeholder Option Development and Screening Workshop on the 23rd September 2010. As a result of the workshop Option TH03A was further modified to avoid direct impacts on the Red Cafe, resulting in the development of Option TH08. Both options TH08 (Proposal A) and TH01 (Proposal B) were taken to public consultation in February 2011.

Feedback from the 2011 consultation process showed overwhelming support for Option TH01 (Proposal B in the brochure) and both the OCB and KCDC noted a strong preference for this option in their submissions. The main rationale for this has been to address visual and proximity effects of the grade separated infrastructure from residences and businesses at Te Horo.

While the MCAT process has indicated an enhanced outcome with Proposal A/TH08 (improved pedestrian/cycle connections), it is recognised that Proposal B (TH01) has local support, reduced impact on residential dwellings, and shifts the grade separated structure to the north of the main settlement. On this basis, and the fact that flood management can be addressed, it was recommended that Option TH01 (Proposal B) was incorporated into the scheme, and this was endorsed by the NZTA Regional Decision Making Team at its 23rd May 2011 meeting.

## Preferred Te Horo Scheme

Figure 7-11 shows the scheme recommended at Te Horo that has been progressed through to scheme design.


**Figure 7-11: Te Horo Preferred Scheme**

## Rahui Road / Waerenga Road

In the February 2011 public consultation brochure two options were put forward for Rahui Road based on earlier scoping assessment work. These were a pedestrian/cycle connection and a vehicular/pedestrian bridge. Vehicular subway alternatives had been discounted on technical grounds due to flood risk in this area. Public and stakeholder consultation feedback identified a strong community desire to maintain two east-west vehicular connections at Otaki (one being provided by the north Otaki interchange).

Following receipt and analysis of feedback from the 2011 public engagement process further extensive stakeholder consultation and workshopping was undertaken, specifically with KCDC, between April and May 2011 to examine potential options for providing a second east-west connection in Otaki. These included consideration of options at Rahui Road and Waerenga Road (being the two locations that interfaced with the Otaki street pattern).

The environmental, social, transportation and technical aspects of potential Rahui Road and Waerenga Road connections were then assessed and subject to an MCAT screening process.

**Specialist Assessment Summary**

Details of the options, specialist assessment, and MCAT outcomes are documented in a working paper within Appendix D of this report.

From a transportation perspective a connection at Rahui Road was assessed as more favourable than a Waerenga Road option given that it met the existing desire lines and did not create a 'detour' of the existing Railway retail strip for east Otaki (and Racecourse) traffic heading south.

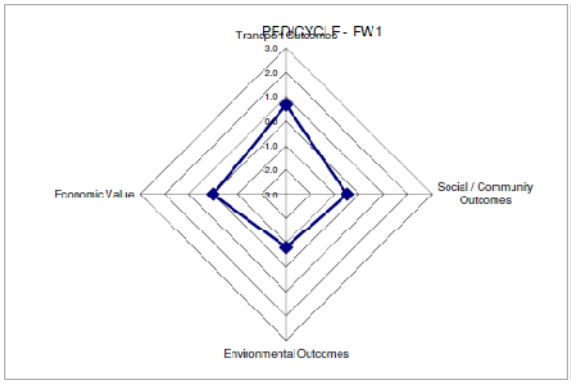
A refined Rahui Road bridge (road, pedestrians and cycle) was assessed as delivering overall better outcomes across all primary assessment criteria, and the majority of secondary criteria when compared with Waerenga Rd linkages. Key assessment differentiators are:

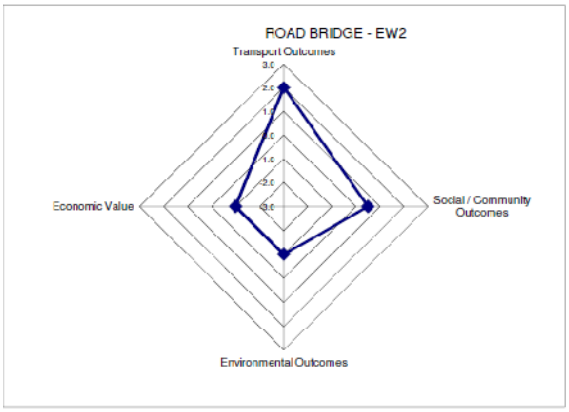
- Transportation – improved level of service for all road users (car, pedestrian and cyclist) and elimination of the existing at-grade rail crossing.
- Social/Community – reduced severance, consistency with the District Plan and support for current and future land use.

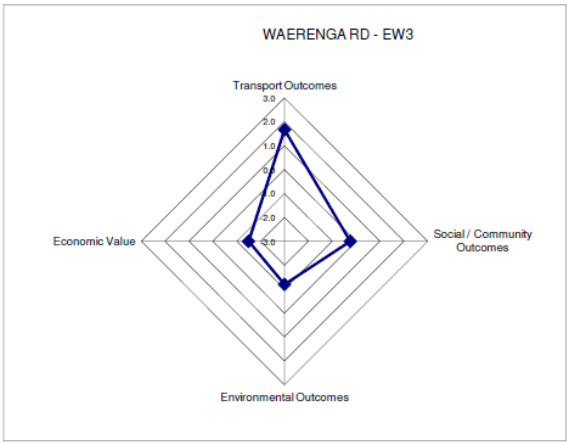
- Environmental – visual impacts for the Rahui Rd option were assessed as more localised/contained relative to the Waerenga Rd options which would also retain a pedestrian/cycle bridge linkage at Rahui Rd.
- Cost – Estimated cost differences (construction & property) relative to a pedestrian/cycle bridge at Rahui Rd have been assessed as:
- EW2 (Rahui Rd Road bridge) = +$2M to $6M (depending on quality of pedestrians/cycle base comparison)
- EW3 (Waerenga Rd link under expressway) = +$11M to $12M
- EW4 (Waerenga Rd link over expressway) = +$15M to $16M
- The incremental BCR for the Rahui Rd bridge is 3.5, compared with 0.5 to 0.7 for a Waerenga Rd linkage [c/f an enhanced pedestrian/cycle linkage].

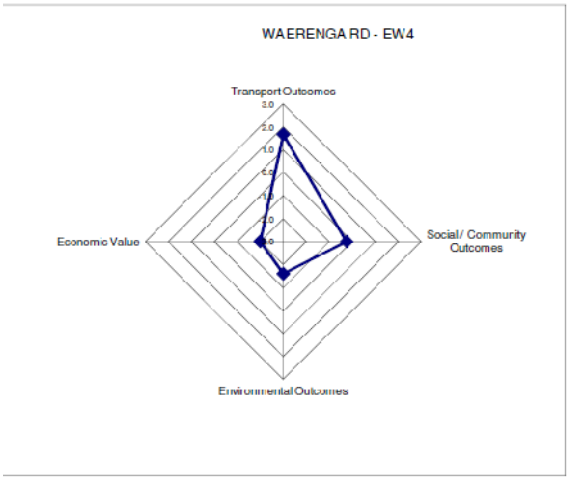
**Assessment Outcomes**

Figure 7-12 summarises the resulting MCAT plots for the East-West cross-corridor connection options at Otaki:



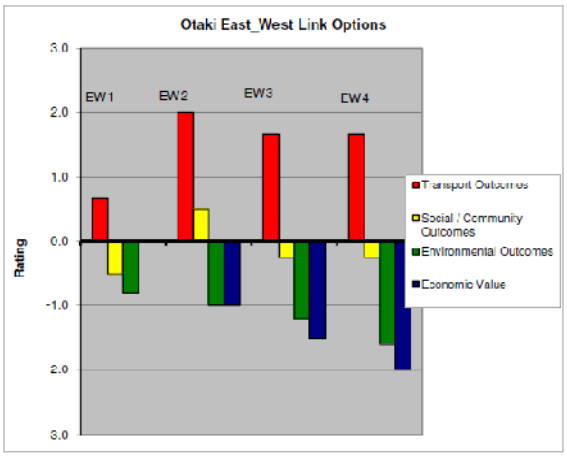



**Figure 7-12: MCAT Summary for Otaki E-W Options**

Option EW2, an improved road, pedestrian and cycle bridge connection across Rahui Rd has been identified as the preferred option for maintaining two points of E-W connectivity. Improvements to the rail and expressway relationship, refined flood assessments, and changes to the eastern approach geometry allow for a reduced structure height (approx 8.5m) and approach grades (approx 8%). This option was assessed as providing the best overall outcome in that it retains the current desire lines, has the most contained visual impact, and provides a positive incremental benefit cost ratio when compared to an improved pedestrian-cycle bridge at this location.

Further information on this assessment can be found in Appendix D.

**Outcomes from Stakeholder workshops & Consultation**

The above MCAT assessment outcomes were developed and shared with KCDC at an MCAT workshop on the 4th May 2011. Wider stakeholder feedback was then sought through a Stakeholder briefing workshop on the 11th May 2011, with specific HPT liaison on the 10th May 2011. The improved Rahui Road proposal has met with support from the key stakeholders. Following NZTA Decision Making Team endorsement on the 23rd May 2011 the Rahui Road bridge has been further developed and incorporated into the scheme proposal.

Public consultation on revised proposals at Rahui Road have yet to be taken back to public consultation, however the Otaki Community Board members provided some positive feedback on the concepts at a board member meeting on the 4th July 2011.

## Preferred Rahui Road Scheme

Figure 7-13 shows the scheme for Rahui Road to progress through to scheme design.

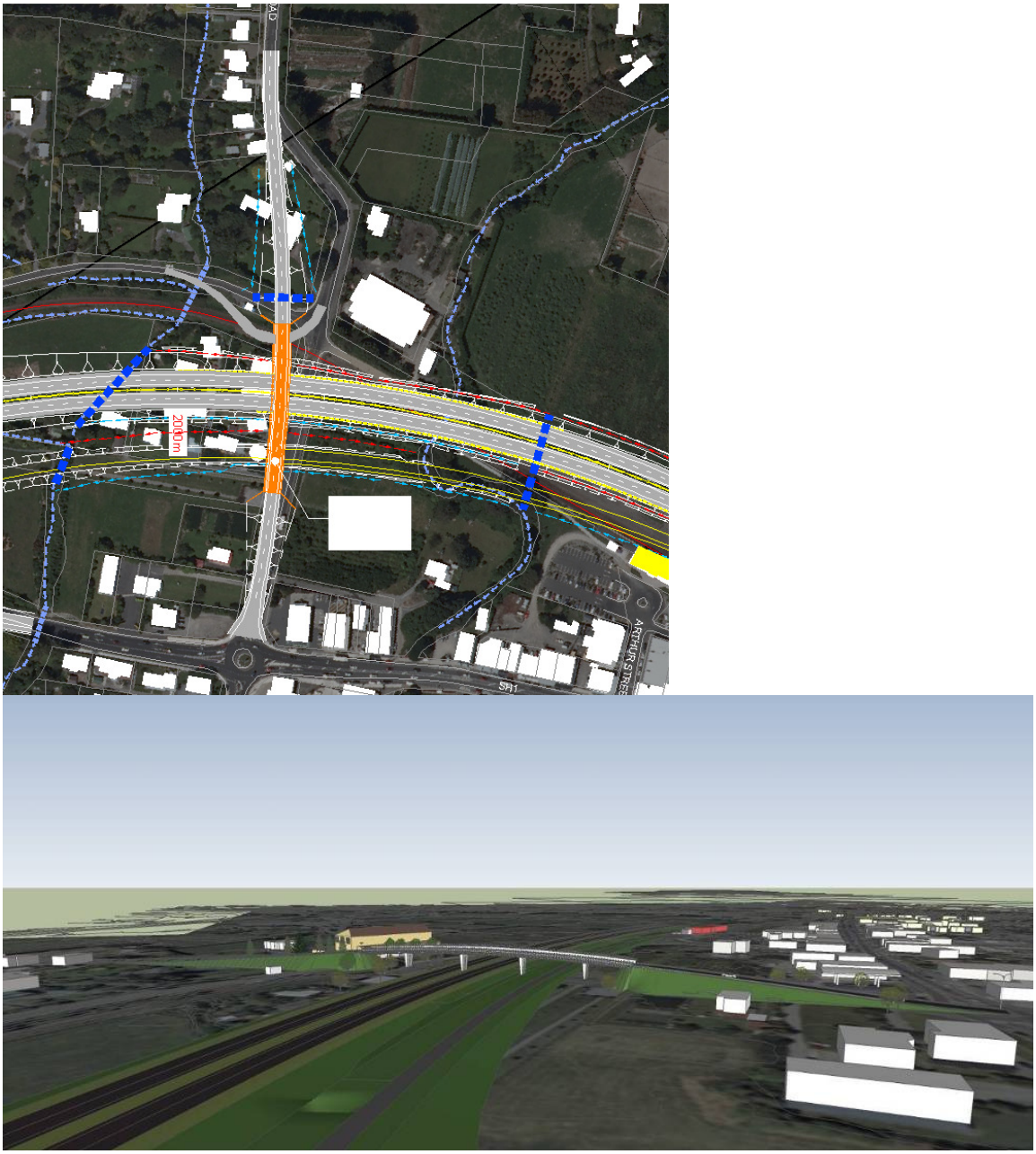



**Figure 7-13: Rahui Road Preferred Scheme**

This option has evolved through the scheme assessment and development phase to deliver a significant improvement over the 2011 as-consulted option. The key improvements are described in the Appendix D working paper, and include:

- Reduction in bridge height and grades on the approaches due to a rationalisation of the expressway and rail levels and placement beneath the bridge.
- Retention of County Road as a local access with this crossing beneath the Rahui Road bridge and then linking into Rahui Road.
- Promotion of a slender segmental structure type with median pier to keep structure depths to a minimum and to assist in reducing the scale of the crossing.

## Old Hautere Road

Specific feedback was not sought on the form of connection at Old Hautere Road In the February 2011 public consultation brochure. However, the proposal to cul-de-sac the existing connection to SH1 was highlighted. Key issues raised in feedback included: concerns around loss of connectivity; emergency accessibility; and concerns around anti-social driver behaviours which provided a mixed response on connectivity desires.

Further extensive stakeholder consultation and workshopping was undertaken, specifically with KCDC, between April and May 2011 to examine potential options for retaining connectivity at Old Hautere Road. These options are described in Section 6.7.3.

### Specialist Assessment Summary

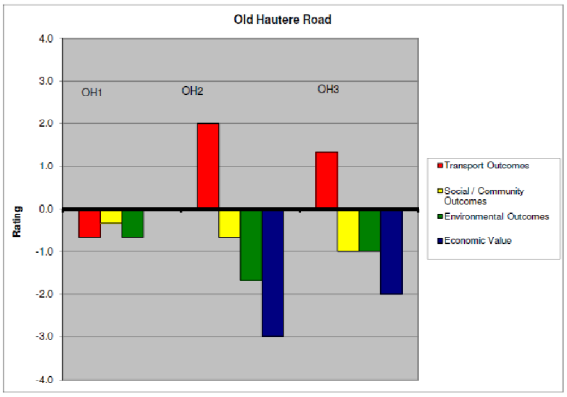
Details of the options, specialist assessment, and MCAT outcomes are documented in a working paper within Appendix D of this report.

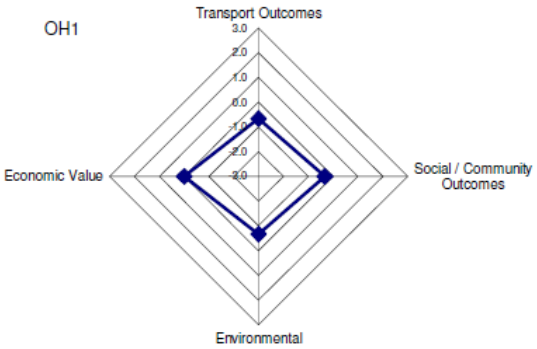
Key assessment differentiators are:

- Physical environmental outcome - The local linkage to Otaki Gorge road had a lower landscape effect compared to a grade separated option.
- Social/Community outcomes – The grade separated and link to Otaki Gorge Road rated similarly overall.
- Transport Outcomes - Both the grade separated solution and link road to Otaki Gorge Rd were assessed as providing enhanced transport outcomes compared with the cul-de-sac option for the approx 500 road users that use the link on a daily basis (year 2026).
- Capital Investment/Value for money – There is a significant difference between the two linkage options with the at-grade link to Otaki Gorge Rd being approx $6-7M cheaper ($3-$4M for at-grade link, relative to $10-$11M for grade separated link). Further net present value assessment with consideration of lifecycle costs did not alter this picture (NPV of $4M for the at-grade link, and $11M for the grade separated).
- The incremental BCRs for the options are 1.3 for a linkage to Otaki Gorge Rd, and 0.5 for a grade separated linkage. More than 40% of southbound trips (more than a doubling of the current assessment) would be required to use the existing SH1 before the grade separated linkage returned an incremental BCR of 1.0.

### Assessment Outcomes

Figure 7-14summarises the resulting MCAT radar plots for the options at Old Hautere Road described in Section 6.7:



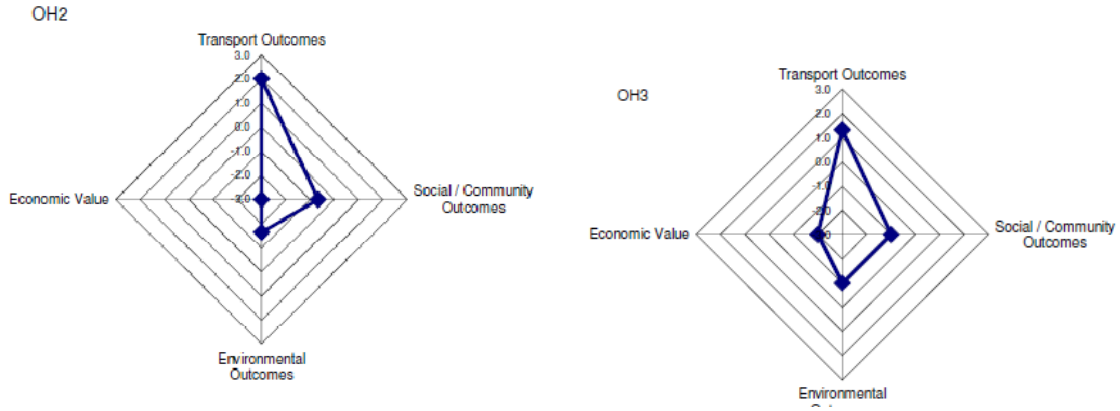



**Figure 7-14: MCAT Summary for Old Hautere Road Options**

Option OH3, which provides for an at-grade link to the south Otaki interchange and Otaki Gorge Road has been identified as the preferred option (similar to the 2009 option), and provides positive incremental benefits over a cul-de-sac proposal. While this option provides slightly less connectivity than a grade separated crossing it delivers significantly better value for money, only marginally reduced connectivity benefits, and reduces the localised visual/landscape and property effects of introducing a grade separated structure at Old Hautere Rd. Speed control/calming measures will need to be explored with KCDC to manage speeds in this area.

Further information on this assessment can be found in Appendix D.

**Outcomes from Stakeholder workshops & Consultation**

The above MCAT assessment outcomes were developed and shared with KCDC at an MCAT workshop on the 4th May 2011. Wider stakeholder feedback was then sought through a Stakeholder briefing workshop on the 11th May 2011. At an officer level within KCDC there remains a desire to explore a grade separated connection for Old Hautere Road, however this is considered difficult to justify given the low demands, proximity to the south Otaki interchange, and the option of an alternative lower impact solution that provides good value for money. Following NZTA Decision Making Team endorsement on the 23rd May 2011 the at-grade connection (Option OH3) has been further developed and incorporated into the scheme proposal.

The option includes an off-road footpath on the west side of the link road to provide a connection through to Otaki from Old Hautere Road.

Public consultation on this revised proposal have yet to be taken back to public consultation, however the concept is similar to the option included within the 2009 scheme and consultation.

### Preferred Old Hautere Road Scheme

Figure7-15 shows the scheme for Old Hautere Road to progress through to scheme design.

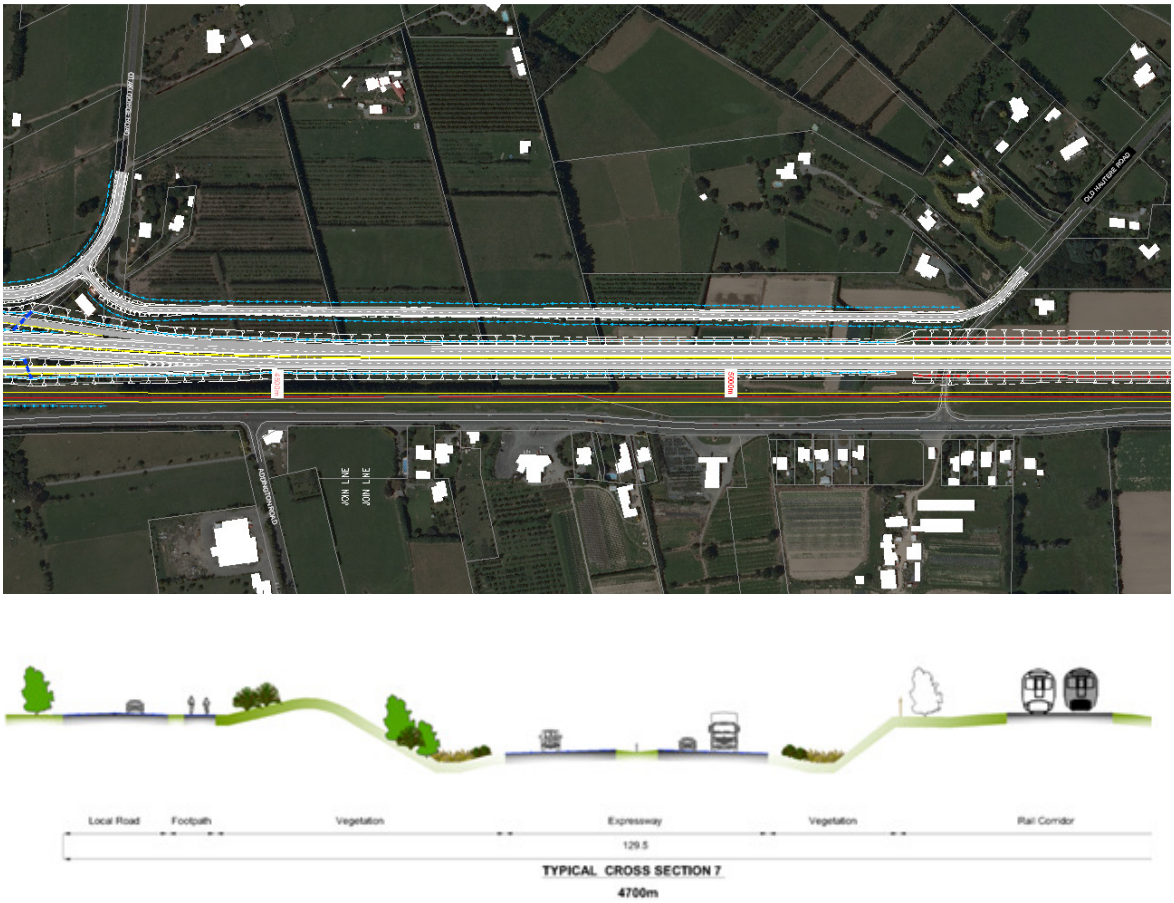



**Figure 7-15: Old Hautere Road Preferred Scheme (plan and section)**

## 7.5 Property Access Options

As mentioned in Section 6.8 above, the preferred options for property access are documented below. It is recommended that consultation is undertaken with the directly affected landowners. Given that the access options are dependent on the interchange and cross expressway connections options, as such consultation has been placed on-hold until the NZTA Board have endorsed the connection proposals at Rahui Road, Old Hautere Road, Te Horo and Mary Crest.

The locations requiring new property accesses are;

- Taylors Road (properties with current direct access to SH1)
- Former SH1 Access (properties with direct access to SH1 at the new off-ramp)
- North Otaki adjacent to the new Otaki Ramp Bridge
- Rahui Road
- Adjacent to the Winstone Quarry in Otaki
- Various properties at Te Horo
- Various properties at Mary Crest

## Taylors Road


**Figure 7-16: Taylors Road Access Option**

Property no. 7 (refer above) will lose its access to SH1 once the expressway is complete. Although the expressway will not be four-laned past this point the access will be required to be removed to provide a safe solution and to future proof the section for the eventual extension of the expressway north. A new access for this property can be provided across property No.6. The access would need to be close to the existing SH1 near to the stream crossing to make use of an extended culvert but then diverge away to ensure sufficient distance between the SH1/Taylors Road intersection. This option is yet to be discussed with the owners of either property No.6 or No.7.

## Former SH1 Access


**Figure 7-17: Former SH1 Access Provision**

Properties 3, 4 and 5 (refer above) currently share an existing access onto SH1. When the expressway is constructed this entranceway will need to be relocated as it is directly adjacent to the southbound off-ramp into Otaki. The off-ramp is one-way in this location until closer to Otaki (approximately 300m from the diverge) and as such the property access will need to be constructed utilising additional property from property number 5. As only three properties will use this access a right-of-way is considered to be the best option for determining ownership and access rights.

## North Otaki

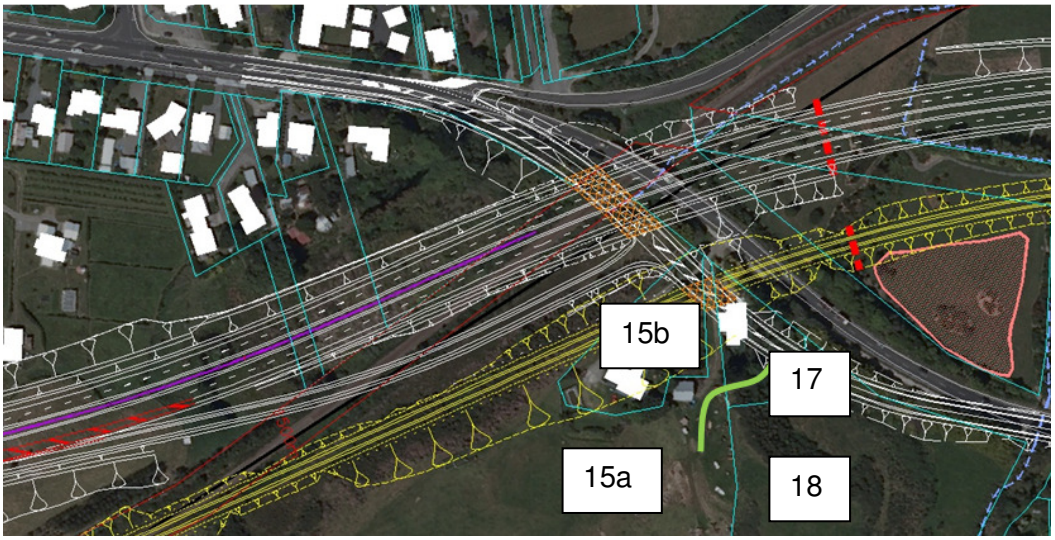



**Figure 7-18: North Otaki Property Access**

Property No. 15a (refer above) will lose its existing access onto SH1 as the realigned SH1 will result in the new rail bridge intersecting with the properties entranceway. As such to provide access to the property a new access way will be required through the adjacent property No. 17. The realignment of the former SH1 will require the purchase of the entirety of property No. 17 and a land-swap may be possible to give property No. 15a the land to construct a new access. The green line indicates the potential new access for the property. The access will need to be in such a location to ensure sufficient sight distance onto the existing SH1.

## Rahui Road West


**Figure 7-19: Rahui Road West Access Options**

There is a parcel used to provide access to the rear of the properties with road frontage south of the Mill Road/SH1 roundabout (refer  above). This parcel has an access onto Rahui Road which will be severed by the elevated embankment for the Rahui Road bridge. There are two possible options to maintain this access. One (shown as green solid line) is to provide a ramp onto the approach embankment for the Rahui Road Bridge. The ramp would need to be approximately 2.3m high in order to tie-in to the elevated level of Rahui Road, which may result in the fill batters from the ramp intruding into the adjacent parcels.

The second option (green dashed line) is to purchase the access off the existing SH1 currently used by the property to the rear of the block. This land could be purchased and the access upgraded to provide for the dwelling at the rear of the block and to provide access to the rear of the shops with street frontage. This option is the preferred option as it will not result in the visual and potential property impacts of a reformed access onto Rahui Road. SH1 will also have a much lower traffic volume which will enable easier access into and out of these properties.

Both of these options would require a right-of-way to be created to give access rights to the adjacent properties and to also formally recognise maintenance responsibilities.

## Rahui Road East


**Figure 7-20: Rahui Road East Access Option**

At present, (refer  above) property 41 uses a rail access (shown in green) or the adjacent access through property 41a to reach the property from Rahui Road. Property ownership information indicates that property 41 has the same owner as the adjacent property 41a. The expressway alignment will preclude the use of the existing rail access to access property 41. In order to provide an access to property 41 once the expressway is constructed an agreement must be reached with the owner of properties 41a and 41 to allow access through property 41a. If a new access outside of property 41a is required for this property it would need to loop around behind property 41a and then connect into Rahui Road, requiring additional property and incurring significant extra cost. Alternatively, property 41 (which is directly affected) could be purchased outright.

## South Otaki – Adjacent to Winstone Quarry

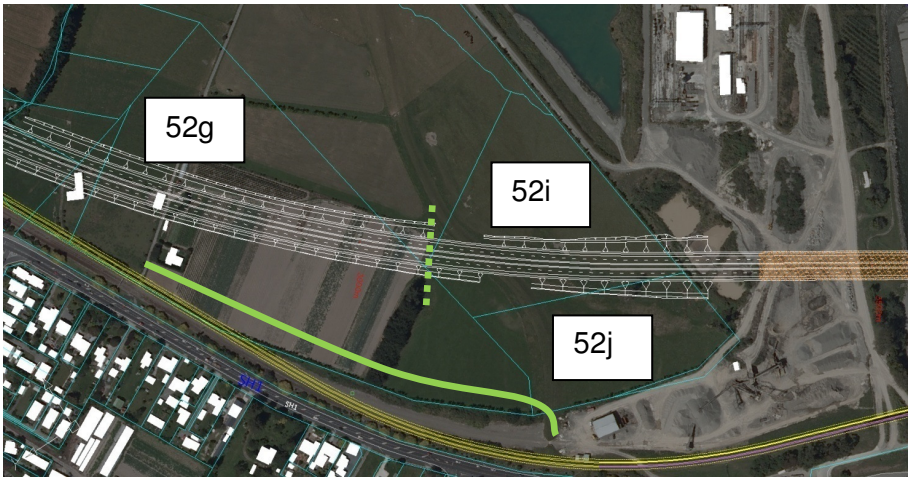



**Figure 7-21: South Otaki Property Access**

Property No. 52g (refer above) will be severed by the expressway leaving the property as two titles. The eastern portion of the title will be able to get access as it does currently on to Te Roto Road. The western portion of the title will be left with no access as it is unable to cross the railway (the crossing was closed some time ago). A new access could be provided along the western border of the residual parcel and then giving an access utilising Winstone Aggregates access way onto the former SH1. As this property is likely to be purchased in its entirety, providing this access is not necessarily required as the land may be on-sold to KiwiRail or Winstones.

Options to provide access under the expressway could be explored depending on the intended future land use, but would be limited to a low height crossing such as a 2.5m high subway (green dashed line above). Given the significant cost of providing a structure at this location (approximately $700,000), this option has not been pursued. However, once further flood assessments are completed as part of the AEE there may be an opportunity to explore combined use of a subway and any dry culverting for the scenario of providing a secondary flow-path in the event the crystal stop-bank is over-topped.

Access to Winstones is maintained beneath the proposed new Otaki River expressway bridge in a similar arrangement to the existing with additional clearance allowances.

## Te Horo

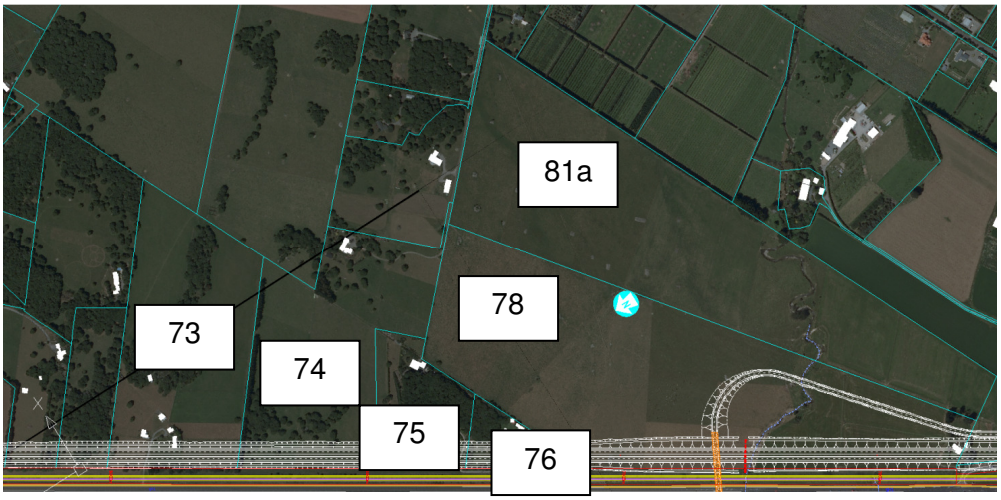



**Figure 7-22: Te Horo Properties**

Properties 73, 75, 76 and 78 (refer  above) will all require new accesses once the expressway is constructed. 73, 75 and 76 currently have access across the NIMT to SH1 which will be severed by the expressway.

In order to provide access to these properties a number of potential solutions have been developed. Most of these solutions will involve crossing property 74, which does not require a new access as it currently has access via a private road to the east connected to Arcus Road. It is likely that property 76 will be used as part of a settlement with one of the adjacent properties and is therefore unlikely to require a new access.

**Southern Access Option**

In order to provide access to the affected properties a link road could be provided from School Road in the south to the required properties (refer  below). The link road could come off from either the eastern or western side of School Road before connecting through to property 73. There are two potential options for connecting to property 73, one running parallel to the expressway while the other runs adjacent to the property boundary between properties 75, 76 and 78.

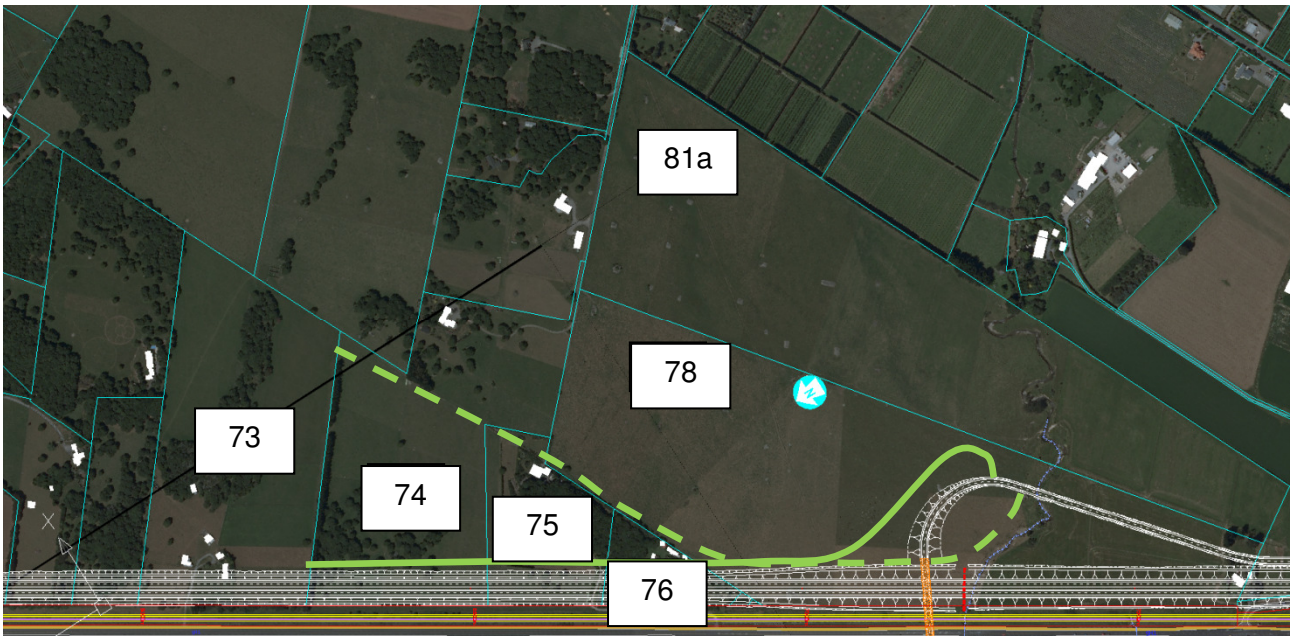



**Figure 7-23: Te Horo Property - Southern Access Alternatives**

Positives:

- Access is provided across properties which are already affected by the expressway.
- Can be designated as part of the expressway designation.

Negatives:

- Both options will require additional land from property 78 which is already heavily affected by the extension to School Road and the embankment for the Te Horo Underpass.
- Results in a long detour to get onto the expressway.

**Northern Access Option**

A link road from Otaki Gorge Road in the north could be connected down to the affected properties with two route options, either close to the expressway or a shorter route to the south east corner of Old Hautere Road (refer  below). One route could come from the first corner along Old Hautere Road then run along property boundaries all the way down to connect to property 76. A second option would be to connect from the end of Old Hautere Road and run parallel to the expressway all the way back to property 76.


**Figure 7-24: Te Horo Property - Northern Access Alternatives**

Positives:

- Access parallel to the expressway is provided across properties which are already affected by the expressway.
- Can be designated as part of the expressway designation.

Negatives:

- The option to run along the property boundaries will affect some properties which are previously unaffected by the expressway.
- Results in a long detour to get access to the existing SH1.
- Will affect areas of District Plan recognised forest remnants.
- This is the most expensive option.

**Arcus Road Access Option**

A private road exists onto Arcus Road which gives property 74 access out onto Arcus Road. It may be possible to extend this private road to connect in the other affected properties (refer below). Given this is a right-of-way, gaining the consent and agreement of the other owners involved may prove to be difficult.

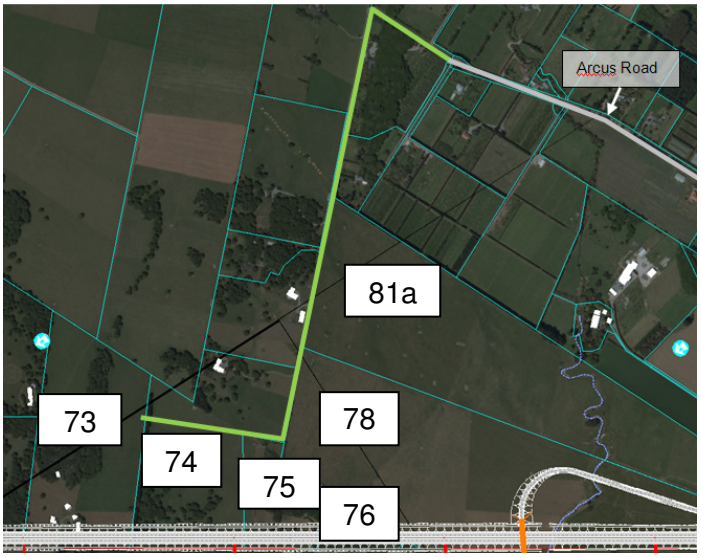



**Figure 7-25: Te Horo Property - Arcus Road Access Alternatives**

Positives:

- Can be designated as part of the expressway designation.
- Does not result in additional land being required from other affected properties (outside of property 74) if new properties can be added to the right-of-way agreement.

Negatives:

- Results in a significant detour to get access to the existing SH1 and the expressway.
- May prove difficult to obtain agreement with other properties in the right-of-way agreement.
- If the private road needs to be turned into a public road in order for access to be granted as the right-of-way is full, this may require additional land from properties not otherwise affected. This would also result in additional cost.
- Increases traffic on Arcus Road which is currently a narrow low volume country road with a one-lane bridge.

**Preferred Solution**

The preferred solution for providing access in this location is to provide an access from School Road in the south. The reasons this is the preferred option are;

- Access is provided across properties which are already affected by the expressway.
- Can be designated as part of the expressway designation.
- Can be constructed without impacting on bush remnants (the eastern option).
- It provides the most direct connection to existing SH1 and the Te Horo community for the affected properties.

The choice between the two alternatives for the southern connection to School Road will need to be decided upon following consultation with the landowners to ensure the best outcome is achieved.

## Mary Crest

**Figure 7-26: Mary Crest Access Alternatives**

The current proposal at Mary Crest is for a local access to be provided beneath the new Mary Crest bridge as shown by the solid green line in the figure above. An alternative access, as shown by the dashed green line, could be provided down the eastern side of the NIMT and connecting into Sutton Road, removing the need for the local access provision beneath the Mary Crest Bridge and reducing the number of crossing movements over the NIMT.

At this stage it is recommended that the proposed connection to the existing SH1 via the Mary Crest Rail Over Bridge is maintained. Potential opportunities associated with the future rail easing can be monitored and safeguarded for by providing some designation flexibility on the east side of the expressway. However this option does not eliminate any rail crossings and requires further land from parcels to the east. If the KiwiRail curve easing project comes online there may be an opportunity to place all of the local access on the east side of the rail (as land will be required for the rail easing) and link this to Sutton Road.

## 7.6 Pedestrian-Cyclist Access Options

Desire lines and the background to identifying the need for non motorised user connections and networks are described in the Urban and Landscape Design Framework included in Appendix M of this report.

### Accessibility Assessment

NZTA commissioned Abley Transportation Consultants to undertake an accessibility assessment for the Peka Peka to North Otaki part of the north of Wellington Road of National Significance.

Accessibility modelling is an analytical method for understanding the geographic ability of people to access goods, services and destinations. Accessibility is a measure of transport potential; essentially it acknowledges the availability of opportunity within the transport network and attempts to understand what people 'could' do. The following trip attractors were considered for this project:

- Otaki Main Street and Railway Precinct
- Supermarkets
- Schools (Primary and Secondary)
- Tertiary Institutions

The assessment was used to determine how implementation of the expressway would affect residents' ability to access these facilities on foot and by bicycle. This approach enables the way in which different parts of the study area are affected.

**Otaki Township**

The analysis found that overall, access was improved by the introduction of the expressway. The shift of traffic from the existing SH1 to the new expressway results in improved access for pedestrians, particularly between the Railway Precinct and the Waitohu Plateau. There is a minor degradation of access to schools on the west of the expressway for pedestrians walking from residences along Rahui Road. This is a result of the change in level associated with the Rahui Road bridge over rail.

**Te Horo**

Te Horo is on the limits of the distance that most people would cycle to reach facilities in Otaki Main Street or Railway Precinct. In this assessment the maximum cycling trip time was based on the 95th percentile trip time from the Ministry of Transport (MoT) New Zealand Household Travel Survey (approximately 40 minutes). The assessment found that people cycling to Otaki from Te Horo Beach or from other parts of Te Horo east of the existing SH1 would maintain their current levels of access.

The introduction of the expressway slightly increases the journey times for people cycling to Otaki from parts of Te Horo east of the NIMT railway. In the future, pedestrians and cyclists wishing to access the shared use path along SH1 from School Road must cross SH1 via the overpass structure and then use the pedestrian/cyclist ramp down to SH1. For users wishing to travel north towards Otaki from School road the overpass will increase their travel distance by approximately 300m. This increase in distance for northbound

trips corresponds to a travel time increase of approximately 3 minutes for pedestrians and less than 1 minute for cyclists.

For pedestrians and cyclists wishing to travel south on SH1 from School Road the increase in distance is approximately 1.2km. This is a result of users having to travel north to the overbridge and then once on the shared use path head south along the path. This increase in distance for southbound trips corresponds to a travel time increase of approximately 13 minutes for pedestrians and 3.5 minutes for cyclists. These travel times have been computed based on an assumed walking speed of 1.5m/s for pedestrians and 20km/h for cyclists.

The deviation and additional distance associated with the proposed link across the expressway between Te Horo Beach Road and School Road degrades the walking and cycling access to Te Horo School from areas west of the existing SH1, increasing the walking time.

**Peka Peka**

In the southern part of the study area, in areas accessed from Te Hapu Road and Te Kowhai Road, walking and cycling access is improved. Most of the trip attractors considered for this project are outside the reasonable walking or cycling distance. The reduction in traffic on the existing SH1, is however shown to improve access form these areas.

**Summary**

This analysis has displayed very little change in accessibility associated with the project, however it is acknowledged that residents of Old Hautere Road wishing to travel southbound will be the most likely to be affected.

Although this accessibility assessment has been undertaken for the PP2O project, there are number of issues currently being addressed as a result of the model peer reviewer's comments. Following the completion of these considerations, this information could be considered for use in the final TIA to accompany the AEE for the project.

## Cross-corridor connections

Pedestrian and cycle links are proposed at all locations in which local roads cross over the expressway, including Otaki North interchange, Rahui Road, Otaki South Interchange(Otaki Gorge Road and Old Hautere Link), and Te Horo.

The table below outlines these locations and the expected demand/justification for these facilities.

**Table 7-7: Cross Corridor Pedestrian and Cyclist Connections**

| Location | Description | Expected Demand | Comments |
|---|---|---|---|
| Otaki North | Proposed 2.5m wide path on the south side of the bridge to cater for pedestrian and cyclist travel between Otaki and the Waitohu plateau. A new 2.5m width path will be constructed from the bridge down to the roundabout at Mill Road. A safe crossing facility will also be constructed adjacent to the roundabout to allow school children to safely cross SH1. A 1.5m wide facility will be retained on the north side of the bridge. | 85 users were surveyed crossing SH1 on the Waitohu plateau (based on a 6 hour count, with 2 hours at each of AM, IP and PM (refer Section 4.2), 73 at County Road and six each at Waitohu Valley Road and Te Manuao Road).<br>The key demand in this area is from the residential area east of SH1 on the Waitohu plateau and the schools to the west of SH1 in Otaki. No information is available on the pedestrian cyclist demand from the west side of SH1 north of the bridge; however the demand is expected to be low). | The scheme proposes to encourage pedestrians and cyclists to travel from the Waitohu plateau down the south east side of existing SH1 to a new safe crossing facility adjacent to the Mill Road roundabout. The scheme would also seek to remove the current kerb-build outs on SH1 north of the bridge to discourage crossing in that location. Access down the north-west side of the existing SH1 will be retained as a minimal width as the demand for this movement is expected to be low and a busy on-ramp divides this path. |
| Rahui Road | Proposed 2m and 2.5m combined path on the south side to tie in with potential link to rail station. | Five users were surveyed crossing SH1 at School Road during a survey in 2010. However, this number would be expected to increase as safer access is provided across SH1. Pedestrians and cyclists would not be expected to travel between east Te Horo and Te Horo beach. However, increased travel between east Te Horo and the 20-30 properties in west Te Horo immediately adjacent to the existing SH1 could be expected. | The demand for a facility over the Te Horo bridge is expected to be low due to the detour length involved, however given the presence of the school inclusion of a combined width footpath is recommended on the south side (ties in with linkages to Te Horo on this side). |
| Otaki South | Proposed 2.5m wide path on the north side of the bridge to cater for pedestrian and cyclist travel between Otaki Gorge Road and Otaki. There will also be a pedestrian link on the east side of the expressway between Old Hautere Road and Otaki Gorge Road. | No pedestrian-cyclist survey data is available for the area around Otaki Gorge Road and only one pedestrian was surveyed crossing SH1 at Old Hautere Road. However, pedestrian and cyclist travel between Old Hautere Road / Otaki Gorge Road and Otaki could be expected to increase with safer pedestrian and cyclist facilities. | The scheme proposes to encourage users from Otaki Gorge Road to use a new shared path on the north-east side of the bridge to avoid the multiple roads on the south side (On-ramp, Off-ramp and Old Hautere Link). Any pedestrians or cyclists travelling down the old Hautere link will be provided with a safe location to cross Otaki Gorge Road onto the northern side. |

| | | | |
|---|---|---|---|
| Te Horo | Proposed 2.5m wide path on the south side of the bridge to cater for pedestrian and cyclist travel east and west Te Horo. | Five users were surveyed crossing SH1 at School Road during a survey in 2010. However, this number would be expected to increase as safer access is provided across SH1. Pedestrians and cyclists would not be expected to travel between east Te Horo and Te Horo beach. However, increased travel between east Te Horo and the 20-30 properties in west Te Horo immediately adjacent to the existing SH1. | The demand for a facility over the Te Horo bridge is expected to be low due to the detour length involved. NZTA are looking at ways that the pedestrian distance could be reduced. |

## Parallel Walking and Cycling Route

As discussed in Section 6.9 the preference for the off road walking and cycling facility in a north / south direction along the corridor is for that to be located within the existing SH1. Options to the east and west have been considered and discussed with KCDC and other stakeholders; however, feedback from stakeholders shows greater support for a facility on the western side.

The landscape drawings (Volume 4) display this facility being located on the east side between Otaki North and Otaki South (through the railway retail area and past the Otaki Rail Station), then switching to the west side from Otaki Gorge Road to Peka Peka. Further work will be undertaken as part of the SH1 revocation project to confirm the exact location of this facility and an adjacent equestrian facility.

An assessment of cost has been completed for the off-road cycle/walkway facility for both the eastern and western option. The western option expected estimated has been assessed as approximately 30% higher than the eastern based on the need for more extensive modifications to the existing SH1 (based on an assumption that a minimum 0.5m separation would be provided from sealed shoulder edges). The comparative costs are summarised as follows:

- Eastern cycle/walkway path: $2.1M to $2.8M with an expected of $2.5M;
- Western cycle/walkway path: $2.7m to $3.6M with an expected of $3.3M;

A 3m pedestrian/cycle bridge addition to the Otaki River Bridge (existing SH1) is also proposed as part of the SH1 revocation package. The estimated cost for this is $2.8M base, with an expected estimate of $3.4M.

Both the local road and the off road facility along the corridor will significantly enhance the current facilities in the study area. The off road cycle facilities will also be further enhanced by the significant reduction of traffic on the existing SH1 and shoulder provision for cyclists utilising this facility.

Although pedestrians and cyclists will not be restricted from the expressway, they will be discouraged due to the presence of a lower speed, reduced traffic environment running adjacent to the expressway.

A pedestrian-cycle link on the east side of the expressway from School Road to Old Hautere Road was also suggested as illustrated in Figure 7-27 below (pink dashed line). However, the expected demand for this facility is less than 6 people per day[18].

[18] This is based on the average walk/cycle distances (New Zealand Household Travel Survey 2006 – 2009). Using this data adults leaving Old Hautere Road would get to Mary Crest (4.8km), however children (1.7/2.1km) would not get to Te Horo

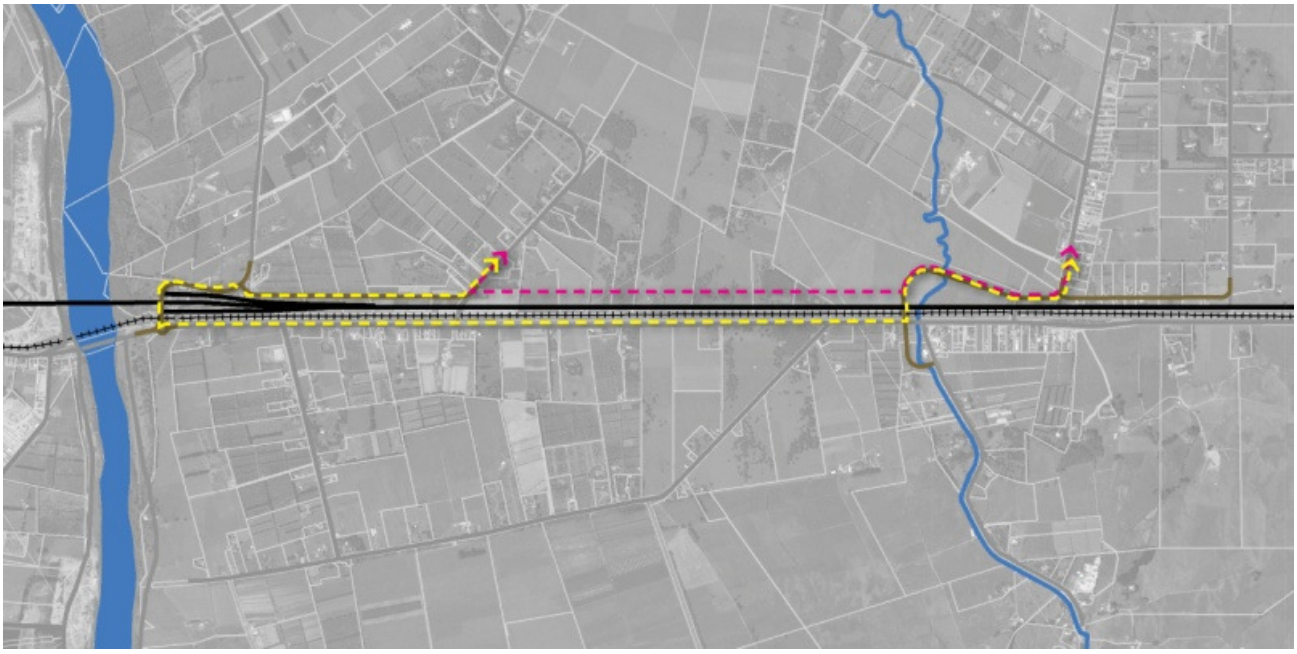


**Figure 7-27: Parallel Walking and Cycling Route**

Given the presence of a proposed off-road walking/cycling path along the existing SH1 corridor (yellow dashed line), a facility on the east side of the expressway between Old Hautere Rd and School Road is likely only to serve walking/cycling movements between Old Hautere Rd residents and Te Horo. In reality the demand and utilisation of such a path is expected to be limited and therefore difficult to justify on value for money grounds. (estimated rough order cost of $0.5M based on a 2.5m path).

## 7.7 Traffic Assessment of the Preferred Option

The traffic assessment of the preferred option builds on options considered and displays how the project fulfils the objectives of providing an expressway between Peka Peka and Otaki as part of the Wellington Northern RoNS project.

A draft Traffic Impact Assessment has also been completed as part of the draft AEE for the project and is contained in Appendix EE.

### Traffic Volumes

For the purposes of assessment, traffic volumes for the 2026 year have been extracted from the PP2OTM SATURN model for the preferred option and the do minimum scenario. The results which have been reported display what is known as the 'development scenario', which includes medium growth from the Wellington Transport Strategy Model (WTSM) model and the inclusion of the Riverbank Road development and those trips associated with additional development in Paraparaumu town centre, Waikanae North and approximately 50% of the Kapiti Aerodrome development.

The results comparing the two way average annual daily traffic (AADT) from the 2010 base model and the 2026 Do Minimum and Preferred Option models has been displayed in Figure 7-28 below.

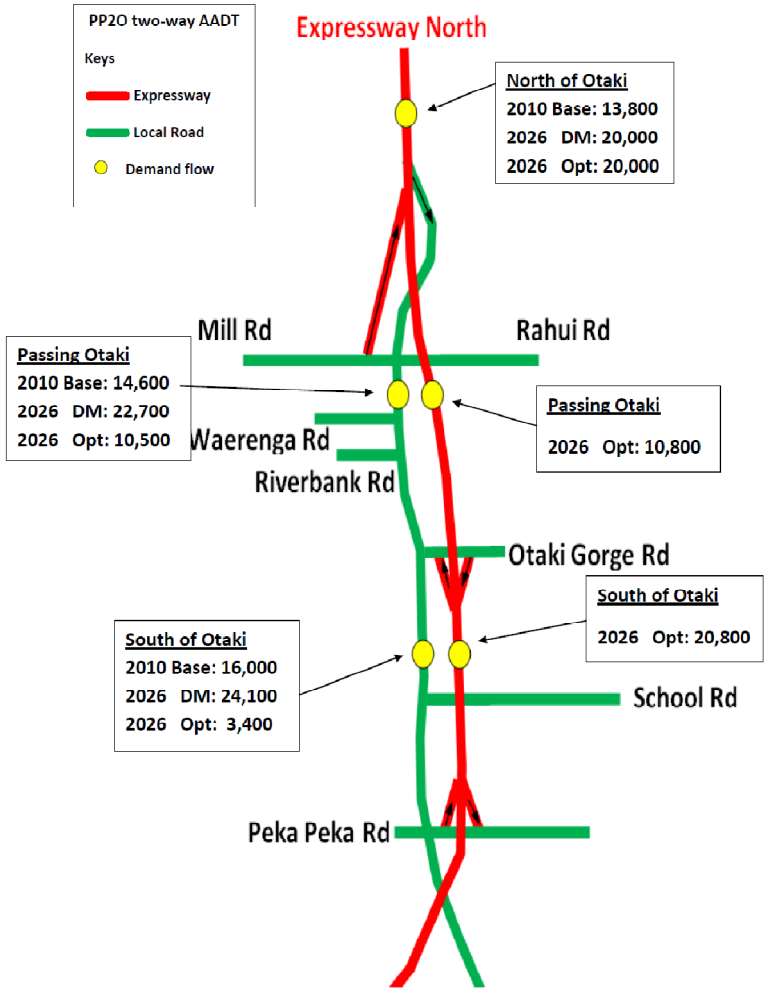



**Figure 7-28: Traffic Volumes through the project**

Table 7-8 below, summarises the forecast traffic volumes on the expressway in 2026 for the preferred option. Between Peka Peka and Otaki Gorge Road the expressway is forecast to carry just under 21,000 vehicles per day. Between Otaki Gorge Road and the ramps to the north of Otaki the demand drops to less than 11,000 vehicles per day, taking into account the significant demand to and from Otaki. North of Otaki demand increases to approximately 20,000 vehicles per day. There are no traffic volumes for the Do Minimum between Peka Peka and Otaki since the expressway is not constructed in this scenario.

The reduction of approximately 11,000 vehicles through Otaki will result in significantly less congestion, delay, disruption, environmental degradation and social severance caused by the existing SH1 traffic and large number of heavy vehicles in particular.

It is noted that the WTSM model predicts higher than expected percentages of HCV, an area of the strategic model that is currently under review by GWRC. For the purposes of aspects such as pavement design the current day percentage HCVs (approximately 9 to 10%) have been applied with projected traffic growth.

**Table 7-8: 2026 Expressway Traffic Volumes**

| Link | Direction | Do Minimum | | | | | Preferred Option | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | IP | PM | AADT | HCV % | AM | IP | PM | AADT | HCV % |
| North of Taylors Road | NB | 631 | 635 | 766 | 9,839 | 29% | 631 | 635 | 766 | 9839 | 29% |
| | SB | 763 | 654 | 760 | 10,309 | 33% | 763 | 654 | 760 | 10309 | 33% |
| | **Two-way** | **1,395** | **1,289** | **1,526** | **20,148** | 31% | **1395** | **1289** | **1526** | **20148** | 31% |
| Otaki on-ramp | NB | | | | | | 275 | 321 | 306 | 4724 | 43% |
| Otaki off-ramp | SB | | | | | | 322 | 319 | 321 | 4822 | 48% |
| North of Otaki on-ramp | NB | | | | | | 638 | 642 | 777 | 9958 | 29% |
| | SB | | | | | | 451 | 344 | 447 | 5609 | 19% |
| | **Two-way** | | | | | | **1089** | **986** | **1224** | **15567** | 25% |
| North of Mill Road | NB | | | | | | 363 | 321 | 471 | 5234 | 16% |
| | SB | | | | | | 451 | 344 | 447 | 5609 | 19% |
| | **Two-way** | | | | | | **814** | **665** | **918** | **10843** | 18% |
| North of Riverbank Road | NB | | | | | | 363 | 321 | 471 | 5234 | 16% |
| | SB | | | | | | 451 | 344 | 447 | 5609 | 19% |
| | **Two-way** | | | | | | **814** | **665** | **918** | **10843** | 18% |
| North of Otaki Gorge Road | NB | | | | | | 363 | 321 | 471 | 5234 | 16% |
| | SB | | | | | | 451 | 344 | 447 | 5609 | 19% |
| | **Two-way** | | | | | | **814** | **665** | **918** | **10843** | 18% |
| Otaki Gorge off-ramp | NB | | | | | | 379 | 306 | 397 | 4950 | 47% |
| Otaki Gorge on-ramp | SB | | | | | | 367 | 319 | 347 | 4963 | 44% |
| North of School Road | NB | | | | | | 742 | 627 | 868 | 10183 | 31% |
| | SB | | | | | | 818 | 662 | 793 | 10572 | 31% |
| | **Two-way** | | | | | | **1560** | **1289** | **1661** | **20755** | 31% |
| Mary Crest | NB | | | | | | 742 | 627 | 868 | 10183 | 31% |
| | SB | | | | | | 818 | 662 | 793 | 10572 | 31% |
| | **Two-way** | | | | | | **1560** | **1289** | **1661** | **20755** | 31% |
| North of Peka Peka Road | NB | | | | | | 742 | 627 | 868 | 10183 | 31% |
| | SB | | | | | | 818 | 662 | 793 | 10572 | 31% |
| | **Two-way** | | | | | | **1560** | **1289** | **1661** | **20755** | 31% |

The traffic volumes on the existing SH1 in the Do Minimum are summarised in Table 7-9, below for 2026. In the Do Minimum scenario, demand is highest to the south of Peka Peka Road with approximately 25,000 vehicles per day. Demands get progressively lower heading north along the route with approximately 21,500 vehicles per day on the current SH1 south of Te Manuao Road. In the preferred option with the expressway constructed, demands on the Existing SH1 are significantly reduced compared to Do Minimum. There is also a reduction in the number of heavy vehicles on the Existing SH1 in the preferred option compared to the Do Minimum; however the percentage mix remains largely the same.

**Table 7-9: 2026 Existing SH1 Traffic Volumes**

| Link | Direction | Do Minimum | | | | | Preferred Option | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | IP | PM | AADT | HCV % | AM | IP | PM | AADT | HCV % |
| South of Te Manuao Rd | NB | 663 | 677 | 834 | 10,512 | 28% | 39 | 46 | 70 | 734 | 14% |
| | SB | 817 | 689 | 796 | 10,879 | 31% | 381 | 357 | 362 | 5,449 | 42% |
| | **Two-way** | **1,480** | **1,367** | **1,630** | **21,391** | 30% | **420** | **403** | **432** | **6,183** | 39% |
| North of Mill Road | NB | 663 | 677 | 834 | 10,512 | 28% | 300 | 356 | 363 | 5,280 | 41% |
| | SB | 817 | 689 | 796 | 10,879 | 31% | 366 | 346 | 349 | 5,271 | 43% |
| | **Two-way** | **1,480** | **1,367** | **1,630** | **21,391** | 30% | **666** | **702** | **712** | **10,551** | 42% |
| North of Riverbank Road | NB | 702 | 685 | 922 | 10,856 | 27% | 353 | 381 | 470 | 5,873 | 36% |
| | SB | 933 | 739 | 904 | 11,874 | 28% | 444 | 373 | 362 | 5,751 | 38% |
| | **Two-way** | **1,635** | **1,424** | **1,826** | **22,730** | 27% | **798** | **754** | **832** | **11,624** | 37% |
| North of Otaki Gorge Road | NB | 872 | 760 | 998 | 12,175 | 28% | 509 | 439 | 527 | 6,942 | 37% |
| | SB | 928 | 793 | 924 | 12,501 | 29% | 477 | 449 | 498 | 6,933 | 37% |
| | **Two-way** | **1,800** | **1,552** | **1,923** | **24,676** | 29% | **985** | **888** | **1,026** | **13,875** | 37% |
| North of School Road | NB | 853 | 741 | 989 | 11,905 | 30% | 111 | 113 | 121 | 1,722 | 24% |
| | SB | 920 | 776 | 899 | 12,247 | 30% | 102 | 113 | 125 | 1,713 | 27% |
| | **Two-way** | **1,773** | **1,516** | **1,888** | **24,152** | 30% | **212** | **227** | **246** | **3,434** | 25% |
| Mary Crest | NB | 851 | 729 | 1,025 | 11,844 | 29% | 109 | 102 | 157 | 1,660 | 19% |
| | SB | 941 | 771 | 917 | 12,274 | 29% | 123 | 109 | 140 | 1,735 | 16% |
| | **Two-way** | **1,792** | **1,500** | **1,942** | **24,118** | 29% | **232** | **211** | **297** | **3,395** | 17% |
| North of Peka Peka Road | NB | 847 | 726 | 1,027 | 11,804 | 29% | 112 | 106 | 165 | 1,735 | 22% |
| | SB | 943 | 768 | 914 | 12,239 | 29% | 131 | 114 | 143 | 1,813 | 19% |
| | **Two-way** | **1,790** | **1,494** | **1,940** | **24,043** | 29% | **243** | **220** | **308** | **3,548** | 20% |
| South of Peka Peka Road | NB | 872 | 761 | 1,105 | 12,396 | 28% | 727 | 612 | 855 | 9,959 | 30% |
| | SB | 1,003 | 811 | 971 | 12,953 | 27% | 805 | 646 | 777 | 10,338 | 30% |
| | **Two-way** | **1,875** | **1,572** | **2,075** | **25,350** | 27% | **1,533** | **1,258** | **1,632** | **20,297** | 30% |

The traffic volumes on the local roads intersecting with the existing SH1 in 2026 for the Do Minimum and Preferred Option scenarios are summarised in Table 7-10 below. Largely the traffic volumes remain the same, however where the local road has been modified (such as Old Hautere Road) the volume has remained largely the same, yet the volume on the Otaki Gorge Road bridge has increased significantly.

The daily traffic volume on the bridge link between School Road and Te Horo Beach Road now accounts for approximately 3,700 vehicles, while the Rahui Road bridge will carry approximately 3,500 vehicles per day.

**Table 7-10: 2026 Local Road Traffic Volumes**

| Link | Direction | Do Minimum | | | | | Preferred Option | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AM | IP | PM | AADT | HCV % | AM | IP | PM | AADT | HCV % |
| Otaki Gorge Rd | WB | 51 | 37 | 41 | 595 | 9% | 51 | 37 | 41 | 595 | 9% |
| | EB | 29 | 36 | 58 | 574 | 10% | 29 | 36 | 59 | 575 | 10% |
| | **Two-way** | **80** | **73** | **99** | **1,169** | 9% | **80** | **73** | **100** | **1,170** | **9%** |
| Old Hautere Rd | WB | 27 | 20 | 22 | 320 | 10% | 27 | 20 | 22 | 320 | 10% |
| | EB | 16 | 19 | 31 | 310 | 12% | 16 | 19 | 31 | 310 | 12% |
| | **Two-way** | **43** | **39** | **53** | **630** | 11% | **43** | **39** | **53** | **630** | **11%** |
| Overbridge at Otaki Gorge Rd | WB | | | | | | 52 | 40 | 44 | 641 | 4% |
| | EB | | | | | | 387 | 357 | 418 | 5,575 | 40% |
| | **Two-way** | | | | | | **440** | **398** | **462** | **6,216** | 36% |
| School Rd | WB | 32 | 24 | 27 | 388 | 11% | 32 | 24 | 27 | 388 | 11% |
| | EB | 21 | 24 | 37 | 377 | 13% | 21 | 24 | 37 | 377 | 13% |
| | **Two-way** | **53** | **48** | **64** | **764** | 12% | **53** | **48** | **64** | **765** | **12%** |
| Gear Rd | WB | 73 | 98 | 129 | 1,494 | 17% | 73 | 98 | 129 | 1,494 | 17% |
| | EB | 106 | 95 | 98 | 1,465 | 20% | 106 | 95 | 99 | 1,467 | 20% |
| | **Two-way** | **180** | **193** | **228** | **2,959** | 19% | **180** | **193** | **229** | **2,961** | **19%** |
| Overbridge at School Rd | WB | | | | | | 104 | 121 | 155 | 1,863 | 16% |
| | EB | | | | | | 126 | 117 | 135 | 1,826 | 19% |
| | **Two-way** | | | | | | **230** | **239** | **290** | **3,688** | 17% |
| Rahui Rd | WB | 189 | 114 | 112 | 1,862 | 16% | 189 | 114 | 112 | 1,863 | 16% |
| | EB | 88 | 102 | 191 | 1,691 | 13% | 89 | 102 | 191 | 1,693 | 13% |
| | **Two-way** | **277** | **216** | **302** | **3,553** | 15% | **277** | **216** | **302** | **3,556** | 15% |

Based on the traffic volumes assessed for the 2026 year, it is considered that each of the links on the network will achieve a level of service (LOS) of A for all links based on a one way mid-block capacity of 3,500 vehicles per hour for a 2 lane divided expressway (AustRoads) and a LOS calculated using the Highway Capacity Manual 2000.

Each of the local road links and existing SH1 in the Preferred Option have also been assessed to have a LOS A, however the traffic volumes and side road friction through Otaki Railway Retail area could be slightly lower.

## Journey Times

Journey times for four key origin and destination pairs have been extracted from the model. These origin and destination pairs are:

(a) SH1 south (Peka Peka) and SH1 north; both northbound and southbound direction

(b) SH1 south (Peka Peka) and retail area near Arthur Street in Otaki; both northbound and southbound direction

(c) SH1 north and retail area near Arthur Street in Otaki; both northbound and southbound direction

(d) SH1 south (Peka Peka) and Te Horo town centre in School Road; both northbound and southbound direction

The SH1 south and SH1 north demands are associated with trips starting or ending beyond the study area on the expressway. Therefore, the southern extent of the study area at Peka Peka was used for SH1 south, while the northern extent of the study area (to the north of Taylors Road) was used for SH1 north.

For motorists travelling to Te Horo there is no direct route via the expressway. Motorists travelling from the south have two options: exit the expressway at Poplar Avenue, Kapiti Road or Te Moana Rd and complete the remainder of their journey on the existing SH1 or alternatively motorists can remain on the expressway to the

ramps at Otaki Gorge Road and loop back via the existing SH1 to Te Horo. The traffic modelling shows that motorists prefer to exit the expressway at Poplar Avenue and travel on the existing SH1 to Te Horo since this is about 13 seconds faster than using the expressway to the Otaki Gorge Ramps and back tracking to Te Horo.

The PM peak travel time for each of the origin destination pairs were extracted from SATURN for the Do Minimum and preferred option and are summarised in Figure7-29 below. There is minimal difference in the travel time between the different time periods. Therefore, the analysis will only focus on the PM peak when considering the travel time performance of the scheme.

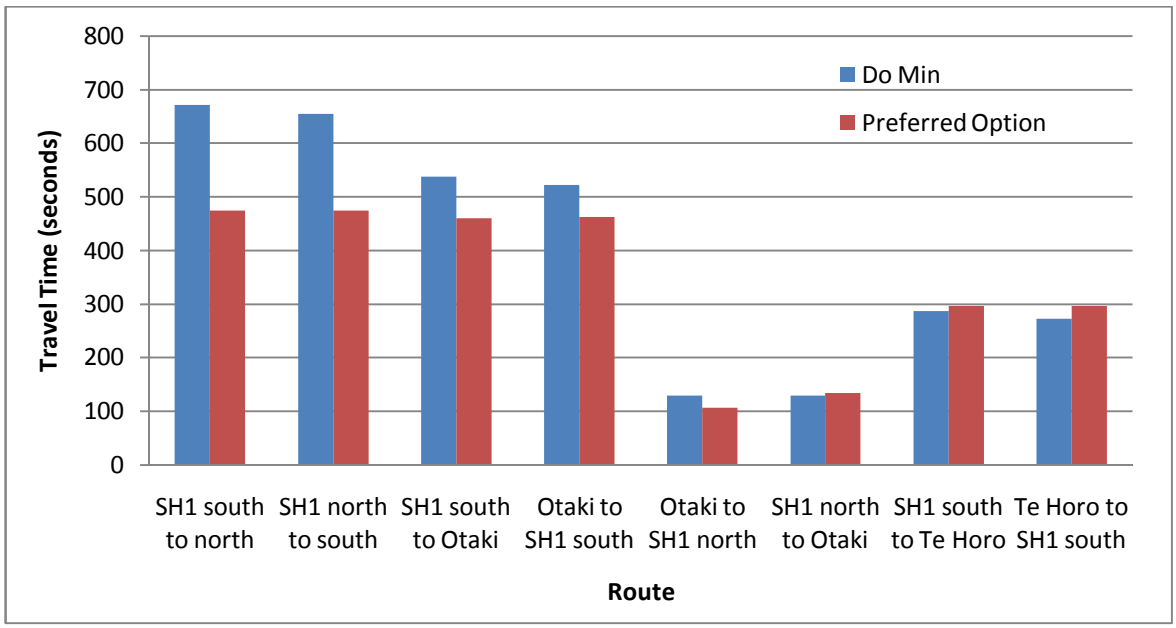



**Figure 7-29: 2026 PM Peak Travel Time Comparison**

There is a travel time savings of over 3 minutes for trips travelling the entire length of the study area on the expressway in either direction. Motorists also save about a minute when travelling between Peka Peka to the retail area in Otaki near Arthur Street with the expressway. The expressway saves 23 seconds when travelling from Otaki to the northern end of the study area. However, when travelling southbound from the northern end of the study area to Otaki the trip will take an additional 5 seconds.

With the expressway built, there is a small increase in the travel time between Peka Peka and the Te Horo town centre in School Road. This analysis has assumed that in both the Do Minimum and Preferred Option motorists travel via the existing SH1 (former SH1) since the modelling has shown that this route is preferred by motorists. This assumption has been support by modelling work undertaken using the M2PP model when combined tests have been undertaken.

For motorists to access School Road in the preferred option they must go around and over the overbridge and since the speed limit on the existing SH1 is reduced to 80km/h compared to a speed limit of 100km/h on the former SH1 in the Do Minimum there is a slight increase in the travel time. It takes motorists approximately 10 to 25 seconds longer to travel between Peka Peka and School Road in Te Horo in the preferred option compared to the Do Minimum.

Although there is a small increase in journey time for some local residents, this has been based upon the assumption that the Existing SH1 will have a reduced speed limit of 80km/hr. If the existing speed limit is retained through further discussions with KCDC, the change in travel time may improve due to the reduction in vehicles using the local road. Irrespective of the outcome, the changes in travel time are not considered to be significant and these will be offset by significant improvements in safety.

## Intersection/ Ramp Performance

The performance of a number of intersections has been assessed using SIDRA. The Mill Road/ Rahui Road roundabout is the only intersection in the list which currently exists. All the other intersections will be formed as a result of the construction of the expressway. Table 7-11, summarises the performance of the Mill Road/ Rahui Road roundabout for the Do Minimum and preferred option scenarios while Table 7-12 shows the overall LOS and delay for along with the LOS and delay for the worst performing movement at each intersection. Appendix EE contains a summary of the SIDRA modelling outputs.

**Table 7-11: Mill Road/ New Arterial (former SH1)/ Rahui Rd 2026 Performance Summary (weekday peak)**

| Scenario | Movement | Period | LOS | Delay | Further Information |
|---|---|---|---|---|---|
| Do Minimum | Overall | AM | A | 7.0 | |
| | | PM | A | 8.5 | |
| | Worst | AM | B | 12.6 | Right turn from Rahui Rd to SH1 |
| | | PM | B | 15.9 | Right turn from Mill Rd to SH1 |
| Preferred Option | Overall | AM | A | 6.9 | |
| | | PM | A | 7.6 | |
| | Worst | AM | B | 10.9 | Right turn from Rahui Rd to existing SH1 |
| | | PM | B | 11.4 | Right turn from Mill Road to existing SH1 |

There is a slight improvement in the performance of the roundabout at the intersection of Mill Road and the New Arterial/ old SH1 with the construction of the expressway. The overall average delay is reduced less than 1 second per vehicle while the delay for the worst movement is reduced by up to 5 seconds.

Table 7-12 summarises the performance of the new intersections resulting from the construction of the expressway.

**Table 7-12: 2026 Performance Summary for New Intersections (weekday peak)**

| Location | Movement | Period | LOS | Delay | Further Information |
|---|---|---|---|---|---|
| North Otaki NB On Ramp / New Arterial | Overall | AM | A | 2.8 | |
| | | PM | A | 2.9 | |
| | Worst | AM | A | 7.9 | Right turn from New Arterial East (to On Ramp) |
| | | PM | A | 8.4 | |
| New Arterial / Otaki Gorge Rd Overbridge | Overall | AM | A | 6.8 | |
| | | PM | A | 6.7 | |
| | Worst | AM | B | 10.6 | Right Turn from New Arterial |
| | | PM | B | 10.5 | |
| Otaki Gorge NB Off Ramp/ Otaki Gorge Rd Overbridge | Overall | AM | A | 3.6 | |
| | | PM | A | 3.7 | |
| | Worst | AM | A | 8.2 | Right and left turn Off Ramp to Overbridge |
| | | PM | A | 7.8 | |
| Otaki Gorge SB On Ramp/ Otaki Gorge Rd Overbridge | Overall | AM | A | 7.2 | |
| | | PM | A | 6.7 | |
| | Worst | AM | A | 9.5 | Right turn Overbridge to On Ramp |
| | | PM | A | 9.0 | |
| Otaki Gorge Rd/ Old Hautere Link Rd | Overall | AM | A | 2.7 | |
| | | PM | A | 2.8 | |
| | Worst | AM | A | 7.6 | Right turn Otaki Gorge Rd to Old Hautere Link Rd |
| | | PM | A | 7.3 | |

All the new intersections perform very well with each having an overall LOS of A and average delay per vehicle of 7 seconds or less. The longest average delay on the worst performing movement is 11 seconds which corresponds to a LOS of B.

## Weekend and Holiday Traffic

The proposed bypass of Otaki will address the current problems experienced in Otaki during weekends and holiday periods as those people wishing to stop will not impact on through traffic. Although the true number of people wishing to stop in Otaki following the construction of the proposed expressway is not truly known, traffic and customer surveys suggest that between 80 and 90% of people currently stopping in Otaki will continue to stop.

The fact that more than 50% of traffic currently coming into and out of Otaki does not have Otaki as a destination (or wish to stop in Otaki) means that the proposed expressway will significantly reduce congestion and improve safety and accessibility for pedestrians in the Otaki Railway Retail area.

The full RoNS project would also see the extension of the expressway to the north (to Levin); however the programme for delivery of this section of the Wellington RoNS is beyond the delivery timeframe for the PP2O section. As a result, it is possible that traffic congestion during holiday weekend may still exist north of Otaki as the expressway merges down from two lanes to one. Based on current traffic volumes (Labour Weekend 2009) this would not be a problem, however travel patterns over recent years have been modified to avoid congestion and delays associated with Otaki. These travel patterns could result in more people wanting to travel at the same time (e.g. 5pm on Friday of a long weekend), thus impacting on the merge capacity north of Otaki.

Further modelling work and data collection is planned as part of the assessment of environmental effects (AEE) phase of the project to assess this impact and better understand the differences in traffic demands, travel patterns and driver behaviour associated with weekend and holiday periods.

## TDM Checklist

The project has been assessed against its alignment with the NZTA TDM checklist (refer Appendix H).

# 8 Stakeholder Relationship Management and Consultation

## 8.1 Purpose

The drivers, methods, and reasons for consultation were set out in the Stakeholder Engagement and Communications Strategy. This is a document that outlines the path to consultation and engagement for the Peka Peka to Otaki project, together with the key activities to be undertaken between now and lodgement of resource consents and Notice of Requirements with the Environmental Protection Agency (EPA). This is a living document, and as such, will be regularly updated..

The primary objective of this consultation on the Peka Peka to Otaki Expressway (the expressway) is to:

- Gain public feedback on the form, function, and location of interchanges and connections.

The secondary objectives are to:

- Provide balanced and objective information on the intent of the project, the decisions that have already been made and the impending project decisions that key stakeholders and the community can provide input into;
- Gather data to help the project team understand stakeholder aspirations and concerns about connectivity and safety for all road users and pedestrians, and potential concerns about the social and environmental impacts of construction;
- Gather community input to the decisions about interchanges, land purchases and transport linkages that can be influenced by stakeholders; and
- Build positive relationships between the NZTA, local stakeholders and the community.

## 8.2 Previous Consultation

Feedback from the 2001, 2002 and 2009 consultation is documented in the various Transit/NZTA consultation reports and has provided input for consideration during development of the scheme. Some of the key issues that have provided input to and been considered as part of this secondary investigation include:

- Effects on the Pare O Matangi Reserve and the Country Road environment;
- Severance at Otaki, particularly the need for a link at Rahui Road;
- Potential economic effects on Otaki;
- Increased noise effects;
- Amenity effects;
- The need for improved access on and off the expressway at Otaki Gorge Road;
- Community severance effects and amenity, particularly at Te Horo;
- Loss of high quality agricultural land;
- Effects on Hautere Plains totara trees and bush;
- The need for local access roads in some areas south of Te Horo; and
- Impact on the amenity of the rear of properties on SH1 north of Otaki where the expressway passes close to the rear of these dwellings.

## 8.3 Public Consultation

Broadly put, the PP2O SARA phase consultation includes the following:

- Regular contact with key stakeholders and interaction with them since mid 2010 to ensure that they have sufficient information about the project, and that the project team understands

stakeholder aspirations/concerns about connectivity and safety for all road users and pedestrians, and potential concerns about the social and environmental impacts of construction;
- Engagement with the community in early 2011 to ascertain feedback in relation to the various options for interchanges and cross corridor connections along the expressway;
- Regular updates on the project in the form of information newsletters and brochures; and
- Further community engagement in early 2012 in relation to the specific mitigation measures to be adopted for the expressway project.

Specific directly affected landowners have also been liaised with on a regular basis, including face to face meetings to provide them with an understanding of the project and the impacts this will have on them.

The consultation report summarising the consultation outcomes is attached in Appendix F.

## Public Consultation Process

To date, consultation has occurred in early 2011 in relation to the expressway interchanges and cross corridor connections. The primary objective of this consultation was to:

Gain public feedback on the form, function, and location of interchanges and connections

The consultation involved open days at Te Horo and Otaki, supported by display panels and attended by NZTA and Opus staff. A 16-page brochure with extensive detail on the project was delivered to 23,000 postal addresses on the Kapiti Coast. Meetings with affected parties and stakeholders have been held and feedback sought. 473 submissions were received from both inside and outside the project area over the six week consultation period.

An information newsletter is to be distributed in September 2011 to provide a formal update to the wider community about the project. This will include releasing the Consultation Report outlining the outcomes from the consultation undertaken to date.

All submissions and feedback received, including information supplied via the 0800 number, are recorded in Darzin. Darzin is a data analysis tool that has enabled submissions to be classified, summarised and collated. This enabled the various specialists on the project to be supplied with the submission comments relevant to their area of expertise.

To support the formal consultation process, one on one meetings were held with directly affected parties, being those landowners whose land may be required or otherwise affected by the project. Following confirmation of the scheme proposals by NZTA the project team will as a top priority provide updated information to affected landowners.

Further details on the consultation process is contained within the Consultation Report (Appendix F).

## Summary of Key Issues

The submissions expressed a range of views from extreme concerns about the impacts, justification, location, and design of the expressway project as a whole, to concern that consultation was continuing to occur and the project should just be built.

The key issues as highlighted through the consultation in early 2011 are:

- Design and location of accesses and interchanges, along with local road changes. For example, at Old Hautere Road whether this should or shouldn't be altered into a cul-de-sac;
- Flooding and stormwater management, in particular in relation to the Mangaone Stream;
- Business viability, especially through Otaki and for other retailers such as the Red House Cafe in Te Horo;
- Landscape and visual impacts, such as light spill, vegetation removal around Mary Crest, and the size of structures associated with or crossing the expressway;
- Traffic and transportation safety;

- Social, community and recreation concerns, in particular the Pare-o-Matangi park in Otaki featured in submission feedback; and
- The importance of maintaining two east-west linkages within Otaki.

Other issues that came up through the consultation include consideration of walking and cycling, access for the Otaki Race days, what happens with the existing state highway, archaeological and heritage matters, and the need for certainty for the community around the project and what land will or won't be required.

### Feedback on Options

The feedback from the community on the proposals for the interchanges and local road connections suggests a high level of support for the interchanges to the north and south of Otaki (Proposal A in the consultation brochure for both Otaki north and south). At Te Horo, there is a clear preference for a connection across the expressway around Te Horo Beach Road (Proposal B from the consultation brochure), and a desire to maintain the existing vehicular link to the Mill Road roundabout via Rahui Road.

These options are the ones that the community clearly support and the refinement of these will be required through the upcoming design phase if these are the options supported by the NZTA Board.

## 8.4 Key Stakeholders

Recognising the influence of certain key stakeholders, various means of consultation have been undertaken to ensure the appropriate parties are talked to and level of detail and input are sought. A record of key meetings and workshops held with stakeholders during the scoping phase are summarised in the Consultation Report (Appendix F), while a summary of further meetings held during the scheme addendum phase are summarised below in Table 8-1.

The desired outcome of consultation with mana whenua and tangata whenua is to build a positive relationship with each of the identified iwi groups and to engage with iwi in a way that is respectful to the cultural beliefs of those iwi groups involved. There are three iwi that are identified to host mana whenua and tangata whenua status. Ngati Te Atiawa to the southern boundary of Peka Peka and Ngati Raukawa from Peka Peka to Otaki North, to Pukehou Hill. Ngati Muaupoko has strong connections within the tribal boundary as well. Ngati Muaupoko and Te Atiawa iwi have consented for Nga Hapu o Otaki and Te Runanganui o Raukawa to prepare a revised CIA. Both iwi groups will review the draft final CIA document and provide and discuss their input into the document with the authors of the revised CIA. The terms of reference for this are currently being confirmed.

For the Otaki Community Board and Kapiti Coast District Council, regular workshops and meetings have been held to update them on the project and to seek their input in relation to the scope of the project and form of changes that are being made or required to be made as a result of the availability of further information, e.g. landscape / ecology values around Mary Crest, and the preferred interchanges arising from the consultation. The identification of opportunities and how to best achieve these has also been undertaken with KCDC through the workshops and meetings.

Other key stakeholders such as Greater Wellington Regional Council, KiwiRail, Historic Places Trust and emergency service providers have all also been met with.

Liaison has taken place with adjacent RoNS teams and the Regional Network team including Dave Robertson and Mark Pilgrim.

KiwiRail have been regularly liaised with in relation to this project to ensure that their interests in relation to the railway line, which is required to be moved as part of the project, are understood. As part of this, clarification around the designation and EPA process for the two requiring authorities has also been ascertained, as noted in Section 1.1 of this report.

**Table 8-1: Key SARA Phase Meetings and Workshops with Stakeholders**

| Key SARA Phase Stakeholder Meetings/Workshops | | | |
|---|---|---|---|
| **Meeting Name** | **Attendees** | **Date** | **Purpose** |
| KCDC Liaison meeting | KCDC, NZTA, Opus | 30th March 2011 | To provide information and gain feedback on the proposed process moving forward. Gain clarity and understanding of the KCDC and OCB submissions to the phase 1 consultation. |
| Urban design focus meeting | KCDC, NZTA, Opus | 7th April 2011 | To discuss KCDC and OCB's submission feedback and outline the PP2O team's urban design process and development to-date including issues and opportunities identified, with an aim to encourage open discussion and feedback. |
| Technical liaison meeting focused on stormwater and flood management | KCDC, Opus, SKM | 8th April 2011 | Initial discussion with KCDC on design approach for stormwater and flood management for the proposed PP2O Project. |
| Technical Liaison Meeting & Review of key connectivity/alignment issues and options. | KCDC, NZTA, Opus | 13th April 2011 | The purpose of this session was to discuss evolving options (addressing feedback) and to explore issues associated with the developing concepts. |
| SH1 and walking/cycling technical liaison meeting | KCDC, NZTA, Opus | 21st April 2011 | To outline the current philosophies for walking and cycling and to discuss the future form/process for revocation of SH1. |
| Technical Liaison Meeting - Update on Options Investigation & 3D Sketch-up Review | KCDC, NZTA, Opus | 27th April 2011 | Workshopping of options focused around the Otaki EW linkage options (Rahui Rd and Waerenga Rd), and Old Hautere Rd. The aim was to present these and discuss issues/further opportunities around the concepts. |
| Option Assessment Workshop | KCDC, NZTA, Opus | 4th May 2011 | MCAT option assessment workshop focusing on Otaki E-W linkage options; Old Hautere Rd; and Mary Crest. |
| PP2O Stakeholder briefing Number 3 | KCDC, GWRC, KiwiRail, NZTA, Opus | 11th May 2011 | The aim was to provide an update and seek further feedback on the evolving project proposals in order for the team to progress scheme design and undertake further engagement. |
| Peka Peka to Otaki Stormwater and Hydraulics Workshop | KCDC, GWRC, Opus | 15th June 2011 | To agree the proposed stormwater and flooding standards for the project. |
| Technical Liaison Meeting – Run through of the evolving scheme plans and urban design proposals. | KCDC, NZTA, Opus | 20th June 2011 | to discuss the evolving scheme design and urban/landscape design thinking to enable feedback and further refinement and development of proposals together with commencement of noise mitigation modelling. |
| Technical liaison meeting – further discussion around design philosophy and urban/landscape plans | KCDC, Opus | 28th July 2011 | to discuss feedback from KCDC on the draft design philosophy statement and landscape concept development to enable these to be further developed for the scheme design. |
| KCDC Liaison Meeting | KCDC, NZTA, Opus | 26th August 2011 | General liaison meeting and discussion around recent design philosophy discussions. |

| | | | |
|---|---|---|---|
| HPT Liaison meeting | HPT, Opus | 10th May 2011 | To provide an update of material to be shared at stakeholder meeting #3 and to share information about Te Horo, Mary Crest, Waerenga Rd, and Rahui Rd. |
| HPT Liaison meeting | HPT, Opus | 25th of May 2011 | HPT staff came into Opus office to look over the 3D model for Rahui Road and other more detailed design aspects associated with Mary Crest and School Road. |
| KiwiRail Technical Meeting. | KiwiRail, Opus, NZTA | 31st March 2011 | Consideration of planning strategy for KiwiRail aspects of the project and an update on engineering progress to-date. |
| KiwiRail Technical Meeting. | KiwiRail, Opus | 2nd May 2011 | Feedback on Basis of Design for KiwiRail aspects of project |
| KiwiRail Technical Meeting. | KiwiRail, Opus | 16th June 2011 | Update on scheme design aspects of project. |
| KiwiRail Technical Meeting. | KiwiRail, Opus | 1st August 2011 | Update on scheme design aspects of project. |
| Nga Hapu Otaki and Raukawa Meeting and Field Walkover | Raukawa, Nga Hapu o Otaki | 29th July 2011 | For the design team to share an update of the project and plans with Raukawa and Nga Hapu Otaki, to walk the sites of interest to assist in sharing of knowledge, understanding of the route and areas of cultural and ecological significance |
| Iwi Liaison Meeting | Raukawa, Nga Hapu o Otaki, Opus | 17th Feb 2011 | Open day / briefing was held on the Marae to talk about options being presented as part of the consultation. |
| Iwi Liaison Meeting | Raukawa, Nga Hapu o Otaki, Opus | 8th of June 2011 | Finalising MoU's with Nga Hapu Otaki and Muaupoko. At these meetings, there was also an approach developed for the July walkover and the preparation of a CIA for the project. |
| Iwi Liaison Meeting | Raukawa, Nga Hapu o Otaki, Opus | 21st of March 2011 | Meetings to finalise draft MoU's with Nga Hapu Otaki and Muaupoko. |
| Otaki Maori Racing Club | President and Members, Opus, NZTA | 28th of Feb 2011 | Briefing and update of options to be consulted on and seeking feedback. |
| Kapiti Emergency Services | Emergency Services Group, Opus | 10th of March 2011 | Briefing to Emergency Service on Options for Consultation and seeking feedback following ideas presented. Happy with project and wanted things to progress. |
| Emergency Services | Rural Fire Service | 7th of September 2011 | To discuss emergency access options for Te Horo Rural Fire Service, the focus was on access to and from the expressway from the School Road area. |
| Meeting with KCDC and OCB | Otaki Community Board | 4th July 2011 | To discuss OCB's submission feedback and provide an update on the further investigations/consideration in relation to this. |

## Engagement Process

The engagement process has been tailored, as discussed above, to specifically accommodate the different key stakeholders, to recognise their level of influence in relation to the project, and ensure that they have the information they need to inform the process and to be able to contribute in a meaningful way.

Many of the key stakeholders have also lodged formal submissions which are recorded in Darzin and also discussed in detail within the Consultation Report (Appendix F).

### Summary of Key Issues

A summary of the key issues that were raised through submissions and meetings by the key stakeholders include:

- Archaeological and heritage matters, including identification of areas that needed further investigations (HPT);
- Issues with conflict between pedestrian and cyclists and vehicles, issues with manoeuvrability for heavy vehicles, and safety issues (AA);
- Capacity for over dimension and overweight vehicles on the expressway (Heavy Haulage);
- Ease of access to retail facilities (Kapiti Chamber of Commerce);
- Access for emergency services (NZ Police, NZ Fire Service, Te Horo Rural Fire Force);
- Need for certainty; local road connections; interchanges and accesses on/off the expressway; amenity concerns with aspects such as Pare-o-Matangi park; the quality of the design; the economic effects; and the status of the existing SH1; (KCDC, Otaki Community Board).

These are not all the matters raised by these submitters, just a short synopsis of the key issues. Detailed discussion on each submission and the comments raised is contained within the Consultation Report (Appendix F).

## 8.5 Key Changes to Scheme Proposal

As an outcome from the above consultation process and ongoing liaison with key stakeholders the key changes made to the scheme in consideration of feedback received include:

- Further investigation and justification for providing a second East-West connection at Otaki, specifically a Rahui Road bridge connection. This has included further focus around improving the aesthetic outcomes and scale/gradients of the proposed connection.
- Exploring opportunities to provide alternative reserve space and "green" connections from the remaining Pare-o-Matangi reserve through to Otaki Station.
- Enhancements to the North Otaki interchange proposal to reduce impacts to dune areas west of the alignment and proposed northbound onramp.
- Refining the expressway and rail alignment to enable the Otaki railway station to be retained but rotated on its current site.
- Identification and provision of a regular and high vehicle access (up to 6m) under the new Otaki River Bridge to enable over-dimension loads egress from the Stresscrete site.
- Further investigation into the form of the Old Hautere Road connection, with inclusion of an at-grade link to Otaki Gorge Road (similar to the 2009 as-consulted proposal).
- Adopting a recommendation for Proposal B at Te Horo (the northern most connection option) to reflect local community and stakeholder desires.
- Further investigation and optimisation of the expressway and existing SH1 alignment at Mary Crest to reduce impacts on potential cultural sites, and to avoid an identified regionally significant stand of bush remnant.

# 9 Preferred Scheme

## 9.1 Description

The preferred scheme is 12.2km long stretching from approximately Te Kowhai Road in the south to Taylors Road to the north. In total there are nine bridges, two of which are the Waitohu Stream Bridge and the Otaki River Bridge. The project will also include a realignment of approximately 2.2km of the North Island Main Trunk Line through Otaki in order to construct the new expressway.

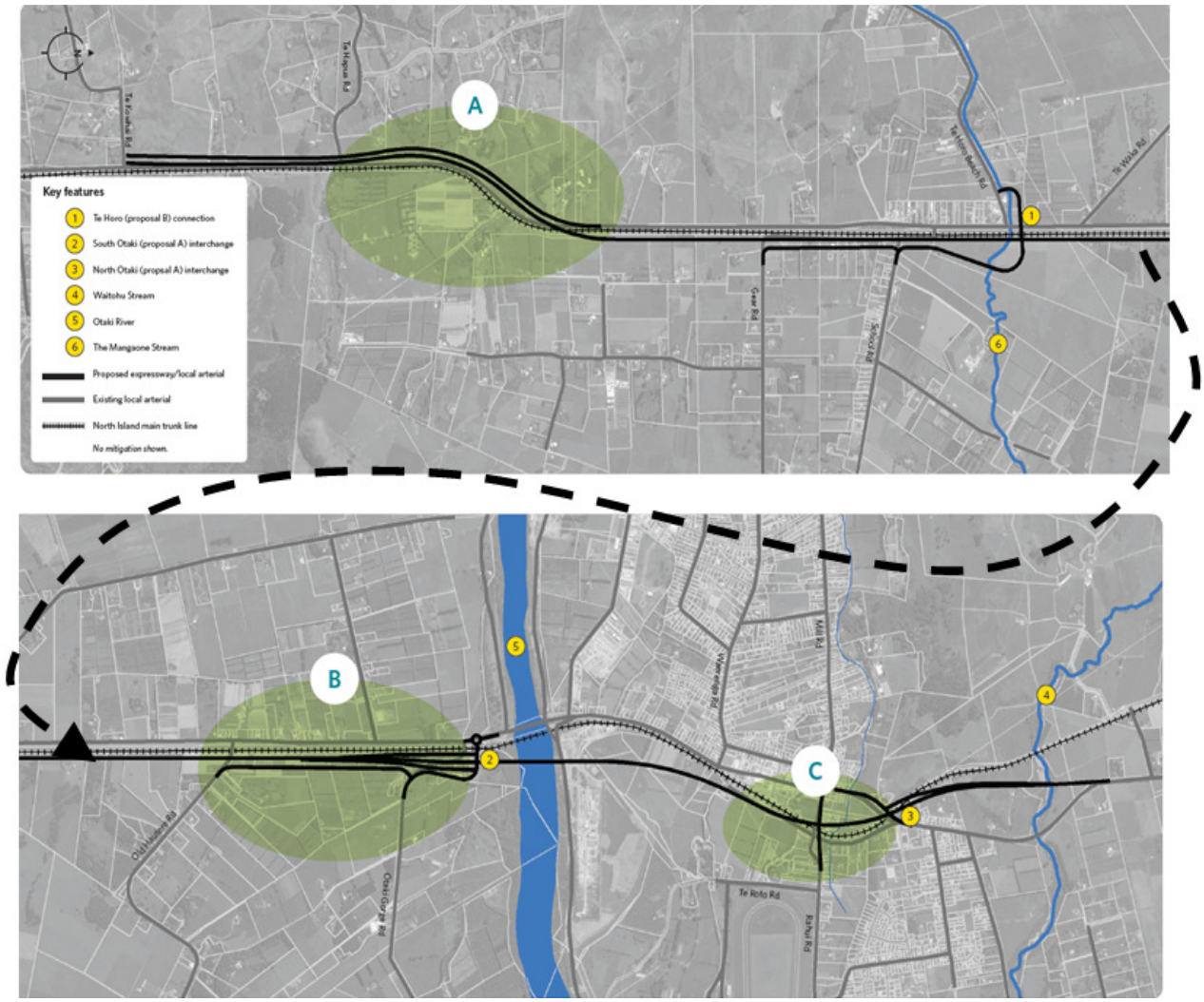



**Figure 9-1: Preferred Scheme**

The preferred scheme is illustrated in Figure 9-1. The key components include:

- North Otaki Interchange (3) – Option NO 02 (Proposal A) that utilises the existing entranceway to Otaki and maintains the rail overbridge in the same location.
- Rahui Road Bridge Connection (C) to maintain two east-west linkages in Otaki.
- South Otaki Interchange (2) – Option OG 07 (Proposal A) providing for south facing ramps and connection to Otaki Gorge Road via a bridge over the expressway.
- Old Hautere Road at-grade linkage (B) from Otaki Gorge Road.
- Te Horo Connection (1) – Option TH 03A (Proposal B) to connect east and west Te Horo (local bridge over expressway).
- An improved western alignment at Mary Crest (A) that avoids significant ecological areas.

- A new section of existing SH1 to the west of the expressway from Mary Crest south.
- Pedestrian and cyclist provision across all local cross-corridor connections.
- Inclusion of a walking and cycling "clip-on" to the east side of the existing SH1 Otaki River Bridge for interface with a potential off-road walking and cycling path within the existing SH1 corridor (to be defined as part of the SH1 revocation process).

The construction of the expressway will involve significant earthworks, particularly at North Otaki, the Otaki River and Mary Crest.

Extensive flood modelling has been undertaken to ensure that the expressway meets the required level of service during flood events. The expressway utilises a swale stormwater system to deal with run-off from the expressway while using bridges and culverts to allow flows under roads and embankments.

## 9.2 Scheme Drawings

The preferred scheme drawings are shown in Volume 4. Note the scheme drawings do not show the location of off-road pedestrian and cycle facilities, these are shown on the Landscape drawings.

## 9.3 Preliminary Land Information Plans

Preliminary Land Information Plans for the preferred scheme are included in Volume 4. These plans allow for land required for permanent features, temporary erosion and sediment control measures and construction space.

## 9.4 Preliminary Design Philosophy Statement

The Preliminary Design Philosophy Statement is attached in Appendix Q. This should be read in conjunction with;

- Stormwater Design Philosophy, Appendix N
- Geotechnical Interpretive Report, Appendix E
- Design Philosophy Bridges, Appendix P
- Urban Landscape and Design Framework, Appendix M
- Hydraulic Assessment Report, Appendix C
- Basis of Design for KiwiRail, Appendix O
- Economic Analysis of Pavement Design Options, Appendix I

## 9.5 Design Opportunities and Value for Money Statement

A value for money challenge workshop was held on the 2nd of August 2011 with attendees from the engineering design team and NZTA. The purpose of the workshop was to;

- Optimise the value being achieved
- Ensure consistency of standards
- Reduce costs where possible without compromising the standards or the performance of the project

Following this workshop a Value for Money Statement was produced which is attached in Appendix J. This statement outlines the value added opportunities which have been identified and could be explored during the detailed design stage.

## 9.6 Safety Audit

A two stage Road Safety Audit process has been adopted. This has included:

- A preliminary Road Safety Audit based on the Scoping Phase Design Proposal (refer Appendix G).

- A Stage 2 Road Safety Audit at the draft SARA stage [Yet to be completed].

# 10 Assessment of Environmental Effects

## 10.1 Introduction

### Project Description

The planned upgrading of State Highway 1 (SH1) between Peka Peka and Otaki North is "part of the Wellington Northern Corridor Road of National Significance (RoNS) – a planned four-lane expressway from Wellington Airport to Levin".

SH1 is the major route in and out of Wellington, linking the centres of Palmerston North, Wanganui and Levin with Wellington. By improving transport networks through the Kapiti Coast, this project will contribute to economic growth and productivity.

Currently the Peka Peka to North Otaki section of SH1 has a relatively poor safety record. It also experiences high levels of congestion during peak periods, weekends and holiday periods. This congestion is compounded by a high proportion of local traffic, and an increasing level of shopping-generated parking and pedestrian movements in the Otaki urban area. A bypass of Otaki, and the provision of a high-standard highway through the area will increase the efficiency of movements between Wellington and the North, will ease local congestion, improve safety, and will facilitate local, regional and national economic development.

The scope of this project is therefore to construct a high quality four-lane expressway bypassing the township of Otaki and the settlement of Te Horo. Together with the MacKays to Peka Peka section to the south, it forms the Kapiti Expressway and when both sections are completed will provide a superior transport corridor providing much improved, reliable and safer journeys through the Kapiti Coast.

The project seeks to safeguard for double tracking of the main trunk rail line and also involves the relocation of the track through Otaki in order to accommodate the proposed expressway.

### Site description/existing environment

The project area is located along the Kapiti Coast approximately 70km north of Wellington. The route stretches for 13km from Taylors Road in the north to Peka Peka Road in the south, and bisects Otaki township. The project area comprises a mix of land uses including rural, residential, industrial, commercial and horticultural. The area surrounding Otaki township is predominantly rural.

The route passes through two townships: Otaki, a small town of approximately 5,600 people and Te Horo, a small community of approximately 640 people. Otaki is the northernmost urban centre of the Kapiti Coast District and the Wellington Region.

The Kapiti Coast is currently experiencing high growth and is one of the fastest growing districts in the lower North Island. Planned development in the Otaki area will place greater demand on the existing road network, and in particular on SH1 as a commuter route to Wellington.

The proposed route traverses relatively flat terrain, crossing Mangaone Stream, the Otaki River, the Waitohu Stream, and railway line. Within this project area, State Highway 1 currently has priority over all except one intersection (the Otaki roundabout). This roundabout can cause significant traffic congestion issues, particularly during busy periods.

SH1 and the adjacent North Island Main Trunk Line (NIMT) rail corridor sever Te Horo and Otaki. This is an issue, particularly in Otaki as there is only one main east-west connection (Mill Road/Rahui Road) providing access across the corridor.

### Preferred proposal

A scheme assessment report was prepared in 2002 (as a deliverable under Transit New Zealand's Contract No PSW-13 – North Otaki to Peka Peka Road). In 2003 an addendum to the scheme assessment report was prepared to consider the western 'Te Waka alignment' favoured by submitters during consultation. The assessment concluded that this alignment was less favourable than the board preferred alignment.

The project is now being developed as part of the Roads of National Significance programme. A number of road corridors options have been considered, with further stakeholder consultation, however the preferred alignment from the 2002 scheme remains largely intact. More detailed work on interchange design and east-west linkages along the route has been conducted.

An assessment of the social and environmental effects of the preferred proposal has been made for traffic impact (including public transport, pedestrian and cycling impacts), landscape and visual, urban form, stormwater, erosion and sediment control, hydraulics/hydrology, ecology (terrestrial and aquatic), heritage and archaeological, culture and iwi, social and community, business viability, noise and vibration and air quality.

The key issues are summarised below. Full reports are included as Appendices R to EE)

## 10.2 Traffic Impact Assessment

(Refer to Appendix EE)

A Traffic Impact Assessment (TIA) has been undertaken to evaluate the traffic effects (including public transport, pedestrian and cycling impacts) and performance of the preferred option for the Peka Peka to Otaki Expressway.

The current network is subject to safety concerns supported by the high number of crashes between Peka Peka and Otaki, while delay, congestion and journey time variability through Otaki impacts on the effectiveness and efficiency of SH1 as a strategic route. There are also a number of existing safety and operational issues which exist along the corridor, these include; accessibility to properties, eight at grade rail crossings, limited provision for walking and cycling, and high volumes of traffic and freight through the urban and retail area of Otaki.

A project specific Peka Peka to Otaki North (PP20N) SATURN model was developed in 2010 and has been used to access the Do Minimum and Option traffic networks.

Network traffic volumes on the expressway in 2026 for the preferred option between Peka Peka and Otaki Gorge Rd are forecast to be just under 19,000 vehicles per day (vpd). Between Otaki and the ramps to the north of Otaki the demand drops to less than 12,000 vpd. North of Otaki demand increases to approximately 17,000 vpd. Forecast traffic volumes on the existing SH1 with the expressway constructed are significantly reduced compared to the Do Minimum. There is also a reduction in the percentage of heavy vehicles on the existing SH1 in the preferred option compared to the Do Minimum. With regard to traffic volumes on the local roads (with the preferred option) there is a significant reduction in demand on Otaki Gorge Rd while there is a slight reduction on Old Hautere and Gear Rd.

In terms of journey times, there are travel time savings of approximately 2 minutes and 40 seconds for trips travelling the entire length of the study area on the expressway in either direction. With the expressway built, there is a small increase in travel time between Peka Peka and the Te Horo town centre in School Rd due to the reduced speed limit to 80km/h and going around and over the overbridge.

All new intersections perform very well based on a 2026 design year, with each having an overall LOS (Level of Service) of A and average delay per vehicle of 7 seconds or less. The longest average delay on the worst performing movement is 10 seconds.

One of the major problems with the current SH1 corridor through Otaki is the congestion, delay and journey time variability associated with travel in weekends and holiday periods. The proposed bypass of Otaki will

address the current problems experienced in Otaki as those people wishing to stop will not impact through traffic. Although the true number of people wishing to stop in Otaki following construction of the proposed expressway is not known, the fact that approximately 50% of traffic currently coming into and out of Otaki does not have Otaki as a destination (or wish to stop in Otaki) highlights that the proposed expressway will significantly reduce congestion and improve safety and accessibility for pedestrians in the Otaki Railway precinct.

Modelling completed to date has focused on weekdays; however there is recognition of significant demands occurring on holidays and weekends. Further work is needed to understand the implication of weekend and holiday demands.

The construction of the expressway results in some properties losing direct access to existing roads (especially existing SH1). Changes to local property access arrangements may result in some residents having to travel further to reach their destination. However, the new access arrangements are much safer with no direct access onto SH1 and a five of the eight existing railway level crossings will be removed.

Assessment using the Wellington Transport Strategy Model (WTSM) has shown that the project will have minimal impact on the provision of passenger transport in the region.

Access to the Otaki railway station will be improved for pedestrians, cyclists and motor vehicles due to enhanced linkages north and south of the station, and the removal of through traffic from the Otaki Railway Area.

Facilities for pedestrians and cyclists have been incorporated into the project for all proposed cross corridor connections and local road linkages, while further work is planned as part of the SH1 Revocation project to confirm the exact location of the north / south off road facility. This will include a shared use path the length of the project.

Given that SH1 is a key strategic corridor between Wellington and the rest of the North Island and an important linkage in the local road network on the Kapiti Coast, it will be critical to manage the effects of construction to avoid significant disruption, delay, congestion and transport user frustration. This corridor will need to be maintained as operational during peak times and any diversions or delays kept to a minimum. An assessment of the construction effects will need to be completed and form part of the traffic management plan for the project.

It can be concluded that the proposed project will provide significant benefit to transport users in Kapiti and for trips to and from Wellington. The creation of a second north / south corridor will provide improve safety, reliability and efficiency, while also providing increased resilience and opportunity to the transport network.

## 10.3 Landscape and Visual

(Refer to Appendix BB)

The landform of the project area is defined by a number of strong features including the coastal edge, the coastal plain, the eastern foothills, and the local rivers and streams. Different soil types will need to be considered during landscape development and plant choice.

As a generalisation, intense agriculture has resulted in a relatively open landscape with scattered mature exotic trees, numerous shelterbelts and hedges and bands of willow common to the river and stream banks.

Indigenous vegetation is largely confined to a few small remnants, though these scattered stands of native vegetation are more common and distinctive in the Otaki Gorge/Old Hautere Road, Te Horo area. The proposed expressway alignment passes through stands of native mature trees and wetland in a few discrete localities along the alignment. Many of these sites are of local significance e.g Cottles Bush. Two areas of swamp forest have also been identified near Mary Crest.

South of Te Hapua Rd, the proposed expressway route traverses lower lying areas (associated with interdune deposits) and undulating mounds (associated with sand dunes). These undulating sand dunes provide

variation in what can be viewed from the existing state highway, and dictate which plant species grow there. This organically shaped topography should be considered during the design process of the expressway.

There are six different landuse types bordering the expressway corridor. These landuses, along with relatively subtle changes in landform, inform landscape character areas.

- Rural – the majority of the expressway corridor passes through rural land, with the resultant character being dominant then from Taylors Road to Waitohu Stream and then from Otaki River to Peka Peka (the Hautere Plains).
- Lifestyle – smallholdings located within the rural character area. These are more intensively subdivided, contain various dwellings and outbuildings and a variety of amenity and production tree and shrub plantings. Their intensity and diversity of development differentiates the character of these lifestyle blocks from their immediate rural surroundings.
- Residential – Within the expressway corridor the areas of residential character are confined to the Otaki township area with a section of residential ribbon development on both sides of the existing highway immediately north of the northern river terrace and the local railway overbridge and on the west side of the highway just north of Otaki River. Dwellings that front SH1 have relatively dense plantings of amenity trees on their highway frontages providing a buffer between dwellings and the highway traffic flow.
- Reserve/open space – the few reserve areas within the study area are focussed in Otaki, being Pare O Matangi Reserve, an 'island' of land between Rahui Road, the highway, the railway and the 'rest area' on the immediate southern bank of the Otaki River.
- Industrial – confined to the immediate northern bank of the Otaki River consisting of gravel extraction for aggregate and concrete making.
- Commercial/retail – predominantly retail land use forms the focus of the Otaki Railway 'main street' retail area.

The rural and urban land uses form the two distinct land use types. An important consideration will be to ensure that the built or 'urban' form of the proposed expressway does not overwhelm the areas of rural landscape and consider integration or re-establishment of the existing contours, existing vegetation patterns, and landscape noise mitigation rather than noise walls.

The proposed expressway will introduce a number of new constructed elements into the landscape, for example; new bridge across the Otaki River, Otaki George Road underpass (expressway passes under Otaki Gorge Road) and Te Horo underpass (expressway passes under Te Horo Rd)

Over the total length the proposed expressway will 'double' the landscape and visual effects of the existing transport corridor by adding the 'footprint' of the four-lane expressway and its local road connections to that of the existing and retained state highway/local arterial and that of the NIMT railway. However, by containing the proposed expressway within the existing transportation corridor the potential landscape and visual effect on the broader landscape and community is lessened.

## 10.4 Urban Form

(Refer to Appendix AA)

Key issues for the Peka Peka to North Otaki Expressway project are around community severance; connectivity across the expressway; effect on underlying urban form and land use patterns; and the impact on the existing State Highway 1. In general terms it is considered that the overall design outcome from the proposed alignment is neutral or positive. Existing corridor connections are retained, with one exceptions at Old Hautere Rd, and is enhanced in North Otaki with improved pedestrian and cycleway provision. This has a positive outcome on the potential for community severance and also maintains the current urban form.

Land use patterns are not overly disrupted as the new expressway alignment broadly follows the existing rail corridor on what is currently rural land.

Important urban design issues will be the finer level of detail design around the bridge and other structures, resolution and integration of the network of walking and cycling routes, the interfaces with key public realm spaces including Pare-o-Matangi Reserve and the Otaki Railway Retail area.

With the reduction in through traffic there are opportunities to create a rich character precinct in Otaki around this central retail/transport core of Arthur Street that could significantly enhance the urban environment.

State Highway 1 and the adjacent North Island Main Trunk Line (NIMT) rail corridor severs Te Horo and Otaki. This is particularly an issue in Otaki as there is only one main east-west connection (Rahui Rd) providing access across the corridor.

Since the 2002 Scheme Assessment the following changes are noted from the 2002 Urban Design assessment as a result of initial stakeholder discussions with KCDC:

- That there is little residential growth pressure in Otaki and what there is should be concentrated in medium density land use development around the rail station transport hub.
- The major commercial growth node is the existing industrial area along Riverbank Road and that has been supported by a recent plan change for the former orchard area to create a 'clean tech' business park. The intention is for this area to have a regional focus and as such will benefit from having good access to/from the expressway.
- Te Horo is now not considered an area of future commercial or residential development with the emphasis on maintaining quality productive agricultural land and containing urban / peri-urban growth within existing boundaries or designated growth areas.

The project has been assessed for effects in sections from north to south (Otaki North to Mary Crest)

The key areas for assessment of effects are as follows:

- Severance
- Urban Form
- Connectivity
- Land Use
- Existing SH1

It is considered that for Urban Design the degree of effects is rated as Low (L positive) for the criteria of Severance, Urban Form, Connectivity and Land Use against the existing baseline on the basis that over the length of the expressway that the current preferred proposal generally reflects the current underlying urban form and reinstates all the key existing cross corridor connectivity.

For the Existing SH1 the degree of effects is rated as Medium (M positive). This is based on the assumed reduction in State Highway traffic volume and speed to 80km creating enhanced amenity for local communities and other users, eg. walking and cycling. The final design will be further determined through the NZTA – KCDC revocation process, which will have a significant bearing on the final effect rating.

For Te Horo the degree of effects is rated Medium (M negative) as the location of the new bridge connection does not support the urban form yet gained significant local support and endorsement.

## 10.5 Stormwater, Erosion and Sediment Control

(Refer to Appendix CC)

There are four main catchments that the existing state highway and proposed alignment cut through. These are the Waitohu, Otaki, Mangaone and Awatea (project assigned name) catchments. There are a further eight catchments in the range 100ha to 500ha, and over 10 catchments smaller than 100ha. There will be waterways (and waterway crossings and potential discharge points) associated with each of these catchments, each with differing sensitivities in terms of receiving environments (refer Appendix T – Aquatic Ecology, for further description of these receiving environments).

The stormwater effects on this project are primarily associated with: increased road connectivity (level of service) during major storm events, downstream flooding levels, sediment load increases, short term and long-term changes to the pollutant load in the road runoff and fish passage. These have been summarised as:

- Road connectivity: The Project has a positive effect on the connectivity of the road corridor during flood events due to the decrease in the frequency of flooding. The expressway road level is generally at a higher level than the existing State Highway 1 (SH1), so the expressway will be free from flooding in a 1% AEP storm event.
- Downstream flooding levels: The increased impermeable area of the expressway would cause a very small increase in the downstream flood levels; however peak flow attenuation is being included in the Project to mitigate this effect. The peak flow attenuation takes the form of attenuation swales and stormwater attenuation ponds.
- Short term increase in sediment loads: During construction there will be the potential for exposed soil to be washed into streams when it rains or extreme events. This effect will be reduced by compliance with Regional Council erosion and sediment control guidelines. Erosion and sediment control measures will be installed, monitored and maintained throughout the works to control and mitigate the effects of sediment runoff until the site is stabilised.
- Long term changes to the pollutant load: The pollutants washed off the road when it rains originate from vehicles and people, not from the road pavement. For the same number of road users, the amount of pollutants generated would be expected to drop slightly as users on the expressway will be braking and cornering less than users on the existing SH1. In addition, there should be a significant reduction of pollutants reaching the receiving waterways as no road runoff from the existing SH1 is formally treated, whereas almost all road runoff from the expressway will go through formal treatment swales before being discharged to the receiving waterways.
- Fish passage: All waterway crossings need to have fish passage considered. There will be some culverts where the waterways are intermittently flowing; these are unlikely to require fish passage. However most culverts under the proposed expressway will be on permanently flowing streams and therefore will be required to be designed and constructed with fish passage in mind.

During construction there will be an overall negative stormwater effect, but in the long-term the overall stormwater effect will be positive.

## 10.6 Hydraulics / Hydrology

(Refer to Appendix DD)

The route for the proposed four-lane expressway between Peka Peka and North Otaki essentially runs parallel to the existing State Highway 1 (SH1) along a narrow coastal plain. This coastal plain is made up of a series of floodplains for one major river (the Otaki River), one medium sized river (the Waitohu Stream), and several smaller streams (including the Mangaone Stream at Te Horo and the Mangapouri Stream through Otaki Township).

The existing SH1 has a history of being inundated by floodwaters every few years at a number of locations including the bridge over the Waitohu Stream immediately to the north of Otaki Township and the culvert system crossing the Mangaone Stream at Te Horo. The natural overflow path for the Otaki River, if a super-design flood was to overtop the current Chystall's Bend stopbank providing protection to Otaki Township, would be directly across the route of the proposed expressway.

It is proposed to construct the expressway as a raised embankment across these floodplain areas and elevate it sufficiently so that it can act as a lifeline and to remain open in extreme flood conditions. However the concept of a "lifeline" formed by a raised embankment which cuts across and blocks a natural floodplain runs completely counter to the philosophy of allowing a super-design flood to break out of its primary watercourse and follow a natural overflow path to the sea. Blockage of the floodplain in such an event could also exacerbate the flood risk to properties lying upstream and outside any natural overflow path.

An assessment of effects of the proposed expressway on the existing flood hazard for each of the floodplain crossings has been undertaken and is briefly described below.

## Waitohu Stream Crossing:

The proposed expressway bridge will cross the Waitohu Stream approximately 260m downstream and to the west of the existing SH1 bridge crossing. The alignment of the proposed expressway passes directly through the extensive flood inundation area to the north of the Waitohu Stream Crossing caused by the combination of surface runoff sourced from the Greenwood sub-catchment and right bank breakout flows from upstream of the bend which the existing SH1 bridge crosses. This area lies right at the northern end of the Peka Peka to North Otaki section of proposed Wellington to Levin Expressway.

Blocking the floodplain with a raised embankment will generally have the effect of elevating upstream flood levels. Providing dry culverts through the southern and northern approach embankments to the expressway bridge crossing to preserve natural drainage paths helps to reduce flood levels down towards those of the existing situation, as long as those culverts are sufficiently large. Flood levels downstream of the proposed expressway embankment are unaffected compared to those for the existing floodplain situation.

## Mangapouri Stream:

The area upstream of the existing County Road culvert acts as a flood detention area. In a significant flood event, water will start to pond in the area upstream before starting to spill over the road to the north of the culvert, filling the area between the North Island Main Trunk (NIMT) railway line and County Road. The railway embankment acts as a second and higher "dam" to pond upstream floodwaters. The County Road culvert and the railway culvert in combination throttle flood flows to limit downstream flood inundation through Otaki. The area between the railway embankment and the existing State Highway 1 (SH1) acts as a third detention pond for floodwaters with the outflow controlled by the discharge characteristics of the SH1 culvert and road overflow. In significant flood events, the culvert and stream system in the existing situation in the SH1 / County Road / Rahui Road triangle behaves hydraulically as a system of three detention ponds in series.

The route of the proposed expressway through this area requires the NIMT railway line to be relocated parallel with and to the west of the expressway. The culvert through the proposed expressway and the relocated NIMT railway line must emulate the current throttling function of the existing County Road and railway line culverts with the expressway embankment acting as a "dam" to hold the ponded floodwaters so as to ensure that downstream flood hazard is not increased.

The culvert and stream system in the SH1 / County Road / Rahui Road triangle will be modified in the proposed situation to behave as a series of four interconnected detention ponds under flood conditions, similar to the current situation.

The route of the proposed expressway also requires an existing flood detention pond to which storm runoff from the 37 hectare urban Te Manuao Catchment (immediately to the north of Mangapouri Catchment on the Waitohu Stream alluvial fan) is directed. Presently the outflow from this detention pond is conveyed by a pipe down the hill into the Mangapouri culvert. With the construction of the expressway this outflow will need to be rerouted to the “detention pond” upstream of the expressway embankment.

## Otaki River and Floodplain:

The existing SH1 crossing of the Otaki River lies to the south of Otaki Township which is located on the floodplain for the river. The bridge crossing is located approximately 60m downstream of the NIMT railway bridge across the river.

The Otaki River incorporates a stopbank system along the true right (northern) bank which provides a 1% AEP standard of flood protection to the township of Otaki. This stopbank (known as Chrystall’s extended stopbank) starts from some high ground about 2.5km upstream of the existing SH1 bridge and then ends downstream at the NIMT railway line. It partially encloses the basin occupied by Stresscrete’s precast concrete factory immediately upstream of the railway line so that the factory site lies between the stopbank

and the river. The railway embankment between the end of the stopbank and the river has been strengthened to form part of the primary flood defence system for Otaki Township.

The proposed expressway bridge crossing will be located approximately 120m upstream of the NIMT Railway Bridge. The crossing will be comprised of two parallel bridges, one for each traffic direction.

The northern approach embankment to the expressway Bridge will bisect the basin occupied by Stresscrete's precast concrete factory. The embankment will be higher than the Chystall's extended stopbank so as not to compromise the existing standard of flood protection provided to Otaki Township. The embankment will therefore act as a partial dam under flood conditions for any floodwaters entering the basin enclosed by the stopbank.

Construction of the proposed expressway provides an opportunity to provide a secondary line of flood defence for Otaki Township in the event of the occurrence of stopbank overtopping. The embankment on which the expressway is constructed can be constructed so that it is elevated sufficiently to act as flood detention dam and at least partially store the volume of water overtopping the stopbank and thereby reduce the effects of flood inundation downstream through Otaki Township. The embankment for the proposed expressway has been configured in this way with the vertical alignment set to have a minimum 0.3m freeboard above predicted flood levels in the ponding area upstream of the embankment for the design 1% AEP flood adjusted for climate change effects overtopping the Chystall's Bend stopbank.

The proposed expressway is predicted to provide a positive benefit for property owners to the west of the expressway up to the level of the 1% AEP design flood case as the embankment conveying the road will act as a flood detention dam for floodwaters overtopping the Chystall's Bend extended stopbank.

**Mangaone Stream Crossing:**

The Mangaone Stream exits from the foothills of the Tararua Ranges and flows westwards across the coastal plain over a distance of about 7km to the sea. State Highway 1 and the NIMT railway line, which run parallel to each other along the coastal plain, follow a roughly north-east / south-west alignment and cross the Mangaone Stream at Te Horo, about halfway between the foothills and the sea.

Under significant flood conditions, the Mangaone Stream breaks out of its relatively low banks across the coastal plain and follows a number of separate flow paths down to the railway line. The railway acts as a partial barrier for these flood flows with intercepted overland flows from the coastal plain being directed back towards the Mangaone Stream by the natural topography of the plain.

A complex culvert system has been constructed to convey intercepted flood flows past the railway line and SH1 (Figure 11). The Mangaone Stream has railway and road culvert crossings but there are additional inter-connected overflow culverts (that are normally dry) under both transport facilities that direct flow through a gap in the houses and other buildings on the west side of SH1. This overflow floodway is located close to the low point on the coastal plain and in fact conveys the bulk of the flood volume past SH1 in a significant flood event. Road overflow (and probably also railway embankment seepage) is a known problem in significant flood events and occurs every few years.

The proposed expressway will run parallel with the NIMT railway line and SH1 but on the upstream side of the railway line. This will make the culvert system past this sequential line of transport links even more complex than it is at present.

With the proposed expressway incorporating the Option B local link road (to the north of Te Horo Beach Road), peak flood levels upstream of the existing railway and SH1 road culverts remain much the same as for the existing situation and peak discharges downstream of SH1 are also very close. This means that the extent of flood inundation downstream of Te Horo along the Mangaone Stream will be unchanged from the present situation for a flood of the same magnitude. However there is a significant increase in flood levels upstream of the expressway.

The expressway embankment through this area takes over the function of the railway embankment in the existing situation as a flood detention bund. The proposed expressway will provide a positive benefit for

property owners to the west of the existing SH1 currently overland flow breaking out of the main stream channel.

## 10.7 Terrestrial Ecology

(Refer to Appendix S)

The alignment passes through a landscape that has been highly modified by agriculture, viticulture and to a lesser extent urbanisation. Most of the alignment impacts areas that support no indigenous vegetation and are likely to be of limited value as habitat for indigenous fauna. There are however a number of areas of indigenous bush and wetland along the alignment of local and district ecological significance that will be impacted.

The main impact on areas of indigenous bush is the loss of habitat. Two indigenous bush areas that will be affected are on the Steven's property (which contains a range of native trees including tawa, karaka and kohekohe) and Hautere Bush F (a totara-matai forest), which is an ecological site listed in the KCDC Heritage register. One significant area of wetland adjacent to the railway in Otaki (listed as K134 in the KCDC Heritage Register) will be completely lost to the Project footprint.

A number of options exist to mitigate the loss of indigenous habitat including increasing protection of existing areas of bush by fencing and weed removal and/or planting additional areas of bush to compensate for the areas lost.

Options to mitigate the loss of the wetland include establishment of a new wetland on nearby land owned by iwi and/or development of stormwater wetland ponds for treatment of road runoff in such a way that they provide wetland habitat for native flora and fauna.

Other threatened native invertebrates, reptiles or amphibians, including long-tailed bats, native frogs and reptile species are unlikely to be present along the alignment due to their restricted distributions and niche habitat requirements, particularly given the degree of habitat modification that has occurred. However it is recommended that further assessment and investigation should be undertaken to confirm this especially in relation to bats, given the term Peka Peka is the Maori word for bat.

## 10.8 Aquatic Ecology

(Refer Appendix T)

Seven waterways exist in the area that may be affected by the proposed expressway. From north to south these are as follows: Waitohu River; Mangapouri Stream; the Otaki River; Mangaone Stream (all of which are permanent waterways), a small drain near Gear Rd, a stream running past Settlement Road and under SH1, and a small stream running under SH1 near Te Hapua Rd (which are all ephemeral and were observed to dry during the summer). Three of these waterways (Waitohu River, Mangaone Stream and the Otaki River) have been identified by the Greater Wellington Regional Council as watercourses with nationally threatened indigenous fish recorded in their catchments (including Brown Mudfish, Shortjawed Kokopu, Koaro, Banded Kokopu, and Giant Kokopu) and as such have significant ecological values.

Fish and invertebrate communities were characterised in five of these seven waterways immediately upstream of SH1. Fish communities were also characterised in smaller headwater tributaries of some of the larger waterways (Waitohu, Mangaone and Otaki River) as many native fish are migratory, and use the lower reaches of waterways for migration between the sea and the smaller headwater streams. Invertebrate communities were characterised by collecting semi-quantitative "kick" samples (where the stream bed is disturbed either by kicking or hand rolling the substrate upstream from a mesh net), while fish communities were surveyed at each site by electric fishing. This field work was conducted in mid March 2011 at only five of these waterways as the other two (Gear Rd Stream and the stream near Te Hapua Rd) had largely dried up.

A total of 9 fish species were found in the five waterways, eight of which were native. Many of the native fish found need access to and from the sea to small headwater streams to complete their life cycle. Six fish species were found in the Otaki and five in the Mangaone catchment, while four species were found in the

Waitohu River catchment. Long finned eels were the only fish found in Mangapouri Creek, while banded kokopu were the only fish found in the small stream near Settlement Road. These results highlight that catchments such as the Mangaone, Otaki and Waitohu support a significant diversity of native fish, especially in their upper reaches and also highlight the importance of small, ephemeral streams which represent important habitat for native fish, as long as sufficiently large ponds remain in them during summer for these animals to live in.

A total of 80 invertebrate taxa found in the five waterways sampled. The fauna was numerically dominated by the common mayfly Deleatidium, three snail species, the amphipod Paracalliope, a number of chironomid midge species, five caddisfly species, and elmid Beatles. No taxa were recorded in all five waterways, but many of the common taxa were found in all four of the gravel bed rivers.

The invertebrate communities in the large gravel bed waterways (the Otaki and Waitohu) were dominated by animals such as mayflies, caddisflys and elmid beetles reflecting the ability of these animals to tolerate conditions such as fast flowing water, unstable substrates, and a low algal biomass. In contrast, communities in smaller slower flowing and low gradient rivers (Mangapouri and the settlement Road stream) were dominated by snails, chironomid midges, true bugs, and the algal piercing caddisfly Oxyethira. These waterways were characterised by slow-moving water and dominance of aquatic macrophytes. The Mangaone Stream supported faunal elements typical of both systems. The highest taxonomic richness was found at Mangaone Stream (40 taxa) while the lowest richness (22 taxa) was found in the Otaki River and the small un-named stream at Settlement Road.

Calculated MCI (Macroinvertebrate Community Index) scores (both hard bottoms and soft bottom varieties) varied greatly between the five waterways. The lowest scores were found at Mangapouri Stream (65 for MCI-sb) and the Settlement Road stream (77 for MCI-sb), and were indicative of waterways and poor ecological condition. The highest MCI score (132) was found at the Otaki River, suggesting "pristine" ecological condition. The Mangaone and Waitohu had scores indicating excellent ecological condition (i.e., MCI > 100).

There are five major potential effects to freshwater ecosystems arising from the proposed road development:

(a) Sediment effects;

(b) Interruption of fish passage through bridges and / or culverts;

(c) Interruption of aquatic insect passage through bridges and / or culverts;

(d) Potential adverse effects from stormwater derived run-off; and

(e) Loss of stream habitat through piping and culverting.

High sediment inputs can adversely affect stream biota depending on the sensitivity of the constituent species to increased turbidity and/or increased siltation, (eg. waterborne sediments may affect filter feeding animals, and animals with gills, increased turbidity affecting animal vision and therefore feeding behaviour , reduction in habitat quality). The severity of impacts is generally related to both the concentration and the duration of excess suspended solids.

Most of these effects are considered relatively minor, and provided that sound design and engineering practices (eg. provision of fish passage, riparian planting) are adopted, all can be avoided or mitigated.

## 10.9 Heritage and Archaeology

(Refer Appendix U)

The Peka Peka to Otaki Expressway will have a number of heritage and archaeological impacts across the project area. Overall the impacts of the effects are generally considered to be low to medium, with a number of positive outcomes for the community.

The Kapiti Coast has a long and rich cultural and historic heritage. Within the district there are a number of recorded archaeological sites, historic sites and buildings, and areas of significance to iwi and the European community.

Missionaries who settled in the area in the 1830s introduced the growing and processing of flax and wheat to the Maori of the district. A number of mills were constructed in the area to support this. Of relevance to this project are two flour mills at Otaki, one on the Haruatai Stream and one on the Waitohu Stream, immediately to the north of the town.

However, compared with the coastal area around Waikanae, the Peka Peka to Otaki area does not appear to have many recorded archaeological sites, possibly reflecting a bias in surveying along the coast or linked with land subdivision and development. It is considered that there are a number of unrecorded archaeological sites in the district.

There is one area containing recorded archaeological sites that will be impacted by the preferred option immediately north of Te Hapua Road, south of Te Horo. This area contains the following recorded archaeological sites:

- R25/5: Midden and oven site
- R25/6: Midden and oven site
- R25/7: Shell midden
- R25/14; pit
- R25/20: pits and two terraces
- R25/30: midden
- R25/31: two terraces
- R25/32: two pits and several terraces
- S25/122: Otaki Railway station

Several recorded archaeological sites and built heritage resources will be physically impacted:

- The historic Otaki Railway Station will need to be moved slightly on its current site.
- Te Horo (former) Railway Station and former workers cottage will need to be moved from its present site (being the former Mirek Smisek property - 990 State Highway 1).
- There is also potential along the route for there to be unrecorded archaeological sites that may be impacted on, particularly within the area of Te Hapua Rd and the Waitohu Stream.

As part of the 2002 SAR phase, a built heritage report was prepared for the project by Ian Bowman and this provides an account of the built heritage previously impacted by the project area and has been used as a reference document in this Heritage Assessment. It is recommended that this document be updated as part of the specialist assessment for the AEE moving forward.

Consultation with tangata whenua has identified several areas of archaeological significance that may be impacted by the preferred route. This includes the location of a settlement (known as Tararua) and urupa in the north end of the project area, close to the Waitohu Stream.

Mitigation measures include:

- Obtain archaeological authority under HPA 1993 for all work that has the potential to impact on archaeological sites, whether known or not.
- Archaeological monitoring be carried out within areas identified as being of archaeological risk (Waitohu Stream; Te Happua R area) and an accidental discovery protocol be developed in consultation with tangata whenua.
- Specialist advice from a conservation architect be sought in regard to moving the Otaki Railway Station and relocation of Te Horo (former) Station and workers cottage on Mirek Smisek property.

## 10.10 Culture and Iwi

(Refer Appendix V)

There are three iwi that are identified to host mana whenua and tangata whenua status, Ngati Te Atiawa, Ngati Raukawa and Ngati Muaupoko.

A cultural impact assessment was prepared in 2003 by Nga Hapu o Otaki commissioned by Transit NZ, however a revised detailed cultural impact assessment will be commissioned as part of this project.

Sites of significance to tangata whenua have been identified that may not have been recorded or identified by any external sources other than iwi knowledge. The identified issues and opportunities from a cultural and iwi perspective have established that Ngati Raukawa people have strongly established connections within the project area since 1831 to post colonisation.

Peka Peka to Otaki North was densely populated over a long period of time (from 13 century AD). In the 1800s the Kapiti Coast was invaded by several northern tribes who moved on to lands in the district. Ngati Muapoko, who living in the district for many decades, were driven out and lost their authority, influence and control over the district following the invasion of Ngati Toarangatira from kawhia in the Tainui region.

The Kapiti Coast has a wealth of cultural heritage. Within the area between Peka Peka and Pukehou Hill are recorded and iwi known historic sites and waahi tapu of significance. Cultural, ecology and heritage sites identified with iwi values located within the project area are:

- Taylors Road end – hosts Pa sites and a burial ground (urupa) west of the far west rail corridor.
- Sand dunes and earth dune hills
- Otaki and Rahui Rd end – wetland and spring (puna) identified by iwi as waahi tapu.
- Waitohu Stream – flows from the Tararua's to the Tasman sea – recreation and kai moana.

The preferred option will result in both cultural and iwi impacts on recorded or known and potentially unknown sites of significance along the route, including:

- The expressway will pass directly through the wetland and spring (adjacent to the railway and just north of the existing SH1 rail overbridge in Otaki) both of which will be lost.
- Three sand and earth dune hills will be completely removed.
- There may be satellite pa sites and settlement traces in the dunes to the south of the Mary Crest bush area that may be impacted.

The Peka Peka to Otaki Expressway will encounter and have a number of cultural and heritage impacts along the project route. Iwi have specified that the impacts they have identified are specific to their tribal boundary connection between Peka Peka to the south and to Pukehou Hill to the north. The impacts of the effects are considered to be low to medium. With continuing mitigation (eg. preparation of a Cultural Impact Assessment and Iwi Management Plan) and monitoring it is considered that a number of positive outcomes will perpetuate for iwi, tangata whenua and the Maori community.

## 10.11 Social and Community

(Refer to Appendix W)

The Peka Peka to Otaki Expressway will have a number of social and community impacts across the project area. Overall, the impact of the effects will generally be low to medium, with a number of positive outcomes for the community.

There are two main communities within the project area – Otaki and Te Horo. With the exception of Otaki and Te Horo the majority of the project area is rural, with a mix of lifestyle and commercial farms, including areas of market gardening. There are numerous community facilities (eg. cemeteries, libraries, public swimming pool, race courses, community halls, schools, parks/reserves, churches, police, fire) within the wider area along the Peka Peka to Otaki route, with the majority located within the Otaki township and not directly affected by the expressway. However, accessibility, connectivity, safety etc. are all factors that need to be considered.

Key positive outcomes are:

- Grade separated crossings which should improve pedestrian safety;
- Removal of at grade level crossings at Te Horo, Old Hautere Road, Rahui Road and numerous private level crossings;
- Reduction in traffic and in vehicle speeds on the existing SH1;
- Improvement to the pedestrian and shopping atmosphere of the Otaki Railway Retail Precinct due to a reduction in through traffic;
- Provide for better connections both within the Kapiti Coast region as well as to key facilities in Wellington to the south and across the rest of the North Island; and
- Furthering of the Greater Otaki Vision, by supporting growth and development in Otaki (e.g. Opportunities to upgrade the Otaki Railway Retail Area and Otaki Main Street streetscapes).

The most significant negative outcomes are:

- Further severance of the Te Horo and Otaki (including Old Hautere Road) communities;
- Impacts on Te Horo and potentially the Otaki retail areas in terms reducing passing trade;
- The loss of existing Pare-o-Matangi Reserve and planting; and
- Temporary construction impacts on houses within close proximity of the route.

A number of mitigation measures are proposed which include:

- Avoid direct physical severance through the inclusion of overbridges which will provide connections between the communities on either side of the expressway.
- Include the community in the ongoing design process to help reduce the feeling of severance.
- Develop appropriate signage for Te Horo, Otaki Railway Retail Area and Otaki Main Street Retail Area.
- Provide relevant and timely information to the community throughout the project so they are adequately informed about the process. Appoint a community liaison person to assist people with the property acquisition process.
- Prepare a Construction Management Plan to minimise adverse effects of construction activities.
- Prepare a Communications Plan to provide information about timing and duration of construction works.
- Utilise Crime Prevention through Environmental Design Principles (CPTED) when designing the route, particularly the overbridge sections

While a number of these mitigations measures were able to be addressed through the preliminary design work that has already occurred to mitigates some of the Social effects, some of these require consideration through the future detailed design phase. All the mitigation options have been identified here to show the connection between the mitigation and the effect it seeks to mitigate, and to ensure that during the future detailed design phase, the relevance or benefit from the mitigation is not lost when changes occur.

## 10.12 Business Viability /Economics

(Refer Appendix X)

The Peka Peka to North Otaki Expressway Project will change how travellers on State Highway One access and use Otaki, Te Horo and other business locations in the study area. The degree to which each area or business is affected is broadly explained by the degree to which their customer base is composed of travellers using the existing SH1.

The Otaki Railway Retail Area (ORRA) is expected to experience a Medium level of effects as a result of the Project, and be the most significantly affected retail area by virtue of currently relying on SH1 travellers for a significant proportion of its customers (spend from non-Kapiti residents makes up 54% of ORRA sales). The ORRA developed along SH1 as a service area for travellers, and has recently developed a strong retail destination role through its provision of outlet shops. It plays a smaller role in servicing local (Otaki) residents, although locals are dependent on the ORRA's supermarket (one of two in Otaki) and Otaki's only petrol stations.

Otaki's Main Street Retail Area (MSRA) is expected to experience only a Low level of effects, a lower level than the ORRA by virtue of the different role it currently plays. That role is influenced by a large degree by the MSRA's location, being further away from SH1 and therefore attracting a smaller proportion of non-local residents. The MSRA plays a very strong local role, and as locals are not expected to change their patronage of the MSRA as a result of the Project, the MSRA will be substantively unaffected by the Project.

Businesses at Te Horo are expected to experience a Medium to High degree of effects, while businesses further away from SH1, which are more likely to currently function as destinations, are likely to be less significantly affected by the Project. There are likely to be some time and travel costs associated with the changed access route to these businesses, although given their location – a significant distance from other (non-Otaki) markets – these costs are expected to represent only a Low level of effects.

It is very unlikely that the effects of the Project on study area businesses will be able to be avoided, although it is probable that they will be able to be mitigated. Mitigation measures will need to inform potential visitors to Otaki/Te Horo about what is on offer in the area, and market that offer in a way that makes visitors want to come to Otaki rather than bypass the area on the expressway.

Key measures to mitigate effects include new signage on the expressway indicating what is available in Otaki/Te Horo, advertising Otaki in other markets (e.g. car rental firms, accommodation, Wellington media) to raise awareness of what is on offer and events that may be occurring in Otaki, creating a more aesthetic environment that makes people want to visit Otaki's business areas which will occur by virtue of reduced through traffic and in particular heavy vehicles and encouraging new business opportunities to take advantage of the changes in the traffic environment (eg. street-side eateries etc.).

Otaki can be promoted as a destination in and of itself, as has occurred recently with the pull of outlet shopping, rather than merely being a stopping off point. Mitigation measures will need to be employed pro-actively to ensure that by the time the Project is completed, the Otaki economy is well positioned to deal with the potential effects it might create. If mitigation measures are left until after the Project's opening to plan or implement, effects will be felt more strongly and recovery from them may become more difficult.

## 10.13 Noise and Vibration

(Refer Appendix Y)

Noise and vibration from road and rail traffic includes both the expressway and new local arterial where it is being altered. The route closely follows the existing state highway through both rural and urban areas. The number of Protected Premises and Facilities (PPFs) located within 200m of the alignment equals 164 houses and a number are already subject to high noise levels. However, in some locations there will be an appreciable increase in road traffic noise.

Noise mitigation design options have been considered in accordance with the method set by NZS 6806. In order to undertake the acoustic modelling the project area was spilt in to seven assessment areas. A variety of noise mitigation options were considered for each area. For each mitigation option the road-traffic noise levels have been predicted and benefit cost ratio (BCR) calculated. For calculating the BCR, the local arterial has been included in the noise model, even where the alignment is not being altered. On the basis of this analysis and the assessment factors (NZS 6806 compliance, structural mitigation, BCR, Transit Guidelines Cost), indicative mitigation measures have been selected.

An indicative noise mitigation solution includes 6.3km of open graded porous asphalt (PA-10) on the expressway and 114m length of 2 metre high noise barrier to six of the assessment areas identified. If a low noise surfaces is not adopted in the Te Horo area, building modification will be required at 2 properties (80 Gear Rd, 14 Old Hautere Rd). South of Mary Crest a do-minimum option is preferred as a barrier has limited effectiveness due to the topography and low-noise road surfaces have limited effectiveness unless extended over a significant length of the expressway and local arterial.

A preliminary assessment of rail noise and vibration has also been performed to identify potential effects and mitigation. There are no standardised criteria for noise from rail lines in New Zealand, however KiwiRail has been developing a reverse sensitivity policy. This policy includes a buffer area of up to 40 metres from the

rail corridor, where development is discouraged, and a rail noise effects zone which continues up to 80 metres from the nearest track edge. This reverse sensitivity policy does not apply to new and altered railways, but the criteria do provide a reference.

The project results in the rail line moving closer to properties to the west through Otaki. The move results in 3 properties falling within the 80 metre buffer zone of the rail noise effects corridor.

With regard to rail vibration, there are no properties within 40 metres of the relocated rail corridor.

It is recommended that further assessment and consultation with KiwiRail will be required during the AEE stage.

Construction noise and vibration and road-traffic vibration have not been assessed at this stage, however is not considered that either issue will raise matters that are unique to this project.

The project will involve substantial earthworks and construction of several major structures. There are houses near to many parts of the works and will be affected by construction noise. Several areas such as on the north bank of the Otaki River are remote from houses, so provide options for a site compound/staging areas/batching plant, which would not cause noise disturbance. As most works are for a new alignment, night works should be limited.

With regard to road traffic vibration there are no PPFs immediately adjacent to the new road and vibration would be expected to be within reasonable limits. There are PPFs near altered road sections which might currently experience road-traffic vibration.

## 10.14 Air Quality

(Refer to Appendix Z)

The ambient concentration of nitrogen dioxide (NO2), carbon monoxide (CO) and PM10 were assessed for the opening year (2016) and the design year (2026). The results indicated that a reduction in concentration can be expected between 2016 and 2026 for the pollutants mentioned. This reduction in concentrations is due to the large decrease in vehicle emissions expected due to improvements in vehicle emission technologies.

The results of air dispersion modelling indicate that reductions in the concentration of vehicle air pollutants can be expected in the Township of Otaki along the existing SH and especially around the Mill Road/State Highway (SH) 1 intersection. For both of the years assessed an increase in concentrations is predicted in areas located within 200 m of the expressway, however this increase is relatively small and likely to only be experienced by a small number of receptors due to the location of the proposed expressway alignment, which takes vehicle traffic to the east and away from the Otaki Township. The settlement of Te Horo can also expect improvements in air quality, especially properties on the western side of SH1. A small increase in concentrations is predicted in areas located on the eastern side of the expressway, however this is not likely to be significant. Overall it is considered that the proposed alignment will improve air quality in the region for the long-term.

With regard to the construction of the expressway, the primary air discharge from the construction of the expressway will be dust. There is potential for the generation of significant quantities of nuisance dust if not appropriately controlled. The potential effects of this dust will depend on the location of sensitive receptors relative to construction activities. This will require mitigation in some areas to reduce the potential for nuisance effects resulting from construction activities, earthworks and stockpiling material. Generally properties located within 100 m of construction activities will be significant affected and mitigation will be required. A number of mitigation measures have been recommended to reduce the potential for dust emissions, with the primary measures being: placing a 100 m wide buffer area around construction areas where practical, limiting the area of the site opened up for construction at one time, speed restrictions on construction vehicles operating near sensitive receptors, use of water tankers to dampen surfaces that have the potential to create dust and the covering of stockpiles when not in use.

There will also be minor emissions (exhaust fumes) from construction vehicles. These are not considered significant due to the relatively small number of vehicles that will be operating during the construction project.

## 10.15 Summary

SH1 is the major route in and out of Wellington, linking the centres of Palmerston North, Wanganui and Levin with Wellington. One of the major problems with the current SH1 corridor through Otaki is the congestion, delay and journey time variability associated with travel in weekends and holiday periods. The proposed bypass of Otaki will address the current problems experienced in Otaki as those people wishing to stop will not impact through traffic. Additionally, by improving transport networks through the Kapiti Coast, this project will contribute to economic growth and productivity.

An assessment of the social and environmental effects of the preferred proposal has been undertaken with respect to traffic impact (including public transport, pedestrian and cycling impacts), landscape and visual, urban form, stormwater, erosion and sediment control, hydraulics/hydrology, ecology (terrestrial and aquatic), heritage and archaeological, culture and iwi, social and community, business viability, noise and vibration and air quality.

For all parameters that have been reviewed a range of potential effects and/or benefits have been identified along with a range of mitigation measures.

### Traffic Impact

The construction of the expressway results in some properties losing direct access to existing roads (especially existing SH1) and may result in some residents having to travel further to reach their destination. However, the new access arrangements are much safer with no direct access onto SH1 and a five of the eight existing railway level crossings being removed.

Modelling completed to date indicates that in terms of journey times, there are travel time savings of approximately 2 minutes and 40 seconds for trips travelling the entire length of the study area on the expressway in either direction.

The proposed project will provide significant benefit to transport users in Kapiti and trips to and from Wellington. The creation of a second north / south corridor will provide improve safety, reliability and efficiency, while also providing increased resilience and opportunity to the transport network.

### Landscape and Visual

The proposed expressway will introduce a number of new constructed elements into the landscape, for example; new bridge across the Otaki River, Otaki George Road underpass and Te Horo underpass.

An important consideration will be to ensure that the built or ‘urban’ form of the proposed expressway does not overwhelm the areas of rural landscape and consider integration or re-establishment of the existing contours, existing vegetation patterns, and landscape noise mitigation rather than noise walls. By containing the proposed expressway within the existing transportation corridor the potential landscape and visual effect on the broader landscape and community is lessened.

### Urban Form

Key issues are around community severance; connectivity across the expressway; effect on underlying urban form and land use patterns; and the impact on the existing State Highway 1. It is considered that the overall design outcome from the proposed alignment is neutral or positive. Existing corridor connections are retained, with one exceptions at Old Hautere Rd, and is enhanced in North Otaki with improved pedestrian and cycleway provision. This has a positive outcome on the potential for community severance and also maintains the current urban form.

Land use patterns are not overly disrupted as the new expressway alignment broadly follows the existing rail corridor on what is currently rural land.

## Stormwater, Erosion and Sediment Control

The stormwater effects on this project are primarily associated with: increased road connectivity (level of service) during major storm events, downstream flooding levels, sediment load increases, short term and long-term changes to the pollutant load in the road runoff and fish passage. Positive effects are anticipated in relation to road connectivity, as the expressway will be free from flooding in a 1% AEP storm event. Peak flow attenuation (such as attenuation swales and stormwater attenuation ponds) will mitigate downstream flooding and installation of erosion and sediment control measures will mitigate the effects of sediment runoff until the site is stabilised. Pollutant loads overall are expected to decrease as almost all road runoff from the expressway will go through formal treatment swales before being discharged to the receiving waterways. Culverts under the proposed expressway will be designed and constructed with fish passage in mind.

## Hydraulics / Hydrology

The existing SH1 has a history of being inundated by floodwaters every few years at a number of locations including the bridge over the Waitohu Stream immediately to the north of Otaki Township and the culvert system crossing the Mangaone Stream at Te Horo.

It is proposed to construct the expressway as a raised embankment across these floodplain areas and elevate it sufficiently so that it can act as a lifeline and to remain open in extreme flood conditions.

At all of the major floodplain crossings, either the existing North island Main Trunk railway line or State Highway 1 already cause upstream ponding to occur under significant flood conditions.

Having assess the effects of the proposed expressway on the existing flood hazard for each of the floodplain crossings it is considered that flood inundation levels downstream of the proposed expressway embankment will generally be no worse than the present situation, mitigated through the action of the expressway embankment as a flood detention barrier and culverts maintaining the continuity of existing natural drainage paths. The extent of upstream flood ponding induced by the embankment acting in this manner is limited by the relative steepness of each floodplain and mitigated by the fact that the land inundated is usually mainly pastoral land. The effect on any residential properties in upstream flood ponding zones is generally no worse than at present except in the case of the Mangapouri Stream when the Chrystall's Bend stopbank protecting Otaki Township is overtopped by an extreme flood in the Otaki River and the overflow spreads across the floodplain.

## Terrestrial Ecology

The existing environment has been highly modified however a number of areas of indigenous bush and wetland along the alignment of local and district ecological significance that will be impacted, specifically an indigenous bush area on the Steven's property (which contains a range of native trees including tawa, karaka and kohekohe) and Hautere Bush F (a totara-matai forest). A significant area of wetland adjacent to the railway in Otaki (listed as K134 in the KCDC Heritage Register) will be completely lost to the Project footprint.

Increasing protection of existing areas of bush by fencing and weed removal and/or planting additional areas of bush and establishing a new wetland or development of stormwater wetland ponds for treatment of road runoff in such a way that they provide wetland habitat for native flora and fauna could compensate for the areas lost.

While it is considered unlikely that other threatened native invertebrates, reptiles or amphibians, including long-tailed bats, native frogs and reptile species will be present due to their restricted distributions and niche habitat requirements, it is recommended that further assessment and investigation should be undertaken to confirm this aspect.

## Aquatic ecology

Fish and invertebrate communities were characterised in five of these seven waterways immediately upstream of SH1. A total of 9 fish species were found in the five waterways, eight of which were native, highlighting that catchments such as the Mangaone, Otaki and Waitohu support a significant diversity of native fish, especially in their upper reaches and also highlight the importance of small, ephemeral streams are significant as they represent important habitat for native fish.

Potential effects to freshwater ecosystems arising from the proposed road development are sediment effects, interruption of fish passage through bridges and / or culverts, interruption of aquatic insect passage through bridges and / or culverts, potential adverse effects from stormwater derived run-off; and loss of stream habitat through piping and culverting. Most of these effects are considered relatively minor, and provided that sound design and engineering practices (eg. provision of fish passage, riparian planting) are adopted, all can be avoided or mitigated.

## Heritage and Archaeology

Several recorded archaeological sites and built heritage resources will be physically impacted along with the potential for unrecorded archaeological sites to be impacted on, particularly within the area of Te Hapua Rd and the Waitohu Stream.

Overall the impact of the effects are generally considered to be low to medium, and with appropriate mitigation measures, such as archaeological monitoring and conservation architect advice in relation to moving the Otaki Railway and relocation of Te Horo (former) Station and workers cottage, it is considered that a number of positive outcomes for the community will result.

## Culture and Iwi

Three iwi are identified to host mana whenua and tangata whenua status; Ngati Te Atiawa, Ngati Raukawa and Ngati Muaupoko.

The Kapiti Coast has a wealth of cultural heritage. Within the area between Peka Peka and Pukehou Hill are recorded and iwi known historic sites and waahi tapu of significance.

The preferred option will result in both cultural and iwi impacts on recorded or known and potentially unknown sites of significance along the route. The impacts of the effects are considered to be low to medium. With continuing mitigation (eg. preparation of a Cultural Impact Assessment and Iwi Management Plan) and monitoring it is considered that a number of positive outcomes will perpetuate for iwi, tangata whenua and the Maori community.

## Social and Community

The Peka Peka to Otaki Expressway will have a number of social and community impacts across the project area. Overall, the impact of the effects will generally be low to medium, with a number of positive outcomes for the community, including grade separated crossings which should improve pedestrian safety, reduction in traffic and in vehicle speeds on the existing SH1 and improvement to the pedestrian and shopping atmosphere of the Otaki Railway Retail Precinct due to a reduction in through traffic.

A number of mitigation measures are proposed and some of these require consideration through the future detailed design phase.

## Business Viability

The Peka Peka to North Otaki Expressway Project will change how travellers on State Highway One access and use Otaki, Te Horo and other business locations in the study area. The Otaki Railway Retail Area (RRA) is expected to experience a Medium level of effects as a result of the Project, and be the most significantly affected retail area by virtue of currently relying on SH1 travellers for a significant proportion of its customers.

Otaki's Main Street Retail Area (MSRA) is expected to experience only a Low level of effects, a lower level than the RRA by virtue of the strong local role it plays.

Businesses at Te Horo are expected to experience a Medium to High degree of effects, while businesses further away from SH1, which are more likely to currently function as destinations, are likely to be less significantly affected by the Project.

It is very unlikely that the effects of the Project on study area businesses will be able to be avoided, although it is probable that they will be able to be mitigated. Mitigation measures (eg. signage) will need to inform potential visitors to Otaki/Te Horo about what is on offer in the area, and market that offer in a way that makes visitors want to come to Otaki rather than bypass the area on the expressway. Mitigation measures will need to be employed pro-actively to ensure that by the time the Project is completed, the Otaki economy is well positioned to deal with the potential effects it might create.

## Noise and Vibration

The number of Protected Premises and Facilities (PPFs) located within 200m of the alignment equals 164 houses and a number are already subject to high noise levels. However, in some locations there will be an appreciable increase in road traffic noise. Noise mitigation design options have been considered and an indicative noise mitigation solution includes 6.3km of open graded porous asphalt (PA-10) on the expressway and 114m length of 2 metre high noise barrier to six of t**he assessment areas identified.**

A preliminary assessment of rail noise and vibration has also been performed. The move results in 3 properties falling within the 80 metre buffer zone of the rail noise effects corridor but there are no properties within 40 metres of the relocated rail corridor where effects from rail vibration could occur.

Construction noise and vibration and road-traffic vibration have not been assessed at this stage, however is not considered that either issue will raise matters that are unique to this project.

With regard to road traffic vibration there are no PPFs immediately adjacent to the new road and vibration would be expected to be within reasonable limits.

## Air Quality

The ambient concentration of nitrogen dioxide (NO2), carbon monoxide (CO) and PM10 were assessed for the opening year (2016) and the design year (2026). The results indicated that a reduction in concentration can be expected between 2016 and 2026 due to the large decrease in vehicle emissions expected due to improvements in vehicle emission technologies.

Results of air dispersion modelling indicate that reductions in the concentration of vehicle air pollutants can be expected in the Township of Otaki along the existing SH and especially around the Mill Road/State Highway (SH) 1 intersection.

The settlement of Te Horo can also expect improvements in air quality, especially properties on the western side of SH1. Overall it is considered that the proposed alignment will improve air quality in the region for the long-term.

The primary air discharge from the construction of the expressway will be nuisance dust which could be in significant quantities if not appropriately controlled. Mitigation measures recommended include buffer areas, limiting areas of site which are opened up for construction, use of water tankers to dampen surfaces.

## Other Potential Impacts

Further assessment and investigations are also being undertaken to establish the extent of contaminated land within the corridor and how resource utilisation can be achieved in the most sustainable and cost effective manner for the project.

Further work in these areas and each of the specialist areas identified above will occur through the full AEE phase of the project in preparation of the application for RMA and HPT approvals associated with the project.

# 11 Cost Estimates

## 11.1 Methodology

The overall estimate approach and methodology is based on quantities derived from the Scheme Plans and specialist's knowledge of their relevant areas of expertise.

The rates used in developing the estimate have been based on:

- Historical information from projects of similar scope and scale;
- Opus database of recent projects within the Wellington Region;
- Engineering judgment and best practice engineering principals;
- First principle estimating; and
- Indicative Construction Programme durations.

The following exclusions apply to the estimate:

- GST;
- Escalation beyond the time the estimate was prepared, namely 2nd Quarter 2011;
- Sunk costs, includes those costs associated with 1998-2003 investigations and 2009 consultation. Project costs only include costs incurred after NZTA Board authority in 2009; and
- Operational and maintenance costs once the project is constructed.

## 11.2 Project Scheme Estimate

A summary and breakdown of the estimate has been included in Appendix J.

The estimates have been prepared and reviewed in accordance with NZTA's 'Cost Estimation Manual' (SM014).

A parallel estimate review has been completed by MacDonald International Ltd. In order to complete their review a schedule of quantities and relevant supporting information was passed over. At the end of the review a reconciliation of the two estimates was completed to ensure agreement between the two estimates.

MacDonald International Ltd's report is included in Appendix J.

## 11.3 Property Costs

Property estimates have been provided by NZTA. They allow for the Nett property cost, as defined in SM014, namely "The market value, at the base date, of any property purchased or required to be purchased for a project, less the market value of any surplus property i.e. Nett Property only includes the corridor required".

The costs include the assessed survey and legalisation costs, as well as the capital cost of the land. The proposed footprint of the route was provided to NZTA, including the area in each land parcel. This footprint was the area required to construct the route but the property costs supplied are the costs required to secure the footprint, i.e. in some instances, the purchase of the whole of a parcel of land has been considered necessary to obtain the land required to construct the route, as opposed to only acquiring the route footprint within the parcel. It also includes the value of land already acquired by NZTA for the project.

The cost of acquiring the extra corridor for future double tracking is not included in the cost estimates; however the design allows for this to occur in the future and the corridor width provided includes sufficient room for sub-grade and drainage provisions.

## 11.4 Base Estimates

Based on the previously noted assumptions and exclusions, the 'Scheme Estimate' (SE) (at Q2/11 values) for the scheme is:

| | |
|---|---|
| Project Base Estimate | $219.4M |
| Property<br>Investigation and Reporting<br>Design and Project Documentation<br>MSQA<br>Physical Works | $26.3M<br>$5.4M<br>$5.3M<br>$8.0M<br>$174.4M |

These estimates are exclusive of GST and escalation.

## 11.5 Risk Assessment

### Methodology

The risk assessment has been carried out in accordance with NZTA's 'Risk Management Process Manual' (AC/Man/1), using the Advanced Approach.

### Identification of Risks (threats and opportunities)

Two risk workshops have been held for the project, one during the Scoping phase and a second during the Scheme Assessment phase.

A risk workshop for the Scoping Stage of the project was held on the 8th of September 2010. The focus for the workshop was to first challenge and debate the identified risks and to ensure there was a clear understanding around the risk consequence and potential treatment, or avoidance options. This workshop was primarily focused on the qualitative risk assessment.

A second workshop during the Scheme Assessment stage of the project was held on the 31st of August 2011. The purpose of the second workshop was to identify risks which would specifically affect the Scheme Estimate and construction programme developed in conjunction with the Scheme Estimate. This workshop was primarily focused on the quantitative risk assessment.

The quantitative risk assessment has been used to derive the:

- Mean or Expected Estimate to determine the NZTA managed contingency; and
- 95%ile estimate to determine the appropriate funding risk.

## 11.6 Risk Analysis

The project risk register is attached in Appendix J. The qualitative assessment involved identification of risks and then categorising of the potential likelihood of occurrence and consequences. Likelihoods were ranked from 'rare' to 'likely', while consequences ranged from 'negligible' to 'substantial'. The qualitative analysis of the risks identified the risk level which is dependent on the likelihood and the potential consequences. Both opportunities and threats were identified in the same manner.

The quantitative risk analysis involved putting a cost against each of the identified risks, this cost was either in terms of a monetary cost as part of the scheme estimate or a time cost against the scheme estimate programme. Depending on whether the risk was an opportunity or a threat this cost was either negative or positive.

Based on the risk workshops a total of 70 risks have been identified as having a potential to impact the estimate or construction programme or both, of which (15) are opportunities. The number of risks in each category is summarised below:

- 8 Extreme (2 opportunities);
- 33 Very High (6 opportunities);
- 18 High (5 opportunities);
- 9 Moderate (1 opportunity);
- 1 Low; and
- 1 Negligible (1 opportunity).

The risk register and plan within Appendix J provides more detal on all these risks including proposed mitigation strategies.

## 11.7 Project Risk Analysis Outputs

### Risk Adjusted Construction Programme

In order to understand the potential out-turn cost of the project, specifically the construction element, we have prepared an indicative construction programme. Some of the risks identified above have an element of time impact either extending the duration of an activity or delaying the start or finish. As a point of added-value to our estimate and risk processes we have modelled these risks against our indicative construction programme to provide a risk adjusted outcome.

The risk adjusted construction programme demonstrates the following:

| | |
|---|---|
| Project Start Date | 1-10-2014 |
| Project Deterministic Finish Date<br>(i.e. the indicative construction programme finish date; model shows it has a 15% probability of being achieved). | 1-5-2018 |
| P50 Finish Date<br>P95 Finish Date | 1-8-2018<br>7-2-2019 |

### Risk Based Cost Estimate

We have undertaken a full risk analysis for the project. Our assessments within the risk analysis use professional judgment, knowledge and experience gained from previous projects and the project risk management process to estimate appropriate risk contingencies and to derive the Expected and 95th Percentile Estimates for the project. Our analysis is statistically based in so far as it does not take just one possible opinion of the out-turn cost, in the way risk assessment does, but models potential real-life scenarios (in this case 10,000 iterations) to produce a statistical model of probable out-turn costs.

In terms of out-turn costs for the project our work and analysis demonstrate the following results:

| | |
|---|---|
| Project Expected Estimate | $251.5M |
| Property<br>Investigation and Reporting<br>Design and Project Documentation<br>MSQA<br>Physical Works | $29.1M<br>$5.4M<br>$5.6M<br>$8.7M<br>$202.6M |

| | |
|---|---|
| Project P95 Estimate | $277.6M |

### Comment

The methodology used and inputs provided for developing both the programme and estimate have incorporated both positive and negative risks (i.e. opportunities and threats). These inputs have a real impact on the Expected Out-turn Cost and Construction Programme and as such enhancement and mitigation of risks is imperative in achieving a positive project result.

A lack of effective project risk management as the project proceeds will likely have a detrimental impact on the overall project delivery, programme and cost outcomes noted above.

## 11.8 Differences between Business Case and SE

A Feasibility Estimate (FE) was completed as part of the wider SH1 Strategy Study project during 2008/09. Given concerns around the reliability of escalated estimates of earlier scheme estimates (dating from 2003) a FE was compiled using parameter rates based on previous projects. The FE expected estimate was reported as $215m as at July 2009 in the NZTA business case. This is $36m less than the current $251M expected estimate from the Scheme Estimate (SE) at September 2011.

The 2009 feasibility estimate was undertaken using a parameter based estimating approach involving compilation of typical parameter rates for various items involved in the project. The parameter rates were based on a range of previous projects (separated into rural and urban) for lengths of highway and also for interchanges. The rates were deemed to be all inclusive. For example, the parameter rate developed for 1km of 4 lane expressway included earthworks, pavement and surfacing, drainage, landscaping, preliminary and general etc.

Such an approach does not take into account site specific finer detail given that it is purely based on projects which are of a similar nature and scale. Some of the projects used in developing the parameter rates included:

- Waiohine Bridge;
- Kapiti Western Link Road;
- Transmission Gully;
- Newlands Interchange;
- Kaitoke to Te Marua;
- SH2 Moonshine Hill to Silverstream;
- Ruby Bay Bypass;
- Rural Section (Plimmerton to Pukerua Bay);
- Mungavin Interchange; and
- Avalon Drive Bypass.

The uncertainty (risk) around the estimate was based on a general percentage contingency approach rather than specific risk quantification and analysis. This was considered consistent with the feasibility status and strategic wider corridor nature of the study, and is not inconsistent with SM014. The range of estimate assessed was $215 expected up to $355M at the 95th%ile.

An analysis of the scope evolution and estimates has been completed to ascertain where the key differences arise between the feasibility estimate and the scheme estimate. These are summarised below:

- Escalation of construction costs from July 2009 to September 2011 are approximately 5% or $11M (based on the latest indices), however, a lower rate has been applied of 3% or $7.5M;
- An increase in forecast property costs. $15.4M in the FE as opposed to $29M in the SE. This is due to changes in the areas required, and a better understanding of property accommodation and injurious affects costs;
- Increased understanding of rail requirements through Otaki, $6M in FE as opposed to $10M in the current SE;
- An increased allowance for local road and property access requirements, e.g. the 2009 scheme and FE provided no allowance for a Rahui Road Bridge, whereas approximately $5.2M is included within the current SE;

- A better understanding of the connectivity requirements. For example, a half diamond interchange has now been provided at South Otaki rather than a lower cost southbound onramp at County Road; and
- Increases in estimated fees and preliminary and general costs as the scope and size of the project increases, $6M.

Other items which have had an impact on the project estimate, which are more difficult to quantify include;

- A greater understanding of the bridging requirements, in particular at Mary Crest.
- A greater understanding of the ground conditions, in particular the extent of peat around North Otaki and Mary Crest.
- A greater understanding of flood requirements and what that means for the vertical alignment of the expressway.
- A detailed quantified risk assessment has now also been completed based on a far higher level of detail and knowledge, and using the advanced approach in accordance with SM014.

| Item | Value |
|---|---|
| Escalation | $7.5M |
| Property | $13.5M |
| Rail Relocation | $4.0M |
| Rahui Road | $5.0M |
| P&G | $6.0M |
| **Total** | **$36.0M** |

## 11.9 Value for Money Workshop

The VFM statement demonstrates how the scheme phase investigation and PP2O Expressway proposal aims to deliver the best value for money spent in terms of meeting the desired social and environmental outcomes while also delivering in terms of project objectives, quality, optimum whole of life, and operational/safety outcomes.

The current scheme proposal incorporates a total estimated base cost premium of approximately $6M, or approximately 3% (basic project estimate of $221M, and Scheme Estimate project base estimate of $220M) to deliver an enhanced project outcome that will meet the stated project objectives, deliver the appropriate level of urban design outcome, and provide an improved risk profile with respect to longer term performance and operation of the expressway.

The value for money workshop identified a number of areas where the project team has provided value added opportunities. The most significant of these opportunities relate to;

- A minimum sealed median width of 4m was possible, however in order to provide a better landscape outcome, not compromise sight lines around the 820m curves through Otaki/Mary Crest and avoid lane closures for maintenance a 6m median consisting of a 4m green strip and two 1m sealed shoulders was adopted at a cost premium of approximately $1M.
- The use of OGPA as a noise mitigation measure could be limited to areas of denser populations due to the relatively low BCR associated with its use. However, OGPA has been used as a noise mitigation measure outside of the densely populated areas at a cost premium of $1.1M.
- Additional urban design and architectural treatments have been employed at bridge structures to ensure that they fit well within the environments they are being placed at a cost premium of $4.1M.

Further discussion around value added opportunities is included in the Value for Money Statement in Appendix J. A life cycle analysis has been undertaken for the road pavements to further identify the value for money expected from the scheme proposals. A report on this assessment is included in Appendix I.

# 12 Economic Evaluation

## 12.1 Wellington Northern RoNS Economic Assessment

The economic analysis for the PP2O project has been considered as part of the wider Wellington Northern RoNS package for the purposes of NZTA's Scheme Assessment Report Addendum (SARA) requirements.

The business case for the Wellington Northern Corridor RoNS package was undertaken in late 2009. This evaluation involved the development of a methodology to capture the benefits of each individual RoNS project (including PP2O), which were then combined to provide an overall BCR for Wellington Northern Corridor RoNS package.

As a result of this analysis it was determined that the Wellington Northern RoNS package (as assessed in 2009) had a BCR of 1.4, if agglomeration benefits and wider economic benefits are included. In order to provide an Expressway from Levin to Wellington and to maximise the achievement of the RoNS the full Wellington Northern Corridor RoNS package of works is required.

## 12.2 Assessment Profile

The project has been assessed against the latest NZTA Planning Programming and Funding Manual (PPFM). A funding assessment profile of "HHL" has been determined for the project following an assessment of the relevant criteria in the PPFM:

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

The Wellington Northern corridor RoNS program (and therefore PP2O) is listed in the GPS as a Road of National Significance (RoNS). The project will provide a major contribution to national economic growth and productivity by improving travel time and reliability on a key freight route.

The project is therefore assessed as having a "High" strategic fit rating.

**Effectiveness of the proposed solution: High**

The project enables and supports a strategic component of the national transport system, and will help give effect to the GPS. In particular, the project will improve travel time, reliability and safety between the North Island and Wellington CBD, CentrePort and the Wellington Airport.

The project therefore has a "High" effectiveness fit rating.

**Economic Efficiency of the proposed solution: Low**

The BCR for the Wellington Northern RoNS project is estimated to be 1.4 if agglomeration and economic benefits are included. It is noted that projects with a BCR of less than 2 are automatically assigned an economic efficiency rating of Low. Accordingly, the project has a "Low" fit rating

# 13 LTMA and Regulatory Compliance

## 13.1 Overview

There is no existing designation under the Resource Management Act 1991 or any other existing statutory approvals for the proposed new Expressway. Accordingly, it is necessary to identify, apply for, and obtain all the required statutory approvals for the proposed new Expressway and associated works.

A "Statutory Approvals Strategy" has been prepared and approved by NZTA. It identifies the required statutory approvals to construct, use and maintain the Expressway and provides a strategy for obtaining the required approvals.

## 13.2 Approvals Required under the RMA 1991

Approvals required under the RMA include:

(a) A designation by NZTA of a new "State Highway 1" corridor shall be sought in the KCDC District Plan within which to construct, use and maintain the proposed Expressway, construct associated works and to accommodate environmental mitigation. The land designated will include any new district/local roads and other associated land where works are required by NZTA to facilitate the construction and operation of the Expressway. Once works for district/local roads are complete, NZTA's designation would be uplifted to enable control and management of the asset to be transferred to KCDC.

(b) The designation in the KCDC District Plan (D0101) over the existing section of SH1 between Peka Peka and Otaki will be uplifted once the Expressway has been constructed and is operational to enable control and management of the asset to be transferred to KCDC.

(c) A designation by NZ Railway Corporation (NZRC) shall be sought in the KCDC District Plan for additional areas required for a realignment of the North Island Main Trunk (NIMT) required to accommodate the Expressway. Once the realignment has been constructed and is operational, the existing rail designation (D0301) over any surplus areas will be uplifted.

(d) Regional Resource consents under the Greater Wellington Regional Plans associated with the construction of culverts, bridges, stream/drain diversions, discharges to water and land, and water takes for construction purposes shall be prepared and obtained to facilitate the construction, operation and maintenance of the Expressway and realigned railway. The specific river crossings are the Mangaone Stream and the Otaki River while there are also a number of smaller tributaries crossed.

(e) District Resource consent shall be sought to adjust the location of the Otaki Railway Station building which is a listed heritage building under the Kapiti Coast District Plan.

(f) An Outline plan process is also required.

All the above RMA approvals can either be lodged with the Environmental Protection Agency (EPA) for processing and determination by a Board of Inquiry (i.e. a one stage approval process), or lodged with the local consent authority (Kapiti Coast District Council) for determination and if subject to appeals, determined by the Environment Court (i.e. a two stage approval process).

Consistent with other proposed Wellington RoNS projects (i.e. the Mackays to Peka Peka Alliance Project) and other nationally significant NZTA projects (i.e. Waterview), NZTA has advised the EPA that it intends to utilise the "National Consenting Process". This will be for the Notices of Requirement for designations by NZTA and NZRC and the applications for resource consent for the main consents required i.e. any applications that will require public notification such as river crossings, adjustment to Otaki Railway Station etc.

The process for obtaining these approvals is following detail design and the development of mitigation measures, including assessment by the various technical specialists for the project, the notice of

requirements and resource consent applications are prepared. There is ongoing liaison with NZRC, Councils and the EPA throughout the application preparation process to ensure all matters required are covered and that all parties involved in the applications have a thorough understanding of the proposals prior to the formal application process commencing. Once lodged, liaison with the EPA will continue in relation to the notification, reporting and hearing processes.

The specific rule breaches that are likely to arise from the project are as follows:

**GWRC – Freshwater Plan**

- Rule 3 – Stormwater discharge from earthworks greater than 0.3ha in area (Controlled Activity)
- Rule 16 – Water Abstraction for de-watering / construction – if more than 20,000 litres per day and/or at a rate more than 2.5 litres per second (Discretionary Activity)
- Rule 16 – Minor diversion from intermittently flowing stream – if greater than 1.5m$^3$/sec (Discretionary Activity)
- Rule 16 – Diversion of groundwater if discharged to land (dewatering during construction) and results in flooding on neighbouring land (Discretionary Activity)
- Rule 49 – uses of river beds – (Discretionary Activity)
    - Culverts with an external diameter greater than 400mm in intermittently flowing watercourses,
    - Bridges over 6m in length;
    - River crossings / structures in watercourse;
    - Vegetation clearance in river margins; and
    - Gravel extraction for construction.

**GWRC – Soil Plan**

- Rule 1 - roading and tracking –(restricted discretionary activity)

**KCDC District Plan**

- Modification of an historic building (Discretionary Activity)

Following the obtaining of the statutory applications lodged with the EPA, after detailed design, and near the time of construction, the detailed non-notified applications for minor resource consents under Regional Plans will be prepared and lodged with the consent authority (GWRC). Outline plans will also be lodged at this time with KCDC.

## 13.3 Alteration to Railway Designation and Line

There has been consultation with NZRC/KiwiRail Ltd concerning alignment options for the new Expressway and NIMT in order to achieve an optimal outcome for both NZTA and NZRC/KiwiRail.

NZTA's preferred alignment for the Expressway will result in an improved (straighter) alignment of the railway line and the removal of existing level crossings thus improving rail efficiency and public safety. Accordingly, the proposal represents an integrated design solution that will enhance both the state highway and rail network.

There has also been consultation with NZRC/KiwiRail Ltd regarding mutual co-operation to obtain all the required statutory approvals for the integrated project. Given that the realignment of the NIMT is required by NZTA in order to accommodate the preferred alignment of the Expressway, all the reasonable costs associated with obtaining all the necessary statutory approvals for the integrated project will need to be met by NZTA.

A Heads of Agreement between NZTA and NZRC is being prepared that provides for mutual co-operation and support in relation to obtaining the required statutory approvals for the combined project. The agreement should also provide for the implementation of the agreed integrated design for the Expressway and realigned NIMT, and include matters such as land exchanges, communications, management of environmental mitigation, detail design, construction etc. This agreement is currently being negotiated between NZTA and NZRC representatives.

## 13.4 Assessment of Environmental Effects

At this stage it is envisaged that there will be one integrated and comprehensive Assessment of Environmental Effects Report (AEE) that will support all the applications to the EPA. The AEE will assess the positive and adverse effects of the designations and works and identify proposed environmental mitigation for the integrated project.

The benefit of a single AEE is that it is consistent with and reflects the integrated design solution for both road and rail and will assist with communicating this to the EPA.

The scope of the AEE has been subject to extensive review by the project team, NZTA National Office, NZTA's legal team and by NZTA's Planning Steering Group. It will be supported by comprehensive specialist assessments prepared by experts selected for their skill and expertise in assessing environmental effects and presenting evidence at Hearings. Currently there are 23 specialist assessments proposed covering the full range of potential environmental effects and statutory considerations.

All applications where NZRC/KiwiRail is the applicant (or joint applicant with NZTA) will be reviewed by and approved by NZRC/KiwiRail. Accordingly, a collaborative approach to preparing the applications is proposed.

Matters that need to be specifically included in the AEE are elements such as:

- positive effects arising from the project;
- flood management, knowing that Mangaone Stream has flood issues;
- an assessment of ecological effects;
- an assessment of effects of vegetation clearance, including around remnant bush areas;
- cultural effects in light of the various historical and culturally relevant areas through which the project passes;
- social effects and the consequential effects on community and business elements; and
- mitigation measures employed to ensure that adverse environmental effects are avoided, remedied or mitigated

## 13.5 Assessment of Alternative Routes

NZTA is required by s171 of the RMA to demonstrate that it has given adequate consideration to alternative routes for the proposed Expressway.

Because the investigations of alternative routes have occurred over at least the last decade and are contained in various TNZ/NZTA reports and publications, a fresh route options assessment report is being been prepared and updated by a suitably qualified and experienced expert.

## 13.6 Width of Designation

NZTA's designation needs to be sufficiently wide to include all the land that is required for the construction, operation and maintenance of the proposed Expressway.

This includes:

- Any temporary construction areas.
- Land upon which NZTA propose to build local purpose roads associated with the Expressway proposal.
- Land upon which environmental mitigation works are proposed.
  - The desigantion plans submitted with the application will need to be sufficient to ensure that these areas are shown within the area to be designated.

## 13.7 Uplifting of Designation

Once the Expressway has been constructed and is operational, it is envisaged that NZTA's designation of some of the land may be uplifted. This is envisaged to include:

- Construction areas no longer required for this activity.
- Local purpose roads once constructed by NZTA.
- The existing State Highway which will no longer be required for this purpose.
  - To uplift a designation, notice of uplifting needs to be lodged with KCDC who is then required to proceed to remove the designation from its District Plan.

## 13.8 LTMA 2003

The Peka Peka to Otaki Expressway project has been assessed against the five key objectives of the LTMA as follows:

**Assisting Economic Development**

The project will support national and regional economic development by ensuring improved connectivity between the North Island and Wellington CBD and CentrePort. The project will also provide opportunities for further industrial and commercial development in the Riverbank Road area and further south associated with Waikanae North and the Paraparaumu Airport Development.

**Assisting Safety and Security**

The project will reduce the number of crashes at a number of intersections and access-ways along the existing SH1 route by relocating trips onto the Expressway. The project will result in reduced traffic volumes on the existing SH1 route through Otaki and Te Horo which will greatly improved amenity and make it safer for pedestrians and cyclists on this corridor. The project also removes 5 at grade rail crossings which are considered a safety risk for KiwiRail, vehicles and non motorised users.

**Improving Access and Mobility**

The project reduces community severance through Otaki and Te Horo by reducing traffic flow on the existing SH1 route and providing grade separated linkages across the corridor for both vehicles and active modes.

**Environmental Sustainability**

The project aims to utilise local resources such as aggregate from the Otaki River that requires extraction for flood mitigation purposes. The project also seeks to enhance active mode travel along the corridor and improve access to the railway station.

**Protecting and Promoting Public Health**

The project will result in a net improvement in air quality within the wider transport network due to the redistribution of traffic from the urban area in Otaki to the Expressway

The project promotes public health through increased walking and cycling resulting from the improved amenity on the existing SH1 corridor and the provision of high quality active mode paths along the existing SH1 corridor.

## 13.9 Approvals Required under the Historic Places Act 1993

Archaeological sites are broadly defined by the HPA to include resources associated with pre-1900 human activity. It is therefore likely that archaeological resources may be encountered during earthworks for the project.

The Otaki Railway Station building itself is not pre-1900, being opened in February 1911, however it is located on a site occupied by a railway station since 1889 and therefore an archaeological approval is required for the works that disturb the site.

The existing building is a Category II listed building under the Historic Places Act; however as a Category II listing, the modifications to the building do not require approval under the HPA. Consultation with HP Trust will be required as part of the resource consent under the District Plan. There are other sites in the wider project area that also have archaeological and heritage values. There are also some areas that are considered to be 'high risk' that require consideration through the HPA process.

Applications under the HPA will therefore be required to be prepared, lodged with, and determined by the NZ Historic Places Trust. The HPA does not enable such applications to be lodged with the EPA for processing and determination by a Board of Inquiry.

The applications will be supported by a comprehensive and robust environmental effects assessment prepared by a suitably qualified and experienced archaeologist in relation to the disturbance works arising from the project, and in relation to the relocation of the Otaki Railway Station, a heritage building architect, noting that this technically doesn't require approval, however is included for completeness.

It is envisaged (subject to landowner consents) that the applications for HPA authority will be prepared, lodged and approvals obtained in advance of, or at the same time as, the RMA applications lodged with the EPA. An advantage of this proposed timing is that the Board of Inquiry can then be satisfied that the required approvals under the HPA have been obtained and thus archaeological resources are being appropriately managed and safeguarded.

## 13.10 Maori Land Court Process

In order for NZTA to acquire property held in a Maori Land Title, for the Expressway, there is a structured process that needs to be followed through the Maori Land Court.

In order for NZTA to be able to acquire the Maori freehold land under a s17 Public Works Act (PWA) agreement, NZTA is required to alienate the property pursuant to Te Ture Whenua Maori. There are a number of judicial procedural requirements which need to be addressed before NZTA will be in a position to acquire under the PWA. As the governance structures are mixed and varying, from common law ownership, to Ahu Whenua Trusts, the mix of judicial orders sought will be again varied. This is by virtue of the land tenure.

For this project there are five parcels subject to the Maori Land Court process. Each one, and the current status of these in the process, is outlined below.

## The Land

| Peka Peka to Otaki | | | | |
|---|---|---|---|---|
| **Blocks** | **Trust/Management Structure** | **Owners** | **Block Area** | **Area of Interest** |
| Ngakaroro 1A No. 6C Block<br><br>CFR WN233/125 | Puti-Winiata Whanau Ahu Whenua Trust. Trustees are:<br><br>Jim Winiata<br>Kimioranga Kohika<br>Maunganui Te Whata Puti<br><br>Trust Order is dated 19 August 2004 at 144 Aotea MB 72-73 | 10 beneficial owners | 27.5388 ha | Approx. half of the interest to be acquired. |
| Ngakaroro 3D Sec 1 Sub 5B No 2<br><br>CFR 433357 | No trust, no lease | 203 beneficial owners | 3.1090 ha | Recommend whole block be acquired |
| Part Pukehou 5L3B Block and Part Lot 2 Deposited Plan 7971<br><br>CFR WN44A/704 | No ahu whenua trust. The two beneficial owners are (equally):<br><br>D H McLaren as Trustee of the estate of Tungia Kaihau, deceased<br>Te Pupuri Whenua Trust O Puke Te Ao Whanau Trust: Trustees are:<br>Grace Moetu Taua<br>Hema (Boxon) Wara<br>Raukawa Te Ao<br>Timi (Tahapeehi) Te Ao<br>Tumohe Malcolm Wara<br>Wayne Te Rawhiti Cooper<br><br>Trust order is dated 1 May 2008 at 130 Waikato MB 220-238 | 2 owners | 13.9660 ha | Significant partial interest to be acquired |
| Part Pukehou 5L2A Block and Part Lot 2 Deposited Plan 7971<br><br>CFR WN27C/701 | Te Pupuri Whenua Trust O Puke Te Ao Whanau Trust (shown as owner in block No 7 above) | Solely owned by whanau trust | 28.6783 ha | Significant partial interest to be acquired |
| Lot 1 DP 28990 - formerly Te Moutere 1 (Hanganoaiho)<br><br>CFR WN34D/539 | Te Pupuri Whenua Trust O Puke Te Ao Whanau Trust (shown as owner in block No 7 above) | Solely owned by whanau trust | 1.5150 ha | Partial interest to be acquired, not extensive at this time. |

## Process to Date

NZTA attended a judicial conference in the Aotea Maori Land Court on the 28th of June 2011. Applications are soon to be filed with the Court for the lands affected by the proposed Expressway. Amongst other things the judicial conference discussed the nature of the applications to be filed at the Court, the timelines taking

into account the nine separate files across the two separate projects (M2PP and PP2O), and the Court's procedural requirements and NZTA duty of consultation.

The duty of consultation is not related to Section 6(e) RMA consultation but is more directed at procedural directions under Part 9 of the Te Ture Whenua Act in regards to appropriate notice to affected owners. The Court drew a distinction between the rights of the affected owners and the interests of anyone else that might have an affected party view under s6(e) of the RMA. To that end, it was noted to the Court that s6(e) affected party consultation has been undertaken with Nga Hapu o Otaki and that they are part of the wider consultation process.

Moving forward the Court is to provide procedural directions at its earliest convenience in relation to Part 9 assembled meeting of owners. This will be undertaken with Court registrars and case managers, as the case may be. Directions were provided by the Court in mid September 2011 and these are currently being progressed through.

Where appropriate governance structures are already in place, Opus is already commencing the prescriptive orders and consultation process to present applications to the Court to:

(a) acquire applications for alienation of the said Maori freehold land;

(b) acquire status orders changing the land from Maori Freehold to general land owned by Maori.

This will provide for the Crown to then acquire an interest either in full or partial in the land by way of transfer under s17 PWA. To support these there are other incidental orders and tasks required which are occurring in parallel.

Through the process of addressing the Maori Land Court requirements, Opus is required to provide memorandums of Counsel to the Court at regular intervals informing the Court as to progress and any issues as they arise before proceeding are finalised and advertised.

## Timeline

The process to undertake these transactions is estimated on a best case scenario to be something in the order of 12 to 18 months. The worst case scenario time wise could be up to 24 months.

## Challenges

Across the five separate case files for PP2O the affected owners are represented in 3 out of the 5 blocks only. Of those 3 blocks, there is a single legal entity and they retained independent legal advice. Of the other 2 blocks before the Court, 1 block has no governance arrangements in place and there are 203 individual owners of that property. Opus and NZTA have requested that the Court appoint an agent to act for and on behalf of those owners and that the Court consolidates that parcel of land into an Ahu Whenua Trust in order for the Crown to have the appropriate mandated person to negotiate an outcome with. The last block of owners is represented by trustees of whom there 10 beneficial owners only and consultation is underway with these owners and trustees.

As the Court is a Court of native title, the Court has signaled that a thorough consultation process with owners of the individual blocks, together or separately, must be undertaken. The issues or concerns will then be identified and isolated and ring fenced. Those issues should then be discussed through with NZTA, the owners and their advisers to see if some resolution is possible. Failing that, then those other matters need to be separated out and bought to the court for determination. This is an issue that has risks associated with that require ongoing management through the property process.

## 13.11 Conclusions

The statutory approvals required for the project have been appropriately identified.

A comprehensive and robust strategy is in place to secure all the required approvals and to effectively manage NZTA's risks.

# 14 Conclusions and Recommendations

## 14.1 Conclusions

This investigation has built on NZTA's earlier SAR investigations in 2002/03 and an earlier Board decision that identified a preference for the Eastern Improved corridor for this section of the RoNS expressway. The NZTA Board, at its December 2009 meeting to select the preferred option, requested that the following issues are further investigated as the project develops, prior to a final NZTA Board decision at the end of this SARA investigation phase:

- The form and location of the interchanges providing access to Otaki and Te Horo are reviewed, in light of the submissions received in the October 2009 public engagement;
- The requirement for signage to indicate destinations off of the State Highway is reviewed (at the scoping stage this has focused on route and access legibility);
- The design should allow for future double tracking of the North Island Main Trunk Railway line through Otaki;
- The alignment is reassessed against current planning requirements prior to preparation the of Notice of Requirement applications; and
- The NZTA should work with Kapiti Coast District Council, the Otaki Community Board and the community in general, with a view to integrating the expressway with the proposals set out in the Otaki Community Vision document.

A structured series of issues identification, and option development meetings and workshops were held with key technical stakeholders to ensure that the options identified responded to the key issues and outcomes sought (including the above NZTA Board directive and project objectives). Key issues and urban design opportunities have been informed by the development of an Urban and Landscape Design Framework (ULDF). Following an initial scoping phase in late 2010 a shortlist of interchange and cross-corridor connection options were taken to public consultation with the feedback received confirming strong support for the preferred half interchanges to the north and south of Otaki.

Further option development and assessment has taken place during the scheme phase to address key issues from the 2011 consultation feedback which has included the following:

- A strong stakeholder and community desire for maintaining two East-West connections at Otaki – this has resulted in further investigation of options and recommendation of retaining a vehicular link at Rahui Road via a new local road bridge (this is also economically justified with an incremental BCR of 3.5 over a pedestrian only bridge);
- A desire to retain connectivity to Old Hautere Road, rather than provide a cul-de-sac – this has resulted in provision of an at-grade link road (with walking/cycle path) back to the South Otaki Interchange (this is economically justified with an incremental BCR of 1.3 over a cul-de-sac);
- A strong community and stakeholder preference for a local road connection at Te Horo that crosses north of Te Horo Beach Road – This proposal has been recommended based on the fact that it has strong local and stakeholder support, reduced impact on residential dwellings, and shifts the grade separated structure to the north of the main settlement. This decision is relatively cost neutral and concerns surrounding flood management issues can be addressed; and
- Concerns raised relating to newly identified significant ecological sites at Mary Crest – this has resulted in further investigation of alternative options and recommendation of an improved western alignment that avoids the direct bush remnant impacts and seeks to minimise impacts on the existing dunescape and areas of potential cultural value.

Completion of the I&R scoping and scheme investigation phase has identified and recommended interchange and cross corridor connection options that will meet the project objectives for the NZTA Board preferred expressway corridor, and with appropriate treatment, can achieve integration with KCDC's Otaki vision. The way in which the recommended scheme addresses the project objectives and NZTA Board's directive is summarised in the following table.

**Table 14-1: Achievements against Project and NZTA Objectives**

| Objectives: | Current SARA Proposal: |
|---|---|
| **NZTA Board 2009 Directive:** | |
| Review of interchange locations in light of 2009 consultation feedback. | Half interchange provided to north and south of Otaki giving improved and intuitive connectivity outcome. This limits the impact on existing local roads, such as County Road, through the design of effective and efficient on and off ramps for the expressway.<br><br>Maintaining a road bridge connection across Rahui Road. |
| Review requirement for destination signage. | Primary focus has been on an intuitive interchange arrangement. Concept guide signage proposals developed. |
| Allow for future rail double tracking. | Double track provision catered for within proposed footprint, including future station duplication. |
| Reassess alignment against current planning requirements. | Further assessment completed with wider corridor alternatives re-assessed and refinements made at Mary Crest to improve cultural, heritage, ecological, resource utilisation and cost outcomes. |
| Work with KCDC and the OCB with a view to integrate the expressway with proposals set out in the Otaki Vision Document | Urban and landscape design proposals developed to integrate with Otaki Vision document, including extensive stakeholder input. |
| **Project Objectives:** | |
| To build a modern, high standard four-lane highway between Peka Peka Rd and Taylor's Rd bypassing Otaki Village, and including a new four lane bridge over the Otaki River | 4-lane expressway consistent with the current RoNS and Austroads Guidelines. Median width reduced to 6m (inclusive of median shoulders) to deliver efficiencies whilst recognising predominantly rural context. |
| To provide high quality connections to the realigned SH1 at Otaki Village and maintain connections to local roads at Otaki Gorge, Te Horo and Gear Rd/School Rd | Enhanced connectivity proposal with support from key stakeholders, including half interchanges to the north and south of Otaki and local road connections at Rahui and Te Horo Beach Road. An at-grade link is proposed to retain connectivity at Old Hautere Rd. |
| To provide a reliable and resilient route offering superior ride comfort, convenience and journey time savings | Lifelines approach adopted for flood and earthquake mitigation.<br><br>Whole of lifecycle analysis adopted for ground improvement and pavement selection to ensure reduced risk relating to settlement or rutting type failures. |
| Contribute to the economic growth and productivity and significantly improve transport links to the lower North Island | Consistent with the overall RoNS strategy with consideration to the Otaki area as a growth node and development opportunities associated with the Clean Tech Riverside Park. |
| To enhance the urban and rural landscape where practicable using urban design principles and environmental best practice | ULDF and landscape proposals developed for the scheme in conjunction with NZTA, Otaki Vision, district plan, stakeholders, and liaison with adjacent RoNS project teams. |
| To mitigate where practicable the social and environmental impact of construction | Key focus to-date has been on social and community connectedness together with development of environmental mitigation proposals. Being further developed as part of the AEE process. |
| To provide connectivity to local road networks and provide a safe experience for vulnerable road users e.g. cyclists and walkers | Connectivity demands identified through the ULDF process and stakeholder/community liaison. Connectivity has been addressed through the appropriate provision of connections and linkages across and beside the expressway.<br><br>A potential off-road walking/cycling path within the existing SH1 corridor can provide for vulnerable users, while commuter/road cyclists can utilise road shoulder provision. |

| | |
|---|---|
| To ensure efficient, local and stage-able interfaces with the adjacent RoNS projects to the North and South | Refined tie-in to the existing SH1 just north of Taylors Road with removal of passing lanes immediately to the north and improvement to vertical sight lines. This tie-in location provides maximum flexibility for the expressway extension being considered by the Otaki to Levin project. This also provides for an interim wire rope barrier project to be implemented through to Pukehou Rail Bridge in the north.<br><br>Sequencing assumes that the M2PP project will be constructed prior to the PP2O Project and that the PP2O project will interface with the M2PP Peka Peka interchange. |
| **NZTA Statement of Intent 2011-2014, Strategic Priorities:** | |
| Planning for and Delivering Roads of National Significnace | Achievement of further project milestones by completion of the Scheme Assessment to maintain the programme for delivery to the statement intent target of undertaking a tender process for PP2O in 2013/14. |
| Improving the Road Safety System | The PP2O expressway will be designed to the RoNS and Austroads Guidelines providing a signifcantly improved safety outcome for users. A reduction of traffic volumes on local roads provides the opportunity for improvements in safety for local journeys and for non-motorised users. |
| Improve Customer Service and Reduce Compliance Costs | The PP2O project continues to be developed to provide a facility that will provide users with outstanding service while being delivered against a focus on value for money. |
| Improving the Effectiveness of Public Transport | Public transport using the new local arterial (formerly SH1) will benefit from a 50% reduction in traffic volumes, enabling improved efficiency. The project will future-proof the NIMT rail corridor for future development if required. |
| Improving the Efficiency of Freight Movements | PP2O project will deliver journey time savings of over 3 minutes for freight movements on the expressway through the project area. The project will also provide relief from the severe congestion around Otaki during peak periods, at weekends and over public holidays. |

## 14.2 Recommendations

It is recommended that the following options are adopted as the scheme proposal for the PP2O project:

### Expressway Interchange Connectivity:

- Adopt half interchanges to the north (north facing access) and south of Otaki (south facing access) to enable intuitive and efficient access to and from Otaki in either direction of travel. This will minimise travel time and distances for road users wishing to stop at Otaki (to take advantage of facilities this destination has to offer) while travelling through the area on SH1;
- Provide no direct connection at Te Horo in line with stakeholder desires to manage growth pressures at this location and focus these at Otaki;
- Continue to liaise with the M2PP project team as further consideration is given to future proofing for a northbound (NB) off-ramp access at the Peka Peka interchange as part of the M2PP Project. As noted above, no NB off-ramp access is recommended for Te Horo in the vicinity of Te Hapua Road.

### Interchanges:

- Option NO02 (Proposal A in the 2011 brochure) is adopted at North Otaki; and
- Option OG07 (Proposal A in the 2011 brochure) is adopted at South Otaki.

## Cross-corridor connections:

- Rahui Road Option EW2 (a Road Bridge) is adopted at Rahui Road to maintain two east-west linkages within Otaki;
- Old Hautere Road Option OH3 (an at-grade link to Otaki Gorge Road) is adopted to maintain connectivity to Old Hautere Rd, in conjunction with an adjacent walking/cycling path; and
- Te Horo Option TH01 (Proposal B in the 2011 brochure) is adopted at Te Horo.

## Alignment Improvement:

- Mary Crest Option West2 is adopted to avoid significant ecological bush remnants yet retain the alignment as close as practicably to the Board Preferred corridor;

## Existing SH1 and Walking/cycling:

- Provide for walking and cycling provision across all local road bridges;
- Allow for an off-road parallel walking and cycling path (with berm provision for equestrian use) along the existing SH1 as part of the revocation package of works;

Figure 14-1 below illustrates the proposed scheme:

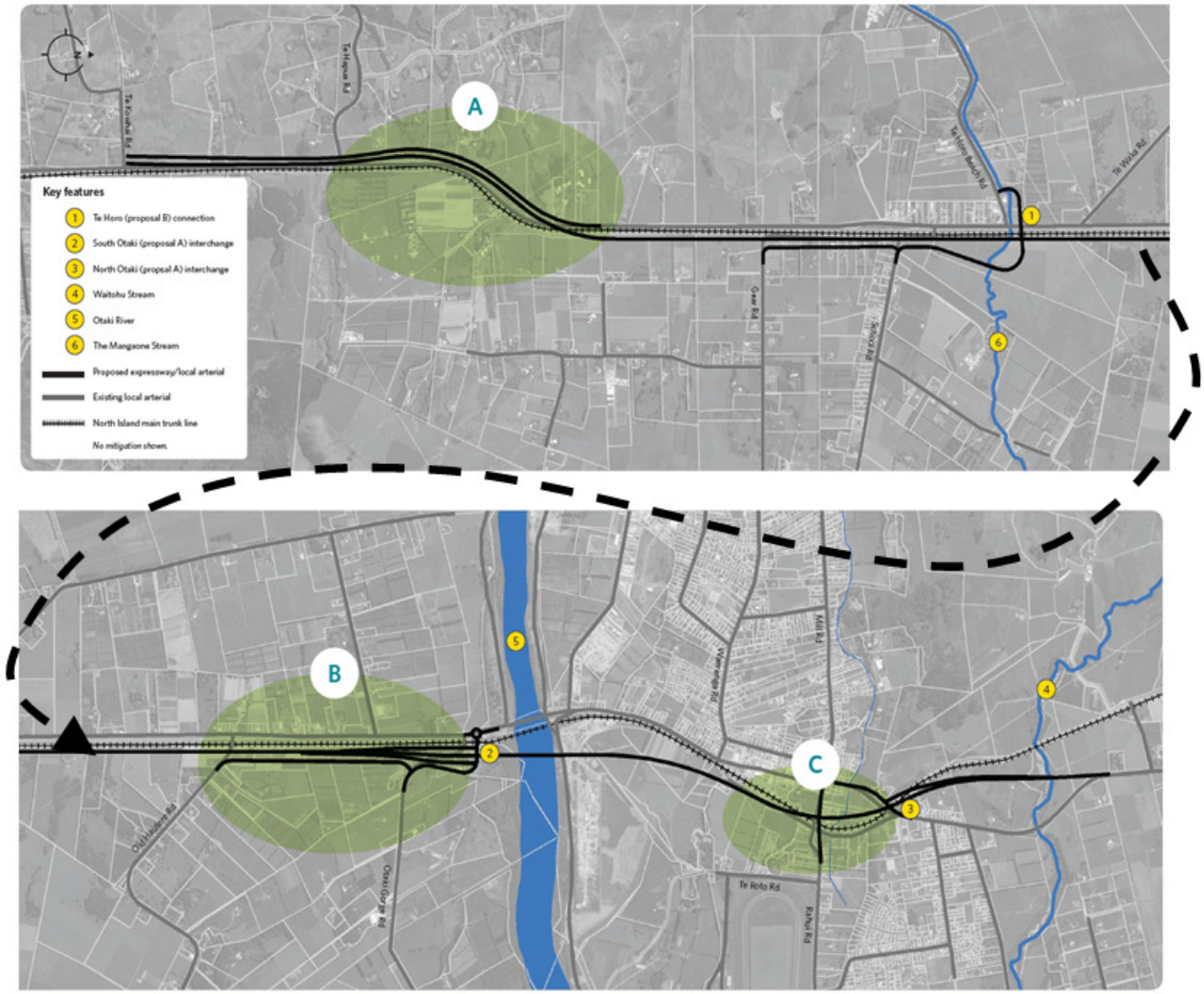



**Figure 14-1: Preferred Scheme**

Prior to lodgement of statutory applications with the EPA it is recommended that the following actions/issues should be considered further to provide input into the preliminary design and AEE phase:

- Take the refined options and decisions back to the public in a newsletter to confirm the decisions made;
- Undertake specific landowner consultation to finalise specific private property access arrangements;
- Progress further environmental and social/cultural assessments (including a CIA) to develop a comprehensive AEE and further inform the development of mitigation measures, and the preliminary design prior to lodging an application with the EPA;
- Complete the stage 3 Road Safety Audit process and follow up considerations;
- Further stakeholder liaison as mitigation options and proposals are refined;
- Further development of an integrated transport model that addresses identified growth scenarios, and provides a consistent data set for presentation to the EPA;
- Undertake further liaison with the Wellington Airport to Levin SH1 Corridor Strategy Project team (commissioned September 2011) to ensure that RoNS wide strategies for HCV refuelling, rest, and inspection (CVIU) areas, are captured and any effects recognised within the project footprint;
- Development of a service level agreement with KiwiRail to clearly capture agreed planning strategies, standards (as documented in the Rail Basis of Design document) and scopes of work;
- Undertake continued liaison with both the adjacent M2PP and O2NL projects to ensure consistency and interface issues are addressed moving forward; and
- Undertake further geotechnical investigation at key structure locations as part of the later specimen design stage to better refine uncertainty/risk around ground conditions.